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***Schwartz's***  
**PRINCIPLES OF**  
**SURGERY**  
**TENTH EDITION**

**F. Charles Brunnicardi**  
Dana K. Andersen • Timothy R. Billiar  
David L. Dunn • John G. Hunter  
Jeffrey B. Matthews • Raphael E. Pollock

# Schwartz's Principles of Surgery

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*Tenth Edition*

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# Schwartz's Principles of Surgery

*Tenth Edition*

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Stephen Lowry, MD, MBA (1947-2011)

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The tenth edition of *Schwartz's Principles of Surgery* is dedicated to the late Dr. Stephen Lowry, consummate surgeon-scientist, educator, colleague, mentor, and long-time contributor to *Schwartz's Principles of Surgery*. At the time of his death, Dr. Lowry served as Richard Harvey Professor and Chair of the Department of Surgery and Senior Associate Dean for Education at the Rutgers-Robert Wood Johnson Medical School (RWJMS) in New Brunswick, New Jersey. He was the inaugural holder of the Richard Harvey Professorship at RWJMS, which honors excellence in innovative teaching and exemplified his absolute dedication to medical education. Dr. Lowry's dedicated and distinguished surgical career produced valuable contributions to both scientific knowledge and patient care, including his seminal investigations utilizing the human endotoxemia model that defined important aspects of the host inflammatory response following injury. His investigations had been supported by continuous National Institute of Health (NIH) funding for more than 25 years and were recognized by the coveted Method to

Extend Research in Time (MERIT) award from the NIH. He authored more than 400 scientific publications and was the recipient of numerous honors that recognized his academic achievements. Although Dr. Lowry received many accolades and awards throughout his career, he was first and foremost an enthusiastic teacher and sincere supporter of people, their goals, and their lives. Dr. Lowry genuinely enjoyed listening, learning, and sharing his knowledge and did so with a depth of feeling that inspired and encouraged those around him. As his wife Susette wrote, "Steve knew he would be remembered for his professional accomplishments, but never imagined he would be honored and missed for his personality and style that set him apart from the rest. The world really was a better place with Steve in it!" The loss of his warmth, professionalism, intellect, and enthusiasm for medical education will be greatly missed.

**Siobhan Corbett, MD, and the editors of  
*Schwartz's Principles of Surgery*, Tenth edition**



Robert S. Dorian, MD, MBA (1954-2014)

*Photo provided by Saint Barnabas Medical Center. Used with permission.*

The Editors of *Schwartz's Principles of Surgery* wish to dedicate this tenth edition to the memory of Dr. Robert S. Dorian, the sole author of the "Anesthesia" chapter in the last three editions. Dr. Dorian was born in Philadelphia and grew up in Livingston, New Jersey where his father was a prominent gynecologist. He received his undergraduate degree in Physics and Music from Tufts University in Boston while at the same time studying piano at the New England Conservatory of Music. Bob received his medical education at Rutgers Medical School in Piscataway, New Jersey. After completing an internship in surgery at Downstate Medical Center in Brooklyn, he trained in anesthesiology at Weill Cornell Medical College and New York Hospital in New York City. He completed a fellowship in pediatric anesthesiology at Boston Children's Hospital and Harvard Medical School. After his training, Bob established practice at the St. Barnabas Medical Center and rose to become the Chairman of the Department of Anesthesiology, a position he held for 14 years until his death. He was highly respected on both a national and international basis as an outstanding chairman.

Bob was a consummate anesthesiologist, educator, mentor, and wonderful friend. He was the greatest of clinical anesthesiologists and was dedicated to providing the highest level of care to his patients. He was an extraordinary teacher and as the Program Director of the St. Barnabas anesthesia residency program for ten years, he trained

scores of residents. His residents adored him because of the tremendous amount of attention he gave to each resident to assure they were highly trained in their craft and that they were placed in the top fellowships around the nation. Bob was also an incredibly gifted musician, scholar, and thinker. His intellect, humanity, and humor were inspiring to everyone who knew him. Bob was respected on an international basis for his humanitarian work with frequent medical missions to underserved populations around the world. In this endeavor, he was often accompanied by his wife, Linda, and their daughters, Rose and Zoe.

Dr. Dorian had a most special gift and that was to bring out the best in every person that he met and make them feel very special. He lit up every room and made each encounter an occasion to remember. Having a conversation with Bob was one of life's great pleasures. Colleagues, nurses, and patients would look forward to his arrival because he would make them laugh and brighten their day. He was loved by all and will be sorely missed. Bob's memory and legacy will live on in the thousands of patients that he cared for, in the academic programs that he fostered, in the generations of anesthesiologists that he trained, and in his remarkable family. His words and intellect will be preserved in this textbook of surgery.

**James R. Macho, MD, FACS, and the editors of  
*Schwartz's Principles of Surgery, Tenth edition***



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# Foreword

The adjective “tenth” connotes a milestone, and, in the case of a “tenth edition” of a textbook, it is evidence of readership acceptability. This continued reader response would evoke parental pride from those who generated the original publication more than 45 years ago. I can still vividly recall the meeting in New York City at which John DeCarville, an editor at McGraw-Hill, brought together David M. Hume, Richard C. Lillehei, G. Thomas Shires, Edward H. Storer, Frank C. Spencer, and me to create a new surgical textbook. The new surgical publication was to serve as a companion to Harrison’s recently introduced medical textbook. The favorable reception of the first edition was most encouraging. The consistency of style and the deliberate inclusion of 52 chapters to allow for review of one chapter a week throughout the year were particularly appealing. Subsequent to the initial publication and following the tragic and premature deaths of Dr. Lillehei, Dr. Hume, and Dr. Storer, Dr. Shires, Dr. Spencer, and I were privileged to shepherd six additional editions over the ensuing 35 years. Under the direction of Dr. F. Charles Brunicaudi and his associate editors, a new vitality was infused over the three most recent editions.

The ten editions, as they are considered in sequence, serve as a chronicle of the dramatic evolution that has occurred in surgery over the past half century. Those, who have been charged with providing current information to the readership, have had to filter and incorporate extraordinary and unanticipated scientific breakthroughs and technical innovations. At the time of the genesis of the first edition, success had not been achieved in cardiac, hepatic, or intestinal transplantation. Adjuvant therapy for a broad variety of malignancies was in its infancy. Minimally invasive surgery would not become a reality for two decades. On the other side of the spectrum, operative procedures that occupied the focus of symposia have slipped into obscurity. Vagotomy for peptic ulcer has become a rarity, as a consequence of an appreciation of

the role of *Helicobacter pylori* and the efficacy of proton pump inhibitors. Surgical procedures to decompress portal hypertension in the treatment of bleeding esophagogastric varices have essentially disappeared from the operating room schedule. They have been replaced by transjugular intrahepatic portosystemic shunt (TIPS) and the liberal application of hepatic transplantation.

As Bob Dylan pointed out, “The Times They Are A-changin.” And they most assuredly will continue to change, and at an unanticipated rate. The scientific basis for the practice of surgery is increasing at an ever accelerating pace, and the technologic improvements and breakthroughs are equally extraordinary. The dissemination of the expansion of knowledge has resulted in a shrinking of the globe, necessitating an extension or adaptation of the more modern approaches to underdeveloped nations and underprivileged populations. Global medicine has become a modern concern. The importance of internationalism is manifest in the clinical trials and data acquisition provided by our surgical colleagues on the other sides of the oceans that surround us. It is therefore appropriate that a more international flavor has been developed for *Principles of Surgery* related both to citations and contributors. A distinct consideration of global medicine and, also, the qualities of leadership in surgery that must be nurtured are evidence of the editorial credo of “maintaining modernization” and “anticipating the future.”

As the editors and contributors continue to provide the most up-to-date information with a clarity that facilitates learning, it is the hope that the seed, which was planted almost a half century ago, will continue to flourish and maintain the approval of its audience.

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**Dentistry**

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# Preface

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Each new edition of this book is approached by the editorial team with a dual vision keeping a dedicated eye affixed to the foundations of surgery while bringing into sharper focus on new and emerging elements. We are entering into a spectacular era of surgery in which the highest quality of care is merging with minimally invasive surgery, robotic surgery, the use of supercomputers, and personalized genomic surgery, all designed to improve the outcomes and quality of life for our patients. With these advances in mind, several new chapters have been added and all previous chapters have been updated with an emphasis on evidence-based, state-of-the-art surgical care. While this tried-and-true method remains the basis for upholding and maintaining the superb efforts and achievements of Dr. Seymour Schwartz and previous co-editors and contributors, this edition expands its vision to see beyond the operating theater and takes a look at the making of a surgeon as a whole, with the addition of the chapter, Fundamental Principles of Leadership Training in Surgery. Surely excellence in craft must be mastered and equal importance must also be given to the nontechnical training of what it means to be a leader of a surgical team.

To this effort, the editors were keen to include as the first chapter in this edition a comprehensive review of leadership methods and ideologies as well as underscoring the importance of instituting a formal leadership-training program for residents that emphasizes mentoring. Our own paths as surgeons have been defined by the mentoring

relationship and we have undoubtedly benefitted greatly from the efforts of our mentors; we sincerely hope that those with whom we have entered into this time-honored tradition have reaped the benefit as well. Simply stated, leadership skills can and should be taught to surgical trainees and in doing so this will help them improve quality of care.

The editors are thankful that this text is a relied-on source for training and crafting surgeons on a global basis. This is due in large part to the extraordinary efforts of our contributors, the leaders in their fields, who not only do so to train up-and-coming surgeons, but to impart their knowledge and expertise to the benefit of patients worldwide. The recent inclusion of many international authors to the chapters within is ultimately a testament to mentorship, albeit on a broader scale, and we thank them all, both near and far.

To our fellow editorial board members who have tirelessly devoted their time and knowledge to the integrity and excellence of their craft and this textbook, we extend our gratitude and thanks. We are to thankful to Brian Belval, Christie Naglieri, and all at McGraw-Hill for the continued belief in and support of this textbook. We wish to thank Katie Elsbury for her dedication to the organization and editing of this textbook. Last, we would like to thank our families who are the most important contributors of all.

**F. Charles Brunicardi, MD, FACS**

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# Preface to the First Edition

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The raison d'être for a new textbook in a discipline which has been served by standard works for many years was the Editorial Board's initial conviction that a distinct need for a modern approach in the dissemination of surgical knowledge existed. As incoming chapters were reviewed, both the need and satisfaction became increasingly apparent and, at the completion, we felt a sense of excitement at having the opportunity to contribute to the education of modern and future students concerned with the care of surgical patients.

The recent explosion of factual knowledge has emphasized the need for a presentation which would provide the student an opportunity to assimilate pertinent facts in a logical fashion. This would then permit correlation, synthesis of concepts, and eventual extrapolation to specific situations. The physiologic bases for diseases are therefore emphasized and the manifestations and diagnostic studies are considered as a reflection of pathophysiology. Therapy then becomes logical in this schema and the necessity to regurgitate facts is minimized. In appreciation of the impact which *Harrison's Principles of Internal Medicine* has had, the clinical manifestations of the disease processes are considered in detail for each area. Since the operative procedure represents the one element in the therapeutic armamentarium unique to the surgeon, the indications, important technical considerations, and complications receive appropriate emphasis. While we appreciate that a textbook cannot hope to incorporate an atlas of surgical

procedures, we have provided the student a single book which will satisfy the sequential demands in the care and considerations of surgical patients.

The ultimate goal of the Editorial Board has been to collate a book which is deserving of the adjective "modern." We have therefore selected as authors dynamic and active contributors to their particular fields. The *au courant* concept is hopefully apparent throughout the entire work and is exemplified by appropriate emphasis on diseases of modern surgical interest, such as trauma, transplantation, and the recently appreciated importance of rehabilitation. Cardiovascular surgery is presented in keeping with the exponential strides recently achieved.

There are two major subdivisions to the text. In the first twelve chapters, subjects that transcend several organ systems are presented. The second portion of the book represents a consideration of specific organ systems and surgical specialties.

Throughout the text, the authors have addressed themselves to a sophisticated audience, regarding the medical student as a graduate student, incorporating material generally sought after by the surgeon in training and presenting information appropriate for the continuing education of the practicing surgeon. The need for a text such as we have envisioned is great and the goal admittedly high. It is our hope that this effort fulfills the expressed demands.

**Seymour I. Schwartz, MD, FACS**

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Basic Considerations

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# 1 chapter

## Fundamental Principles of Leadership Training in Surgery

Amy L. Hill, James Wu, Mark D. Girgis, Danielle Hsu, Areti Tillou, James Macho, Vishad Nabili, and F. Charles Brunicardi

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Definitions of Leadership	3	Willingness / 4	Mentoring / 10	
Fundamental Principles of Leadership	3	Time Management / 7	Conclusion	11
		Leadership Styles		

### INTRODUCTION

The field of surgery has evolved greatly from its roots, and surgical practice now requires the mastery of modern leadership principles and skills as much as the acquisition of medical knowledge and surgical technique. Historically, surgeons took sole responsibility for their patients and directed proceedings in the operating room with absolute authority, using a command-and-control style of leadership. Modern surgical practice has now evolved from single provider-based care toward a team-based approach, which requires collaborative leadership skills. Surgical care benefits from the collaboration of surgeons, anesthesiologists, internists, radiologists, pathologists, radiation oncologists, nurses, pharmacists, social workers, therapists, hospital staff, and administrators. Occupying a central role on the healthcare team, surgeons<sup>1</sup> have the potential to improve patient outcomes, reduce medical errors, and improve patient satisfaction through their leadership of the multidisciplinary team.

1▶ Thus, in the landscape of modern healthcare systems, it is imperative that surgical training programs include formal instruction on leadership principles and skills to cultivate their trainees' leadership capabilities.

Many medical and surgical communities, including residency training programs, acknowledge the need for improved physician leadership.<sup>2</sup> Surgical trainees identify leadership skills as important, but report themselves as “not competent” or “minimally competent” in this regard.<sup>2,3</sup> While a small number of surgical training programs have implemented formal curriculum focused on teaching leadership principles, it is now imperative that all surgical training programs teach these important skills to their trainees.<sup>4,5</sup> Interviews of academic chairpersons identified several critical leadership success factors,<sup>6</sup> including mastery of visioning, communication, change management, emotional intelligence, team building, business skills, personnel management, and systems thinking. These chairpersons stated that the ability of emotional intelligence was “fundamental to their success and its absence the cause of their failures,” regardless of medical knowledge.<sup>6</sup> Thus, training programs need to include leadership training to prepare trainees for success in modern healthcare delivery.

In the United States, the Accreditation Council for Graduate Medical Education (ACGME) has established six

core competencies—patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice (Table 1-1)<sup>4</sup>—that each contain principles of leadership. The ACGME has mandated the teaching of these core competencies but has not established a formal guide on how to teach the leadership skills described within the core competencies. Therefore, this chapter offers a review of fundamental principles of leadership and an introduction of the concept of a leadership training program for surgical trainees.

### DEFINITIONS OF LEADERSHIP

Many different definitions of leadership have been described. Former First Lady Rosalynn Carter once observed that, “A leader takes people where they want to go. A *great* leader takes people where they don't necessarily want to go, but where they ought to be.” Leadership does not always have to come from a position of authority. Former American president John Quincy Adams stated, “If your actions inspire others to dream more, learn more, do more, and become more, you are a leader.” Another definition is that leadership is the process of using social influence to enlist the aid and support of others in a common task.<sup>7</sup>

### FUNDAMENTAL PRINCIPLES OF LEADERSHIP

Clearly, leadership is a complex concept. Surgeons should strive to adopt leadership qualities that provide the best outcomes for their patients, based on the following fundamental principles.

#### Vision

The first and most fundamental principle of leadership is to establish a vision that people can live up to, thus providing direction and purpose to the constituency. Creating a vision is a declaration

2▶ of the near future that inspires and conjures motivation.<sup>8</sup> A classic example of a powerful vision that held effective impact is President Kennedy's declaration in 1961 that “. . . this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth.” Following his declaration of this vision with a timeline to achieve it, the United States mounted a remarkable unified effort, and by the end of the decade, Neil Armstrong

# Key Points

- 1▶ Effective surgical leadership improves patient care.
- 2▶ A fundamental principle of leadership is to provide a vision that people can live up to, thereby providing direction and purpose to the constituency.
- 3▶ Surgical leaders have the willingness to lead through an active and passionate commitment to the vision.
- 4▶ Surgical leaders have the willingness to commit to lifelong learning.
- 5▶ Surgical leaders have the willingness to communicate effectively and resolve conflict.
- 6▶ Surgical leaders must practice effective time management.
- 7▶ Different leadership styles are tools to use based on the team dynamic.
- 8▶ Surgical trainees can be taught leadership principles in formal leadership training programs to enhance their ability to lead.
- 9▶ Mentorship provides wisdom, guidance, and insight essential for the successful development of a surgical leader.

took his famous walk and the vision had been accomplished (Fig. 1-1).

On a daily basis, surgeons are driven by a powerful vision: the vision that our surgical care will improve patients' lives. The great surgical pioneers, such as Hunter, Lister (Fig. 1-2), Halsted, von Langenbeck, Billroth, Kocher (Fig. 1-3), Carrel, Gibbon, Blalock, Wangenstein, Moore, Rhoads, Huggins, Murray, Kountz, Longmire, Starzl, and DeBakey (Fig. 1-4), each possessed visions that revolutionized the field of surgery. In the nineteenth century, Joseph Lister changed the practice of surgery with his application of Pasteur's germ theory. He set a young boy's open compound leg fracture, a condition with a 90% mortality rate at that time, using carbolic acid dressings and aseptic surgical technique. The boy recovered, and Lister gathered nine more patients. His famous publication on the use of aseptic technique introduced the modern era of sterile technique. Emil Theodor Kocher was the first to master the thyroidectomy, thought to be an impossible operation at the time, and went on to perform thousands of thyroidectomies with a mortality of less than 1%. He was awarded the Nobel Prize in Physiology or Medicine in 1909 for describing the thyroid's physiologic role in metabolism. Michael E. DeBakey's powerful vision led to the development of numerous groundbreaking procedures that helped pioneer the field of cardiovascular surgery. For example, envisioning an artificial

artery for arterial bypass operations, Dr. DeBakey invented the Dacron graft, which has helped millions of patients suffering from vascular disease and enabled the development of endovascular surgery. Dr. Frederick Banting, the youngest recipient of the Nobel Prize in Physiology or Medicine, had a vision to discover the biochemical link between diabetes and glucose homeostasis. His vision and perseverance led to the discovery of insulin.<sup>9</sup> In retrospect, the power and clarity of their visions were remarkable, and their willingness and dedication were inspiring. By studying their careers and accomplishments, surgical trainees can appreciate the potential impact of a well-developed vision.

Leaders must learn to develop visions to provide direction for their team. The vision can be as straightforward as providing quality of care or as lofty as defining a new field of surgery. One can start developing their vision by brainstorming the answers to two simple questions: "Which disease needs to be cured?" and "How can it be cured?"<sup>10</sup> The answers represent a vision and should be recorded succinctly in a laboratory notebook or journal. Committing pen to paper enables the surgical trainee to define their vision in a manner that can be shared with others.

## Willingness

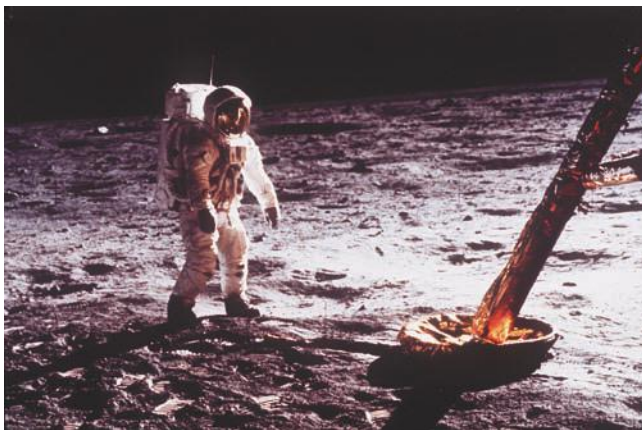
The Willingness Principle represents the active commitment of the leader toward their vision. A surgical leader must be willing

**Table 1-1**

### Accreditation Council for Graduate Medical Education core competencies

CORE COMPETENCY	DESCRIPTION
Patient care	To be able to provide compassionate and effective healthcare in the modern-day healthcare environment
Medical knowledge	To effectively apply current medical knowledge in patient care and to be able to use medical tools (i.e., PubMed) to stay current in medical education
Practice-based learning and improvement	To critically assimilate and evaluate information in a systematic manner to improve patient care practices
Interpersonal and communication skills	To demonstrate sufficient communication skills that allow for efficient information exchange in physician-patient interactions and as a member of a healthcare team
Professionalism	To demonstrate the principles of ethical behavior (i.e., informed consent, patient confidentiality) and integrity that promote the highest level of medical care
Systems-based practice	To acknowledge and understand that each individual practice is part of a larger healthcare delivery system and to be able to use the system to support patient care

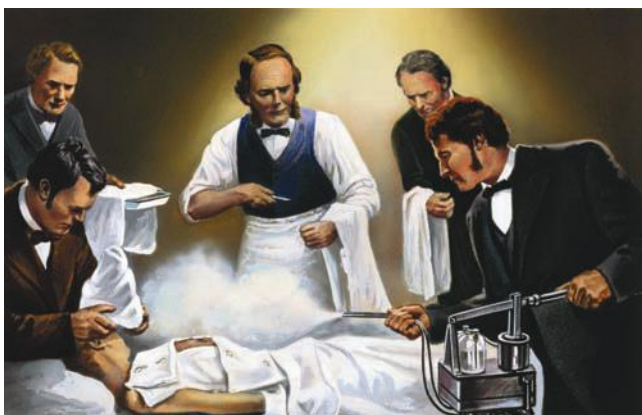




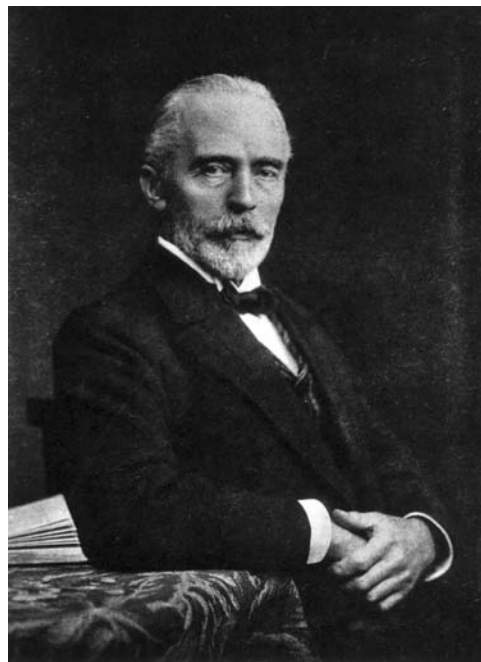
**Figure 1-1.** Apollo 11 Lunar Module moon walk. Astronaut Edwin “Buzz” Aldrin walks by the footpad of the Apollo 11 Lunar Module, July 1969. (Reproduced with permission from AP Photo/NASA. © 2014 The Associated Press.)

to lead, commit to lifelong learning, communicate effectively, and resolve conflict.

**To Lead.** A key characteristic of all great leaders is the willingness to serve as the leader. Dr. Martin Luther King, Jr., who championed the civil rights movement with a powerful vision of equality for all based on a commitment to non-violent methods,<sup>11</sup> did so at a time when his vocalization of this vision ensured harassment, imprisonment, and threats of violence against himself, his colleagues, and his family and friends (Fig. 1-5). King, a young, highly educated pastor, had the security of employment and family, yet was willing to accept enormous responsibility and personal risk and did so in order to lead a nation toward his vision of civil rights, for which he was awarded the Nobel Peace Prize in 1964. Steve Jobs, co-founder of Apple Inc., chose to remain in his position as chief executive officer (CEO) to pursue his vision of perfecting the personal computer at great personal expense. He described this experience as “. . . rough, really rough, the worst time in my life. . . . I would go to work at 7 a.m. and I’d get back at 9 at night, and the kids would be in bed. And I couldn’t speak, I literally couldn’t, I was so exhausted. . . . It got close



**Figure 1-2.** Joseph Lister directing use of carbolic acid spray in one of his earliest antiseptic surgical operations, circa 1865. (Copyright Bettmann/Corbis/AP Images.)



*Emil Kocher*

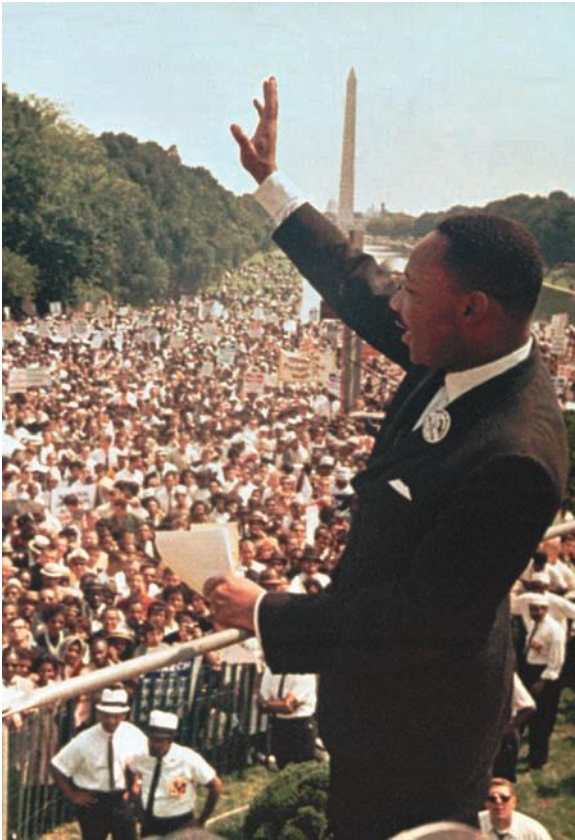
**Figure 1-3.** Emil Theodor Kocher. (Courtesy of the National Library of Medicine.)

to killing me.”<sup>12</sup> Both individuals demonstrated a remarkable tenacity and devotion to their vision.

Willingness to lead is a necessity in any individual who desires to become a surgeon. By entering into the surgical theater, a surgeon accepts the responsibility to care for and operate on patients despite the risks and burdens involved. They do so, believing fully in the improved quality of life that can be achieved. Surgeons must embrace the responsibility of leading surgical teams that care for their patients, as well as leading surgical trainees to become future surgeons. A tremendous sacrifice is required for the opportunity to learn patient care. Surgical trainees accept the hardships of residency with its



**Figure 1-4.** Michael E. DeBakey. (Reproduced with permission from AP Photo/David J. Phillip. © 2014 The Associated Press.)



**Figure 1-5.** Dr. Martin Luther King, Jr. acknowledges the crowd at the Lincoln Memorial for his “I Have a Dream” speech during the March on Washington, D.C., August 28, 1963. (Reproduced with permission from AP Photo. © 2014 The Associated Press.)

accompanying steep learning curve, anxiety, long work hours, and time spent away from family and friends. The active, passionate commitment to excellent patient care reflects a natural willingness to lead based on altruism and a sense of duty toward those receiving care. Thus, to ensure delivery of the utmost level of care, surgical trainees should commit to developing and refining leadership skills. These skills include a commitment to lifelong learning, effective communication, and conflict resolution.

**To Learn.** Surgeons and surgical trainees, as leaders, must possess willingness to commit to continuous learning. Modern surgery is an ever-changing field with dynamic and evolving healthcare systems and constant scientific discovery and innovation. Basic and translational science relating to surgical care is growing at an exponential rate. The sequencing of the human genome and the enormous advances in molecular biology and signaling pathways are leading to the transformation of personalized medicine and surgery in the twenty-first century (see Chap. 15).<sup>13</sup> Performing prophylactic mastectomies with immediate reconstruction for *BRCA1* mutations and thyroidectomies with thyroid hormone replacement for *RET* proto-oncogene mutations are two of many examples of genomic information guiding surgical care. Technologic advances in minimally invasive surgery and robotic surgery as well as electronic records and other information technologies are revolutionizing the craft of surgery. The expansion of minimally invasive and endovascular surgery over the past three decades required surgeons to retrain

in new techniques using new skills and equipment. In this short time span, laparoscopy and endovascular operations are now recognized as the standard of care for many surgical diseases, resulting in shorter hospital stay, quicker recovery, and a kinder and gentler manner of practicing surgery. Remarkably, during the last century, the field of surgery has progressed at an exponential pace and will continue to do so with the advent of using genomic analyses to guide personalized surgery, which will transform the field of surgery this century. Therefore, surgical leadership training should emphasize and facilitate the continual pursuit of knowledge.

Fortunately, surgical organizations and societies provide surgeons and surgical trainees a means to acquire new knowledge on a continuous basis. There are numerous local, regional, national, and international meetings of surgical organizations that provide ongoing continuing medical education credits, also required for the renewal of most medical licenses. The American Board of Surgery requires all surgeons to complete meaningful continuing medical education to maintain certification.<sup>14</sup> These societies and regulatory bodies enable surgeons and surgical trainees to commit to continual learning, and ensure their competence in a dynamic and rapidly growing field.

Surgeons and trainees now benefit from the rapid expansion of web-based education as well as mobile handheld technology. These are powerful tools to minimize nonproductive time in the hospital and make learning and reinforcement of medical knowledge accessible. Currently web-based resources provide quick access to a vast collection of surgical texts, literature, and surgical videos. Surgeons and trainees dedicated to continual learning should be well versed in the utilization of these information technologies to maximize their education. The next evolution of electronic surgical educational materials will likely include simulation training similar to laparoscopic and Da Vinci device training modules. The ACGME, acknowledging the importance of lifelong learning skills and modernization of information delivery and access methods, has included them as program requirements for residency accreditation.

**To Communicate Effectively.** The complexity of modern healthcare delivery systems requires a higher level and collaborative style of communication. Effective communication directly impacts patient care. In 2000, the U.S. Institute of Medicine published a work titled, *To Err Is Human: Building a Safer Health System*, which raised awareness concerning the magnitude of medical errors. This work showcased medical errors as the eighth leading cause of death in the United States with an estimated 100,000 deaths annually.<sup>15</sup> Subsequent studies examining medical errors have identified communication errors as one of the most common causes of medical error.<sup>16,17</sup> In fact, the Joint Commission identifies miscommunication as the leading cause of sentinel events. Information transfer and communication errors cause delays in patient care, waste surgeon and staff time, and cause serious adverse patient events.<sup>18</sup> Effective communication between surgeons, nurses, ancillary staff, and patients is not only a crucial element to improved patient outcomes, but it also leads to less medical litigation.<sup>19-21</sup>

A strong correlation exists between communication and patient outcomes.

Establishing a collaborative atmosphere is important since communication errors leading to medical mishaps are not simply failures to transmit information. Communication errors “are far more complex and relate to hierarchical differences, concerns

with upward influence, conflicting roles and role ambiguity, and interpersonal power and conflict.”<sup>17,22</sup> Errors frequently originate from perceived limited channels of communication and hostile, critical environments. To overcome these barriers, surgeons and surgical trainees should learn to communicate in an open, universally understood manner and remain receptive to any team member’s concerns. A survey of physicians, nurses, and ancillary staff identified effective communication as a key element of a successful leader.<sup>23</sup> As leaders, surgeons and surgical trainees who facilitate an open, effective, collaborative style of communication reduce errors and enhance patient care. A prime example is that successful communication of daily goals of patient care from the team leader improves patient outcomes. In one recent study, the modest act of explicitly stating daily goals in a standardized fashion significantly reduced patient length of intensive care unit stay and increased resident and nurse understanding of goals of care.<sup>24</sup> Implementing standardized daily team briefings in the wards and preoperative units led to improvements in staff turnover rates, employee satisfaction, and prevention of wrong site surgery.<sup>22</sup> In cardiac surgery, improving communication in the operating room and transition to the postanesthesia care unit was an area identified to decrease risk for adverse outcomes.<sup>25</sup> Behaviors associated with ineffective communication, including absence from the operating room when needed, playing loud music, making inappropriate comments, and talking to others in a raised voice or a condescending tone, were identified as patient hazards; conversely, behaviors associated with effective collaborative communication, such as time outs, repeat backs, callouts, and confirmations, resulted in improved patient outcomes.

One model to ensure open communication is through standardization of established protocols. A commonly accepted protocol is the “Time Out” that is now required in the modern operating room. During the Time Out protocol, all team members introduce themselves and state a body of critical information needed to safely complete the intended operation. This same standardization can be taught outside the operating room. Within the Kaiser system, certain phrases have been given a universal meaning: “I need you now” by members of the team is an understood level of urgency and generates a prompt physician response 100% of the time.<sup>22</sup> As mentioned earlier, standardized forms can be useful tools in ensuring universally understood communication during sign-out. The beneficial effect of standardized communication further demonstrates how effective communication can improve patient care and is considered a vital leadership skill.

**To Resolve Conflict.** Great leaders are able to achieve their vision through their ability to resolve conflict. During the pursuit of any vision, numerous conflicts arise on a daily basis; numerous conflicts arise on a daily basis when surgeons and surgical trainees provide high-quality care. Therefore, the techniques for conflict resolution are essential for surgical leaders.

To properly use conflict resolution techniques, it is important for the surgeon and surgical trainee to always remain objective and seek personal flexibility and self-awareness. The gulf between self-perception and the perception of others can be profound; in a study of cooperation and collaboration among operating room staff, the quality of their own collaboration was rated at 80% by surgeons, yet was rated at only 48% by operating room nurses.<sup>26</sup> Systematic inclusion of modern conflict resolution methods that incorporate the views of all members of a multidisciplinary team help maintain objectivity. Reflection is

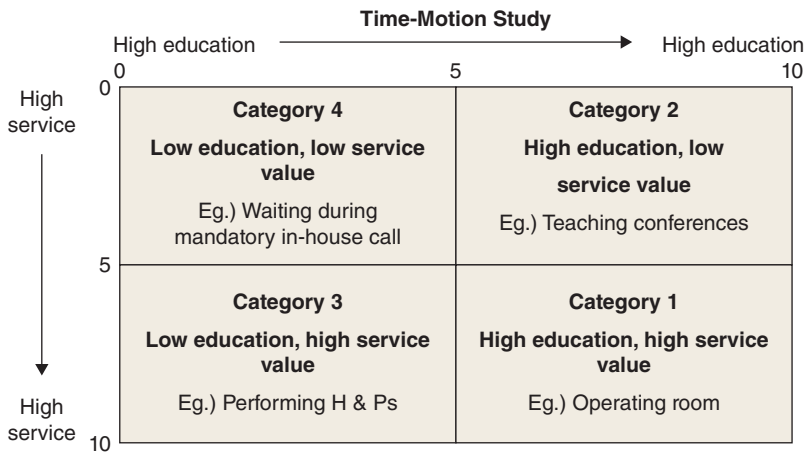
often overlooked in surgical residency training but is a critical component of learning conflict resolution skills. Introspection allows the surgeon to understand the impact of his or her actions and biases. Objectivity is the basis of effective conflict resolution, which can improve satisfaction among team members and help deliver optimal patient care.

Modern conflict resolution techniques are based on objectivity, willingness to listen, and pursuit of principle-based solutions.<sup>27</sup> For example, an effective style of conflict resolution is the utilization of the “abundance mentality” model, which attempts to achieve a solution that benefits all involved and is based on core values of the organization, as opposed to the utilization of the traditional fault-finding model, which identifies sides as right or wrong.<sup>28</sup> Application of the abundance mentality in surgery elevates the conflict above the affected parties and focuses on the higher unifying goal of improved patient care. Morbidity and mortality (M&M) conferences are managed in this style and have the purpose of practice improvement and improving overall quality of care within the system, as opposed to placing guilt or blame on the surgeon or surgical trainees for the complication being reviewed. The traditional style of command-and-control technique based on fear and intimidation is no longer welcome in any healthcare system and can lead to sanctions, lawsuits, and removal of hospital privileges or position of leadership.

Another intuitive method that can help surgical trainees learn to resolve conflict is the “history and physical” model of conflict resolution. This model is based on the seven steps of caring for a surgical patient that are well known to the surgical trainee.<sup>29</sup> (1) The “history” is the equivalent of gathering subjective information from involved parties with appropriate empathy and listening. (2) The “laboratory/studies” are the equivalent of collecting objective data to validate the subjective information. (3) A “differential diagnosis” is formed of possible root causes of the conflict. (4) The “assessment/plan” is developed in the best interest of all involved parties. The plan, including risks and benefits, is openly discussed in a compassionate style of communication. (5) “Preoperative preparation” includes the acquisition of appropriate consultations for clearances, consideration of equipment and supplies needed for implementation, and the “informed consent” from the involved parties. (6) The “operation” is the actual implementation of the agreed-upon plan, including a time-out. (7) “Postoperative care” involves communicating the operative outcome, regular postoperative follow-up, and the correction of any complications that arise. This seven-step method is an example of an objective, respectful method of conflict resolution. Practicing different styles of conflict resolution and effective communication in front of the entire group of surgical trainees attending the leadership training program is an effective means of teaching conflict resolution techniques.

## Time Management

It is important for leaders to practice effective time management. Time is the most precious resource, as it cannot be bought, saved, or stored. Thus, management of time is essential for a productive and balanced life for those in the organization. The effective use of one’s time is best done through a formal time management program to improve one’s ability to lead by setting priorities and making choices to achieve goals. The efficient use of one’s time helps to improve both productivity and quality of life.



**Figure 1-6.** Surgery resident time-motion study. H & P = history and physical examination.

It is important for surgeons and surgical trainees to learn and use a formal time management program. There are ever-increasing demands placed on surgeons and surgical trainees to deliver the highest quality care in highly regulated environments. Furthermore, strict regulations on limitation of work hours demand surgical trainees learn patient care in a limited amount of time.<sup>30</sup> All told, these demands are enormously stressful and can lead to burnout, drug and alcohol abuse, and poor performance.<sup>30</sup> A time-motion study of general surgery trainees analyzed residents' self-reported time logs to determine resident time expenditure on educational/service-related activities (Fig. 1-6).<sup>31</sup> Surprisingly, senior residents were noted to spend 13.5% of their time on low-service, low-educational value activities. This time, properly managed, could be used to either reduce work hours or improve educational efficiency in the context of new work hour restrictions. It is therefore critical that time be used wisely on effectively achieving one's goals.

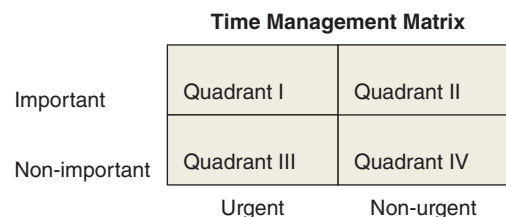
Parkinson's law, proposed in 1955 by the U.K. political analyst and historian Cyril Northcote Parkinson, states that work expands to fill the time available for its completion, thus leading individuals to spend the majority of their time on insignificant tasks.<sup>32</sup> Pareto's 80/20 principle states that 80% of goals are achieved by 20% of effort and that achieving the final 20% requires 80% of their effort. Therefore, proper planning of undertaking any goal needs to include an analysis of how much effort will be needed to complete the task.<sup>32</sup> Formal time management programs help surgeons and surgical trainees better understand how their time is spent, enabling them to increase productivity and achieve a better balanced lifestyle.

Various time allocation techniques have been described.<sup>32</sup> A frequently used basic technique is the "prioritized list," also known as the ABC technique. Individuals list and assign relative values to their tasks. The use of the lists and categories serves solely as a reminder, thus falling short of aiding the user in allocating time wisely. Another technique is the "time management matrix technique."<sup>28</sup> This technique plots activities on two axes: importance and urgency, yielding four quadrants (Fig. 1-7). Congruous with the Pareto's 80/20 principle and Parkinson's law, the time management matrix technique channels efforts into quadrant II (important but nonurgent) activities. The activities in this quadrant are high yield and include planning, creative activity, building relationships, and maintaining productivity. Too often, surgeons spend a majority of their time attending to

quadrant I (important and urgent) tasks. Quadrant I tasks include emergencies and unplanned or disorganized situations that require intensive and often inefficient effort. While most surgeons and surgical trainees have to deal with emergencies, they often develop the habit of inappropriately assigning activities into quadrant I; excess time spent on quadrant I tasks leads to stress or burnout for the surgeon and distracts from long-term goals. Efficient time management allows surgeons and surgical trainees to be proactive about shifting energy from quadrant I tasks to quadrant II, emphasizing preplanning and creativity over always attending to the most salient issue at hand, depending on the importance and not the urgency.

Finally, "the six areas of interest" is an alternative effective time management model that can help surgeons and surgical trainees achieve their goals, live a better balanced lifestyle, and improve the quality of their lives.<sup>32</sup> The process begins by performing a time-motion study in which the activities of 6-hour increments of time over a routine week are chronicled. At the end of the week, the list of activities is analyzed to determine how the 168 hours in 1 week have been spent. The surgical trainee then selects six broad categories of areas of interest (i.e., family, clinical care, education, health, community service, hobbies, etc.), and sets a single activity goal in each category every day and monitors whether those goals are achieved. This technique is straightforward and improves one's quality of life by setting and achieving a balanced set of goals of personal interest, while eliminating time-wasting activities.

A formal time management program is essential for modern leadership. The practice and use of time management strategies can help surgeons and surgical trainees achieve and maintain their goals of excellent clinical care for their patients, while maintaining a more balanced lifestyle.



**Figure 1-7.** Time management. (From Covey S. *The Seven Habits of Highly Effective People*. New York: Simon & Schuster; 1989.)

## LEADERSHIP STYLES

The principles of leadership can be practiced in a variety of styles. Just as there are many definitions of leadership, many classifications of styles exist as well. A landmark study by Daniel Goleman in *Harvard Business Review* identified six distinct leadership styles, based on different components of emotional intelligence.<sup>33</sup> Emotional intelligence is the ability to recognize, understand, and control the emotions in others and ourselves. By learning different styles, surgeons and trainees can recognize their own leadership style and the effect on the team dynamic. Furthermore, it teaches when the situation may demand change in style for the best outcome. The six leadership styles identified are *Coercive, Authoritative, Affiliative, Democratic, Pacesetter, and Coaching*.

The Coercive leader demands immediate compliance. This style reflects the command and control style that has historically dominated surgery. Excessive coercive leadership erodes team members' sense of responsibility, motivation, sense of participation in a shared vision, and ultimately, performance. However, it is effective in times of crisis to deliver clear, concise instruction. This style should be used sparingly and is best suited for emergencies.

The Authoritative leader embodies the phrase "Come with me," focusing on mobilizing the team toward a common, grand vision. This type of leader allows the team freedom to innovate, experiment, and devise its own means. Goleman's research indicates this style is often the most effective. These leaders display self-confidence, empathy, and proficiency in initiating new ideas and leading people in a new direction. This is best used when a shift in paradigm is needed.

The Affiliative leader creates harmony and builds emotional bonds. This requires employment of empathy, building relationships, and emphasis on communication. An affiliative leader frequently gives positive feedback. This style can allow poor performance to go uncorrected if too little constructive/critical advice is given. Affiliative leadership is most useful when motivating people during stressful circumstances or healing rifts in a team.

The Coaching style of leadership focuses on developing people for the future. Coaching is leadership through mentorship. The coach gives team members challenging tasks, counsels, encourages, and delegates. Unlike the affiliative leader who focuses on positive feedback, the coach helps people identify their weaknesses and improve their performance, and ties their work into their long-term career aspirations. This leadership style builds team capabilities by helping motivated learners improve. However, this style does not work well when team members are defiant and unwilling to change or learn, or if the leader lacks proficiency.

The Democratic leader forges consensus through participation. This leadership style listens to and values each member's input. It is not the best choice in an emergency situation, when time is limited, or when teammates cannot contribute informed guidance to the leader. It can also be exasperating if a clear vision does not arise from the collaborative process. This style is most appropriate when it is important to obtain team consensus, quell conflict, or create harmony.

The Pacesetter leader sets high standards for performance and exemplifies them. These leaders identify poor performers and demand more from them. However, unlike the coach, the pacesetter does not build the skills of those who are not keeping

up. Rather, a pacesetter will either take over the task himself or delegate the task to another team member. This leadership style works well when it is important to obtain high-quality results and there is a motivated, capable team. However, pacesetters can easily become micromanagers who have difficulty delegating tasks to team members, which leads to burn out on the part of the leader. Additionally, team members can feel overwhelmed and demoralized by the demands for excellence without an empathic counter balance.

Each of the above styles of leadership has strengths and weakness. Importantly, leaders who are the most successful do not rely only on one leadership style alone. They use several of them seamlessly depending on the situation and the team members at hand. Therefore, the more styles a leader has mastered, the better, with particular emphasis on the Authoritative, Affiliative, Democratic, and Coaching styles. Each leadership style is a tool that is ultimately employed to guide a team to realizing a vision or goal. Thus, leadership training programs should teach the proper use of all leadership styles while adhering to the principles of leadership.

## FORMAL LEADERSHIP TRAINING PROGRAMS IN SURGERY

Since it has been shown that effective leadership can improve patient outcomes, leadership principles and skills should be taught to surgical trainees using formal leadership training programs. The importance of teaching leadership skills is reflected by the ACGME mandated core competencies (see Table 1-1). However, surgical trainees, most notably chief residents, find themselves in various leadership roles without ever having experienced formalized leadership training, which has been shown to result in a self-perceived lack of leadership ability.<sup>23</sup> When surveyed on 18 core leadership skills (Table 1-2), 92% of residents rated all 18 skills as important, but over half rated themselves as "minimally" or "not competent" in 10 out of 18 skills.<sup>2</sup> It has been documented that trainees are requesting leadership training and wish to close the gap between perceived need for training and the implementation of formal leadership training programs.<sup>34-37</sup>

A number of leadership workshops have been created. Extracurricular leadership programs have been designed mostly for physicians with an MBA or management background but have not been incorporated into the core residency training program.<sup>38</sup> Also, there are many institutions that have published experiences with leadership retreats or seminars for residents or young physicians.<sup>39-42</sup> The ACGME hosts multiple leadership skills workshops for chief residents, mostly targeted toward pediatricians, family practitioners, and psychiatrists.<sup>43</sup> Similarly, the American College of Surgeons leads an annual 3-day leadership conference focusing on leadership attributes, consensus development, team building, conflict resolution, and translation of leadership principles into clinical practice.<sup>44</sup> These programs were all received well by participants and represent a call for a formal leadership program for all surgical trainees.

An innovative leadership curriculum first implemented in 1999 taught general surgery trainees collaborative leadership skills, at a time when the traditional command-and-control leadership style predominated.<sup>45</sup> Surgical residents participated in 18-hour-long modules based on the leadership principles and skills listed in Table 1-2, taught by the surgical faculty.