PART I

Operations, Systems, and Financial Management

Part I of this text provides the reader with a foundation of operations management and explains its role in improving health care's financial and business condition. Health care activities and processes are complex. To perform optimally, they must be managed as a system. Operations and systems management requires knowledge of process improvement, quality, finance, and many other business practices. As a service industry, financial outcomes are driven primarily by labor and supply costs, so an understanding of the income statement and the use of key ratios to manage these areas is provided. Understanding the concepts of operations management, and its relationship to financial margins, is also explored.

Chapter 1 offers an overview of the discipline of operations and systems management and that of management in general. Goals of operations management, from cost reduction to network optimization, are described, as well as the key functions and roles performed by operations managers. This chapter sets the stage for the rest of the text.

Chapter 2 provides an introduction to the health care marketplace. Because health care organizations are businesses, they must generate revenues and sustain themselves financially, as organizations do in other industries. This chapter defines the hospital and health care organization and discusses the nature of its

goods and services. This chapter provides an overview of some of the significant health policies that affect patient operations, including the Affordable Care Act. The concept of health care production, distinct from operations, is also explored.

Chapter 3 provides a structured introduction to health care finance for the operations manager. An understanding of the drivers of improved financial performance is essential to effective operations management. This chapter addresses how hospitals earn revenue, and it defines the basic terms used in health care finance. Of great importance, it explains the key external financial statements that represent the financial condition of the organization, which are used as data sources for a variety of operational analyses in this text.

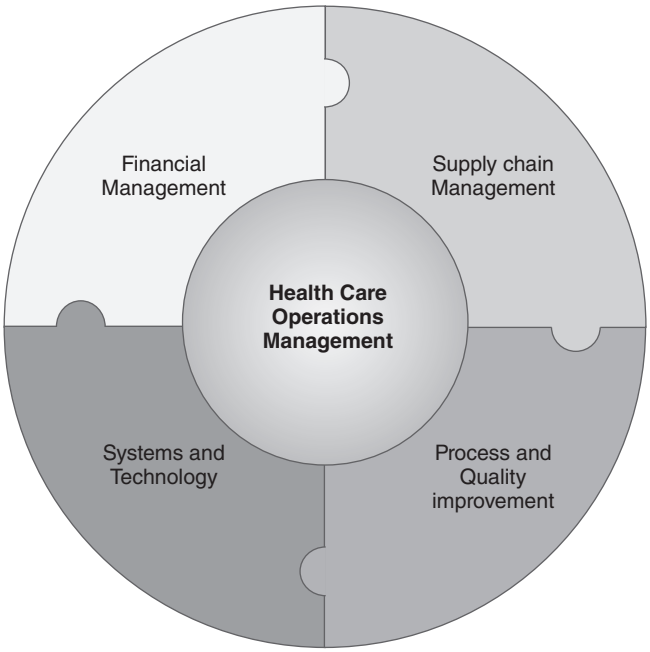

FIGURE P1–1 Operations Management in Health Care

CHAPTER 1

Health Care Operations and Systems Management

GOALS OF THIS CHAPTER

1. Describe the need for improved decisions and management systems.
2. Define health care operations management.
3. Describe the roles and responsibilities of health care operations managers.
4. Examine the management decision-making process.
5. Understand the goals of operations management.
6. Describe the management discipline and where operations management fits.

Health care operations management is a discipline that integrates scientific principles of management to determine the most efficient and optimal methods to support patient care delivery. Today, most hospital positions are roles that involve the coordination and execution of operations. This chapter provides the rationale for operations management and describes its evolving role in helping hospitals become more competitive.

THE ROLE OF HEALTH CARE OPERATIONS MANAGEMENT

Health care operations is about management of interconnected processes, or systems. A **system** is a set of connected parts that fit together to achieve a purpose.

Health care operations and systems management is the set of diverse and interrelated activities that allow for diagnosis, treatment, payment, and administrative management in health care facilities.

Most hospitals are nonprofit in nature. Nearly 80% of hospitals are considered nonprofit and exist solely to serve the community in which they operate, down from 85% a few years ago. As nonprofits, these organizations are exempt from most federal and state taxation and are not expected to show continuous positive growth rates or large profit margins, as most publicly traded firms do. However, if a hospital or health care organization cannot show some return on the capital or dollars invested, there will be negative consequences. For example, failure to show reasonable margins will likely cause the public bond market (which finances most health care growth today) to assign subpar credit ratings; therefore, the bonds themselves will have poor yields, making hospitals less than stellar investments for bondholders.

Most important, the term *limited profit margins* implies that there will be fewer dollars to invest back into the business to ensure that buildings are updated, equipment is replaced and technology is modern, and clinical programs will continue to expand and be enhanced. Without these investments, hospitals will likely be unable to attract the most qualified physicians and administrators, which will continue the downward spiral. While some hospitals and health care systems wait for changes in the public health policy to save them, the more competitive and successful hospitals are acting now to protect their margins.

In this era of continual pricing pressures affecting the top line of the income statement, and with a large majority of all hospitals reporting negative profit margins, it is essential that hospitals begin to look toward more sophisticated business strategies to succeed. Differentiated marketing programs and strategies, broader use of advertising, and more careful and precise long-term planning about service lines are all strategies that must be utilized (Rovin, 2001).

Equally as important, there must be a broader adoption of operations management techniques into hospital business affairs. Monitoring and maximizing labor productivity for all medical support and allied health professionals is critical to maintaining salary expenses. Incorporating queuing theory and scheduling optimization methods helps drive waste and cycle time out of hospitals. Incorporating logistical and supply chain management techniques helps reduce operational expenses, eliminate excess safety stocks, and generally improve working capital management. Most important, using technology to further automate and streamline all processes in hospital operations can help reduce costs and maximize efficiencies.

Hospitals and other health care organizations cannot rely on extrinsic factors (such as health policy, federal payer regulation changes, or shifts in managed care market structures) to change their margin potential. Although these are important issues, they are covered in other texts and will evolve regardless of the managerial behavior that hospitals employ. However, equally significant to these macro-level issues are the micro-economic and organization factors that can be affected by operations and logistics management. Operations management can help organizations today.

Think of health care profit margins as a balloon, where a variety of extrinsic, or external, factors cause deflationary pressure from the outside. On the inside is the set of decisions and management systems put in place to combat these pressures and essentially inflate the balloon, or expand the margin. In effect, operations management is the set of intrinsic, or internal, processes and decisions that help address costs, process, technology, and productivity. Strategic management, although equally important, is not a focus of this text. **Figure 1–1** shows conceptually the margin-expansion role that operations management plays.

Health care is primarily a service sector, in that the industry provides intangible or nonphysical "goods," as opposed to physical objects that can be seen or touched. Hospital services primarily deliver care through providers to patients and therefore lack a manufacturing or assembling process. These services are unique and somewhat differentiated from other hospitals, knowledge based, and have high levels of customer interaction. Of course, there is a physical good that

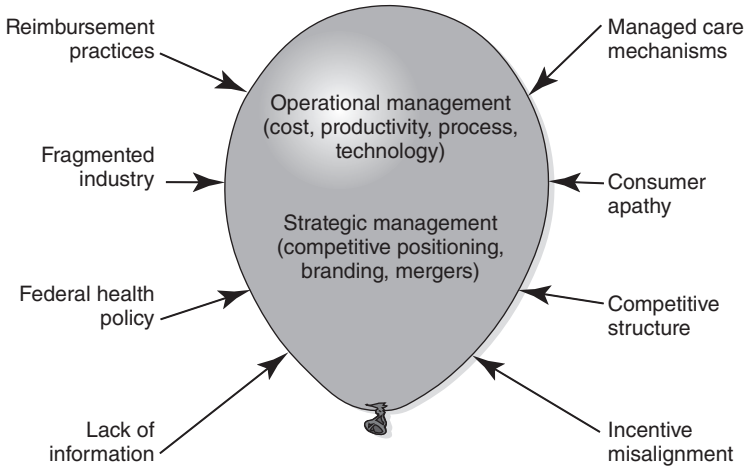

FIGURE 1–1 Operations Management Counters the Extrinsic Pressures Deflating Health Care Margins

accompanies the service, which is the focus of supply chain management in hospitals that procures, replenishes, and stores medical supplies and pharmaceuticals as well. In this regard, hospitals have a mix of both tangible and intangible characteristics. All of these attributes make health care operations management somewhat different from industries that strictly produce and market physical goods or widgets.

Health care operations management can therefore be defined as the quantitative management of the supporting business systems and processes that transform resources (inputs) into health care services (outputs). Inputs are defined as resources and assets such as labor and capital, including cash, technology, personnel, space, equipment, and information. Outputs include the actual production and delivery of health care services. Quantitative management implies a heavy use of analytical and optimization tools, as well as extensive use of process and quality improvement techniques to drive improved results.

Health care operations management is a discipline of management that integrates scientific or quantitative principles to determine the most efficient and optimal methods to support patient care delivery. This field is relatively new to health care, but it has existed in other industries for nearly 100 years.

KEY FUNCTIONS OF HEALTH CARE OPERATIONS MANAGEMENT

The scope of health care operations management includes all functions related to the management systems and business processes underlying clinical care. This includes extensive focus on the following: workflow, physical layout, capacity design, physical network optimization, staffing levels, productivity management, supply chain and logistics management, quality management, and process engineering. **Table 1–1** summarizes these key functions and illustrates some of the critical issues and questions that must be addressed for the health care enterprise.

Health care operations management includes all of these business functions and provides job opportunities for those with titles such as administrator, scheduling manager, operations supervisor, vice president of support services, quality manager, operations analyst, director of patient transportation, procurement manager, management engineer, inventory analyst, facilities manager, supply chain consultant, and so on. Nurses, technicians, and other health providers also play a key role in managing service operations. Operational management positions in hospitals will continue to grow as the need for increased cost efficiency and accountability rises.

Table 1–1 Key Functions and Issues in Health Care Operations Management

Operations Management Function	Objective or Issue to Consider
Workflow process	• Are there too many departments or people performing the same task? • Do we have an end-to-end map of our major business processes? • How many manual processes exist? • Are there ways to reduce cycle time, steps, and choke points for key processes? • Can we improve speed and patient satisfaction?
Physical layout	• Are our facilities designed with the consideration of speed, capacity, traffic flow, and operational efficiency? • Are unit or floor layouts designed to eliminate redundancy (e.g., safety stock on all resources)?
Capacity design and planning	• How can we reduce bottlenecks to improve patient throughput for each area? • In which cases should we increase the use of technology to improve labor productivity?
Physical network optimizations	• Where should we position appropriate par locations, pharmacy satellites, warehouses, and supplies to minimize resources and costs? • Do we strategically utilize vendors and their facilities? • How can we design and position optimal locations for clinics or resources to ensure lowest total costs?
Staffing levels and productivity management	• How much output can we expect from our staff? • Have we maximized the use of automation and electronic commerce to increase productivity? • Have we implemented sophisticated analytical models to optimize labor and resource scheduling?
Supply chain and management	• Have we built collaborative planning and forecasting logistics processes to standardize items and reduce total costs? • Should we operate *just in time*? • Do we use automated, optimized replenishment of medical–surgical supplies to increase turns and asset utilization? • How much inventory of each item do we need? • Do we use perpetual inventory systems to ensure stringent internal controls and accurate financial reports?
Quality, planning, and process improvement	• Do we use advanced tools for tracking projects? • Are we measuring the right performance indicators to bring visibility to trends and exceptions? • Do we know how we compare to our key competitors? • Have we identified the quality issues that affect our customer satisfaction and efficacy goals, in addition to efficiency, costs, and speed?

THE NEED FOR OPERATIONS MANAGEMENT

The *Future of Emergency Care* report series produced by the Institute of Medicine of the National Academies describes the problems facing health care today, especially the emergency care arena. The report outlines several recommendations for solving the current crisis, and one key recommendation notes, "Hospitals should reduce crowding by improving hospital efficiency and patient flow, and using operational management methods and information technologies" (Institute of Medicine, 2006, p. 2).

Others outside of the health care industry have also identified weaknesses in how health care managers administer the processes and systems. IBM has recognized that the service sector must focus more on applying management science to improve processes and outcomes and is collaborating with universities to implement what it calls *services science*. Irving Wladawsky-Berger, IBM's Vice President for Technical Strategy and Innovation, was quoted in *The New York Times* as saying,

> All those processes [in a hospital] get done in a relatively ad hoc way. If we want to apply information technology and engineering discipline to improve the quality of the service to reduce errors and to improve productivity, you need people who know how to design a hospital system. (Holstein, 2006, p. 10)

Clearly, even those on the periphery of the health care system understand the complexity and the lack of sophistication that currently exist in the industry.

Many other researchers and associations have called for operations management to help drive improvements and efficiencies in the health care system (Herzlingertt, 1999). The purpose of this text is to help students and practitioners do just that.

GOALS OF THE OPERATIONS MANAGER

The operations manager may hold any number of the job titles discussed earlier, but generically the term *operations manager* will be used to describe all such positions in this text. A clinic manager who ensures that processes are in place so that patients efficiently move from registration to treatment rooms to payment is an operations manager. An administrative director who oversees financial operations is an operations manager. An operations manager is any individual who directs

and transforms processes to improve the delivery of patient care. What else do operations managers do? They have a variety of broad goals and functions in the hospital, including all of the following: reduce costs, reduce variability and improve logistics flow, improve productivity, improve quality of customer service, and continuously improve business processes. These are outlined in more detail in the following sections.

Reduce Costs

The primary role of operations managers is to take costs out of the health care system. Finding waste, improving utilization, and generally stabilizing and reducing the overall cost of delivering services are essential functions. A hospital with appropriate tracking and management systems—that can isolate all personnel, material, and other resources utilized for delivery of care—will be much more likely to reduce costs because it understands the underlying cost structure. Identifying costs and eliminating unnecessary waste and effort is at the forefront of an operations manager's priority list.

Reduce Variability and Improve Logistics Flow

Operations managers continuously look for the most efficient and optimal paths for movement of resources, whether those resources are physical or information flows. Similarly, there is a continuous focus on reducing variability. **Variability** is the inconsistency or dispersion of inputs and outputs. Variability threatens processes because it results in uncertainty, too many or too few resources, and generally inconsistent results. If there are 10 patients typically seeking care in a specific clinic within a certain time period, and then 20 appear the following period, it will be difficult to staff, control waiting times, and manage patient flows.

Improving flow means seeking higher throughput or yields for the same level of resource input. **Throughput** is the rate or velocity at which services are performed or goods are delivered. If a hospital typically sees four patients an hour and can increase throughput to six per hour, this is a 50% improvement in logistical flow and throughput. Similarly, if patient volumes double but a hospital maintains the same historical inventory levels of pharmaceutical supplies, this represents significant improvement in material flow, because assets have higher utilization and turns.

Staffing and resource consumption should be tied directly to patient volumes and workload: If patient volumes increase, so too should resources. Unfortunately,

many health care facilities do not understand patient volumes and the variability that exists from hour to hour and day to day. Managing this variability allows an adjustment to staffing mix and scheduling to accommodate the changes, without staffing at the peaks (which causes excessive costs), staffing for the valleys or low points (which will cause long lines periodically due to limited resources and therefore service quality issues), or staffing for the average (which is the most common suboptimal approach). **Figure 1–2** shows how variability changes over time, which necessitates both capacity and demand analyses.

Logistics is defined as the efficient coordination and control of the flow of all operations, including patients, personnel, and other resources. The role of operations managers is to facilitate improved logistics and throughput by using streamlined process and facility designs to increase capacity, workflow, and throughput.

Improve Productivity

Hospitals have a tendency to hire additional staff faster than in other industries. This is partly driven by the highly structured organizations that are common in health care and partly because of the historical lack of focus on costs. In years past, hospitals were reimbursed by the government and other payers on a "cost-plus" basis—meaning that whatever the cost to deliver, hospitals would be fully reimbursed along with a small profit margin.

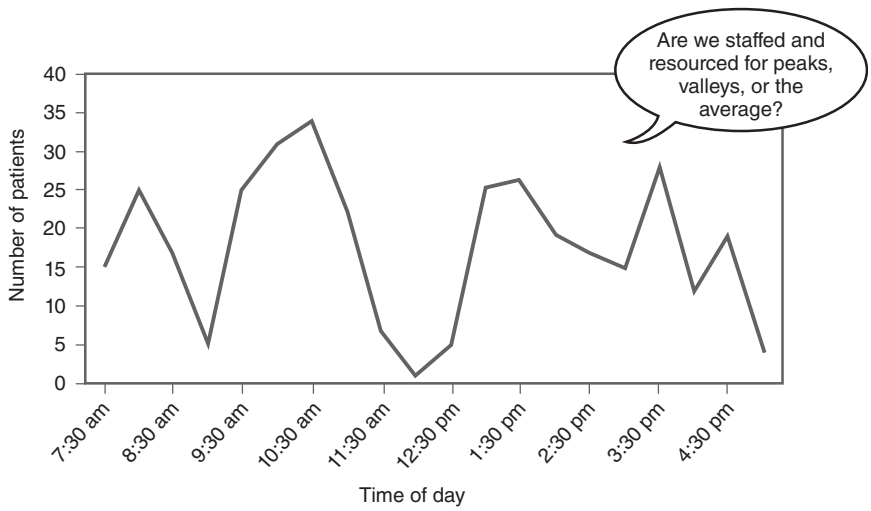

FIGURE 1–2 Variability Creates Chaos and Inefficiency

When pricing is guaranteed to cover costs, there is not a tendency to be overly cost conscious. Even though the industry continues to move toward a prospective payment system and managed care, the mentality and behavior of many hospitals have been slow to adapt. **Productivity** is defined as the ratio of outputs to inputs. Improving productivity implies a search for higher levels of output from all employees and other assets. This is one of the most vital roles of an operations manager.

Improve Quality of Customer Service

Health care cannot become so focused on cost and efficiency that quality starts to diminish. Improved quality implies reduced medical errors and improved patient safety, in addition to higher levels of patient satisfaction. Maintenance and improvement of high quality and service levels, both from patient care and other business services (such as the cafeteria or admissions), are expected from an operations manager. Across all industries, higher-quality services lead to the ability to secure higher prices, which drives increased market shares and operating margins (Buzzell & Gale, 1987).

Ensuring that services continue to improve patient satisfaction levels while simultaneously reducing response and waiting times are key deliverables to providing higher-quality services. The **cost–quality continuum** refers to a theoretical trade-off in which a focus on one side of the equation leads to diminishing returns on the other. A focus on costs may lead a hospital to reduce services provided, which may affect overall quality. Operations professionals must balance both and help to make optimal decisions on many fronts.

Continuously Improve Business Processes

In highly structured organizations, business processes tend to be unique to each department and are not highly cross functional or integrated. The operating room in one hospital may handle procurement of goods one way, while the same hospital's gynecology department handles it another. There is typically no sharing of best practices internally, standardization of processes that can lead to improved learning and economies of scale, and very little multidepartment workflow automation. Each department in large hospitals today operates as an independent business, which creates multiple efficiency problems. The role of operations management is to find ways to carry out business processes while improving process efficiency and effectiveness. **Figure 1–3** shows the operations management process of converting inputs into outputs.

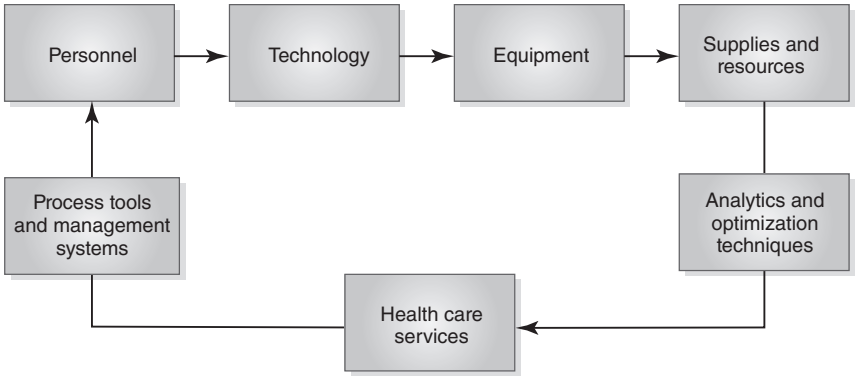

FIGURE 1–3 The Operations Management Process

COMPETITIVE ADVANTAGE OF OPERATIONS

Overall, if a hospital is successful at delivering on each of these goals throughout the facility, it will deliver improved operational effectiveness. **Operations effectiveness** is a measure of how well the organization is run. It considers both the efficiency of resource inputs and usage and the effectiveness of overall management in achieving desired goals and outcomes (Kilmann & Kilmann, 1991). **Operational excellence** is a term often used to describe a business strategy that focuses exclusively on maximizing operational effectiveness.

A hospital that is operationally effective is heading toward increased competitiveness. **Competitiveness** is management's ability to respond to environmental changes (such as changes in reimbursement practices) as well as competitors' actions (such as adding new facilities or expanding existing service lines). If a hospital can achieve a competitive edge or advantage over other hospitals—and sustain this position—it will have higher operating margins and be able to continue improving, expanding, and surviving. Operations management is critical to this outcome.

Competitiveness is often driven by innovation. **Innovation** is the continuous search for a way to do new things or to do current things better. Organizations innovate by using new technologies or finding ways to change the playing field so that processes that once were considered essential are no longer necessary. The electronics industry is an example in which firms continuously innovate. A firm that was competitive based on analog technology had its perspective of the world shaken up considerably when digital technology was created, and the products

that the firm once made became completely irrelevant. In addition, continuous innovation often results in hypercompetition, which ultimately is characterized by economics wherein both prices and costs decline (D'Aveni, 1994). For example, when digital video disc players were first introduced, prices were nearly $1,000. Today, they can be purchased for as little as $30 in discount stores. The prices of smartphones, tablets, televisions, laptops, and many other electronics all follow the same pattern. In health care, innovation also helps to improve competitiveness.

FACTORS DRIVING INCREASED HEALTH CARE COSTS

Imagine that rather than a health care organization's annual budget increasing between 5% and 15% (the range of industry average annual changes), expenses could be maintained and even show signs of deflation, or negative price/cost growth. This would be very beneficial to a hospital's financial condition if it could reduce costs and maintain similar pricing levels.

The historical argument justifying continuously growing health care inflation rates typically focuses on five points:

1. Consumers are aging and living longer and are increasingly utilizing a greater number of services than in prior years.
2. The costs of medical technology and equipment continue to rise, and this represents a growing percentage of capital budgets for most organizations.
3. The labor costs of key resources (such as physicians and nurses) are governed by market shortages for these positions, which have increased steadily in the past few decades.
4. Prices of pharmaceuticals, which represent a sizable portion of medical treatment plans, continue to escalate to cover high costs of research and development, long U.S. Food and Drug Administration approval cycles, and generally high industry margins for pharmaceuticals.
5. Emphasis on strict managed care, which appeared to be the predominant model a decade ago, is slowly shifting and diminishing in practice.

The result has been a steadily increasing cost of care. For example, the Bureau of Labor Statistics tracks inflation growth through its consumer price index, a mathematical calculation of the average pricing changes over time, using a market basket approach. The general consumer price index for all items in years 1999 through 2005 showed an increase of less than 14% over 7 years, or around

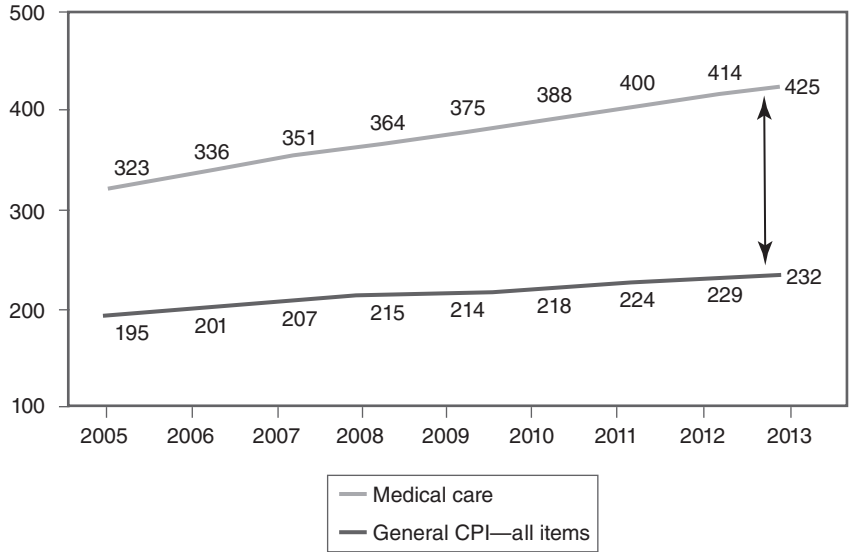

FIGURE 1–4 Controlling Exponential Price Increases in Health Care
Data from U.S. Department of Labor, Bureau of Labor Statistics, 2014.

2% per year (Bureau of Labor Statistics, 2014). Compare that with the cost of medical care, which rose nearly 30% in that same time period—almost double that of all the other goods tracked. **Figure 1–4** shows this growth over time.

Overall spending for health care in the United States has risen steadily. In 1993, health care costs represented 13% of the national gross domestic product; in 2006, this number increased to more than 16.5%; and today it is nearly 18–19% of the gross domestic product. Economists project that this will double again in the next decade (Heffler et al., 2005). While some hospitals wait for the national debate to continue, it is important to first look at the intrinsic factors in the organization that are driving excessive costs: redundancy, inefficiency, bureaucracy, waste, paper, limited productivity, lack of performance monitoring, poor deployment of information technology, and generally unsophisticated levels of management.

LEARNING FROM OTHER INDUSTRIES

Although health care is unique and has its own set of challenges, hospitals can learn a great deal from other industries that have evolved faster due to technology

or process innovation, industry economics, more aggressive competition, reduced barriers to entry and exit, or just better trained business managers. For example, if managers looked at a hospital as being similar to the retail industry, they could better understand how to lay out floors, design configurations to achieve more efficient movement and handling, and use analytical forecasts to drive all aspects of the business. There is a lot to learn from the more operationally effective industries. The tools and techniques that are most similar should be borrowed and applied to health care where appropriate.

For example, in the airline industry, thousands of planes move through the sky fairly seamlessly. Planes land every few seconds at major airports throughout the world, and yet there are very few accidents (as a percentage of total flights), very high levels of on-time rates (given numerous factors such as weather and security), and very little lost baggage. Nearly 650 million passengers boarded planes in 2013 in the United States alone (Bureau of Transportation Statistics, 2014). Airlines have learned to operate using speed and volume as an advantage. When an airplane lands, there is very little time before it must be turned around and readied to take off to another destination. This changeover process allows less than 30 minutes, on average, to completely refuel, check maintenance and mechanical conditions, validate aviation systems, restock food and supplies, change over personnel, and unload and reload hundreds of passengers. Think of this changeover as it relates to the process a hospital goes through when changing out beds after a patient is discharged (i.e., admitting and bed management process). A lot can be learned from how another industry approaches a somewhat similar problem. **Table 1–2** summarizes what operations managers in health care can learn from other industries.

Table 1–2 Teaching from Other Industries

Retail	Building layout and configuration, customer flows, use of forecasts and planning, electronic commerce
Airlines	Scheduling, logistics, strategic pricing (yield management)
Chemicals	Efficiencies, economies of scale, extensive use of linear programming and quantitative modeling
Electronics	Technology innovation, product life-cycle management, pricing strategy
Telecommunications	Command and control center

PRINCIPLES OF MANAGEMENT

Operations management is one discipline in the broader field of management. According to most theorists, management concerns itself with four key functions: planning, organizing, leading, and controlling. **Planning** involves the establishment of goals and a strategy to achieve them. In health care, planning can be strategic (such as deciding which geographic region to invest in a new facility), or it can be operational (such as how many employees to have on staff for each shift). **Organizing** includes making decisions about which tasks will be done, where, when, and by whom. Organizing uses a variety of tools, such as an organizational chart to manage people's roles and reporting relationships, process flowcharts for improving activities, and Gantt charts for managing projects. **Leading** includes motivating employees, building support for ideas, and generally getting things done through people. Providing direction and clarification of expectations, as well as the role of change management, or preparing the organization for changes to come, are instrumental in providing leadership in hospital operations management. **Controlling** includes all tasks to monitor and track progress toward goals, ensure performance improvement, and make corrective changes in strategy where necessary. The use of status reports, budgets, procedures, and a multitude of other tracking tools is useful in helping enhance management control.

Managers wear many hats and play many roles. They may serve as a figurehead, make decisions, reward employees, and handle conflicts and solve problems. Managers help plan tasks, organize and direct them, and continually adjust and control. Henry Mintzberg (1973), one of the earliest researchers on management processes, described the nature of a manager's work as grouped around three key themes: informational, decisional, and interpersonal. Informational refers to collecting, monitoring, and disseminating information from the external and internal environments to work teams. Decisional refers to making key decisions for the organization, such as allocation of scarce resources, rewards and penalties for employees, and negotiations with employees and others. Interpersonal includes training and motivating employees, serving as a spokesperson, facilitating communication exchanges among various groups, and serving as a liaison.

The study of management continues to evolve. It has moved through a variety of schools of thought: from scientific management to process focused to human behavior to decision or management sciences theory to social and open systems (Certo & Certo, 2005). These schools of thought represent different contexts or perspectives on which a manager's role and tasks should be based. For example,

the systems theory schools emphasize that a manager views the organization as a living organism, which is changing and adapting and that operates by an integrated network of open processes. Behavioral schools tend to view management from a psychological aspect, highlighting the importance of understanding what motivates employees and how human and cognitive factors influence work environments.

For purposes of operations management and looking for ways to improve operational effectiveness, the school of thought that is most relevant is that of scientific management.

THE SCIENTIFIC AND MATHEMATICAL SCHOOLS OF MANAGEMENT

Operations management seeks to apply quantitative and analytical techniques to achieve the goals of reduced costs, higher quality, higher productivity, improved processes, and improved logistical flows. The role of mathematics started to drive concepts of industrial efficiency in what is now known as the scientific management era, which began prior to the turn of the 20th century.

Scientific schools of thought historically focused on use of concepts such as time and motion studies, which measured how long business processes took, seeking ways to reduce the variability of the results and continuously shrinking the times and associated costs. Early work by Frank and Lillian Gilbreth helped drive a focus on continual improvements—finding ways to do things faster and with fewer resources. In fact, the Gilbreths' research has had a profound effect on health care as well (Gilbreth & Carey, 1966). In the early 1900s, they were credited as observing the productivity of surgeons and found that the introduction of changes in both staffing and workflow could significantly alter physician productivity. The introduction of a surgical nurse—to help provide surgical instruments and supplies when needed in order to free up the surgeon, thereby improving overall productivity—was one of the key recommendations made. In addition, the Gilbreths recommended other hospital improvements, such as a tray to hold common surgical instruments. These are just two of the contributions made by scientific management to health care.

Frederick Taylor, one of the original management researchers and the "father of scientific management," was often quoted as saying that scientific management is a great "mental revolution" (Matteson & Ivancevich, 1996). By this, he meant that a scientific approach encourages a different perspective or outlook

that can change management behaviors and results. This revolution led to some key concepts, such as specialization, division of labor, and mass production. The concept of **specialization** suggests that if people repeatedly perform just one task, they will be able to perform that task faster and with higher quality than others, because they have repeated exposure to the process and have learned from their experiences. Specialization, in many regards, is what leads hospitals to structure their organization around units such as nursing or materials management. Continued specialization helps to produce well-defined roles and tasks, concentrated work efforts, and higher efficiencies. This is also known as **division of labor**. **Mass production** is the creation of rapid production processes through the use of assembly-line techniques. Mass production has been embraced by most other industries, but, in many respects, it is not relevant in health care.

The scientific era has been shown to have several failings and issues, which led to other schools of thought. The lack of focus on human behavior, alignment of employee rewards with those of the organization, and understanding the need for job rotations and expansion all are major issues that well-rounded managers must consider. Thus, many of the analytical concepts of scientific management remain vital to health care operations management. First, scientific management suggests the need for a strong understanding of processes, their costs and resource utilizations, constraints, and cycle times. Second, scientific management encourages an initial focus on understanding expected outcomes and subsequently designing management systems and business processes around this operational strategy. Third, the variability of processes has to be smoothed out and consistently managed. Finally, scientific management shows that in many cases quantitative approaches can help create mathematically optimal results for common management decisions and problems. These four fundamental concepts are the foundation of the operations management discipline.

MANAGEMENT DECISION MAKING

Management decision making is a process in an organization in which decisions are made (Yates, 2003) and reflects the major processes involved in managing the work of organizations (Szilagyi & Wallace, 1990). Decisions are the output of the process and are typically described as a choice between two or more alternatives (Rowe, Boulgarides, & McGrath, 1984). Decisions can also be described as an "action" taken as a result of a process. As Hoch and Kunreuther (2001) stated, "The strength or weakness of managerial decisions is the linchpin of the business enterprise" (p. 9).

Herbert Simon (1960), one of the first researchers on decision making in organizations, described the decision-making process as having three steps:

1. Finding occasions to make a decision.
2. Finding possible courses of action.
3. Choosing among many options.

Browne (1993) described it similarly as that "which occurs at the highest level of an organization" (p. 2). Schwenk (1988) described management or strategic decisions as ill structured, nonroutine, important to the organization, involving large resource commitments, and generally very complex. A traditional management decision process, adapted from Browne, is shown in **Figure 1–5**.

Decision-making theory has been defined by many perspectives: sociology, psychology, economics, engineering, and business. Because management decisions are made within organizations, organizational theorists early on shaped the field by suggesting a rational approach where decision makers make decisions in the best interests of the organization and emphasize "information processing." More recently, there has been a strong emphasis on decision making as a behavioral process, as decisions are made by individuals, where personality and judgment represent both a source of bias and influence on decision processes.

Harrison (1987) described decisions as either "routine and programmable" or "complex and unique." If decisions are routine, then they are procedural and can use computation and rational models for decision support. This area is well suited for operations research methods. The latter is more unstructured and relies more on judgment and general problem-solving approaches. This method has typically been considered to emphasize behavioral processes over quantitative ones, because they involve ambiguity, conflict, negotiations, and bias created by the interaction of individuals and personalities.

Similarly, Allison (1971) outlined three perspectives on strategic decision making: rational, organizational, and political.

1. *Rational*. Barnes (1984) was one of the earlier researchers in this area, which defines decisions as the product of a "conscious choice." The rational, conscious choice emphasizes a "search and selection" process that has limited alternatives, maximizes decision outcomes, and adjusts for risks. Other researchers have outlined structured methods for organizational decision makers to follow to reach optimal or maximizing outcomes (see Christensen, Andrews, Bower, Hammermesh, & Porter, 1982).

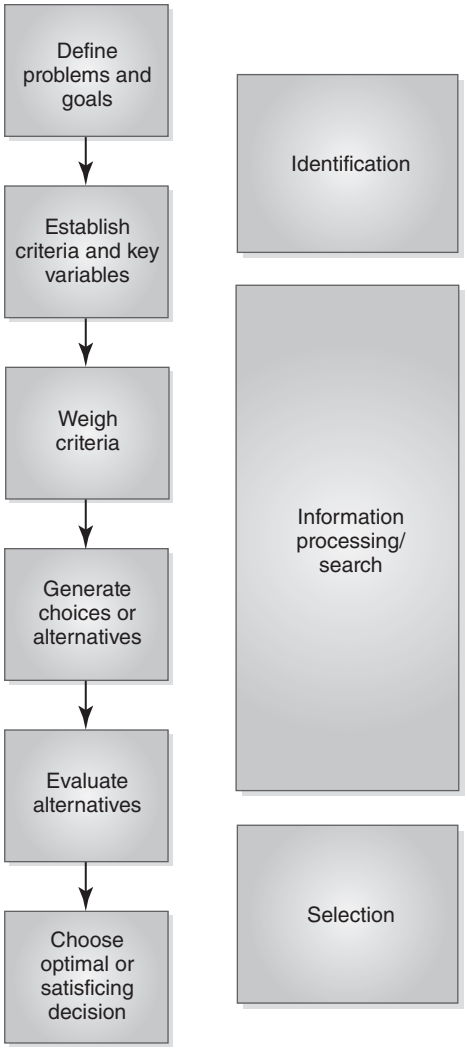

FIGURE 1–5 Traditional Decision-Making Process

2. *Organizational*. Henry Mintzberg (1978) is generally recognized as one of the leading researchers on decision making from an organizational theory perspective. This views decisions as the outputs of organizational processes, not individual ones, and includes adapting astrategy to the environment. The organizational approach emphasizes *satisficing*. **Satisficing** is a process of making a less than optimal decision, but one that can be supported and is acceptable because it meets the minimal criteria (e.g., the decision is reached quickly, is adequate, and/or is the result of

consensus between parties). Satisficing terminates the search for alternative processes early. Ambiguity plays a critical part, as does the concept of randomness, which leads to models of decision making that are less than rational and that can be described as "organized anarchies" or "garbage can" models (March & Olsen, 1979).

3. *Political*. From this perspective, decisions are the result of bargaining among individuals attempting to achieve their own personal goals (Abell, 1975). This includes social, nonprofit, educational, and other organizations. Political models tend to redefine the decision processes, structures, and goals on a continual basis, making evaluation difficult. Behavioral concepts, such as the roles of judgment, biases, emotions, and heuristics, are often a component of this perspective. Bazerman (2005) is one of the prominent researchers on individuals and behavior in decision-making processes.

From both the organizational and political perspectives, the concept of bounded rationality has emerged. Bounded rationality suggests that humans or individuals have only a limited, finite capacity to understand all of the options available to them and process them in an evaluation mode (Simon, 1979). Bounded rationality can also be described as limits on a human's ability to process and interpret large volumes of data (Bazerman, 2005). Theory suggests that while rational models think all alternatives are known, they usually are not and there is no known probability or consequences of the actions. In addition, goals are changing and the process is not always as sequential as it would appear. The complexity of decision processes is also often used to describe why rational models are not appropriate.

There are two components of bounded rationality: search and satisficing (Simon, 1979). Search refers to how extensively a decision maker searches for information to guide decision making (Tiwana, Wang, Keil, & Ahluwalia, 2007). Simon envisioned an "aspiration point" where managers determine what is "good enough." This process of terminating the search process without incorporating more extensive information is called *satisficing*, as discussed earlier. This can create biases and risks for managers.

The concept of trade-offs is related to satisficing (Simon, 1965). Trade-offs represent a cognitive process of balancing the pros and cons of attributes or decision criteria in an effort to accept less of something to get more of something else (Luce, Payne, & Bettman, 2001).

Browne (1993) described four models or perspectives in decision theory: normative, descriptive, analytical, and behavioral. Normative models, or prescriptive models, describe what managers should be doing to produce optimal outcomes.

Browne suggested that normative models are the contributions of scientific management. Simon (1965) argued that rational models of management science are valuable contributions toward normative decision-making theory. Descriptive models describe what actually occurs in organizations, not what should occur. Analytical models, which are the contribution of management science, involve risk and uncertainty in quantification and in the role of modeling decisions and predicting outcomes. Finally, behavioral models examine the roles of bias and cognition in humans, as well as how information is processed and used.

As theory has established, decision making is not necessarily a rational search and evaluation process, where alternatives are clearly defined, evaluated, and then the best alternative is selected. Brunsson (1985) argued that decision making is less about finding the right choice and more about giving an impression of rationality in organizational processes. He also described other more common irrational processes used by managers. In decision sciences, decisions are sometimes categorized into one of two types: routine or complex. Routine decisions have been described as "programmable" and are sometimes associated with selection and evaluation methods that can be mechanized or automated (Harrison, 1987). These routine decisions are often supported by methods such as operations research. The more complex the decisions are, the greater the use of intuition or judgment in the process, and presumably the less likely that methods such as operations research will be used. Discussion in strategic management literature about the role of intuition versus analytics touches on this subject but does not comprehensively address the role of quantitative methods using the routine-complex dimension (Miller & Ireland, 2005).

In summary, organizational decision-making processes are complex and appear to be variable in nature. In addition, the complexity of the decision and the cognitive capacity of the decision makers both influence the form of decision processes. As a result, some health care organizations may find a quantitative component of operations management decision making more useful or relevant, while others may value it to a lesser extent.

POWER AND DECISION MAKING IN HEALTH CARE

Decisions in health care do not follow the traditional, logical processes used in industrial organizations. In other industries, where profit maximization and shareholder wealth are the primary motives, decisions are usually driven by goal alignment for both managers (those who run the business) and owners

(shareholders who invest in equity or debt and have a claim on the profits and assets). Decision making tends to follow cost-benefit models and focus on risk minimization, cash flows, and return on investment. Although disputes and conflicts may arise because of incomplete or imperfect information (as described in the agency theory of economics), these disputes can typically be minimized by changing incentives, behaviors, and structural mechanisms.

In health care, however, there is incomplete alignment of goals between different agents, or managers, in the organization because of three issues:

1. *Goals are unclear*. There are clinical goals, financial goals, educational or academic goals, societal goals, community goals, and so on. The ambiguity that exists in terms of priorities and focus makes goals much less acute than in other industries.
2. *Organizations are complex*. In industrial organizations, the organization is clearly focused on the key aspects of buying, making, selling, and moving products to the marketplace. In health care, reporting relationships often involve complex matrices and dual-reporting structures. This is not the "command and control" structure, focused on speed and efficiency of decision making, that might work in other places.
3. *Relationships are ambiguous*. Many business units in health care are interconnected, but they often behave as if they were not. Independent departments and providers help create an environment that is less team focused than in other industries, making relationships important for purposes of mutual support as allies. There are also continuous power struggles in the health care arena between different factions of employees. This creates ambiguity in decision making.

Physicians are typically the most dominant players, given their clinical expertise and control over the "production" of health care services, and they have a very substantial role in most major organizational decisions (Young & Saltman, 1985). Power conflicts with nurses and other providers are frequent and have developed (for structural reasons) in the struggle for control over patients, their care, and overall patient management processes (Coombs, 2004). As such, several formal power bases have emerged: business managers, who increasingly are becoming more professional and sophisticated; physician leadership, which historically dominates the power pendulum; and nursing leadership, which may have the most intimate knowledge of patients and their needs.

Those who control the "production" process in most industries tend to have the most influence and can control decision making for many things. In the production

of health care (i.e., delivery of treatments and provision of care) physicians are by far the dominant players, yet their role in most operational management processes in most hospitals is waning as professional business managers evolve.

Decision making in teaching hospitals and academic medical centers is even more complicated due to the introduction of another dominant party: academic faculty and researchers (Choi, Allison, & Munson, 1986). In the largest hospitals, this complexity in decision making is complicated by large business infrastructures, which may employ hundreds or thousands of individuals in all types of support functions from admissions to patient finance to facilities.

Three characteristics define this complexity of decision processes: problematic preferences, unclear technology, and fluid participation (Cohen, March, & Olsen, 1972). These characteristics, together with "streams" of both problems and choices, can be combined in unclear decision processes in a "garbage can," where they can often address the wrong problems at the wrong time. This garbage can tends to allow issues and solutions to resurface in strange ways, which often results in a lack of clarity and focus.

With all of these dominant players and complexities, many hospitals have become large bureaucracies. These bureaucracies make it difficult to make important decisions, address financial and business issues, change behaviors and business processes, and implement new technology.

Sophistication in operations and logistics management requires not only understanding concepts and their application to health care, but also understanding the persuasive and leadership characteristics necessary to navigate the bureaucracy, influence dominant power groups, engage support for ideas, and ultimately gain approval for and acceptance of changes. These changes will come only if business executives achieve more dominant power positions, which can evolve only as operations and logistics executives are recognized for their contributions, specialized education, professional expertise, and leadership skills. Collaboration within these multidisciplinary organizations is just one way to retain more control in the decision-making process.

THE ROLE OF TECHNOLOGY

With its focus on improvements, operations management rests highly on the use of technology and automation. Many new technologies—including mobile devices, handhelds, scanning capabilities, asset tracking, database management, health information exchanges, and electronic health records—help managers improve their capture of data and transform it into improved decisions. Decisions about capital investment in new information and management systems are

always at the forefront of the modern operations manager's mind. Technology should be considered whenever quality and efficiency is low. Processes that are repetitive in nature and that can be replaced by less expensive automation are also suitable for a technology investment. Technology often serves one of three roles:

1. Automate manual processes.
2. Improve transaction processing capabilities.
3. Improve the quality of analysis, reports, and decisions.

Technology has the ability to substantially alter the economics of a process. Processes that can be mechanized allow for faster production or delivery, with less resource usage—two keys to improving operational effectiveness. The decision to substitute capital, or technology, for labor—especially in areas of business support services—is the only way to reduce processing and transactional costs over the long run.

TRENDS IN OPERATIONS MANAGEMENT

There are several trends that are being widely considered and adopted in hospitals. These are depicted in **Table 1–3**, and the trends correspond to the role or function of operations management most closely related to it.

Table 1–3 Roles and Trends in Health Care Operations Management

Primary Role of Operations Managers	Evolving Trends
1. Reduce costs	Standardization Optimization Resource tracking systems
2. Reduce variability and improve logistical flow	Integrated service delivery Analytics Supply chain management
3. Improve productivity	Information technology; mobile devices; asset and patient tracking systems Return on investment
4. Provide higher-quality services	Evidence-based health care Six Sigma
5. Improve business processes	Outsourcing Globalization

Outsourcing is the contracting of an outside firm to perform services that were once handled internally. Outsourcing is common in many industries, and in health care it has been used successfully for cafeteria operations, bookstore management, investments, and even nursing and other clinical care areas. Outsourcing is not a new concept, but it has a slow adoption rate in health care, where decisions such as these are often difficult to make, especially when they result in the dismissal of employees from hospital payrolls. However, outsourcing, when used selectively to target the right areas, can be beneficial from a cost perspective.

Outsourcing relies on the notion that a hospital should focus on its core competencies—delivering clinical care—and not on some of the less mission-centric functions, such as housekeeping, materials management, finance, and information technology. When analyzing pre- and postperformance improvement, the evaluation of internally performed or selective outsourcing costs must be undertaken to ensure that all options are explored and the most operationally effective process remains.

Integrated service delivery is another trend that has developed over the past few years. Many researchers have pointed to the excessive cost of care as being driven by the medical community's continued desire for specialization and concentration on discrete diseases and treatments, rather than integrative, comprehensive care (Porter & Teisberg, 2006). In response to this, hospitals are looking for ways to push care toward more integrative medicine, including higher sharing of information, resources, and collaboration. The effect on operations management will include redesign of business processes and changes in the number and frequency of logistics networks.

Supply chain management is the integrated management of all products, information, and financial flows in a network designed to pull products from manufacturers to consumers. In health care, there has been widespread adoption of improved sourcing and inventory techniques, designed to lower overall supply expense ratios (which typically account for 25% to 50% of all hospital costs). Significantly more detail about the use of supply chain and logistics management will be covered elsewhere in the text.

Another trend in health care operations management is globalization. The world is becoming smaller, and vendors from all around the globe are competing for business in retail and other industries. Health care has only recently felt the effects, but this trend will continue. When firms look for outsourcing opportunities (e.g., in information technology), they are now able to turn to vendors as far away as Ireland and India to help manage their information technology operations infrastructure. Medical care that may once have required on-site specialists

is now only a television away, allowing physicians to practice medicine without setting foot in the hospital. Vendors for certain medical supplies, pharmaceuticals, and equipment are emerging and starting to compete for business as potential suppliers, requiring hospital managers to understand global logistics. As more and more hospital services become automated, the location of the technology does not matter. This is the true result of globalization, and it will require adjustments by hospital management.

Investments in a hospital's information technology infrastructure are common today. Electronic medical records, computerized physician order entry, enterprise resource planning, picture archival communication systems, supply chain management, and many other systems are much more prevalent today than in years past. Investments in many lesser-known technologies for admissions, cashiering, inventory management, and even bed management are also becoming more common.

The basic premise of most technologies is that they provide some return that, when quantified, is greater than the costs associated with it. In some cases, this is simple to calculate, as when a system creates known financial value and has well-defined costs. In others, when the information technology produces vague benefits (such as extending a system's end of life or improving clinical quality), the returns are more difficult to measure and quantify and thus are more complex if creating a cost-benefit comparison. Regardless, the trend in leading hospitals is to conduct thorough return on investment analyses that clearly define the pre- and postenvironment and then make comparisons of the delivered or earned value for the project.

The growth in deployment of resource tracking systems is also interesting. Information systems and technology are being developed specific to health care to allow for tracking of patients, equipment, supplies, pharmaceuticals, bed occupancy, and much more. Microprocessor chips, bar-coding technology, global positioning systems, and radio frequency identification systems are all technologies that are being slowly adopted in larger hospitals. Many of these use existing wireless frequencies and infrastructure, so they are becoming easier to implement at lower costs. These tracking systems allow for closer monitoring of utilization patterns, location analysis, stationary or down times, and logistical flows, which thus helps better manage the number, type, and mix of resources required. Improved operational effectiveness results from improved utilization and higher asset productivities.

Another trend that is being followed closely in operations management is that of standardization. **Standardization** is the use of consistent procedures, resources, and services to achieve consistent results across multiple departments. In a system or network, standardization suggests that two hospitals could use the

same basic medical supplies for multiple procedures, rather than a wide variety of them, which helps reduce inventory and purchasing costs and creates some economies of scale. Standardization also refers to the use of common standards for information systems, as well as personnel and operational processes. Standardization helps ensure alignment among departments, promote familiarization and learning curves, and reduce the number of transactions processed—all of which result in lower costs and higher productivity.

Finally, many hospitals practice what is called *evidence-based health care*. **Evidence-based medicine** applies the scientific method to medical practice and seeks to quantify the true outcomes associated with certain medical practices by applying statistical and research methods (Centre for Evidence-Based Medicine, 2014). Evidence-based health care, as it applies to logistics or operations, emphasizes that prior to decisions being made, the options are conscientiously analyzed for the effects each would have on operations. For example, if a certain piece of equipment needs to be replaced, evidence-based medicine suggests that the true costs and outcomes associated with this item be carefully analyzed over time; a replacement piece of equipment undergoes the exact same controls to guarantee and quantify the total effect of this change on the system. Evidence-based health care, in its use of quantitative methods and in seeking to comprehensively analyze operations, is completely in alignment with operations management theory. The use of quality management processes such as Six Sigma, which attempts to improve processes and outputs through continuous improvement techniques, is beginning to gain a solid foundation in the health care industry.

CHAPTER SUMMARY

Operations management is the quantitative management of the supporting business systems and processes that transform resources into health care outputs. Operations management is about coordinating diverse, complicated activities into a comprehensive system. It is focused on achieving operational effectiveness—defined as lower costs, higher productivity, and continuous process improvement. There are five key goals of the operations manager: reduce costs, reduce variability and improve logistics flows, improve productivity, improve quality of customer service, and continuously improve business processes. Operations management is a field within the discipline of management, and it evolved initially from the scientific management school of thought. The process of management decision making supports the choices for how operations management occurs. The decisions made affect the quality and efficiency of operations. With the increased

emphasis on efficiency and quality in health care organizations, operations management has progressed to become more comprehensive and valuable. There are several evolving trends that are changing health care operations.

KEY TERMS

Competitiveness
Controlling
Cost–quality continuum
Decision making
Division of labor
Evidence-based medicine
Health care operations management
Innovation
Leading
Logistics
Mass production
Operational excellence
Operations effectiveness
Organizing
Outsourcing
Planning
Productivity
Satisficing
Specialization
Standardization
System
Throughput
Variability

DISCUSSION QUESTIONS

1. What is operations management in health care?
2. How is health care representative of a system?
3. What are the five key goals of operations managers?
4. Does operations management affect a hospital's competitive advantage?
5. What are three of the key trends affecting hospital operations?
6. Who is considered the "father" of scientific management?
7. How are decisions made in organizations?
8. What are the basic steps of a rational management decision-making process?
9. What are the common sources of cost increases in health care?
10. How does the medical care consumer price index relate to cost increases for other items?
11. What four things can be learned from scientific management?
12. What are the three reasons decision-making processes in health care are more ambiguous than in other organizations?
13. How does evidence-based medicine support operations management techniques?

EXERCISE PROBLEMS

1. Health care organizations routinely make complex organizational decisions. As an example, a decision to modify the physical layout or space of a department, or alter the schedules of a nursing unit, will affect patient care in many ways. Because so many stakeholders are involved, which process for making management decisions do you think will be followed? How would you use the decision-making process to make important decisions such as this in an organization?
2. Richmond Community Hospital currently receives more than 10,000 boxes of pharmaceutical supplies per month. All of these items are manually inspected and logged to ensure adequate receipt prior to payment. Eight employees manage receipts and deliveries, while four employees manually record and track them. A new software package that allows automated scanning of bar codes will replace all or some of the employees used for manual tracking, or at least allow redeployment to other areas of the hospital. What are some of the key questions that must be explored to fully understand the effects of technology and whether a capital investment should be made to substitute capital for labor?

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