Quality and Performance Improvement in Healthcare

Theory, Practice, and Management

Seventh Edition

Patricia Shaw, EdD, RHIA, FAHIMA,
and Darcy Carter, DHSc, MHA, RHIA

AHIMA PRESS

ISBN: **978-1-58426-663-1**
AHIMA Product No.: AB102718

AHIMA Staff:
Jessica Block, MA, Production Development Editor
Chelsea Brotherton, MA, Assistant Editor
Megan Grennan, Managing Editor

Cover image: ©Kseniya_Milner, iStock

The websites listed in this book were current and valid as of the date of publication. However, webpage addresses and the information on them may change at any time. The user is encouraged to perform his or her own general web searches to locate any site addresses listed here that are no longer valid.

For more information, including updates, about AHIMA Press publications, visit **http://www.ahima.org/education/press.**

American Health Information Management Association
233 North Michigan Avenue, 21st Floor
Chicago, Illinois 60601-5809
http://www.ahima.org

Brief Table of Contents

Detailed Table of Contents

QI Toolbox Techniques Table of Contents

About the Authors

Patricia Shaw, EdD, RHIA, FAHIMA, earned her doctorate and master's degrees in education. Dr. Shaw has been on the faculty of Weber State University since 1991, where she teaches in the Health Information Management and Health Services Administration programs. She has primary teaching responsibility for the quality and performance improvement curriculum in those programs. Prior to accepting a position at Weber State University, Dr. Shaw managed hospital health information services departments and was a nosologist for 3M Health Information Systems. In addition to this publication, Dr. Shaw is an editor for the *Registered Health Information Administrator (RHIA) Exam Preparation* and the *Registered Health Information Technician (RHIT) Exam Preparation* books published by AHIMA.

Darcy Carter, DHSc, MHA, RHIA, earned her doctorate degree in health science with an emphasis in leadership and organizational behavior and her master's degree in Healthcare Administration. She is the program director for the Master's in Healthcare Administration program, and continues to teach in the Health Information Management and Technology programs at Weber State University. Dr. Carter is also an editor of the *Registered Health Information Technician (RHIT) Exam Preparation* and the *Registered Health Information Administrator (RHIA) Exam Preparation* books published by AHIMA.

Preface for Students

You will soon be entering your chosen profession in the healthcare field. The issues involved in the management of quality in healthcare span the various clinical and administrative disciplines and must be approached from a variety of perspectives. Many improvements for healthcare services are developed through team-based activities. Employers also will expect you to be able to apply performance improvement (PI) data analysis and presentation tools. Prepare now for the possibility that at some point in the future you will be asked to facilitate a PI team meeting.

The authors of this text hope that this tool for programmed, incremental learning of the PI process will prepare you well for the challenges you will face in your new career. If you use this text carefully, you will probably find yourself miles ahead of your fellow students in preparation for today's healthcare environment.

Preface for Educators and Practitioners

This textbook from AHIMA presents a comprehensive introduction to the theory, practice, and management of performance and quality improvement processes for quality of patient care in healthcare organizations. Parts I and II provide a basic background in performance improvement (PI) philosophy and methodology for healthcare practice today. Each chapter has real-life examples and case studies from healthcare settings that bring home the importance of quality in healthcare services. QI toolbox techniques are presented both in theory and in practice so that your students can see how the techniques can actually be used in PI activities. Healthcare information management students will find the textbook's unique step-by-step and case study–based approach to the subject easy to use and understand. Students also will gain hands-on practice applying the analytical and graphic tools used in performance and quality improvement. Integrated into the chapter discussions are student projects that range from designing specific improvement projects to ongoing quality monitoring and managing quality improvement programs and staff.

Part III focuses on the issues inherent in the management of quality and PI programs in healthcare. Each chapter presents the issues and their backgrounds and most conclude with a case study to reinforce student learning and encourage critical thinking about the issues.

Instructor materials for this book are provided only to approved educators. Materials include lesson plans, PowerPoint slides, and other useful instructional tips, reminders, and resources. Please visit http://www.ahima.org/publications/educators.aspx for further instruction. If you have any questions regarding the instructor materials, please contact AHIMA Customer Relations at (800) 335-5535 or submit a customer support request at https://my.ahima.org/messages.

Acknowledgments

AHIMA Press and the authors would like to thank Angela Campbell, MSHI, RHIA, CHEP, and Dorinda Sattler, MJ, RHIA, CHPS, CPHRM, who served as technical reviewers.

PART I

A Performance Improvement Model

Introduction and History of Performance Improvement

1

Learning Objectives

- Summarize the historical events that have contributed to modern performance improvement programs
- Relate how key legislation has influenced healthcare quality initiatives
- Illustrate how key individuals and organizations have shaped the theory and developed models for use in performance improvement activities

Key Terms

Accountable care organization (ACO)
Affordable Care Act (ACA)
Cost
Outcome
Performance improvement (PI)
Process
Quality
Quality assurance (QA)
Retrospective payment system
Structure
Total quality management (TQM)
Value-based purchasing

People naturally expect their world to improve over time. This expectation affects everything people come into contact with, including food, housing, cars, education, and healthcare, and stimulates general social progress. Progress may take considerable time to develop, and the desire for progress sometimes takes a counterproductive path, as during times of war and political upheaval. Still, the objective of making the human situation better is a constant in human endeavors.

Progress is commonly accomplished in one of two ways. First, progress can be achieved through an understanding of the scientific basis of the natural world and its constituent parts. Understanding the way the human body functions through biochemistry, for example, facilitated the development of the pharmaceuticals in use today. Second, progress can be achieved through improvements in the ways that people perform their work. Understanding the procedures that healthcare professionals must perform to help people get well, for example, facilitated the development of one of the best healthcare delivery systems in the world. This textbook examines the second approach to progress.

The focus of this textbook is how healthcare organizations use **quality** and **performance improvement (PI)** methods to improve healthcare delivery in the US. Quality is defined as the degree or grade of excellence of goods or services, including, in healthcare, meeting expectations for outcomes of care. Performance improvement is the continuous adaptation of a healthcare organization's functions and processes to increase the likelihood of achieving the desired outcomes. For healthcare organizations to improve the quality of care delivered they must be engaged in performance improvement activities. Every healthcare professional needs to understand the issues surrounding quality and PI in healthcare because society expects that healthcare entities will produce progressively better healthcare products and services.

Early Quality and Performance Improvements in Healthcare

There is a long tradition of quality and performance improvement in healthcare, a representation of which is shown in table 1.1. From colonial times to the present, healthcare in the US has undergone a series of developments and reforms, from the creation of hospitals in the 18th century and the scientific discoveries of the 19th century, to the professionalization of medical and nursing practices in the early 20th century and the technological advances of the late 20th and early 21st centuries. Healthcare institutions, professional associations, individual leaders, and political visionaries all laid the foundations of modern healthcare.

Healthcare Institutions

During the mid-1700s, before the American colonies became a nation, the citizens of Philadelphia, PA, recognized the need for a place to house the mentally ill and to provide relief to the sick and injured. They also recognized the need to sequester newly arrived immigrants, who often contracted diseases during their long voyages. Thousands of people immigrated to the Pennsylvania colony in an attempt to improve their lives. Although most healthcare was provided in people's homes, established inhabitants, particularly the poor, were sometimes in need of a place to rest and mend during times of illness and injury. Recognizing these needs, Dr. Thomas Bond, with the help of Benjamin Franklin, persuaded the Pennsylvania legislature to undertake the organization and development of a hospital for the community. The famous Pennsylvania Hospital was the first in the growing nation (Morton and Woodbury 1973, 5–7).

Table 1.1. Historical perspectives on quality and PI in healthcare

1700s	1800s	1900s	2000s
Mid-1700s Pennsylvania Hospital becomes the model for organization and development of hospitals.	**1837** Massachusetts General Hospital sets limitations on clinical practice in the first granting of clinical privileges.	**1903** North Carolina passes the first nurse registration bill in the US.	**2001** Ambulatory payment classification system is initiated.
1760 New York State begins the practice of medical licensure.	**1853** Massachusetts General Hospital establishes the first disease/procedure index by classifying patient disposition.	**1910** Flexner Report indicates unacceptable variation in medical school curricula.	**2002** HCFA becomes the Centers for Medicare and Medicaid Services (CMS).
1771 New Jersey begins the practice of medical licensure.	**Mid-1800s** Medical licensure is deemed undemocratic and is stopped.	**1917** American College of Surgeons (ACS) establishes the Hospital Standardization Program.	**2003** JCAHO implements the National Patient Safety Goals.
	1872 New England Hospital for Women and Children organizes a general training school for nurses.	**1920** Most medical colleges meet rigorous academic standards and are approved by the Association of American Medical Colleges.	**2005** JCAHO begins unannounced and tracer methodology surveys.
	1874 American Medical Association (AMA) encourages the creation of independent state licensing boards.	**1946** Hill-Burton Act establishes funding to build new hospitals.	**2007** JCAHO renames itself the Joint Commission.
		1952 Joint Commission on Accreditation of Hospitals (JCAH) was formed by the AMA, the American College of Physicians (ACP), the American Hospital Association (AHA), and the Canadian Medical Association (CMA).	**2008** Medicare Severity diagnosis-related groups (MS-DRGs) are implemented.
		1965 Public Law 89-97 establishes Medicare and Medicaid.	**2009** Health Information Technology for Economic and Clinical Health Act (HITECH) legislation is passed.
		1972 Local peer review organizations are formed.	**2010** Patient Protection and Affordable Care Act (ACA) is passed.
		1980s Prospective payment system is established. State and regional peer review organizations contract with Health Care Financing Administration (HCFA).	**2014** Improving Medicare Post-Acute Care Transformation Act (IMPACT Act) is passed.
		1990s JCAH becomes Joint Commission on Accreditation of Healthcare Organizations (JCAHO). Deming's total quality management (TQM) philosophy begins to spread in US healthcare. JCAHO integrates quality improvement into the accreditation process.	**2015** ICD-10-CM and ICD-10-PCS implemented.
			2015 Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) is passed.

Over the next 150 years, the Pennsylvania Hospital became a model for the development of hospitals in other communities. The hospital even standardized its care processes by publishing rules and regulations for its physicians and staff (Morton and Woodbury 1973, 549–552). These regulations represent early attempts at healthcare improvement.

The annals of Massachusetts General Hospital provide an early example of an action taken by a hospital board of trustees to ensure the quality of care provided in the institution. In 1837, the trustees became aware that the son of a resident surgeon (a surgeon who had not attained appointment to the hospital) had practiced in the hospital during his father's absence. The trustees reiterated to all of the medical staff the need for allowing only those accorded privileges at the institution to practice there:

> The Trustees have recently seen with great pain, that a violation of the rules of the institution by one of its officers has become the subject of newspaper animadversion. In an institution like this, to which it is so difficult to attract, and in which it is so important to command, public confidence, the strictest and most scrupulous adherence to rules, of which the propriety is unquestioned, is required by a just regard as well to its usefulness to the public, as to the character of those who have any agency in its direction and control. Where many persons are connected in different departments, the reputation of all is more or less affected by the conduct of each; and all are therefore bound, by respect for others as well as themselves to conduct in such a manner as to give no reasonable ground of complaint. (Bowditch 1972, 135)

It is also interesting to note that the trustees believed that the expectations of the members of their community—their customers—should be considered.

The annals of Massachusetts General Hospital include other examples of the hospital's concern about service quality. In 1851, the hospital hired a watchman to guard against the danger of fire during the night (Bowditch 1972, 367). In 1853, the hospital commended one of its surgical staff members for compiling an analytical index for the surgical records of the institution and reflecting on the quality of the surgical services provided (Bowditch 1972, 483). In 1872, the trustees decided to regulate the use of restraints at the institution, and they identified each by type and set the conditions under which the restraint could be used (Bowditch 1972, 679–680). Throughout the history of the institution, the trustees received regular reports on the number of patients treated as well as the classification of each patient's outcome at discharge: "well," "relieved," "not relieved," or "dead" (Bowditch 1972, 447).

Medical Practice

Human anatomy and physiology were not well understood before the 20th century. At one time, it was believed that four basic fluids, called *humors,* determined a person's temperament and health and that imbalances in the proportion of humors in the body caused disease. The therapeutic bleeding of patients was practiced into the early 20th century. Early physicians also treated patients by administering a variety of substances with no scientific basis for their effectiveness. The science of medicine began to evolve in the late 19th century but was not fully realized until the second and third decades of the 20th century.

Early on, the medical profession recognized that some of its members achieved better results than others and attempted to regulate the practice of medicine. At first, the regulation took the form of licensure, beginning in New York in 1760 and New Jersey in 1771. The New Jersey law stated that "no person whatsoever shall practice as a physician or surgeon, within this colony of New Jersey, before he shall have first been examined in physic and surgery, approved of, and admitted by any two of the judges of the Supreme Court" (Wickes 1879, 103). The examination was to be performed before a board of "medical men" appointed by the state medical society (Trent 1977, 91). Various states developed similar legislation over the following decades.

By the middle of the 19th century, however, medical licensure had been repudiated as undemocratic, and the penalties for practicing medicine without a license were removed in most states. "Buyer beware" was the rule of thumb because the title of "doctor" could be used by anyone who wanted to sell medical services (Haller 1981, 200–201). During this period, medical education consisted primarily of an apprenticeship with an already established practitioner of some kind. After the apprenticeship, the new doctor could hang out a shingle and begin to treat patients. Some trainees did attend schools that claimed to teach them how

to become physicians, but there was no established medical curriculum. Many people received diplomas just by paying a fee. Many others with no education, apprenticeship, or license just hung out a sign and began collecting fees. Effectively, doctoring had become a commercial enterprise. Any man with sufficient entrepreneurial talents could enter the practice of medicine. The emphasis was on making a living rather than joining a true profession. The result was an overabundance of "medical men" who provided medical care based on all kinds of traditions and, at times, no tradition at all.

The American Medical Association (AMA) was established in 1840 to represent the interests of physicians across the US. The organization was dominated by members who had strong ties to medical schools and the status quo. The organization's ability to lead reform was limited until it broke its ties with the medical colleges in 1874. At that time, the association encouraged the creation of independent state licensing boards (Haller 1981, 214).

In 1876, the Association of American Medical Colleges (AAMC) was established. The AAMC was dedicated to standardizing the curriculum of US medical schools and developing the public's appreciation of the need for medical licensure.

Together, the AMA and the AAMC pushed for medical licensing. By the 1890s, 35 states had established or reestablished a system of licensure for physicians. Fourteen states granted medical licenses only to graduates of reputable medical schools. The state licensing boards discouraged the worst medical schools, but the criteria for licensing continued to vary by state and were not fully enforced (Haller 1981, 223).

By the early 20th century, it had become apparent that promoting quality in medical practice required regulation through curriculum reform as well as licensure. The membership of the AMA, however, was divided on this issue. Conservative members continued to believe that the organization should stay out of the regulatory arena. Progressive members advocated the continuing development of state licensure systems and the development of a model medical curriculum.

The situation attracted the attention of the Carnegie Foundation for the Advancement of Teaching and its president, Henry S. Pritchett. Pritchett offered to sponsor and fund an independent review of the medical curricula and the medical colleges of the US. The review was undertaken in 1906 by Abraham Flexner, an educator from Louisville, KY (Flexner, 1910).

Over the next four years, Flexner visited every medical college in the country and carefully documented his findings. In his 1910 report to the Carnegie Foundation, the AMA, and the AAMC, he documented the unacceptable variation in curricula that existed across the schools. He also noted that applicants to medical schools frequently lacked knowledge of the basic sciences. Flexner reported how the absence of appropriate hospital-based training limited the clinical skills of medical school graduates. Perhaps most important, he documented the huge number of graduates produced by the colleges each year, most with unacceptable levels of medical expertise.

Several reform initiatives grew out of Flexner's report and the recommendations made by the AMA's Committee on Medical Education. One reform required medical college applicants to hold a baccalaureate degree. Another required that the medical curriculum be founded in the basic sciences. Reforms also required that medical students receive practical, hospital-based training. Most important, Flexner recommended the closing of most medical schools in the country. Most of these recommendations were instituted over the decade after the release of Flexner's report, but only about half of the medical colleges actually closed. By 1920, most of the colleges met rigorous academic standards and were approved by the AAMC.

Nursing Practice

During the 19th century and throughout the first part of the 20th century, more than half of the hospitals in the US were sponsored by religious organizations. Nursing care at that time was usually provided by members of religious orders. As the US population grew and more towns and cities were established, hospitals were built to accommodate the healthcare needs of new communities. Older cities were also growing, and city hospitals became more and more crowded.

In the late 19th century, nurses received no formal education or training. Nursing staffs for the hospitals were often recruited from the surrounding communities, and many poor women who had no other skills

became nurses. The nature of nursing care at that time was unsophisticated, and ignorance of basic hygiene often promoted disease rather than wellness. For example, in 1871 at Bellevue Hospital in New York City, 15 percent of patients died while hospitalized, and hospital-acquired infections were common (Kalisch and Kalisch 1995, 71). Even simple surgical procedures and maternity care often resulted in death due to infection.

In 1868, the president of the AMA, Dr. Samuel Gross, called the medical profession's attention to the need for trained nurses. During the years that followed, the public began to call for better nursing care in hospitals.

A small group of women physicians working in the northeast area of the country created the first formal program for training nurses. Dr. Susan Dimock, working with Dr. Marie Zakrzewska at the New England Hospital for Women and Children, organized a general training school for nurses in 1872 (Kalisch and Kalisch 1995, 67–70). The school became a model for other institutions throughout the US. As hospital after hospital struggled to find competent nursing staff, many institutions and their medical staffs developed their own nurse training programs to meet staffing needs.

The responsibilities of nurses in the late 19th and early 20th centuries included housekeeping duties, such as cleaning furniture and floors; making beds; changing linens; and controlling temperature, humidity, and ventilation. Nurses also cooked the meals for patients in kitchens attached to each ward. Direct patient care duties included giving baths, changing dressings, monitoring vital signs, administering medication, and assisting at surgical procedures (Kalisch and Kalisch 1995, 76–79). Nurses generally worked 12-hour shifts, 7 days per week.

During this time, nurses were not required to hold a license to practice. Because licensure was not required, and because it was difficult to attract women to nursing staff positions, many women who had no training at all continued to work as nurses in the nation's hospitals and as private-duty nurses.

In the years immediately following the turn of the 20th century, nurses began to organize state nursing associations to advocate for the registration of nurses. Their goal was to increase the level of competence among nurses nationwide. Despite opposition from many physicians who believed that nurses did not need formal education or licensure, North Carolina passed the first nurse registration bill in the US in 1903. Many other states initiated similar legislation in subsequent years. Today, all the states have carefully developed boards of nursing registration that maintain basic standards for nursing practice, promulgate advanced standards for clinical and managerial nurse specialists, license the professional membership, and require ongoing education for maintenance of nursing skills.

Allied Health Professions

Other healthcare professions in the US developed as specialized areas of practice over the course of the 20th century. The allied health professions, for instance, include radiologic technology, respiratory therapy, occupational therapy, and physical therapy, among others. Each specialized area underwent periods of formalization in similar ways. Each became regulated either by the states or by national professional associations as membership and professional responsibilities grew and the public demanded that they document their professional competence. For example, health information management professionals, another allied health profession, are certified and registered by the American Health Information Management Association (AHIMA). These developments made important contributions to the quality of healthcare delivered in the US.

Historically Significant Contributions of Individual Healthcare Professionals

Many individual healthcare professionals have made significant contributions to the early improvement of healthcare delivery in the US, including the development and implementation of a variety of improvement strategies. A small sample of these individuals and their contributions is included here. It is important to recognize the progress that can be made when healthcare professionals care about the quality of their work.

Maude E. Callen, an African American public health nurse-midwife, undertook the training of midwives in coastal South Carolina in 1926. A registered nurse, Callen recognized that the midwives' lack of training

contributed to high infant and maternal mortality rates in the region, and she traveled extensively throughout the region to assist at deliveries and improve the expertise of midwives (Hill 1997, 49–54).

Robert Latou Dickinson, an obstetrician and gynecologist practicing in New England around the turn of the 20th century, developed a standardized patient questionnaire. He used the patients' answers on the questionnaire to structure his examinations. His questionnaire represents one of the first uses of a structured health assessment tool in the US (Bullough 1997, 75–78).

Lavinia Lloyd Dock, a nurse and early nurse educator, developed important approaches to disaster nursing at the end of the 19th century. After graduating from a nurse training program, Dock worked to institute appropriate nursing practices during the yellow fever epidemic in Jacksonville, FL, in 1888, and during the aftermath of the Johnstown, PA, flood in 1889 (Leighow 1997, 79–85).

Roswell Park, a physician and surgeon during the late 19th century, helped disseminate the principles of antisepsis during surgical procedures in the US. Park used the findings of English scientist Joseph Lister to advocate for the use of antiseptic techniques and appropriate wound care in the treatment of surgical cases, well before such approaches were common in the US (Gage 1997, 204–208).

Nicholas J. Pisacano, a physician who practiced in the middle and late 20th century, recognized the need to upgrade the general practitioner's skills as new technologies and treatments were developed. He worked tirelessly to develop and promote the specialty of family practice in the US (Adams and Moore 1997, 222–226).

Ernst P. Boas, a physician who practiced in New York City during the first half of the 20th century, was among the first to call for the coordinated, interdisciplinary care of the chronically ill. Prior to his advocacy, the chronically ill often were considered incurable. He believed that the development of new therapeutics and restorative technologies could return people with chronic illnesses to better health and productivity. His work led to the establishment of the Goldwater Memorial Hospital for Chronic Diseases on Welfare Island in New York City (Brickman 1997, 21).

Mary Steichen Calderone, medical director of the Planned Parenthood Federation of America during the 1950s, launched a clinical investigation program to scientifically identify effective contraceptive methods. Hers was one of the first efforts to identify appropriate clinical practice through the use of scientific evidence in a controversial area (Meldrum 1997, 43–48).

Hospital Standardization and Accreditation

In 1910, Dr. Edward Martin suggested that the surgical area of medical practice become more concerned with patient outcomes. He had been introduced to this concept through discussions with Dr. Ernest Codman, a physician who believed that hospital practitioners should track their patients for a significant time after treatment to determine whether the end result was positive or negative. Dr. Codman also advocated the use of outcome information to identify practices that led to the best results.

Dr. Martin and others had been concerned about the conditions in US hospitals for some time. Many observers felt that part of the problem was related to the absence of organized medical staffs in hospitals and to lax professional standards. In the early 20th century, hospitals were used primarily by surgeons who required their facilities to treat patients with surgical modalities. Therapies based on medical regimens were not developed until later in the century. It was natural, therefore, for the impetus for improvement in hospital care to come from the surgical community.

In November 1912, the Third Clinical Congress of Surgeons of North America was held. At this meeting, Dr. Franklin Martin made a proposal that eventually led to the formation of the American College of Surgeons (ACS). Dr. Edward Martin made the following resolution:

> Be it resolved by the Clinical Congress of Surgeons of North America here assembled, that some system of standardization of hospital equipment and hospital work should be developed to the end that those institutions having the highest ideals may have proper recognition before the profession, and that those of inferior equipment and standards should be stimulated to raise the quality of their work. In this way, patients will receive the best type of treatment, and the public will have some means of recognizing those institutions devoted to the highest levels of medicine. (Roberts et al. 1987, 936)

Through the proposal and the resolution, the ACS and the hospital improvement movement became intimately tied. Immediately upon formation, however, officers of the college realized how important their work would be. They were forced to reject 60 percent of the fellowship applications during the college's first three years because applicants were unable to provide documentation to support their clinical competence (Roberts et al. 1987, 937). Medical records from many hospitals were so inadequate that they could not supply information about the applicants' practices in the institutions. Because of this situation and many others of which they became aware, college officers petitioned the Carnegie Foundation in 1917, for funding to plan and develop a hospital standardization program.

That same year, the ACS formed a committee on standards, and met to consider the development of a minimum set of standards that US hospitals would have to meet if they wanted approval from the ACS. On December 20, 1917, the ACS formally established the Hospital Standardization Program and published a formal set of hospital standards called *The Minimum Standard.*

During 1918, and part of 1919, the ACS undertook a review of hospitals across the US and Canada as a field trial to see whether *The Minimum Standard* would be effective as a measurement tool. In total, 692 hospitals were surveyed, of which only 89 met the standard entirely. Some of the most prestigious institutions in the US failed to meet the standard. Brief and clear in its delineation of what was believed to promote good hospital-based patient care in 1918, *The Minimum Standard* stated

1. That physicians and surgeons privileged to practice in the hospital be organized as a definite group or staff. Such organization has nothing to do with the question as to whether the hospital is "open" or "closed," nor need it affect the various existing types of staff organization. The word staff is here defined as the group of doctors who practice in the hospital inclusive of all groups such as the "regular staff," the "visiting staff," and the "associate staff."
2. That membership upon the staff be restricted to physicians and surgeons who are (a) full graduates of medicine in good standing and legally licensed to practice in their respective states or provinces; (b) competent in their respective fields; and (c) worthy in character and in matters of professional ethics; that in this latter connection the practice of the division of fees, under any guise whatever, be prohibited.
3. That the staff initiate and, with the approval of the governing board of the hospital, adopt rules, regulations, and policies governing the professional work of the hospital; that these rules, regulations, and policies specifically provide: (a) that staff meetings be held at least once each month (In large hospitals, the departments may choose to meet separately); and (b) that the staff review and analyze at regular intervals their clinical experience in the various departments of the hospital, such as medicine, surgery, obstetrics, and the other specialties; the clinical records of patients, free and pay, to be the basis of such review and analysis.
4. That accurate and complete records be written for all patients and filed in an accessible manner in the hospital—a complete case record being one which includes identification data; complaint; personal and family history; history of present illness; physical examination; special examinations, such as consultations, clinical laboratory, x-ray, and other examinations; provisional or working diagnosis; medical or surgical treatment; gross and microscopic pathological findings; progress notes; final diagnosis; condition on discharge; follow-up; and, in case of death, autopsy findings.
5. That diagnostic and therapeutic facilities under competent supervision be available for the study, diagnosis, and treatment of patients, these to include, at least (a) a clinical laboratory providing chemical, bacteriological, serological, and pathological services; (b) an x-ray department providing radiographic and fluoroscopic services. (ACS 1930, 3)

The adoption of *The Minimum Standard* marked the beginning of the accreditation process for healthcare organizations. A similar process is still followed today. (For more information, see chapter 16 of this textbook.) Basically, the process is based on the development of reasonable quality standards and a survey of the organization's performance on the standards. The accreditation program is voluntary, and healthcare organizations request participation to improve patient care (Roberts et al. 1987, 938).

The ACS continued to examine and approve hospitals for three decades. By 1950, however, the number of hospitals being surveyed every year had grown to be unmanageable, and the ACS could no longer afford to administer the program alone. After considerable discussion and organizing activity, four professional associations from the US and Canada—the AMA, the American College of Physicians (ACP), the American

Hospital Association (AHA), and the Canadian Medical Association (CMA)—decided to join the ACS to develop the Joint Commission on Accreditation of Hospitals. The new accrediting agency was formally incorporated in 1952 and began accreditation activities in 1953. It continued its activities almost 50 years later as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) before renaming itself the Joint Commission in 2007.

Check Your Understanding 1.1

1. Using the American College of Surgeons' *Minimum Standard* and knowledge of accreditation requirements, illustrate how they are similar and different.
2. Why was Henry Pritchett of the Carnegie Foundation so concerned about healthcare that he volunteered to sponsor and fund the first review of medical college curriculum and education processes, leading to more rigorous academic standards for medical schools?

Quality, PI, and Modern Healthcare

Until World War II, most healthcare was still provided in the home. Quality in healthcare services was considered a byproduct of physicians' appropriate medical practice and oversight. The positive and negative effects of other factors and the contributions of other healthcare workers were not given much consideration.

In the 1950s, the number of hospitals grew to support developments in diagnostic, therapeutic, and surgical technology and pharmacology. Fueled by an expanding economy, the Hill-Burton Act of 1946 funded extensive hospital construction. A renewed insurance industry helped pay for the new healthcare services provided to groups of individual beneficiaries.

During this period, the Hospital Standardization Program was replaced by the Joint Commission on Accreditation of Hospitals (JCAH) (JCAH 1952). A whole new set of standards covered every aspect of hospital care. The intent was to ensure that the care provided to patients in accredited hospitals would be of the highest quality.

The construction of new facilities and the growth of the medical insurance industry, however, did not guarantee access to services. As new treatments and "miracle" drugs, such as antibiotics, were developed, healthcare services became more and more costly. Many Americans, particularly the poor and the elderly, could not afford to buy healthcare insurance or to pay for the services themselves.

Medicare and Medicaid Programs

The idea of federal funding for healthcare services goes back to the 1930s, the Great Depression, and Franklin Roosevelt's New Deal. Harry Truman also supported a universal healthcare program in the late 1940s. But it was not until the 1960s and the presidency of Lyndon Johnson that the federal government developed a program to pay for the healthcare services provided to the poor and the elderly (AHA 1999, 52–53).

In 1965, the US Congress passed Public Law 89-97, an amendment to the Social Security Act of 1935. Title XVIII of Public Law 89-97 established health insurance for the aged and the disabled. This program soon became known as Medicare. Title XIX of Public Law 89-97 provided grants to states for establishing medical assistance programs for the poor. The Title XIX program became known as Medicaid. The objective of the programs was to ensure access to healthcare for citizens who could not afford to pay for it themselves. The Great Society, as the geopolitics of the US was called in the 1960s, marshaled billions of federal tax dollars to fund care for millions of Americans.

During the 1970s, attempts were made to further standardize and improve the clinical services provided by physicians and hospitals. Under the authority of Medicare officials, hospital audits of physicians' medical records were mandated to identify physicians with substandard practice patterns or excessive patient care costs. Local peer review organizations (PROs), usually sponsored by local medical societies, reviewed the findings at each local institution and developed recommendations for physician continuing education. These audit activities were designed to measure the quality of services, products, or processes followed by remedial action to improve care delivery. These activities were referred to as **quality assurance (QA)**. Such retrospective QA efforts were only partially successful and had little effect on the mounting cost to the government of the Medicare and Medicaid programs. As a result, utilization review (UR) programs were mandated to justify hospital admissions. The concept and practice of UR survives today (see chapter 8). Institutions must still provide payers a rationale for the level of services provided to be reimbursed.

The changes that most significantly improved patient outcomes in the 1970s involved the development and use of sophisticated medical technology and pharmaceuticals. The overall benefits of modern healthcare were evident in increased life spans and better medical outcomes. Americans had come to expect the best and the newest medical care available as a personal right, not to be taken away.

By 1980, however, it was obvious that healthcare spending in the US would consume even more economic resources if left unchecked. The Medicare and Medicaid programs were on their way to becoming the most expensive government programs in US history. At the same time, healthcare experts also began to understand that increased spending and technological advances did not automatically guarantee quality healthcare.

In the early 1980s, a new nationwide system was developed to standardize reimbursement for hospital services provided to Medicare and Medicaid beneficiaries. Until 1983, Medicare and Medicaid reimbursement was based on a **retrospective payment system**. In a retrospective payment system, a type of fee-for-service payment, providers are paid for the services they provided to a patient in the past. The patient goes to the doctor, the doctor cares for the patient, the doctor assigns charges and submits a bill to a payer, and the doctor is reimbursed for his or her charges. The problem with this system is that there is no incentive for the doctor to hold down costs. If the doctor provides more services, then he or she bills more and, consequently, gets paid more. So, this type of arrangement did not help rein in ever-increasing healthcare costs.

To slow the growth in cost of federal healthcare programs, a prospective payment system was developed. In a prospective payment system, providers receive a fixed, predetermined payment for the services they provide. The reimbursement amounts are determined annually by the Centers for Medicare and Medicaid Services (CMS), and billing of carriers and patients cannot exceed these assigned amounts. Because the amount of reimbursement is fixed and often lower than the provider would otherwise charge, providers are theoretically motivated to use only those services absolutely necessary to the patient's care. In this way, costs could supposedly be controlled and unnecessary services avoided. However, by the first decade of the 21st century, this system became less and less capable of controlling costs due to a variety of factors, none of which are currently completely understood. Healthcare costs continue to be one of the fastest growing segments of the gross domestic product as well as one of the most contentious subjects of the US political arena.

In the Medicare and Medicaid prospective payment system, reimbursement for hospital inpatient services has long been based on diagnosis-related groups (DRGs). This system assumes that similar diseases and treatments consume similar amounts of resources and therefore have similar total costs, at least on a regional, if not national, basis. Every hospital inpatient has been assigned to an appropriate DRG on the basis of his or her diagnosis since 1984. Since that time, reimbursement levels for each DRG are updated annually and adjusted for the geographic location of the healthcare facility. For federal fiscal year 2009, however, CMS undertook a major revision of the DRG structure to create groups that reflect the medical severity of the patient's condition (Medicare severity DRGs [MS-DRGs]). MS-DRGs identify conditions that significantly inflate the use of resources and the overall costs of the provision of care when they occur concurrently with the reason for admission.

The Healthcare Common Procedure Coding System (HCPCS) was developed in the early 1980s. HCPCS codes are used to report the healthcare services provided to Medicare and Medicaid beneficiaries treated

in ambulatory settings. HCPCS initially included three separate levels of codes: level I, Current Procedural Terminology (CPT) codes; level II, national codes; and level III, local codes. The level III local codes were eliminated by CMS in 2003 (CMS 2014).

A prospective payment system for hospital outpatient and ambulatory surgery services provided to Medicare and Medicaid beneficiaries was implemented in 2001. This system, known as the Outpatient Prospective Payment System (OPPS), is based on ambulatory payment classification (APC) groups. The APCs are generated on the basis of the HCPCS CPT codes assigned for services such as outpatient diagnostic procedures and outpatient radiology procedures. A similar system was implemented for the reimbursement of professional fees. This resource-based relative value scale (RBRVS) system takes into consideration the level of services provided by the physician in terms of time spent with the patient, complexity of physical examination and information gathering, the diagnostic and procedural actions performed to arrive at the reimbursement amount, and the geographic location of the service.

Hospitals and physicians in the US provide billions of dollars' worth of care to Medicare and Medicaid patients every year. The implementation of prospective payment systems has made it necessary for healthcare organizations to devise ways to control costs without endangering safe and effective patient care. It is necessary to recognize, however, that there are limits to the amount of money that can be extracted from the system by these methods.

The issue of linking payment of services to quality and performance has continued to evolve and has led to the development of value-based purchasing, or pay-for-performance systems. **Value-based purchasing (VBP)** is defined as a payment model that holds healthcare providers accountable for both the cost and quality of care they provide (Healthcare.gov 2018). In the private sector, pay-for-performance programs are more common and base provider payments on performance and incentives.

Finally, at the end of the first decade of the 21st century, US politicians tackled the issues of payment and insurance discrimination with the passage of the **Affordable Care Act (ACA)** of 2010. The major focus of the act is providing or improving access to healthcare services for millions of US citizens, including new restrictions on the ability of payers to limit coverage on the basis of pre-existing conditions, an end to lifetime limits on coverage, and a requirement for payers to spend premium dollars on healthcare costs and not administrative costs. Recognizing that access is a financial issue as well as a quality issue, the act also has requirements directly related to the issue of quality. For example, it requires establishment of a quality measures program for Medicaid; requires long-term care, rehabilitation, and hospice facilities to submit quality data to CMS; and expands the quality reporting in the prospective payment system that can have a negative impact on reimbursement rates when the patient encounters adverse events or complications resulting from inadequate treatment by providers.

Managed Care

The growth of managed care in the US also has had a tremendous impact on healthcare providers. Managed care is a broad term used to describe several types of managed healthcare plans. Health maintenance organizations (HMOs) are one of the most familiar types of managed care. Members of an HMO (or their employers) pay a set premium and are entitled to a specific range of healthcare services. HMOs control costs by requiring beneficiaries to seek services from a preapproved list of providers, by limiting access to specialists and expensive diagnostic and treatment procedures, and by requiring preauthorization for inpatient hospitalization and surgery.

Other types of managed care include preferred provider organizations (PPOs) and point-of-service (POS) plans. These types of managed care plans negotiate discounted rates with specific hospitals, physicians, and other healthcare providers. Many also restrict access to specialists and require preauthorization for surgery and other hospital services. In PPOs, enrollees are required to seek care from a limited list of providers who have agreed in advance to accept a discounted payment for their services. Enrollees in POS plans pay for a greater portion of their healthcare expenses when they choose to seek treatment from providers who do not participate in their plan.

Together, the Medicare and Medicaid programs and the managed care insurance industry have virtually eliminated fee-for-service reimbursement arrangements. At the same time, healthcare consumers are demanding more services and greater quality. Hospitals and physicians now find that they have no choice but to become more efficient and effective if they are to stay in business. Programs that promote efficiency and effectiveness have become the only way for providers to add value to the services they provide and ensure their financial viability.

Accountable Care Organizations

Established as a key component of the Affordable Care Act of 2010, an **accountable care organization (ACO)** is a network of doctors and hospitals that share responsibility for providing care to patients. An ACO agrees to manage all of the healthcare needs for their Medicare beneficiaries for a period of at least three years. During the period agreed upon between the network and ACO, ACOs will:

- "Engage in various activities during the performance year, including coordinating care for beneficiaries, measuring and improving quality, and public reporting;
- Prepare for the next performance year by making sure contact information is current in CMS systems and completing the Annual Certification process; and
- Receive financial and quality performance results after the close of every performance year" (CMS 2018a).

Check Your Understanding 1.2

1. In 1965, the US Congress passed Public Law 89-97, an amendment to the Social Security Act of 1935. This law established the Medicare and Medicaid programs. Discuss the impact of this legislation and how it changed the healthcare industry.
2. Which of the following is *not* a type of managed care?
   a. HMO
   b. PPO
   c. ACO
   d. POS

Evolution of Quality in Healthcare

In the 1980s, leaders in the healthcare industry began to take notice of a theory from general industry called **total quality management (TQM)**. The concept of TQM was developed by W. Edwards Deming in the early 1950s as an alternative to authoritarian, top-down management philosophies. Philip Crosby and J. M. Juran each further adapted TQM and developed similar approaches. TQM mobilizes individuals directly involved in a work process to examine and improve the process with the goal of achieving a better product or outcome. It does not matter what the product or outcome might be. TQM is firmly based in the statistical analysis of objective data gathered from observation of the process being examined. The data are then carefully analyzed to identify the steps in the process that lead to a less-than-ideal product or outcome. Once the problematic steps in the process have been identified, individuals or teams can make recommendations for changing the process to get a better product or outcome. Key to Deming's philosophy is the concept that problematic processes, not people, cause inferior products and outcomes.

TQM revolutionized industrial production in Japan during the post–World War II period. When Japanese automobiles took over much of the US car market in the late 20th century, American manufacturers began to

take notice of TQM. They recognized that Deming's management philosophy might help them create more efficient and effective manufacturing processes.

Avedis Donabedian was one of the first theorists to recognize that the TQM philosophy could be applied to healthcare services (Donabedian 1966). Beginning in 1966, Donabedian advocated the assessment of healthcare from four perspectives:

- **Structure**: The foundation of caregiving, which includes buildings, equipment, technology, professional staff, and appropriate policies
- **Process**: The interrelated activities of healthcare organizations—including governance, managerial support, and clinical services—that affect patient outcomes across departments and disciplines within an integrated environment
- **Outcome**: The results of care, treatment, and services in terms of the patient's expectations, needs, and quality of life, which may be positive and appropriate or negative and diminishing
- **Cost**: The amount of financial resources consumed in the provision of healthcare services

Only in the 1990s, however, were his approaches widely adopted. As the concept of TQM (or continuous quality improvement [CQI], as it became known in the US healthcare system) was integrated into the quest for healthcare improvement, the industry began using Donabedian's four perspectives to identify processes of providing care that could be improved. Using the team approach from Deming and his emphasis on objective data gathering to describe a process clearly, members of the industry began a self-examination that focused very specifically on the processes of care rather than on the individuals who provided it. Many improvements were made for the nation's recipients of care in all types of healthcare organizations using this variant of Deming's TQM.

By the end of the 1990s, however, some individuals involved in the improvement of quality in healthcare had made a significant realization: quality in healthcare was tied very closely to the performance of individuals in the healthcare organization. Unlike the products of manufacturing firms that utilized machinery to shape raw materials into physical products, the products of healthcare organizations were the services provided to patients by healthcare professionals who defined processes of practice. The performance of the professionals in healthcare processes often determined the quality of the services. Quality improvement initiatives in healthcare organizations were renamed *performance improvement* initiatives, at least in those organizations affected by the Joint Commission's PI standards. Quality improvement was refocused to examine the performance of the people in the organization, rewarding those who obtained good outcomes or costs, and requiring those working in the healthcare industry to become more accountable for their patient or client outcomes.

The IOM's landmark report *To Err is Human* (IOM 1999) was instrumental in raising awareness about that status of healthcare quality and patient safety in the US. This report famously estimated that 44,000 to 98,000 deaths occur every year due to medical errors in hospitals and is viewed as a catalyst for moving quality and patient safety to the forefront of healthcare organizations. This study was considered such an eye-opening event for US healthcare that all stakeholders, including consumers, took note and expected change. Early in the 21st century, federal agencies began to emphasize quality improvement in the programs they sponsored. The approach by federal Medicare and Medicaid programs retained the quality improvement terminology but focused largely on the same kinds of process issues. Today, contracted healthcare examiners—once called PROs and now called quality improvement organizations (QIOs)—retrospectively examine the care provided to beneficiaries and compare it with similar providers' performance in different regions of the country.

This comparison of providers' performance was facilitated by the collection and submission of mandated data sets by the Joint Commission and CMS, called core measures, on the most common diagnoses, such as pneumonia, congestive heart failure, or myocardial infarction. The core measures defined the practices used in managing a health condition that achieve the best outcomes, often on the basis of research identifying the best practices and methodologies used across the country. Analysis of the core measure data allowed

providers to examine where their performance on various characteristics of care does not measure up to the performance of the general community. Thereby, they can identify aspects of their services that can be improved. The core measure data collection process has evolved into many other manual and electronic data collection processes, such as abstracting measures or direct feeds from the electronic health record into the federal value-based purchasing programs. Much of this data is now available to consumers through websites for this public reporting purpose.

In the first decade of the 21st century, the Joint Commission evolved its philosophy to emphasize patient safety. This was in response to the IOM's analysis in *To Err is Human*, which revealed that hundreds of thousands of patients die in hospitals every year from mistakes or miscommunication involving the care they are receiving. In particular, the analysis highlighted mistakes occurring in medication administration and provision of surgical procedures. In response to these revelations, the Joint Commission developed a set of National Patient Safety Goals (NPSGs) (Joint Commission 2018). All institutions participating in accreditation must promote and train their staff members who provide care to adhere to the NPSGs. The Joint Commission has continued to revise and fine-tune the original set of NPSGs that went into effect in 2003, moving some of them into the formal accreditation standards (see chapter 9). Finally, the Joint Commission undertook radical restructuring of the survey processes used to examine hospitals for accreditation, emphasizing foremost the processes by which nurses and other allied health professionals provide care at the bedside, rather than emphasizing the development of policy and procedure and retrospective review of records. This process began with the Joint Commission's move to unannounced surveys in 2006.

In parallel with these changes in the philosophy of the Joint Commission, the federal government has sponsored more and more research into the issues inherent in the US healthcare delivery system through its Agency for Healthcare Research and Quality. In the private sector, organizations such as the National Quality Forum have brought together a variety of stakeholders, including researchers, providers, consumer advocates, payers, and accreditors, to develop quality measures for use across most healthcare organizations. The IOM has used funding from a variety of sources to examine the areas in which the system is failing people in the US and to make recommendations on systematic improvement. Since its inception, the IOM has published hundreds of reports on different healthcare topics, such as *To Err is Human* previously mentioned and *Crossing the Quality Chasm: A New Health System for the 21st Century.*

Students of healthcare quality improvement might want to read *Crossing the Quality Chasm* (IOM 2001). After acknowledging that the current system is overly complex and inequitable with respect to various socioeconomic groups, the IOM cites six core requirements necessary to focus US healthcare delivery in the 21st century: care should be "safe, effective, patient-centered, timely, efficient, and equitable." At the same time, the IOM proposed a set of 10 rules or general principles to inform efforts in redesigning the healthcare system:

- Care is based on continuous healing relationships. Patients should receive care whenever they need it and in many forms. . . .[for example,] over the Internet, by telephone, and by other means in addition to in-person visits.
- Care is customized according to patient needs and values. . . .
- The patient is the source of control, [and should be given] the necessary information and opportunity to exercise the degree of control they choose over healthcare decisions that affect them. . . .
- Knowledge is shared and information flows freely. Patients should have unfettered access to their own medical information and to clinical knowledge. Clinicians and patients should communicate effectively and share information.
- Decision-making is evidence-based. Patients should receive care based on the best available scientific knowledge. Care should not vary from clinician to clinician or from place to place.
- Safety is a system [priority]. . . . Reducing risk and ensuring safety require greater attention to systems that help prevent and mitigate errors.

- Transparency is necessary. . . . Information describing the system's performance on safety, evidence-based practice, and patient satisfaction [should be readily available].
- [Patient] needs are anticipated. . . .
- Waste is continuously decreased. . . .
- Cooperation among clinicians is a priority. . . . (IOM 2001, 3–4)

Following publication of *Crossing the Quality Chasm* and heightened discussion between accrediting and licensing agencies regarding some of the report's recommendations, healthcare entities renewed their emphasis on the issues the report raised regarding safety of care, patient centricity of care, the scientific basis for care, and the transparency of the outcomes of care. In 2008, the IOM published *Knowing What Works in Health Care: A Roadmap for the Nation*. This report further reveals how the science on which healthcare is based could be promulgated to US providers and consumers. The report makes recommendations for a national clinical effectiveness assessment program "with authority, overarching responsibility, sustained resources, and adequate capacity to ensure production of credible, unbiased information about what is known and not known about clinical effectiveness." It goes on to make specific recommendations regarding how the assessment should be undertaken:

- Set priorities for, fund, and manage systematic reviews of clinical effectiveness and related topics.
- Develop a common language and standards for conducting systematic reviews of the evidence and for generating clinical guidelines and recommendations.
- Provide a forum for addressing conflicting guidelines and recommendations.
- Prepare an annual [summary] report to Congress. (IOM 2008, 9–10)

Many of these dialogues have taken place alongside political discussions, debates, and demonstration projects about healthcare reform in the face of burgeoning healthcare costs in the first decade of the 21st century and the projected financial inadequacies of the Medicare and Medicaid programs taking effect as the century progresses. Many political figures of this period assumed that they had an adequate understanding of the complexities of US healthcare delivery to formulate plans to solve the issues. Few undertook a solid attempt at doing so at the federal level, however, until 2009 and 2010. Prior to that, those charged with administration of the Medicare and Medicaid programs put forward little in the way of reform, except to require the development of more specific data sets: MS-DRGs; the *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM); and the *International Classification of Diseases, Tenth Revision, Procedure Coding System* (ICD-10-PCS).

After many years of debate, around 2010, the US Congress passed three sets of legislation in an effort to positively impact the quality of care in the healthcare system as a whole. The American Recovery and Reinvestment Act of 2009 (ARRA), the Health Information Technology for Economic and Clinical Health Act (HITECH), and the ACA all have provisions designed to improve the quality of a patient's healthcare: the ARRA by focusing funding on the expansion of the healthcare workforce; HITECH by stimulating investment in the information systems infrastructure of professional practices, clinics, and hospitals; and the ACA by mandating increased quality measure reporting by payers and providers at all levels of care, by implementing penalties for poor care in terms of reimbursement, and by improving access for the millions of Americans who, prior to the act's implementation, had nowhere to turn but the nation's emergency departments.

In 2014, Congress passed the Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT Act) that established a quality reporting program for skilled nursing care. This program requires long-term care hospitals, skilled nursing facilities, home health agencies, and inpatient rehabilitation facilities to submit standardized data pertaining to resource use, hospitalization, and discharge to the community. These types of facilities were subject to Medicare payment reductions beginning in fiscal year 2018 for noncompliance with the data reporting and submission requirements. Each of these actions taken by Congress is part of the National Quality Strategy for better care that is patient-centered, reliable, accessible, and safe; to improve the

health of the US population; and to reduce the cost of quality healthcare (CMS 2015). This National Quality Strategy includes the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA). MACRA created the Quality Payment Program that changed how Medicare reimburses providers and made significant changes to data collection efforts to assess quality of care (CMS 2018b).

All of these initiatives have provided the foundation and set the stage for a climate of paying for quality care. Most public and private payers have this premise of paying for value at the core of their reimbursement models. No longer will healthcare providers be paid for medical errors, complications, and readmissions that resulted from lack of quality care (see chapter 8 for discussion on value-based purchasing).

Check Your Understanding 1.3

1. Summarize the contributions of the following individuals to modern day quality improvement and how these contributions are being used in healthcare today: Crosby, Deming, Donabedian, and Juran.
2. Which of the following entities is responsible for retrospectively examining the care provided to beneficiaries and comparing it to similar providers' performance in different regions of the US?
   a. Agency for Healthcare Research and Quality
   b. American Medical Association
   c. Quality improvement organizations
   d. The Joint Commission

Why Care About Quality and PI?

An individual working in the US healthcare industry today hears many terms that reflect the long-term development of quality improvement philosophy, including *quality assurance*, *quality improvement*, *quality management*, and *performance improvement*. The differences in meaning are subtle, reflecting the time and place of their origins as well as the individuals and philosophies that generated them. However, they are all, in reality, focused on one thing: helping people with health challenges return to healthier, more productive lives and doing so by the most efficient and effective means possible. It is an evolving mission and one that is always seeking a better way.

There is a long tradition of seeking improvement in the healthcare industry, and healthcare professionals must continue to be concerned with PI. Today, PI is the key to ensuring high-quality care, and a PI philosophy pervades leading healthcare organizations. To contribute to personal and organizational success, one must commit to participate in PI. Today's patients are increasingly able to choose their professional and institutional providers on the basis of quality due to increased transparency and public reporting of outcomes. Furthermore, most contemporary payers prefer to negotiate with organizations that provide high-quality, yet cost-effective, services. Today's healthcare organizations must be able to back up their espousal of quality with reliable, objective data. Government-sponsored and commercial health plans, employers, and consumers are all now asking for more information on the quality of the healthcare services they receive and pay for. In addition, a focus on quality is the key to meeting regulatory, licensure, and accreditation requirements. Demonstrating quality and improving performance are the definitive keys to success in the healthcare industry's mission to provide high-quality care.

Review Questions

1. Select a significant historical event described in the chapter and demonstrate how this event has shaped current performance improvement or quality initiatives in the modern era.
2. Summarize the ways in which the Affordable Healthcare Act of 2010 changed healthcare delivery in the US.
3. During the mid-1700s, the citizens of Philadelphia, PA, recognized the need to sequester newly arrived immigrants, who often contracted diseases during their long voyages to America. This procedure is an example of early _____.
   a. Infection control
   b. Utilization management
   c. Performance improvement
   d. Standardization
4. Compare and contrast the activities taken by Massachusetts General Hospital in the 1800s with modern day quality and performance improvement activities.
5. Discuss the key activities required of accountable care organizations to fulfill their agreements with networks.

References

Adams, D. P. and A. L. Moore. 1997. Nicholas J. Pisacano. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

American College of Surgeons (ACS). 1930. Manual of Hospital Standardization and Hospital Standardization Report. Chicago: American College of Surgeons.

American Hospital Association (AHA). 1999. *100 Faces of Health Care*. Chicago: Health Forum.

Bowditch, N. I. 1972. *History of the Massachusetts General Hospital*. Boston: Arno Press and New York Times.

Brickman, J. P. 1997. Ernst P. Boas. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Bullough, V. L. 1997. Robert Latou Dickinson. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Centers for Medicare and Medicaid Services (CMS). 2018a. "For ACOs." https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/for-acos/index.html.

Centers for Medicare and Medicaid Services (CMS). 2018b. "What's MACRA?" https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-MIPS-and-APMs.html.

Centers for Medicare and Medicaid Services (CMS). 2015. "SNF Quality Reporting." https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/SNF-Quality-Reporting.html.

Centers for Medicare and Medicaid Services (CMS). 2014. "HCPCS: General Information." http://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/index.html.

Donabedian, A. 1966. Evaluating the quality of medical care. *Milbank Quarterly* 44:166–203.

Flexner, A. 1910. *Medical Education in the United States and Canada, Bulletin Number Four*. New York: The Carnegie Foundation for the Advancement of Teaching. http://archive.carnegiefoundation.org/pdfs/elibrary/Carnegie_Flexner_Report.pdf.

Gage, A. 1997. Roswell Park. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Haller, J. S. 1981. *American Medicine in Transition 1840–1910*. Chicago: University of Illinois Press.

Healthcare.gov. 2018. Glossary. https://www.healthcare.gov/glossary/.

Hill, P. E. 1997. Maude E. Callen. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Institute of Medicine (IOM). 2008. *Knowing What Works in Health Care: A Roadmap for the Nation*. Washington, DC: National Academies Press.

Institute of Medicine (IOM). 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Press.

Institute of Medicine (IOM). 1999. *To Err is Human: Building A Safer Health System.* Washington, DC: National Academies Press.

Joint Commission. 2018. *Hospital National Patient Safety Goals*. Oakbrook Terrace, IL: Joint Commission. https://www.jointcommission.org/assets/1/6/2018_HAP_NPSG_goals_final.pdf.

Joint Commission on Accreditation of Hospitals (JCAH). 1952. *Standards of Hospital Accreditation*. Oakbrook Terrace, IL: JCAHO.

Kalisch, P. A. and B. J. Kalisch. 1995. *The Advance of American Nursing*. Philadelphia: J. B. Lippincott.

Leighow, S. R. 1997. Lavinia Lloyd Dock. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Medicaid. 1965. Public Law 89-97, Title XIX.

Medicare. 1965. Public Law 89-97, Title XVIII.

Meldrum, M. 1997. Mary Steichen Calderone. In *Doctors, Nurses, and Medical Practitioners: A Bio-Bibliographical Sourcebook.* Edited by L. N. Magner. Westport, CT: Greenwood Press.

Morton, T. G. and F. Woodbury. 1973. *The History of the Pennsylvania Hospital*. New York: Arno Press.

Roberts, J. S., J. G. Coate, and R. Redman. 1987. A history of the Joint Commission on Accreditation of Hospitals. *JAMA* 256(7):936–940.

Trent, J. C. 1977. An early New Jersey medical license. Chapter X in *Legacies in Law and Medicine.* Edited by C. R. Burns. New York: Science History Publications.

Wickes, S. 1879. *History of Medicine in New Jersey: And of its Medical Men, From the Settlement of the Province to A.D. 1800.* Newark, N.J.: L. J. Hardham.

Resources

Agency for Healthcare Research and Quality. 2018. http://www.ahrq.gov.

Crosby, P. B. 1984. *Quality without Tears*. New York: Plume Books.

Crosby, P. B. 1980. *Quality Is Free*. New York: Mentor Books.

Deming, W. E. 1986. *Out of the Crisis*. Cambridge, MA: MIT Press. First published in 1982 as *Quality, Productivity, and Competitive Position*.

Donabedian, A. 1988. The quality of care: How can it be assessed? *JAMA* 260(12):1743–1748.

Donabedian, A. 1980. *The Definition of Quality and Approaches to Its Management*. Volume 1. *Explorations in Quality Assessment and Monitoring*. Ann Arbor, MI: Health Administration Press.

Hill-Burton Act of 1946. 42 USC 6.

Juran, J. M. 1988. *Juran on Planning for Quality*. New York: Free Press.

Juran, J. M. 1980. *Upper Management and Quality*. New York: Joseph M. Juran.

Juran, J. M. 1970. *Quality Planning and Analysis*. New York: McGraw-Hill.

Juran, J. M. 1967. *Management of Quality Control*. New York: Joseph M. Juran.

Juran, J. M. 1964. *Managerial Breakthrough*. New York: McGraw-Hill.

Juran, J. M. 1951. *Quality Control Handbook*. New York: McGraw-Hill.

Juran, J. M. 1945. *Management of Inspection and Quality Control*. New York: Harper & Brothers.

Silin, C. I. 1977. A state medical board examination in 1816. In *Legacies in Law and Medicine.* Edited by C. R. Burns. New York: Science History Publications. 93–106.

Walton, M. 1990. *Deming Management at Work*. New York: G. P. Putnam's Sons.

Walton, M. 1986. *The Deming Management Method*. New York: Perigee Books.

Defining a Performance Improvement Model

2

Learning Objectives

- Model the cyclical nature of performance improvement activities
- Define terminology and standards common to performance improvement activities
- Distinguish between organization-wide performance improvement activities and team-based performance improvement activities
- Apply the organization-wide performance improvement cycle
- Use the team-based performance improvement cycle

Key Terms

Benchmark
Continuous monitoring
High reliability organizations (HROs)
Leadership group
Lean
Lean Six Sigma
Plan, do, check, act (PDCA)
Plan, do, study, act (PDSA)
Opportunity for improvement
Performance improvement (PI) team
Performance measure
Process redesign
QI toolbox techniques
Six Sigma
Systems thinking

Efforts to ensure the quality of healthcare services provided in the US have been in place for nearly 50 years. Through the years, these efforts have had many different names: quality assurance (QA), total quality management (TQM), quality improvement (QI), continuous quality improvement (CQI), quality management (QM), and performance improvement (PI). Each of these terms represents a quality and PI model or methodology that healthcare organizations have used with varying degrees of success. Many books and articles have been written on the subject, and new models and terminology will likely be developed in the future.

A new professional entering the healthcare field will probably work for many organizations over his or her career and participate in many quality and PI projects. He or she will learn to use specific quality and PI models and techniques as needed. With experience, healthcare professionals will develop the skills necessary to customize the models to specific organizations and healthcare services.

The goal of this chapter is to provide a general overview of quality and PI as it is applied in healthcare organizations. The chapter describes a generic PI model, defines commonly used PI terms, and explains the philosophy of continuous performance improvement. This chapter also includes the current techniques and methodologies used in healthcare today.

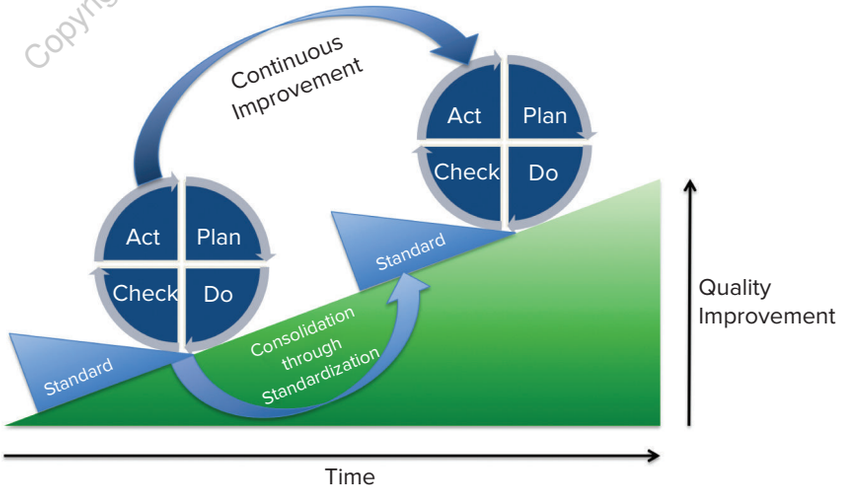
PI as a Cyclical Process

Various healthcare organizations, including accreditation bodies, groups of clinical professionals, QM professionals, healthcare providers, and government regulatory and policy-making entities have unique perspectives on quality in healthcare. Many have developed their own methodologies for quality and PI. Most PI models applied in healthcare today share one structural characteristic: they are cyclical in nature.

W. Edwards Deming developed the **plan, do, check, act (PDCA)** cycle (see figure 2.1):

- P = Plan the change
- D = Do or test the change
- C = Check or analyze the test
- A = Act on the results of the test (ASQ 2018a)

Figure 2.1. Deming's Plan, Do, Check, Act cycle



Source: Vietze 2013.

This cycle, sometimes called the Deming cycle or Shewhart cycle, has been modified over the years to become the **plan, do, study, act (PDSA)** cycle, where "check" has been replaced with "study," which refers to observing and learning from the consequences. The PDSA model is a foundation for quality and PI activities in healthcare today (AHRQ 2013; IHI 2018). The PDSA is the basis for most performance improvement models currently in use.

The cyclical model is based on the assumptions that PI activities will take place continually and that services, processes, and outcomes can always be improved. Quality should not be treated as a goal that is accomplished and then forgotten. Rather, it should be an ongoing mission that guides everyday operations.

Accreditation and licensing agencies expect hospitals and other healthcare facilities to strive for the highest possible quality of care at all times. Healthcare leaders and their boards of directors are responsible for the quality of the organizations' services. Many large healthcare organizations employ experts in QM who are responsible for organizing PI activities and reporting results to the leadership and the boards of directors. At the same time, however, all employees are expected to have a basic understanding of PI principles and to participate in PI activities.

The general PI model presented in this textbook includes two interrelated cycles. The cycle illustrated in figure 2.2 represents the organization's ongoing performance monitoring function. The cycle illustrated in figure 2.3 represents the activities of individual PI teams working on specific PI projects. Together, the two cycles make up the healthcare PI model (see figure 2.4).

Monitoring Performance through Data Collection

Monitoring performance based on internal and external data is the foundation of all PI activities. Each healthcare organization must identify and prioritize which processes and outcomes (in other words, which types of data) are important to monitor based on its mission and the scope of care and services it provides. Logical areas in which to begin monitoring performance include those that perform important organizational functions (addressed in part II of this text), particularly functions that are high risk, high volume, or

Figure 2.2. Organization-wide PI process

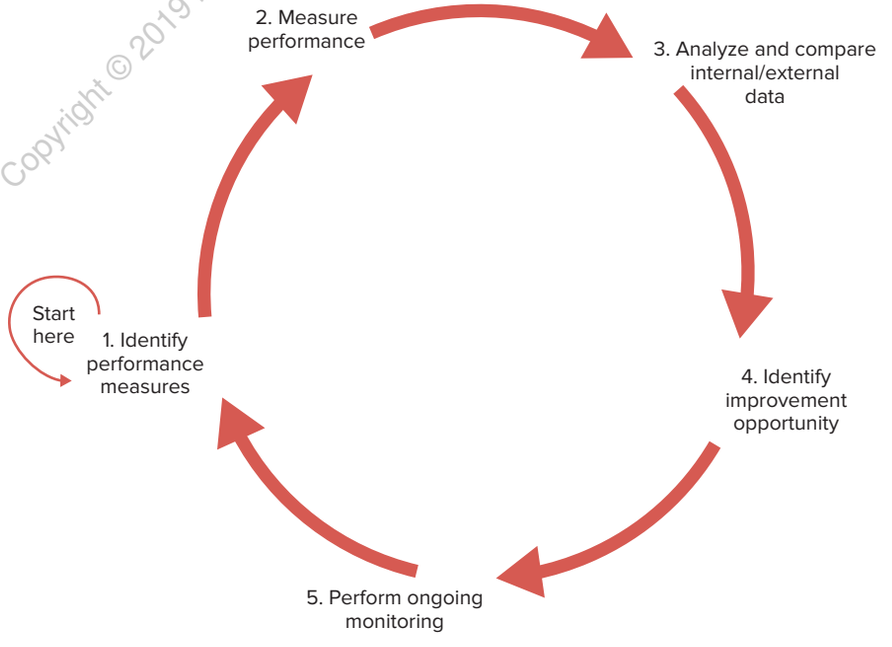


Figure 2.3. Team-based PI process

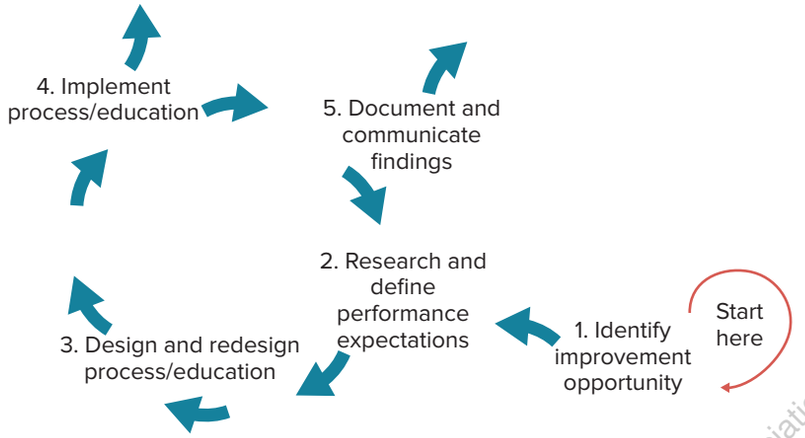
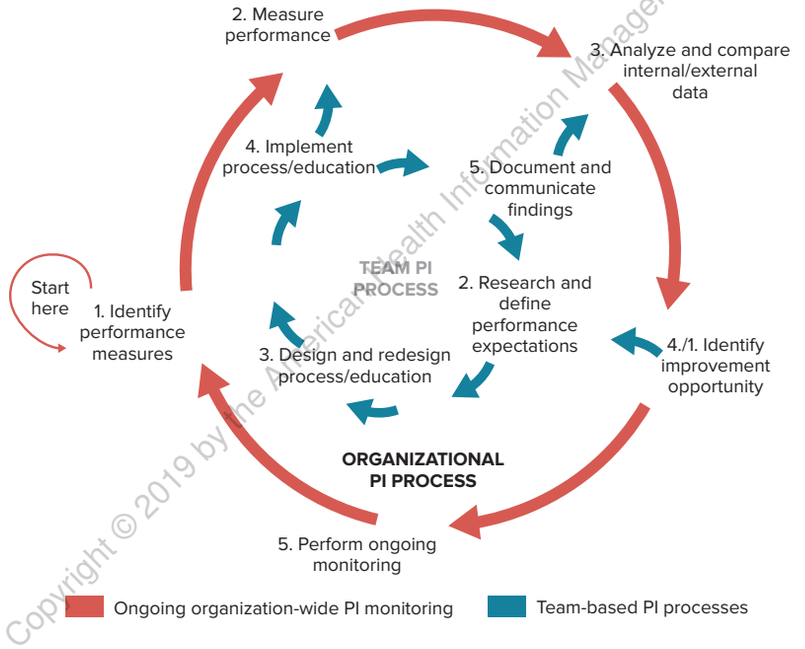


Figure 2.4. PI model



problem prone, such as a patient's unplanned return to the operating room, medication administration, or transfusions. Outcomes of care, customer feedback, and the requirements of regulatory agencies are additional areas that organizations consider when prioritizing performance monitors. Once the scope and focus of performance monitoring are determined, the organization's leaders define the data collection requirements for each performance measure.

As shown in figure 2.2, monitoring performance depends on the identification of performance measures for each service, process, or outcome deemed important to track. A **performance measure** is "a gauge used to assess the performance of a process or function of any organization" (CMS 2014). Monitoring selected performance measures can help an organization determine process stability or identify improvement opportunities. Specific criteria are used to define the organization's performance measures. Components of a good performance measure include a documented numerator statement, a documented denominator statement, and a description of the population to which the measure is applicable.

$$\frac{\text{Numerator (number of times it occurred)}}{\text{Denominator (number of times it could have occurred)}}$$

In addition, the measurement period; baseline goal; data collection method; and frequency of data collection, analysis, and reporting must be identified. One important outcome that hospitals are required to continuously monitor is the documentation appropriateness rate. The criteria used to establish this performance measure include:

$$\frac{\text{Number of patient records with appropriate documentation}}{\text{Number of patient records reviewed}}$$

This measure would be collected through patient record review or from quarterly reports the health information management (HIM) department generates from the electronic health record (EHR). The HIM department would send results to a medical staff committee responsible for documentation oversight. A baseline goal might be 90 percent of documentation being deemed appropriate.

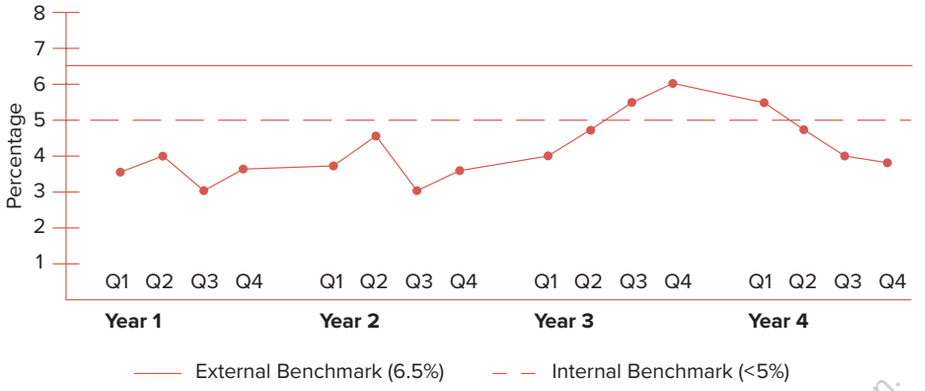
The populations included in this performance measure are the medical staff and inpatient health records staff. Tracking this outcome allows the hospital to continuously monitor its compliance with appropriate documentation. (See figure 2.2. to review this process.) If the appropriateness of documentation does not meet the hospital's established performance standards (an internal comparison) or nationally established performance standards (an external comparison), this constitutes an opportunity for improvement (step 4 in the PI process in figure 2.2). An **opportunity for improvement** is defined as a healthcare structure, product, service, process, or outcome that does not meet its customers' expectations and, therefore, could be improved. In this case, not meeting the established performance standard signifies an opportunity for improvement. Following this conclusion, a team-based PI process, shown in figure 2.3, may be initiated to investigate the reasons for noncompliance with the standard.

When an organization compares its current performance with its own internal historical data, or uses data from similar external organizations across the country, it establishes a **benchmark**, also known as a standard of performance or best practice, for a particular process or outcome. Establishing a benchmark for each monitored performance measure assists the healthcare organization in setting performance baselines, describing process performance or stability, and identifying areas for more focused data collection. The Joint Commission is one available external resource that can be used to establish the performance measure of the average monthly health record delinquency rate for a hospital. The Joint Commission will cite the healthcare organization with a requirement for improvement if the total average health record delinquency rate exceeds 50 percent of the average monthly discharges in any one quarter. Hospitals commonly set the benchmark for their health record delinquency rate at less than 50 percent.

Once a benchmark for each performance measure is determined, analyzing data collection results becomes more meaningful. Results that fall outside the established benchmark often trigger further study or more focused data collection on a performance measure. When variation is discovered through **continuous monitoring**—the regular and frequent assessment of healthcare processes and their outcomes and related costs—or when "unexpected events suggest performance problems, members of the organization may decide that there is an opportunity for improvement. The opportunity may involve changing a process or an outcome to better meet customer feedback, needs, or expectations" (Lovaglio 2012).

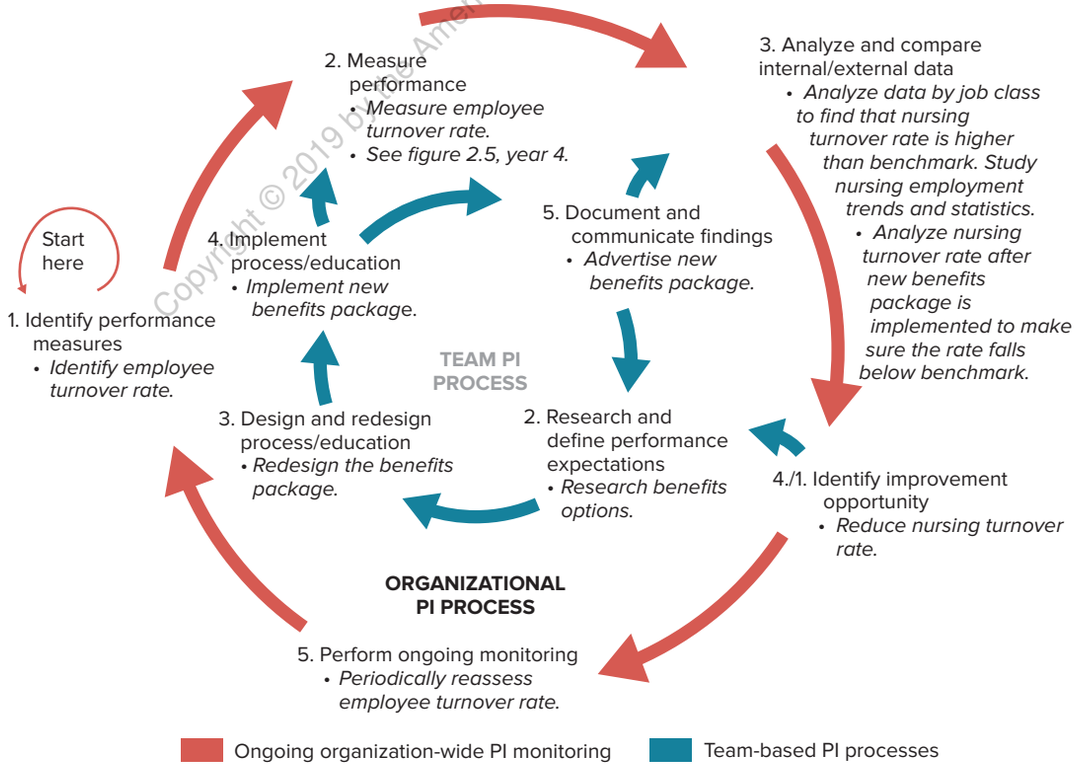
An example of the PI model in use for an improvement opportunity identified from ongoing data collection at Community Hospital of the West is shown in figure 2.5. The hospital administration had previously identified the employee turnover rate as an important performance measure to monitor and had collected a number of years of historical internal data on this performance measure. In addition, it researched external comparison data from other hospitals in the community and throughout the state and determined that the best-practice rate for employee turnover in its area should be 5 percent. Accordingly, the administration set its employee turnover rate benchmark at less than 5 percent.

Figure 2.5. Community Hospital of the West employee turnover rate



During the third year, the employee turnover rate began to steadily increase from 3 percent to 6 percent. After receiving third-quarter data that showed a continued increase in turnover, the Performance Improvement and Patient Safety Council recommended further data analysis by job class. The findings from this analysis showed a pattern in employee turnover within nursing. Exit survey data received from nursing staff were also studied, with reasons for leaving linked to salary and benefits. The council immediately recommended that the human resources department research community salary and benefits packages offered to nurses. The results of the research revealed that Community Hospital of the West's salary and benefits package had not remained competitive, and nursing personnel were being recruited by hospitals with more attractive benefits packages. Once Community Hospital of the West redesigned, implemented, and advertised its benefits package for nurses, the turnover rate decreased to below the established benchmark. Figure 2.6 shows how the PI model was applied in this situation.

Figure 2.6. Community Hospital of the West PI model



It has been a common practice in many healthcare organizations and is now a Joint Commission requirement to appoint a **leadership group** to oversee organization-wide PI activities. The leadership group is composed of the senior governing, administrative, and management groups of a healthcare organization that are responsible for setting the mission and overall strategic direction of the organization. This leadership group (sometimes named the Performance Improvement and Patient Safety Council or quality council) is responsible for defining the organization's PI program. Establishment of a PI program includes the following steps:

1. Define and implement the organization-wide PI model.
2. Establish a staff education plan to train employees in PI.
3. Prioritize and define PI measures.
4. Define data collection and reporting responsibilities.
5. Appoint PI teams when process variation exceeds established benchmarks.
6. Maintain a process of reporting significant findings and corrective actions to the board of directors and other stakeholders.

Chapter 15 of this text covers PI leadership responsibilities in greater detail.

Who identifies opportunities for improvement depends primarily on leadership's commitment to establishing a culture of continuous improvement. Ideally, PI opportunities should be identified by those closest to care or service processes.

Once an improvement opportunity has been identified, the leadership group can respond in a variety of ways. When the improvement opportunity is believed to be the result of a lack of knowledge or experience, an educational program may be recommended. When the improvement opportunity is the result of inefficiency or ineffectiveness in a work process, the leadership group may convene a **performance improvement (PI) team**—members of the healthcare organization who have formed a functional or cross-functional group to examine a performance issue and make recommendations with respect to its improvement—to examine the process. (The relationship between organization-wide performance monitoring and team-based PI processes is illustrated in figure 2.4.)

Team-Based PI Processes

Once an improvement opportunity has been identified through performance monitoring, and a team that consists of staff involved in the process under study has been assembled, the first task is to research and define performance expectations for the process targeted for improvement. The first steps may include the following:

1. Create a flow chart of the current process.
2. Brainstorm problem areas within the current process.
3. Research any regulatory requirements related to the current process.
4. Compare the organization's current process with performance standards or nationally recognized standards.
5. Conduct a survey to gather input on customers' needs and expectations.
6. Prioritize problem areas for focused improvement.

Process redesign incorporates the knowledge gained from data collection to change the process and involves the following steps:

1. Incorporate findings or changes identified in the research phase of the improvement process.
2. Collect focused data from the prioritized problem areas to further clarify process failure or variation.
3. Create a flow chart of the redesigned process.

4. Develop policies and procedures that support the redesigned process.
5. Educate involved staff about the new process.

PI teams can use a variety of tools to accomplish their goals. This textbook calls these quality improvement tools collected from traditional quality improvement practice and theory **QI toolbox techniques**. The tools make it easier to gather and analyze information, and they help team members stay focused on PI activities and move the process along efficiently. Several chapters in part I of this textbook, and all of the chapters in part II, introduce at least one technique from the QI toolbox.

After implementing a new process, the team continues to measure performance against customers' expectations and established performance standards. The team may need to redesign the process or product if measurements indicate that there is room for further improvement. When measurement data indicate that the improvement is effective, ongoing monitoring of the process is resumed (as shown in figure 2.2). The team documents and communicates its findings to the leadership group and other interested parties in the organization. Results also may be communicated to interested groups in the community.

The team is usually disbanded at this point in the cycle, and routine organizational monitoring of the performance measures is resumed. If another opportunity for improvement arises, the team-based improvement process may be reinstituted.

Check Your Understanding 2.1

1. Defend the following statement: PI models used in healthcare today are always cyclical in nature.
2. Before any improvement process begins, an organization must identify a performance measure. Articulate why this is the first step in the organization-wide PI process.

Systems Thinking

Systems thinking is an objective way of looking at work-related ideas and processes with the goal of allowing people to uncover ineffective patterns of behavior and thinking and then find ways to make lasting improvements. A critical element of systems thinking is viewing an organization as an open system of interdependencies and connectedness rather than a collection of individual parts and professional enclaves. This approach sees interrelatedness as a whole and looks for patterns rather than snapshots of organizational activities and processes. Because so much of what is done in healthcare is related, the method of solving one problem and then going on to solve the next problem without understanding the connection between them will prove to be counteractive over time. This approach may work in a field where there is little change, but healthcare systems are often changing and require a systems thinking approach to ensure strategic alignment throughout the organization (Haines 2016, 7–8).

As an example, there are many subsystems of a healthcare organization that are dependent on accurate patient identification and demographic data collection at the time of admission or encounter registration. If the patient information is not entered correctly during the registration process, this could have a negative impact on many other processes that are dependent on this information. Some of these processes include accurate billing for patient services, coding accuracy, data abstraction for indexing and other databases, and accuracy of the master patient index and the EHR.

Process orientation traditionally has relied on measurements of cost, productivity, quality, and time to improve processes. There is a tendency to approach processes in a linear fashion, fixing one process at a time in a piecemeal approach. The challenge with this approach is that it is rarely effective in complex systems (Haines 2016, 7–8). Healthcare is a complex system because it has many interacting elements and parts. Anyone who has worked in a hospital or an integrated healthcare system should intuitively understand how systems thinking is more appropriate for managing complex organizations with very diverse professional

staff. PI efforts, such as quality control and QA, have focused heavily on structure and compliance standards. However, as PI efforts became focused on process and outcomes, the need to understand and embrace systems thinking became more apparent. Focusing on the outcome of a patient encounter forces all members of the healthcare team to work together rather than to operate as individuals who only contribute their expertise and energies to patient care in an episodic and isolated manner. This allows for a shared vision and supports a team working as a cohesive unit.

Systems thinkers consider the world around them from a holistic point of view and "have the ability to make high-impact decisions at a clinical or organizational level. Even expert clinicians who are specialists honed by years of training and experience can err when they fail to consider the systems-level impact" (Bleich 2014). The physician's role has always been crucial to healthcare delivery. In the past, healthcare organizations operated under the assumption that physicians possessed all the necessary medical knowledge, and everyone should respond to their instructions. Then, schools of nursing began to specialize, and nursing began to develop a body of unique knowledge and skills. Other areas of specialization, such as medical laboratories, pharmacy, radiology, physical therapy, and health information, also have developed their own unique bodies of knowledge. Few individuals, including physicians, are capable of retaining the extensive knowledge and understanding of all specialized areas in health services organizations. Out of necessity, a greater degree of interdependence emerged among health professions. There is a need for information to flow in many directions rather than just from the physician to all others in the organization.

Systems Analysis Tools

Systems analysis can be applied at the work team, organizational, and healthcare setting levels. It involves four groups of analysis tools, shown in table 2.1.

Table 2.1. Systems analysis tools and sample uses

Tool	Example	Application
Modeling and simulation	Queuing methods	Queuing is a term for waiting in line (i.e., waiting for a blood draw in the lab, waiting to be registered, etc.); this tool has enormous applicability to the healthcare system.
	Discrete-event simulation	Discrete-event simulation analyzes the independent variable of time against dependent variables such as patients, caregivers, administrators, inventory, capital equipment, and others.
Enterprise management	Supply-chain management Game theory and contracts Systems dynamic models Productivity measuring and monitoring	The complexity of business in the healthcare system lends itself to the application of mathematical tools used in other industries to manage networks of suppliers, distributors, and service providers.
Financial engineering and risk management	Return on investment Reduce risk Increase efficiency	The inherent risks of using these tools in healthcare involve the patient, the organization, and the environment. Healthcare organizations can use stochastic analysis (statistical forecasting) and risk models to predict the risk of financial losses.
Knowledge discovery	Data mining Predictive modeling Neural networks	Four different types of information can be retrieved through data mining: classifications, estimations, variability, and predictions. The information obtained through data mining also can be used to predict outcomes for a variety of actions through predictive modeling or neural networks.

Source: Adapted from Reid et al. 2005, 37–44.