BUILDING A CULTURE OF PATIENT SAFETY THROUGH SIMULATION

An Interprofessional Learning Model

Kathleen Gallo | Lawrence G. Smith
Editors

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Building a Culture of Patient Safety Through Simulation
Kathleen Gallo, PhD, MBA, RN, FAAN, is senior vice president and chief learning officer for the North Shore-Long Island Jewish Health System (NS-LIJ). Under her leadership, the Center for Learning and Innovation—NS-LIJ’s corporate university—and the Patient Safety Institute were created to transform the health system into a learning organization by strategically focusing on workforce development. Dr. Gallo is responsible for leadership development throughout the organization. She initiated the creation and implementation of a comprehensive learning strategy, and the development of a new human resources (HR) architecture that transformed HR into a strategic business partner. Within NS-LIJ, Dr. Gallo has served as system director for emergency medicine and vice president for emergency medical services. She has more than 25 years’ experience in emergency nursing, having held a variety of clinical and administrative positions in tertiary care hospitals on Long Island.

Dr. Gallo serves on the advisory boards for the Executive Program in Work-Based Learning Leadership at the University of Pennsylvania, and the Institute of Healthcare Improvement Open School for Health Professions. She is the former chair of the Quality Committee for the Council for Accreditation, Society for Simulation in Healthcare, and serves on the editorial board of the Journal for Applied Nursing Research. Dr. Gallo is an associate professor of science education at the Hofstra NS-LIJ School of Medicine; an associate adjunct professor at the Frances Payne Bolton School of Nursing, Case Western Reserve University; and an adjunct professor at the Bouvé College of Health Sciences, Northeastern University. She served as an examiner for the Malcolm Baldridge Quality Award Program from 2003 to 2005 and also served on the advisory board for the National Center for Healthcare Leadership (NCHL) from 2004 to 2010. In addition, she has held several regional posts for emergency medical services and emergency nursing.

A noted speaker, Dr. Gallo addresses a wide range of subjects including Future Workforce Requirements, Creating a World Class Learning Organization, Effective Leadership for Today’s Workforce, Preparing Tomorrow’s Clinicians for Tomorrow’s Healthcare System, Enhancing Patient Safety Through Interprofessional Education and Collaboration, Herding in a New Era: Patient Safety at the Forefront, Transforming Healthcare Into Higher Reliability Organizations, and Creating a Culture of Safety: Lessons Learned from Aviation.

Dr. Gallo is a board member of the American Nurses Foundation Board of Trustees, the National Advisory Council on Nurse Education and Practice for the U.S. Department of Health and Human Services, National Advisory Council for the National Center of Interprofessional Practice and Education, the American Association of Colleges of Nursing Futures Task Force, the Advisory Council for Career and Technical Education for the New York City Department of Education, and the Commission on Accreditation of Healthcare Management Education. Dr. Gallo was inducted as a fellow in the American Academy of Nursing in 2011. She was also inducted into the 2005 Hall of Fame at Adelphi University School of Nursing, and received the 2005 Distinguished Alumni Award from State University of New York at Stony Brook.

Dr. Gallo received her bachelor of science in nursing from Excelsior College, University of the State of New York; a master of science (nursing) degree from the State University of New York at Stony Brook; a PhD (nursing) from Adelphi University, Garden City, New York; and a master in business administration, also from Adelphi University.

Lawrence G. Smith, MD, MACP, is the physician-in-chief of the North Shore-Long Island Jewish Health System (NS-LIJ) and founding dean of the Hofstra North Shore-LIJ School of Medicine. Dr. Smith joined NS-LIJ in May 2005, as chief academic officer and senior vice president of academic affairs and then served as the Health System’s chief medical officer, prior to his current role. Dr. Smith earned his medical degree from New York University School of Medicine, along with a bachelor of science degree in physics from Fordham University. His residency in internal medicine at Strong Memorial Hospital was followed by military service as captain in the Army Medical Corps at Fitzsimmons Army Medical Center in Denver, Colorado. He practiced general internal medicine at SUNY Stony Brook, where he served as director of education and program director of the residency in internal medicine for 6 years. For the next 11 years, at Mount Sinai School of Medicine in Manhattan, he served as dean and chairman of medical education, founder and director of the school’s Institute for Medical Education, professor of medicine, and an attending physician. Prior to his appointment as dean at Mount Sinai, Dr. Smith had been vice chair of medicine and program director of the Internal Medicine Residency.
He is a national leader in medical education with many peer-reviewed publications and national presentations. He is a former member of the board of directors of the American Board of Internal Medicine and has served in multiple capacities in the Association of Program Directors of Internal Medicine, including president. He is a former governor and a former regent of the American College of Physicians. In April 2011, he was awarded Mastership of the American College of Physicians. Dr. Smith is a member-at-large of the National Board of Medical Examiners and a member of the New York Academy of Medicine. He serves on the Executive Committee of the Associated Medical Schools of New York (AMSNY) and on the Advisory Committee on Long-Term Clinical Clerkships for the New York State Education Department.
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As an expert in aviation simulation, having created globally recognized programs for the U.S. Navy and JetBlue Airways, I am inspired by the visionary leaders at North Shore-LIJ who have made such a remarkable commitment to improving performance outcomes across their system through simulation.

Mike Barger, EdD
Co-Founder, Chief Learning Officer, Captain, JetBlue Airways
Former Chief Training Officer, United States Navy Fighter Weapons School (TOPGUN)

Simulated learning provides a safe environment for testing new behaviors and skills. This book is a timely and much needed resource that will serve as a guide to educating new and existing members of all health professions. I think it should be required reading for anyone seeking to drive change in health care.

Geraldine Polly Bednash, PhD, RN, FAAN
Chief Executive Officer/Executive Director
American Association of Colleges of Nursing

This book will save lives. The authors generously share their journey to building a world class integration of safety tools, from simulation and communication, to team training and safety science. They show how simulation will teach new ways to see and offer insights into performance that will improve care in every part of a hospital system. Every physician, nurse, pharmacist, and student will learn and care for patients in a new way.

Maureen Bisognano
President and CEO
Institute for Healthcare Improvement

This book isn’t just an inspirational story about a patient safety journey of a large health care organization. It’s full of great lessons with enough detail to guide others to do the same. And, it’s a virtual roadmap for how the wise and varied use of simulation can help to move the giant boulder of safety culture up the steep hill of resistance to change.

Jeffrey B. Cooper, PhD
Professor of Anaesthesia, Harvard Medical School
Department of Anaesthesia, Critical Care & Pain Medicine
Massachusetts General Hospital, Boston, Massachusetts
Executive Director, Center for Medical Simulation

This book is not fundamentally about medical simulation. Rather, it is truly about the concepts of safety and quality, coupled with health care reformation, utilizing simulation as the mechanism of organizational improvement in service to patients. The new era of safety and quality, begun by forces such as the Institute of Medicine reports, finds in this text the natural evolution of positive process change.

William F. Dunn, MD, FCCP, FCCM
Associate Professor of Medicine
Division of Pulmonary & Critical Care Medicine
Mayo Clinic
Past President, Society for Simulation in Healthcare
Past Medical Director, Mayo Clinic Multidisciplinary Simulation Center
Gallo and Smith have provided us with a definitive roadmap of how simulation can be used successfully to advance interprofessional health education for all disciplines. Focused on patient safety, the patient is, in fact, at the center of their thinking as it should be for all of us . . . .

[This book] adds the theoretical underpinnings of that work that has been missing in other textbooks. I recommend it to every health educator who is interested in preparing students for the complexity of the clinical environment in order to improve safety and quality in all care.

**Terry Fulmer, PhD, RN, FAAN**

Dean, Bouvé College of Health Sciences, Northeastern University

Trustee, Josiah Macy Jr. Foundation

[This] is not a typical text—rather, a guide with intentional simulation learning encounters to foster and implement a culture of patient safety. Impressively in its approach, each chapter within the book uses simulation to address patient safety across the continuum of health from system-wide initiatives to combat sepsis; or respond to medical emergencies in psychiatric care, perinatal care, and pediatric care; to improve retention of members of the health care team; and improve our ability to assess and evaluate learning.

**Beverly Malone, PhD, RN, FAAN**

CEO, National League for Nursing

This is an important and timely book from a highly functioning, integrated health care system that also has made an enormous commitment to health professions education. The book is both practical and aspirational in detailing how interprofessional simulation can be a powerful tool to help achieve the common goals of educational reform and delivery reform—more reliable, safer, and efficient patient care.

**George E. Thibault, MD**

President, Josiah Macy Jr. Foundation
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As I write this Foreword, I’m sitting in seat 3A on board an American Airlines flight. I have confidence in the cockpit crew because they have been through a rigorous training program, including hundreds of hours in a flight simulator. They have been steeped in a culture of crew resource management (CRM). I observed earlier how they introduced themselves to the flight attendants and to one another. They seemed relaxed and all of this was rather routine. When I return to my own academic medical center, my professional home for the past 24 years, I don’t have a similar level of confidence in our systems. How could that possibly be?

Drs. Gallo and Smith have brought together a core group of national leaders to produce what I think is a paradigm-busting book that will help to transform education at the graduate level in medicine, nursing, and all related fields. The book speaks expertly about the high fidelity of simulation training, the need for synthetic models, and the adult learning theory behind the debrief—all of this is amazing, but I think here of patients.

In my nearly 30 years in academic medicine, regrettably, there is no single place for us to come together in a safe environment, without recrimination, to review our work as a team. If the general public had a deeper knowledge of our daily work process, they would be in shock. I first visited the North Shore-Long Island Jewish (LIJ) Patient Safety Institute (PSI) back in 2009, 4 years after it opened. The history of PSI is covered in detail in the pages that follow. We learn that it was an outgrowth of the Center for Learning and Innovation, which was first created in 2002, following the early formation of the North Shore-LIJ Health System around 2000. Having grown up 20 minutes south of both the North Shore and LIJ Hospitals, I never thought that in my adult life they would come together to create the current powerhouse that they represent. Nor did I ever think possible that they would build their own medical school known to the world now as the Hofstra North Shore-LIJ School of Medicine, which opened its doors officially in 2011.

So for me, this book is not only a “paradigm buster” for education in the health professions, but it is a manifesto about where we must go as an interprofessional team, caring for the patient of the future. Sure, they had all of the key
ingredients to implement social change, starting with their charismatic leader, Michael Dowling, who recognized special characteristics in medical educators like Larry Smith and innovative nurse educators like Kathy Gallo.

All of those leaders are part of the “right recipe,” but other ingredients include a willingness to collaborate with corporations, such as General Electric, and an open-mindedness to work with other leaders such as those at the Institute for Healthcare Improvement in Cambridge, Massachusetts. It is as though all the right ingredients came together with a winning recipe to build one of the most impressive simulation centers in our country.

And yet, the simulation center itself, while very impressive, is only bricks and mortar. It takes a senior-level commitment across a gigantic system like North Shore-LIJ to turn this simulation center into the “paradigm buster” that it has become. We all talk about learning organizations and the need to train our people to create a safe culture. The simulation center and the deep science that now lie behind it enable North Shore-LIJ to achieve this national leadership position, which, in turn, gave rise to this winning book.

Again, to me it is all very personal. Not only were these hospitals looming large in my adolescence, but as a national leader myself, in the movement to bring quality and safety into the mainstream of medical education, my in-person visits to PSI played a seminal role in my thinking. That is, while the technology is impressive, the culture is even more so. Imagine the following scenario: There is a difficult delivery of a preterm infant at a North Shore-LIJ member hospital and the team members are very upset about a poor outcome. Weeks later, this same team, in a completely safe environment, free from any recrimination, can come together under the expert leadership of Dr. Gallo and her team to evaluate what went wrong. Essentially, they do an “autopsy” on the cultural failure that led to the poor clinical outcome. How many organizations can make a similar claim? Not only does the simulation center practice this kind of task-based learning, but Drs. Gallo and Smith have taken this to the next level, whereby they practice cultural change, implement cultural change, and teach cultural change to the nation at large.

How will we know if this book is successful? I think there are several metrics. Certainly, I’m paying close attention to the Hofstra North Shore-LIJ School of Medicine. I’m hoping that its graduates will be the future proselytizers; they will be the “teach the teacher” model for the use of simulation training to improve quality and safety. That will be a key educational metric.

Another metric of success might be the quick adoption of this book as a how-to manual to move most of the nation’s simulation centers from task-based learning to cultural change and the tools for creating such change. The final metric might be that this book becomes obsolete in 3 to 5 years. Meaning, we’ll look back on 2014 as the inflection point in our understanding of the power of CRM. In 5 years we’ll say, “Wow, that was the time when the science of simulation training was powerful enough to alter hundreds of years of clinical culture—the culture of ‘see one, do one, teach one’ without any real evaluation of the ‘one.’”
I’m grateful to Drs. Gallo and Smith and their colleagues for putting together such a volume. The chapters have a comfortable flow and even a novice reader new to CRM will grasp the key concepts quite readily. Perhaps Drs. Gallo and Smith have actually stumbled on a new type of Flexner report; one that will have a dramatic impact on medical and nursing education for the 21st century. Here I speak of patients. Future patients will be similarly grateful for the work of these authors and contributors.

I am truly privileged to have visited this award-winning institution and to count their leaders among my professional colleagues and friends.

David B. Nash, MD, MBA
Dean, Jefferson School of Population Health
Philadelphia, Pennsylvania
Foreword

Viewed as an organizational imperative, patient safety is an aspect of quality of care. Today, aided by increasingly powerful abilities to track and evaluate the care we provide, and implement incentives to ensure optimal treatment, the business case for safety is that if you take the right steps in the right order the first time, the outcome will be better and ultimately cost effective. Although healthcare is more complex than other industries, and people are not machines, the best result will be the most efficient—and therein we find the case for extensive, system-wide use of simulation. If the series of initiatives detailed in this book share a common basis, it may be found in the long-term effort to instill and nurture in our organization a culture of continuous learning.

A forthright examination of any health care system in the United States at the beginning of the 21st century would show that without question its most valuable asset is the people it employs—at all levels and on all fronts—to make it work. Employees present the greatest potential, from a business standpoint, for producing value and enabling successful evolution in a rapidly changing marketplace. If organized with some understanding of the steps people at all levels can take to enhance their capabilities, education from within can generate a return on investment rather than a drain on resources. Infrastructure is always aging and requires maintenance and renewal; technology is constantly advancing in complexity and requires constant upgrades. But the capability to improve an organization committed to caring for and treating other human beings, and keeping them well, resides in the employees who, in whatever capacity, provide that care. These include not only physicians and nurses but all individuals whose work and intelligence can detect opportunities for improvement, target efficiencies, and ensure that every patient’s experience embodies the highest possible quality of care.

The crucial importance of the workforce and the individual and collective roles of people in creating leadership to drive cultural change represented the root and branch of a series of questions that, in 2001, I posed to executive colleagues within the newly formed North Shore-Long Island Jewish Health System (NS-LIJ). In effect, the inquiry was simple: Who were the right people for the organization? How would we find them and keep them? Who would be responsible for hiring them and who was to be accountable?
My purpose in posing those questions was the vital need to respond to the powerful forces of transformation in the health care industry as a whole. Then, as today, they were inescapable: underlying social and demographic shifts; newly minted consumer demand for high-quality, affordable health care; pressures exerted by revolutionary biomedical technologies; and advances in therapeutics. On the financial side, those forces had generated impetus for the mergers through which NS-LIJ had been created and by which it was beset with grave, potentially perilous issues that would absolutely have to be resolved if it were to prosper and advance as a leader in a huge competitive marketplace. Two large tertiary-care hospitals that for decades had competed with each other were now a single entity; further acquisitions of many other hospitals completed the picture. Employee retention rates were low and, overall, patient satisfaction was not high. Located in a major metropolitan area, NS-LIJ was then a system with more than 35,000 employees that served a highly diverse patient population but lacked a shared identity. In the universe of contemporary health care economics, to simply settle for financial oversight of disparate institutions was not an attractive option, but rather, a potential recipe for failure.

Although I did not have all the answers, I sketched a plan to respond to these issues with an overarching aim: to infuse the entire organization with opportunities for meaningful learning. To foster improvement and innovation meant engaging employees on all levels and evoking and promoting leadership congruent with clear institutional values. My inclusive search for potential leaders (as distinct from managers) may have seemed idiosyncratic to some, but it was a response to the need to respond swiftly to the marketplace as a means of seeking a competitive advantage. An organization with a flexible hierarchy, with leaders seeded throughout who are purposely equipped with skills to identify problems, to devise solutions, and to adapt to new data, seemed to me essential if the organization was to succeed.

From these considerations and the concept, at first, of a “leadership institute,” there emerged NS-LIJ’s Center for Learning and Innovation (CLI), established in 2002. It was the first “corporate university” to be established by a health care system—many more have emerged over the past decade—and it followed the model set by General Electric (GE) and emulated by other corporations, such as Motorola and IBM. I had spent time at GE’s Crotonville Institute and was able to recruit both that company and the Harvard School of Public Health as strategic partners—with others, both corporations and universities, to follow. Each helped to formulate educational methodologies, devise courses for a broad range of management topics and clinical domains, and to implement curricula.

Most importantly, CLI was not meant to be a “training” branch of the health care system, separate from its everyday operations. It was designed to be central to NS-LIJ and its employees: to provide opportunities for focused, meaningful learning and, at the same time, to serve as a central platform to inaugurate culture change and ultimately bring about an integrated health care
system. In addition to course offerings and programs for adult learning and enrichment, we developed leadership pedagogies for physicians and nurses, and introduced process improvement methodologies such as Six Sigma and Lean, with the intention of engaging the employees’ creativity throughout the system. CLI grew exponentially: from a single classroom in 2002 to 3,000 employee-students in 2004, and 15,000 by 2007. In 2013, to apply the current standard, the NS-LIJ workforce engaged in more than 265,000 learning hours in the course of the year.

One decision I made helped pave the way for the Patient Safety Institute, founded under the aegis of CLI. Just because part of my larger purpose intended to avoid the narrow scope of training courses that most health care organizations provide their employees—often, it seems, as nothing more than a way of filling their days—I appointed a chief learning officer (CLO) whom I also tasked with overseeing what I viewed as the fairly anachronistic domain of Human Resources. Purposely seeking someone not imbued with received wisdom from the world of education, but an executive who could also participate in developing a complex matrix management system, I chose, from within NS-LIJ, Kathleen Gallo.

Originally an emergency and trauma nurse with a degree in business administration and a PhD in nursing, Kathy brought me the suggestion that CLI investigate the use of simulation with a view to improving patient safety. That idea, if it could be put into practice, represented a clinical focus that would wholly align with our business aim of generating efficiencies throughout the system. At the time—this was 2005—simulation was beginning to make substantial inroads in health care. Its hands-on quality made it ideal to serve purposes of both learning and assessment while, at the same time, by addressing safety issues, it could improve the experience of providers and patients alike.

In creating the Patient Safety Institute, we had the express aim of making simulation not a one-off research project or an ancillary department—hence its name. It was not to be a standalone flavor of the month but constitute part of the institutional DNA that equates with quality. Viewed as a means to an end, we thought that simulation could become integral to an organization in the sense that quality of care is everybody’s job and affects everything they do. The framework of supporting ideas bears this out: interprofessional teamwork that flattens the traditional top-down hierarchy, purposeful learning that does not treat adults like children, and emotional and intellectual engagement through hands-on experience and debriefing. Simulation represents an investment in human capital that may be expected to provide the whole organization, and the consumers of health care who frequent it, with substantial and long-term dividends.

Finally, allow me to say something about what to me seems the most attractive aspect of simulation for patient safety—and that, in a word, is its appeal to flexibility and adaptability to today’s complex clinical realities. The forms it takes—with high-fidelity simulators, standardized patients, or both—provides learners with new dimensions and prospects that are not found in
slide presentations, outdated didactics, or multiple-choice exams. Rather, the rational limits of simulation are formed by the application of scientific knowledge and the art and science of caring for patients; within those boundaries may be found great room for imagination and the play of ideas.

In the era we are about to enter, in which brick-and-mortar hospitals will not be where most patients will receive care, interprofessional education through simulation will reward organizations that employ it with insight and creativity. In years to come, we anticipate more and more care will be dispensed in outpatient and ambulatory facilities, in patients’ homes or in settings such as hospice. Simulation has unlimited potential for introducing caregivers to these venues, for helping to detect threats to safety, and for adapting new treatment modalities of all kinds. In brief, people and organizations that can adapt and use simulation for patient safety will be prepared to lead and succeed in the complex and always surprising future of health care.

Michael J. Dowling
President and Chief Executive Officer
North Shore-LIJ Health System
Today, the drive to improve patient safety is a worldwide movement, an educational and clinical priority of global significance (Donaldson & Philip, 2004). In the 15 years since publication of To Err Is Human raised alarm over the extent of preventable harm, efforts to improve safety have spawned both a vast literature and a host of programmatic efforts (Kohn, Corrigan, & Donaldson, 2000). Widespread awareness has replaced tacit understanding that health care is a high-risk industry. As a field, patient safety is characterized by numerous projects and protocols, concepts and ideas, principles, approaches, and initiatives. Unfortunately, there is considerable distance between rhetoric and exhortation on one hand, and substantive advances on the other. Simulation and interprofessional learning work hand-in-hand to close that gap. Together they can help build a culture of safety that reaches across all clinical domains and all venues for learning.

Our goal at the Patient Safety Institute (PSI) of the North Shore-LIJ Health System (NS-LIJ), the genesis of which is described in Chapter 1, is to provide clients and stakeholders with a consistent process and set of options for pursuing simulation that will correspond with their larger aim of improving safety. The PSI, inaugurated in 2006, forms part of an expanding health system’s concerted effort to reimagine and reshape itself as a learning organization—defined as an entity in which “people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together” (Senge, 1990, p. 3).

Our contention, expressed throughout this book, is that when simulation is strategically employed—that is, aligned with the unique requirements and larger goals of the health care system—it functions to concretely implement a culture of patient safety. It lends substance and body to the organization’s “collective aspiration.” Simulation employed in this way is a disruptive innovation that introduces major changes in the way that health providers communicate, with both patients and one another, for both learning and assessment; it creates advantages in the way people acquire competencies, put scientific knowledge to use, and affect treatment outcomes. It places great emphasis on principles of adult learning and work in interprofessional teams, all with a view to ensuring
safety, detecting threats, and ultimately providing efficient care. Used in this way, simulation introduces a “new value proposition” (Christensen, Anthony, & Roth, 2004, p. xvii) that creates competencies and prioritizes safety.

Although PSI has evolved into a large center within a corporate university, it began in a single unused hospital room. We wish to emphasize that interprofessional learning through simulation is a scalable enterprise. Success is not about size. Health care systems of any magnitude can benefit from simulation if they deploy it in planned, strategic ways that connect aims with overall organizational goals. Effective simulation does not require the most sophisticated technology or elaborate props, but it does demand commitment to interprofessional learning and a well-trained faculty versed in the tenets of adult, experiential learning, and deliberate practice. To be effective, simulation also requires commitment to extensive debriefing that ensures learning takes place in a context that allows reflection, improved teamwork, and self-discovery. Equally important are organizational support and committed, mission-driven leadership.

USING THIS BOOK

Each chapter in this book addresses discrete aspects of simulation in the larger context of patient safety. Unlike a textbook that elucidates specialized areas for specific didactic purposes, we have devised content that will be relevant to health care professionals of all specialties. Chapters are interdisciplinary by design and composition, with a view to helping individuals and groups learn from one another.

Of the introductory chapters that comprise Part One, we provide in Chapter 1 a narrative account of the origins of PSI that emphasizes its integration and alignment with the strategic goals of the larger health care system—an example, in effect, of innovation that, from within the organization, creates new capabilities. No aspect of simulation is more central to successful application than debriefing, and Chapter 2 elaborates its historic development and evolution at PSI, offering concrete methods and examples to help show how theory translates into practical application. Chapter 3 provides an account of a system-wide initiative to combat sepsis—aligned with the international movement to stem an epidemic that costs 200,000 lives annually in North America alone; this chapter illustrates the concept of systems integration as representing a fourth domain of simulation, in addition to teaching/education, assessment, and research (Dunn, Deutsch, Maxworthy, Gallo, & Dong, 2013).

Accounts of interprofessional teams operating with distinct goals make up Part Two. In Chapter 4, cardiothoracic surgeon Alan Hartman and colleagues describe how they employed simulation as an organizing tool for safety and process control in advance of opening a postsurgical tertiary-grade intensive care unit in a former community hospital. In devising methods to improve the interprofessional response to acute medical emergencies in a psychiatric hospital, Kristy Loewenstein, in Chapter 5, provides an instructive example of the ways in which simulation offers distinctive advantages over simple hands-on training.

After pioneering work in anesthesiology, pediatrics and perinatal medicine became two of the first disciplines in which providers recognized the considerable potential for simulation, as indicated by the chapters that comprise Part Three. Leah Kaufman and Adiel Fleischer explain their comprehensive effort to improve patient safety in a regional perinatal center in Chapter 7, which they tracked with a research component, and describe how they use simulation in conjunction with other long-term efforts to avoid adverse events. In Chapter 8, Sandeep Gangadharan details the way in which, for several programs in a children’s hospital, each scenario serves a distinct purpose in addressing the rare acute emergencies that pediatric nurses and physicians must be prepared for, including detection of latent safety threats. Helen Scott discusses in Chapter 9 how simulation can prepare pediatric interprofessional clinical teams to contend with the common disorders seen in pediatric hospitals; she also outlines a program that employs standardized patients to improve interpersonal and communication skills among pediatrics residents.

The chapters in Part Four provide accounts of several programs that indicate both the depth and range of simulation. For a 3-year training program for cardiology residents, Donna Marchant and Stanley Katz delineate in Chapter 10 the comprehensive use of high-fidelity simulators and haptic-enhanced simulation together with standardized patients for purposes of both learning and assessment. In Chapter 11, we describe the development of a critical care nurse fellowship program that has improved retention of newly hired nurse graduates, an aim recognized as significant for patient safety; that program, initiated in 2005, proved to be in full alignment with the subsequent Institute of Medicine (IOM) recommendations by the Initiative on the Future of Nursing (2010). (The fellowship, renamed in 2007, is today the William Randolph Hearst Critical Care Nurse Fellowship Program.) In Chapter 12, Barbara DeVoe and Robert Kerner recount the stepwise effort they devised to ensure safety in lithotripsy, an example of in-situ simulation in a highly specialized unit. Finally, Kristy Loewenstein in Chapter 13 details her program with highly skilled standardized patients to teach psychiatric personnel how to contend with potentially violent patients in a behavioral health setting, as part of an ambitious initiative to manage aggressive behavior in a humane, patient-focused way.

Finally, we ask readers to take note of the Foreword by Michael J. Dowling, who explains how, in his role as president and chief executive officer of North Shore-LIJ, he developed the concept of a learning organization within a health care system and went on to create the corporate university from which PSI emerged as one of the central components of his visionary commitment to patient safety. His contribution was both foundational and integral to the strategies and processes that we describe throughout this book.

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We hope that this book will encourage others to use simulation as a platform for interprofessional education in an effort to improve teamwork, communication, and clinical decision making. A positive future for health care tomorrow depends on creating a culture of patient safety today.
Share
Building a Culture of Patient Safety Through Simulation: An Interprofessional Learning Mode
One: Call to Action: Improving Patient Safety
Patient safety, a constant and timeless goal in medicine, is of paramount concern in an age in which health care delivery, in new and unprecedented ways, demands attention far beyond the ancient imprecation that physicians must “do no harm.” As it evolves and matures, engages nurses and physicians at all levels of education and in all capacities, the patient safety movement both strongly embraces an interprofessional model of teamwork and advocates the systematic use of simulation—a multifaceted, multipurpose, and complex tool that we explore throughout this book. Today, its underlying aims in terms of learning, education, and assessment have come together to create a powerful and largely unified set of principles that shape a host of practical applications. The result, broadly speaking, is emergence of a renewed commitment to safety that signals broad, substantive culture change that is already beginning to generate future transformations of the health care landscape (Elwyn & Corrigan, 2005; Small & Barach, 2002).

Principal among the many factors that account for convergence of the patient safety movement and contemporary advances in simulation is the ongoing crisis that affects virtually all health care organizations. Pressing problems include workforce shortages, variations in competence among nurse graduates and physicians alike, and a patient care model that is inconsistent with consumer demand. Allied with these internal issues are various external factors: an aging and diverse population, the exponential expansion of the knowledge base, advances in helpful but potentially harmful technologies, and a consumer movement that demands transparency and participation in patient care and decision making. Add to this the competitive
environment that may be expected to persist through implementation of the Affordable Care Act (Oberlander, 2012), whatever its economic and structural consequences, and the result could be described as a perfect storm: a health care system that is unreliable, costly, unsafe, inefficient, and ineffective (Gallo & Smith, 2010; Sanford, 2007; Whitcomb, 2011).

SCOPE AND PURPOSE

Simulation, as we understand and use it and emphasize from the outset, is not a narrow enterprise that aims merely to provide drill systems for training medical personnel or simple “hands-on” learning exercises to reinforce a set of educational objectives (Levine, DeMaria, Schwartz, & Sim, 2013a). Rather, it is an approach that is central to implementing necessary and far-reaching change in the provision of health care.

As we show in Chapter 1, concerning the establishment of the Patient Safety Institute (PSI), simulation can serve as a flexible instrument and conduit for introducing changes in practice and procedures. It is a tool for enhancing teamwork and communication and it can be used to uncover the root causes of medical errors, as a first step in correcting and preventing them. It allows for assessment of individual and team competency, not just recall of facts. It is a reliable process that can be employed on a routine basis in systematic ways; the same basic operational principles and methodology, that is to say, can be used in applying simulation to all disciplines and procedures.

Furthermore, as we discuss more fully below, if it is employed with attention to coherent theoretical and practical bases, simulation can be central to a form of “systems integration” that can positively impact an entire organization (Dunn et al., 2013). The Society for Simulation in Healthcare (SSH) has articulated just such a goal for accrediting programs that “demonstrate consistent, planned, collaborative, integrative and iterative application of simulation-based assessment and teaching activities” with the aim of achieving “excellent bedside clinical care, enhanced patient safety, and improved metrics across the health-care system” (Deutsch, Mancini, Dunn et al, 2013).

ORIGINS OF THE CONTEMPORARY PATIENT SAFETY MOVEMENT

Current concepts surrounding patient safety percolated through the medical literature during the 1990s and achieved a dramatic breakthrough at the turn of the 21st century with the Institute of Medicine (IOM) publication, To Err Is Human: Building a Safer Health System (Kohn, Corrigan, & Donaldson, 2000). Seeking and reaching a broad audience, the 287-page report emerged from the IOM’s Committee on Quality of Health Care in America and aimed to initiate long-term improvement in an industry that, by the evidence from a safety standpoint, could only be described as substantially deficient and defective. The dramatic estimate of deaths owing to medical errors, from 44,000 to 98,000
annually, also pointed to a far greater number of preventable medical errors. In addition, *To Err Is Human* drove home the host of negative consequences beyond lost life and unnecessary adverse events: low levels of trust and satisfaction among patients, diminished morale on the part of health care professionals, litigation, and huge financial costs to the system as a whole.

The goal of *To Err Is Human*, however, was not only to bring to light the nature and extent of the problem but “to break this cycle of inaction,” and it became an example of how a “policy report can transform a healthcare issue into a national priority” (Stelfox, Palmisani, Scurlock, Orav, & Bates, 2006, p. 177). The IOM also set out a prescriptive and reasoned list of recommendations. Hoping to provide a long-term patient safety strategy, the authors effectively outlined a national agenda: a mandatory error-reporting system, legislation to ensure collection and protection of safety data, higher performance standards, and greater commitment from professional societies and organizations. In addition, the report pointedly advised “Implementing Safety Systems in Health Care Organizations.”

One among its formal recommendations (8.1) included a set of points worth verbatim citation because they delineate the fundamentals that undergird our efforts at PSI, together with the rationale for its integral status within the North Shore-LIJ Health System. Health care organizations must “develop a culture of safety” and should:

- provide strong, clear and visible attention to safety
- implement nonpunitive systems for reporting and analyzing errors within their organizations
- incorporate well-understood safety principles, such as standardizing and simplifying equipment, supplies, and processes
- establish interdisciplinary team training programs for providers that incorporate proven methods of team training, such as simulation (Kohn et al., 2000, p. 14)

Demonstrating the real-world development and deployment of these notional suggestions constitutes the form and substance of each of the chapters that comprise this book. We should add that today, nearly 15 years after its appearance, as we note in Chapter 3, *To Err Is Human* has impacted the patient safety movement in ways comparable to Abraham Flexner’s 1910 report advocating changes that, a century ago, were imperative to impose if the American medical establishment were to embrace the advent of scientific medicine (Cooke, Irby, Sullivan, & Ludmerer, 2006). Today in health care, the exponential expansion of the knowledge base and new information streams require nothing less with respect to patient safety.

**TEAMWORK TRUMPS AUTONOMY**

Simulation, as we understand and use it, is an eminently interprofessional endeavor. Both historically and conceptually, recognizing the value added by
teams comprised of physicians, nurses, and other providers working together has been crucial to organizing the use of simulation. Vast shifts in the medical marketplace in the final decades of the 20th century brought into question the control that the “medical profession”—headed by physicians—could wield over “markets, organizations, and standards of judgment” (Starr & American Council of Learned Societies, 1982, p. 421). Far-reaching advances in treating and managing many previously unrecognized and untreatable diseases generated not only institutional change and economic transformations but also raised many of the serious safety issues that undermined the concept of the doctor-in-charge as the autonomous decision maker. Although the “hierarchy gradient” remains a legacy issue in need of attention and resolution, there is today widespread acknowledgment that the safety net in medicine must be the team and not the individual (Thistlethwaite, Moran, and World Health Organization Study Group on Interprofessional Education and Collaborative Practice, 2010).

It is teams working together that enable more complex tasks to be accomplished safely, competently, and effectively—and, in fact, there would be little point to simulation as we employ it, without them. The platforms we develop in simulation are important not only “for the acquisition of critical skills in each of the [health] professions, but they can also be a powerful means for teaching and assessing team-based competencies interprofessionally” (Thibault, 2013, p. 1931). “Teamwork trumps autonomy” is not a slogan but an imperative.

**ADVANCING A NEW PARADIGM**

Both conceptually and historically, simulation for patient safety owes much to measures first developed in industries outside health care. Aviation is the field most directly responsible. Although the use of “flight simulators” to train pilots and crew dates to the first decades of the 20th century, the principles of crew resource management (CRM), so crucial to airline safety, developed over a quarter of a century beginning in the 1970s (Helmreich, 2000). They included attention to human interaction, an emphasis on team-based cooperation, and a “shift away from autocratic and individualistic styles of aircraft command” to one that is “team based with mutual interdependence and shared responsibility” (Musson & Helmreich, 2004, p. 26). In addition, the founders of CRM created the basic format of extensive postincident, nondidactic, non-hierarchical debriefings that are carried out in conjunction with every high-fidelity flight simulation.

Adaptation of CRM techniques to medicine occurred first in anesthesiology, closely associated with pioneering explorations by David Gaba at Stanford University. He and colleagues developed Anesthesiology Crisis Resource Management (ACRM) in the late 1980s. They used an off-the-shelf manikin, re-engineered for computerized simulation of several physiologic variables, including electrocardiogram (ECG), heart rate, blood pressure, and oximetry. Teams were interprofessional, comprised of nurses and an operating surgeon in
addition to the anesthesiologist. The first course in ACRM, in 1990, included most if not all the elements that would go on to define medical simulation today: pre-assigned reading, brief scenarios to emulate critical events, video recording of sessions, and facilitated debriefings based on the aviation industry model (Gaba, Fish, Smith & Sowb, 2001).

Use of simulation may focus on patient safety but, it should be added, its broader potential has always been understood: It is a tool for education and assessment. In an independent and parallel development, also working in anesthesia, Michael Good and colleagues at the University of Florida at Gainesville developed a manikin simulation program that they used to teach basic procedures and techniques. Their efforts, also beginning in the 1980s, evolved into several extensive projects to create computer-controlled simulators that could be manufactured and marketed commercially. The Gainesville group represented one of a number of successful efforts to advance manikin technology in ways to enhance fidelity during simulation (Rosen, 2013).

Anesthesiology, as a surgery-related specialty that requires teamwork by definition, was a logical domain to present the case for simulation, and it turned into a gateway for other domains and specialties. As Gaba enumerated them in 2001, not long after publication of To Err Is Human, the first of these included the intensive care unit, emergency medicine bays, and the specialties of cardiology, radiology, and obstetrics (Gaba, 2001). Subsequent research concerning the efficacy and effectiveness of simulation, as expected, proved to be a difficult proposition—it is still a work-in-progress—and a dearth of head-to-head studies may have slowed its widespread adoption. But it remains that today, within a short span of 2 decades, “healthcare simulation has gone from ‘best secret’ to ‘best practice’” (Levine et al., 2013a, p. 4).

HOW IT’S DONE: TYPES AND MODALITIES

Simulation is employed to educate trainees, providing advanced learning to experienced providers, and for assessment at all levels. While use of the manikin has been the most prominent modality and may be considered the “mainstay of simulation training” (Hope & Chin, 2008, p. 82), it should be understood in context. Today there are dozens of models—partial and full-sized, neonatal, pediatric, and adult; yet they are best viewed not as indispensable technologies but as fundamentally useful props. In guided learning contexts and with the help of debriefing, they can be put to a multitude of uses. High-fidelity simulation generally refers to the computer-based applications for which the manikin is programmed and, if it possesses interactive capabilities, it can evince signs and symptoms and react to various stimuli and interventions. Representing a further advance, the so-called haptic devices incorporate tactile feedback technology and have found a growing number of applications. Remote interactions, including the patient’s voice and symptoms such as wheezing or coughing, are generally initiated during simulation scenarios from the observation booth.
The “standardized patient” (SP) or “confederate”—the human actor who portrays a patient, family member, or physician—is equally important to simulation. Originating in the 1960s, for many years SPs found employment in assessment, frequently as part of the objective structured clinical exam (OSCE; Wallace, 1997). They play a wider role in simulation today, research supports their use, and they can be employed in conjunction with high-fidelity manikins and in scenarios that aim at improving communications skills, such as delivery of bad news and discussions of adverse events (Howley, 2013). A key advantage to the use of SPs, whether alone or in such hybrid contexts, is their participation in post-simulation assessments and debriefs, where they provide useful emotional feedback to learners. In developing PSI, which today serves both experienced health care providers, new employees, and medical students, we inaugurated a Clinical Skills Center that trains and deploys SPs in any number of venues.

All these modalities are discussed in the various chapters in this book. At PSI we put the various models of computerized manikins to a range of uses, sometimes in combination with SPs. Our endovascular simulator, a haptic device, is principally employed to train cardiac fellows but may be adapted for use with other specialties such as neurosurgery and vascular surgery. Our de-escalation program in behavioral health uses standardized patients exclusively, with actors trained to portray patients in acute states of decompensation; they are similarly engaged to help improve communications skills in both pediatrics and cardiology. We use both the manikin and standardized patients in behavioral health emergencies and in all programs for emergency-related pediatrics.

**ASPECTS OF ADULT LEARNING**

Whatever modality employed, simulation is a form of adult learning. Its principles, as they have developed over the past 3 decades, pay tribute to classical theories that emphasize the singular ways in which adults learn, the crucial importance of experiential learning (Kolb, 1984), and investigations into the most effective ways that professionals act, or “reflection-in-action” (Schön, 1983). Adults bring knowledge to learning situations; they are goal- and relevancy-oriented, self-directed, and favor practical aims (Knowles, 1980). These theories all align with and favor teamwork and interprofessional learning in health care (Oandasan & Reeves, 2005). Two concepts stand out across all modes of simulation for patient safety: debriefing and deliberate practice.

**Deliberate practice** has proved to be a crucial organizing concept. It expresses revision of the widely held view that individuals differ greatly in their potential for acquiring various skills, and that they reach an asymptotic limit beyond which they cannot improve. Emerging from empirical research by cognitive scientist K. Anders Ericsson and based on information processing theory, deliberate practice points to two key features of simulation that are requisite for success: repetition and guided practice (Ericsson, 1993). Deliberate practice has been described as “an important property of powerful [simulation-based
medical interventions used to shape, refine, and maintain trainee knowledge, skills and attitudes” (McGaghie, Issenberg, Petrusa, & Scalese, 2010, p. 55).

**Extensive debriefing** is so crucial to interprofessional simulation that without it, the activity might best be described as of no value. The postsimulation debriefing is not a short discussion but typically lasts longer than the simulation scenario itself. Closely examined in terms of concepts that derive from educational theory (Lederman, 1992), the fundamental principles of nonthreatening, facilitated debriefing, as noted above and as we describe and discuss them in Chapter 2, originated with CRM. From the Center for Medical Simulation (CMS) at Harvard Medical School there has since emerged the cluster of concepts known as “Debriefing with Good Judgment” that rationalizes and refines the process for simulation in health care (Rudolph, Simon, Dufresne, & Raemer, 2006). This stepwise approach incorporates the theory of reflective practice with emphasis on learners’ assumptions, their “mental frameworks,” and a form of guided facilitation, known as “advocacy-inquiry,” which enables identification and remediation of knowledge and performance gaps.

**THE BIGGER PICTURE: SIMULATION, HEALTH CARE, AND SYSTEMS INTEGRATION**

Simulation for patient safety, as it has evolved over the past 15 years, has proved to be just as rich in theory as it is extensive in range of application (Bradley, 2006). When employed effectively, it represents a form of systems engineering (SE) used to address one of the most pressing problems in health care, with the elaboration of qualitative and quantitative concepts and methodologies suited to creating and improving systems that are effective, efficient, and patient-centered (*Building a Better Delivery System: A New Engineering/Health Care Partnership*, 2005). From a design and engineering perspective, health care organizations are complex adaptive systems (Rouse, 2008). That is to say that they are dynamic and technologically complex, comprised of multiple components and populated by a variety of agents and stakeholders; they are also subject to external forces, such as regulatory agencies and market forces, and are neither predictable nor steady-state. Above all, such systems benefit from quality-improvement strategies and methods, such as Six Sigma and Lean, and constitute a comprehensive engineering toolkit. In this context, simulation and the interprofessional learning model represent a combined educational matrix, both of them disruptive innovations in health care that aim to build an organizational culture of safety.

Our initiative in perinatal services, discussed at length in Chapter 7, can serve as a brief real-world illustration of process and application. In 2008, prompted by adverse events, clinical service and risk management personnel, together with PSI leadership, collaborated to provide a root cause analysis using both process and SE tools such as flowcharting and statistical process control. Results enabled the integrated development of a comprehensive safety initiative.
comprised of formalized interprofessional team training, renewed emphasis on communication, assessment of competence in electronic fetal monitoring, and simulation for high-risk obstetrics emergency procedures together with a targeted educational curriculum. A research component built into the initiative enabled validation (Wagner et al., 2012).

Simulation used in this way, to perform analysis and implement changes to improve patient safety, constitutes the strategy and process of systems integration (SI) in a health care system. The SSH recognizes SI as an accreditation standard for programs that employ simulation in ways consonant with goals and principles set out by the IOM’s canonical reports. Although “integration” and “continuum of care” have been concepts in health care for a generation, simulation today represents a practical tool for designing and putting to use solutions based on sound and tested principles of process and SE.

**FUTURE DIFFUSION**

Pondering the future in 2004, David Gaba identified no less than ten “driving forces and implementation mechanisms” by which simulation—and, by extension, teamwork and interprofessional education—might be integrated into the fabric of health care (Gaba, 2004, Table 1, p. i8). In addition to simulation societies and research teams, stakeholders would include health care systems, educational institutions and professional societies, the accrediting organizations such as the Accreditation Council for Graduate Medical Education (ACGME), various funders and nongovernmental organizations, the concerned public, and government policy entities. Speculating on what might come to pass, Gaba imagined two contrasting futures: one in which, by 2025, simulation was extensively used and fully accepted, and another, more pessimistic outcome, in which it failed to live up to its potential and could not win enough support to sustain continued adoption. He suggested that simulation was close to a threshold of tipping point or threshold for “a revolutionary change in health care” that would be evident by 2014 though it would take another decade to fully evolve (Gaba, 2004, p. i9).

Today, at that 10-year midway point in time, simulation is indeed moving toward widespread adoption and full-scale diffusion. Disruptive innovations always entail early adopters, late adopters, and a cautious broad middle; subsequent diffusion after development of a critical mass is a long and nonrigid process of adaptation (Rogers, 2004). But the “vision of simulation embedded in the fabric of care” (Gaba, 2004, p. i7) is on its way to becoming a ubiquitous reality for learning and assessment alike (Levine et al., 2013b). With respect to its potential, we should add that the interprofessional model and the imperative to reduce preventable harm have created innumerable rich contexts for further innovation, for research into all the interactive and cognitive components that underlie adult learning, and for investigations and initiatives that advance the broader goal of building a robust culture of patient safety. Each of the chapters in this book represents a further step along that path.
NOTES

1. Simantha®: Medical Simulation Corporation.

2. For further examples of the strategic application of SE processes, see also Chapter 3 (sepsis) and Chapter 11 (critical care nurse fellowship program).

3. In addition to To Err Is Human (Kohn et al., 2000), these include Crossing the Quality Chasm (2001), Envisioning the National Health Care Quality Report (2001), Priority Areas for National Action (2003), and other publications.

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1: Launching PSI: Establishing a Culture of Patient Safety

The Patient Safety Institute (PSI), one of the most extensive simulation centers currently in operation, provides a safe environment for collaborative educational experiences in which learners can acquire and improve clinical skills, critical thinking abilities, and the capacity to work in teams. Designed in accordance with principles of adult education and deliberate practice, the PSI plays a strategic role within a broader educational context in the second largest nonprofit, secular health care system in the country.

DEVELOPING A LEARNING ORGANIZATION

Founding and organizing the PSI represented not so much the gradual evolution of an idea but, rather, the concrete result and practical outcome of broad organizational aspirations. In 2001 Michael Dowling, then executive vice president of the North Shore-LIJ (NS-LIJ), soon to become its chief operating officer, prepared a white paper in which he proposed establishing a “leadership institute” to facilitate a culture of continuous learning among all its employees (Dowling, 2001). While concern for quality of personnel was nothing new, Dowling faced a major task in forging a unified culture in a large, newly formed health care system comprised of two recently merged metropolitan hospitals and a growing number of small community hospitals and ambulatory services. The broader historic context was the “emergence of large-scale systems” in health care in the United States, an institutional transformation in that field unrivaled in magnitude since creation of the modern hospital system in the late 19th century (Stevens, 1989).
Dowling was disposed by his background in both administration and education to observe that “performance management” was “one of the least developed areas” in health care (Dowling, 2001). With a master’s degree in social work, he had entered the field of corporate health care after serving as New York State’s director of Health, Education and Human Services for 7 years and as commissioner of the state’s Department of Social Services; he had also taught at Fordham University Graduate School of Social Services, where he was assistant dean and professor of social policy. His proposal to create a leadership institute bore the overall aim of turning it into a “learning organization” whose employees could help it adapt to the changing “consumer-focused competitive landscape.” This broad idea encountered some resistance among other executives but the pressing need for a workforce with a shared identity and values in one of the largest integrated health systems in the United States, newly born of mergers and acquisitions, worked in his favor. The Center for Learning and Innovation (CLI) opened in 2002, the same year Dowling was named CEO of the entire organization.

CLI—from which PSI would soon emerge—was designed as a “corporate university,” the first such entity established within a health care system, and it would eventually become the largest of its kind in the United States. Historically, learning facilities operating under a corporate umbrella with strategic aims date to the 1950s, and Dowling had spent time at GE Crotonville, which General Electric had established in 1956 (Assen, 2010; GE Crotonville, n.d.). Both General Electric and the Harvard School of Public Health, recruited as strategic partners, helped design CLI; its name, incidentally, originated with NS-LIJ health system employees.

Patient safety as an institutional aim at CLI would represent a logical but not self-evident shift in focus after the corporate university took steps to cultivate the workforce through education and to regard its members as a resource for innovation, efficiency, and improvement (Gebauer, Lowman, & Gordon, 2008). As chief learning officer (CLO), Dowling appointed Kathleen Gallo; and soon after, as a strategic decision, he asked her to also manage human resources (HR) for the entire system. With a doctorate in nursing, a background in trauma care and emergency medicine, and a degree in business administration, Gallo was aware, like Dowling, of the advantages that might be had by applying lessons from industries outside health care (Chassin, 2013). She viewed the founding of CLI as a form of disruptive innovation in health care that would generate a new pedagogical model. She helped design and implement CLI’s entire program, which offered courses for managers and executives, and she instituted “Six Sigma,” the quality assurance and efficiency system closely associated with GE. She also implemented a leader-as-teacher model whereby executive leadership partnered with the CLI team and became faculty for the management programs. In her dual role, she spent the best part of 4 years integrating recruitment, personnel functions, and learning activities across the entire organization.

But as an academic and, unlike most HR executives, also trained as a nurse, Gallo’s instinct was always to return to clinical issues. The most pressing of these to emerge in health care, coincidentally with the founding of CLI, was patient safety.
IMPACT OF TO ERR IS HUMAN

In terms of raising awareness, *To Err Is Human*, the Institute of Medicine (IOM) report published in late 1999, had a seismic impact on medicine in the United States (Kohn, Corrigan, & Donaldson, 2000). Its system-wide scope—the 287-page report did not focus on physicians or exclusively on hospitals but covered the whole realm of health care delivery—sent a powerful message: The industry was not safe and most errors were preventable. Medical missteps that resulted in death—as many as 98,000 annually—constituted only the tip of the error iceberg. The report won widespread attention in the media and in Congress, and it stimulated a variety of governmental and organizational initiatives (Stelfox, Palmisani, Scurlock, Orav, & Bates, 2006), including establishment of a database by the Agency for Healthcare Research and Quality and attention from (as it’s now known) The Joint Commission (Blouin & McDonagh, 2011).

Importantly, *To Err Is Human*, as the title indicated, was not devoted to exposé and blame. It dispensed with the older tendency to examine error in terms of egregious mistakes, incompetent clinicians, or dysfunctional institutions. Instead it focused on human factors, the failures of people to work together in teams, and the lack of a culture of safety. The IOM report straightforwardly estimated the cost of preventable errors at from $38 to $50 billion annually. It also contained two broad recommendations that directly aligned with Michael Dowling’s vision of a continuous learning experience and with Gallo’s charge as CLO. These were, first, to “make patient safety a priority corporate objective” (p. 166) and, in addition, to “create a learning environment” (p. 178) (Kohn et al., 2000).

SAFETY AND SIMULATION

Off the printed page, Kathleen Gallo had the first glimmer of how patient safety might have an integral fit with CLI in 2004 when, at a national conference for CLOs, she met Michael Barger. He was the CLO of Jet Blue, the airline he had helped found in 1999, and a former TOPGUN in the U.S. Navy, with experience training fighter pilots. With a doctorate in education, Barger headed the airline’s own corporate university counterpart to CLI. He effectively introduced Gallo to the widespread use of simulation for safety in the airline industry, lending substance to ideas that she had read about in the IOM report but had not otherwise encountered. Barger explained in some detail how pilots and flight crews trained in teams and used constructed scenarios to prevent disaster. The airline industry, well-known as a model for safety, extensively employed simulation not only to train but to augment teamwork. A learning instrument and an assessment platform at once, it prepared crews for the rare but catastrophic events that cause planes to crash.

Gallo was intrigued by the possibilities for simulation, with which she was not familiar beyond the bare recommendations of the IOM report. The idea seemed attractive: “to be able to deconstruct any adverse event that occurred
in the hospital with clinical teams, so that we could learn exactly what hap-
pened, and then put together a program that would redesign clinical care to
prevent the error from occurring again.” Although simulation for teaching in
modern medicine was not new, it was limited—a minor aspect of medical and
nursing education. If one meant using a puppet-like “phantom” to help learn
forceps delivery or practicing hypodermic injection on a tennis ball, simulation
was quite old (Gardner & Raemer, 2008). Life-size blue-suited Resusci Annie,
the manikin for cardiopulmonary resuscitation that dated to 1960, was a “task
trainer”; so were computer-based software packages marketed beginning in the
1980s (Rosen, 2008). In addition, medical schools employed live “standardized
patients,” mostly for performance assessment (Wallace, 1997).

But simulation that aimed specifically at improving patient safety and team-
work was a more recent development. In only one specialty, anesthesiology, was
high-fidelity, or computer-assisted, simulation already well advanced (Gaba,
Howard, Fish, Smith, & Sowb, 2001). Success in that field, initially motivated by
concern over rising malpractice insurance costs and spearheaded by David Gaba
at the Stanford University School of Medicine, helped stoke interest in other
fields and was no longer confined to a few institutions. But implementation was
for the most part still spotty, theoretical, and, in spite of growing efforts of several
fledgling groups, largely unorganized. In terms of scale, simulation as a way to
create a culture of safety within a large health care system was almost as uncom-
mon in 2004 as it had been at the tail end of 1999, when To Err Is Human was
first published (Leape & Berwick, 2005). As Jeffrey B. Cooper, a proponent and
professor of anesthesiology, noted at the time: “Simulation in healthcare educa-
tion and training appears to be gaining acceptance, but it has not yet reached what
would be called a ‘tipping point’ of widespread adoption” (Cooper & Taqueti,
2004, p. i16). Although the authors of the IOM report recommended the use of
simulation “whenever possible,” it was only one among a welter of policy sug-
gestions to emerge from that document. Few readers would then have heard of
crew resource management (CRM), which the report also mentioned.

“Building a culture of safety is proving to be an immense task,” wrote
Lucian Leape and Donald Berwick 5 years later, in 2005. Both had served on
the committee that produced the IOM report: “[A]nd the barriers are formi-
dable. Whether significant progress will be achieved in the next 5 years depends
on how successfully those barriers are addressed” (Leape & Berwick, 2005, p.
2385). Progress, they noted, was “frustratingly slow.” At the same time, a culture
of safety was an aspiration consistent with the breadth of vision that Dowling had
articulated in proposing the learning institute that became CLI. Gallo, turning
to clinical issues after years spent organizing CLI’s management and leadership
programs at NS-LIJ, recognized its broad, system-wide potential.

MISSION: CONCEPTION AND ALIGNMENT

Gallo soon learned more. Mike Barger was aware of the first academic efforts
to adapt CRM principles to health care. He put her in touch with Robert L.
Helmreich and later in 2004 she traveled to Austin, Texas, to meet him. A professor of psychology—he died in 2012—Helmreich had worked on airline safety and was one of the original architects of CRM. He focused on human factors and his work was strongly data-driven. He had made detailed studies of a large number of airline accidents and disasters; then, after publishing extensively on aviation-related safety and spaceflight (he also worked with NASA and analyzed the behavior of astronauts), he turned to medicine. There his research tracked safety in the operating room and he had followed the same pattern, recording actual procedures and developing a typology of the communications breakdowns that led to preventable surgical errors. In 2000, when To Err Is Human was published, he had summarized his research in an article in the British Medical Journal. With respect to simulation, he wrote pointedly that “such [simulation] training needs to be ongoing, because in the absence of recurrent training and reinforcement, attitudes and practices decay; and secondly, it needs to be tailored to conditions and experience within organizations” (Helmreich, 2000, p. 783).

With gathering conviction that patient safety both deserved institutional support and had a good fit with CLI, Gallo pursued the literature, learning about Gaba’s work, for example, but also more broadly about the educational philosophy underlying adult learning. She had herself been taught in a nursing silo and recognized that classroom experience had a poor fit with the team approach that was more typical in her field of emergency medicine, which was a relatively new specialty (Zink, 2006). About the same time, in early 2005 she also visited the Peter M. Winter Institute for Simulation Education and Research (WISER) at the University of Pittsburgh School of Medicine. Here she saw first-hand the current high-fidelity manikins and could begin to contemplate what a stand-alone institute might accomplish. A decade earlier, anesthesiologist Peter Winter had developed a small simulation suite and some of the medical school faculty over the next several years added curricula and broadened its scope. Established in 2001, WISER had contributed to the development of SimMan® (Laerdal), and 2 years later it opened as the largest dedicated simulation center in the United States (Peter, n.d.).

Gallo returned from Pittsburgh convinced that simulation might work for CLI; it would be an undertaking consistent with the corporate university’s overall mission. An additional factor, underscoring the importance of clinical education, was publication of a second IOM report in 2003, Health Professions Education: A Bridge to Quality. That document emphasized the need for a substantial shift in educational strategy and methodology, replacing the older model of professional autonomy with one that emphasized teamwork and interprofessional learning. The aim, to improve safety, was in full alignment with the theory underlying clinical simulation (Institute of Medicine, 2003; Jeffries, 2009). Gallo recognized that the literature brought up a number of concepts that comported readily with the aims of the “profound culture change” that Dowling had forecast in 2001. The new pursuit of patient safety through the rationalized use of simulation could indeed be, if properly mounted, an instance of disruptive innovation applied to health care (Bower & Christensen, 1995).
To be sure, in terms of the real world, the evidence base in terms of producing safety through the guided use of simulation was yet to create a wellspring of enthusiasm; but a Best Evidence Medical Education (BEME) review in 2005, for which the lead author was high-fidelity simulation expert S. Barry Issenberg, was highly encouraging (Issenberg, McGaghie, Petrusa, Lee Gordon, & Scalese, 2005). Even without a surfeit of evidence, simulation was eminently worth a try. As Gaba and others often pointed out, the airline industry did not and could scarcely be expected to use randomized trials before adopting CRM (Rosen, 2008). As he noted in a paper published in 2004, “Pioneering centres in health care are starting to take the leap of long-term application with less than absolute proof of benefit” (Gaba, 2004, p. i7).

Gallo talked with Dowling about the prospect of a pilot project and he agreed. In 2005 they set aside a small budget. At Glen Cove Hospital, two labor and delivery rooms were identified as available and could serve for space; Gallo hired a staff of one—Barbara DeVoe, as CLI’s director of clinical education.

**PSI: ESTABLISHMENT AND FIRST STEPS**

So in late June 2005, DeVoe watched with concentrated attention as a sales representative put together the various parts of the Laerdal manikin known as SimMan, which had been delivered in boxes to the Center for Learning and Innovation. She was charged with and intent upon learning everything that the full-sized computer-driven manikin could do. Trained, like Gallo, in emergency medicine, DeVoe had also worked as a critical care nurse and nurse practitioner before moving into administration. Now she paid attention as the manikin was fitted and bolted together from the tip of his toes to the top of his head and connected to the computer feedback system. Soon after, Dowling and other executives came out to the hospital as she demonstrated some of its capabilities and responses to computer-controlled inputs.

The first year at the small, still unnamed institute in Glen Cove was given over to proof of concept and, as it turned out, to first steps in aligning theory and practice. Although there were more lethal preventable errors, as *To Err Is Human* reported, than deaths from motor vehicle accidents, AIDS, or breast cancer, the numbers were invisible in individual departmental metrics (Naik & Brien, 2013). Without a statistical blunt weapon, the problem of effectively organizing high fidelity simulation for patient safety that was not narrowly focused on task training was twofold. First, who from the hospital would serve as interested stakeholders? And second, how was simulation to work in actual practice? What would it look like (Kerner, 2010)?

Gallo found a solution to this start-up issue by making use of the health system’s new Critical Care Nurse Fellowship Program (CCNFP), just initiated at North Shore-LIJ in 2005 (Friedman, Cooper, Click, & Fitzpatrick, 2011; Friedman, Delaney, Schmidt, Quinn, & Macyk, 2013) (see Chapter 11). Owing to stress and burnout, retention rates for new nurse graduates in acute care settings were known to be low; in metropolitan New York they were alarmingly
so. The CCNFP proposed to remedy high attrition by offering new nurses a critical care core curriculum, seminars, and assigned preceptors, among other components. Some 30 nurses would work through the program each year. Into this blended learning platform Gallo introduced a simulation program. Nurses ran through a gamut of emergency and critical care procedures, with scenarios crafted in line with the curriculum they followed. They reported greater comfort and confidence when actually deployed to clinical units. Research would show the program to be both cost saving and successful in its aim to retain nurses; it has expanded to include other subdisciplines and continues to the present.

Despite the nurses’ promising reception of simulation, the physical setup at Glen Cove proved inadequate. Barbara DeVeoe worked the manikin during scenarios while seated at the computer; she served as its voice and worked the controls. But she and a colleague would be in the same room with the nurses and they tended to notice; instead of paying attention to the manikin, they would look at her. After calling each session, she would also run debriefings—fairly informal discussions at first. “It was totally unrealistic,” DeVeoe recalls. As the language of simulation would later put it, if psychological fidelity could be described as passable, physical and environmental fidelity were lacking.

FRAMEWORK: DEFINED AND EXPANDED

Within a year from its beginnings at Glen Cove, PSI was formally named and established at a 5,000 square-foot facility at NS-LIJ in Hauppauge, Long Island New York, with Barbara DeVeoe promoted as director. Here the physical design was in line with the more advanced simulation centers that were beginning to crop up elsewhere in the United States. Gallo and DeVeoe had visited several of the major ones: the Simulation Center at Hartford Hospital in Connecticut; the Gordon Center at the University of Miami Miller School of Medicine (where the Harvey® high-fidelity manikin had been developed); and the Center for Experiential Learning & Assessment at Vanderbilt University. The PSI incorporated the common elements of design: control rooms with one-way mirrors that looked onto clinical and procedure rooms, an emergency disaster suite, and an operating room. There was a separate classroom and, to transport learners to the center from the health system hospitals, the institute purchased a bus.

In and of itself, the move to a larger, state-of-the-art facility did not reflect a more profound development in the intellectual framework. At the beginning, the technology of the operation seemed impressive. High-fidelity simulators such as SimMan, followed by still more sophisticated models, made use of impressive technologies to simulate a variety of conditions for learning exercises. They impressed students, nurses, and physicians alike. Gradually—others have described the same learning curve—Gallo and DeVeoe came to realize that the high-fidelity manikin was a means to an end; it was essentially a prop (Kerner, 2010; Lampotang, 2008). If it were to become genuinely effective, simulation required the underpinnings of an educational philosophy that was beginning, in the wake of such publications as To Err Is Human, to promise genuine impact on health care delivery and patient
safety. “It had started out being about the technology and all the tasks you could
do,” remembered DeVoE, “but as time went on we came to the realization that it
was far more than technology.” Gallo and DeVoE discovered or rediscovered it for
themselves and this view—that successful use of simulation in medicine was not at
root beholden to technology but represented an educational philosophy in action in
which interprofessional learning was critical—became widely shared in the field
(Society for Simulation in Healthcare, 2013).

If developed in line with recommendations in the 2003 IOM report, Health
Professions Education, PSI would help health care providers in all capacities
deliver patient-centered care rooted in evidence-based medicine, and it would
emphasize team training. But a deeper look into the research that supported
the IOM recommendation led directly to educational concepts that could be
used in concrete ways to design simulation, carry out scenarios, and assess
performance. Simulation raised the larger question of mastery, in fact, in any
domain—whether music, athletics, or medicine. Didactics was wholly insuf
ficient to describe what happened in simulation, which was a form of experien
tial learning, widely associated with work by educational theorist David Kolb
(1984). Gallo liked the metaphor of a child learning to ride a bicycle: “Your
parents didn’t bring you into the living room and give you a PowerPoint pre
sentation and a lecture.” The educational methodology used throughout health
care, which usually involved lectures and slideshow demonstrations, would not
assign value to simulation much less lay down a path to its effective application.

Central to simulation, as Gallo and others in the field discovered, was the
concept of deliberate practice (Ericsson, 1993). Developed during the 1990s by
K. Anders Ericsson, a Swedish-born psychologist at the University of Florida,
it provided a critique of the received wisdom around expert performance. Then
the generally accepted view was that people reach a “stable asymptotic level”
in learning beyond which they do not improve; the limits of mastery are geneti
cally determined; and length of experience in a given field can account for level
of expertise.

Ericsson developed an alternative view that was rooted in an empirical exam
ination, first carried out with violinists and later extended to other domains, of
how appropriate practice positively impacts performance. “Deliberate practice”
was not the simple idea that “practice makes perfect” but, rather, the concept
that educational activities can be designed to improve specific areas of perfor
mance. Violinists in Berlin, Ericsson and his colleagues discovered, “concent
rated on improving specific aspects of the music performance as directed by
their music teachers” (Ericsson, 2004, p. S73). He replicated his research with
other musicians, notably pianists.

When he first discussed the concept of deliberate practice in relation to
medicine in 2004, Ericsson in effect helped establish the mature framework for
simulation. Setting out the goals of a scenario would mean watching for specific
behaviors that indicated knowledge gaps or lack of expertise in specific areas
that needed improvement. He pointed to the importance of immediate feedback
and, discussing surgery, Ericsson recommended video recording “as is a common practice for enhancing the performance of athletes in soccer, football, and basketball” (Ericsson, 2004, p. S78). He noted that practice for rare events also represented acquisition of expertise. Debriefing, which would soon be developed more fully in terms of methods and aims (see Chapter 3), was in line with the same pedagogical philosophy.

**ACQUIRING STAKEHOLDERS**

Recognizing the underlying educational philosophy that simulation put into practice proved worthwhile in bringing PSI to the attention of early stakeholders. Not surprisingly, emergency medicine and family medicine, both specialties that tended to emphasize teamwork, turned out as early adopters; so, too, were departments of obstetrics/gynecology, a specialty in which patient satisfaction demanded nothing less than perfection. Neonatology and pediatrics would follow with a variety of specialized programs; so would behavioral health. Interprofessional teams would predominate in modeling programs, but there was also room for specialized group programs such as, in graduate medicine, cardiology fellows.

One early visitor to the institute was Alan Hartman, chairman of the Department of Cardiovascular and Thoracic Surgery at North Shore University Hospital. In terms of background and training, Hartman had no experience with simulation, and his zero exposure was the case with almost all physicians and surgeons trained in the 20th century. He had attended medical school from 1975 to 1979; his surgical internship and residency lasted until 1986. “The dictum of how you learned things then was ‘See one, do one, teach one.’ We had no simulation.” When he toured PSI, Hartman was quick to recognize not only the possibilities for heart surgery and other cardiac interventions, but also its advantages in terms of de-emphasizing the hierarchy gradient and empowering all clinicians on a team. He could foresee that other clinical disciplines and specialties would eventually realize its multiple advantages. “In my education, my experience, we had none of this.”

Hartman soon developed an initiative at both North Shore University Hospital and at Long Island Jewish Medical Center. Both cardiothoracic intensive care units (CT-ICUs) had good safety records but he was concerned about optimum response to rare cardiac emergencies. “We could have been a little bit better oiled machine.” He understood how, ironically, excellent outcomes meant fewer opportunities to contend with emergencies, and he wanted to improve the communications skills and comfort level of his staff in dealing with them. In collaboration with PSI, he started to rotate teams of surgeons, intensivists, physician assistants, and critical care nurses through the simulation laboratory on a routine basis.

Collaboration between Hartman and the PSI staff intensified with the planned inauguration of a new tertiary CT-ICU at the health system’s Southside Hospital (see Chapter 4). In fall 2010 they launched an intensive educational program designed to improve communication and teamwork among all staff on
the surgical and post operative teams—physicians, physician assistants, nurses, nurse practitioners, and respiratory therapists. The program, formally known as the Cardiothoracic Service Focus Group, included both complex simulation scenarios at PSI and on-site drills. Five months after submission of the final Certificate of Need, working on an accelerated timetable, the new unit opened in February 2011—on schedule and without incident. Hartman credited simulation with efficiencies in team building and performance, noting that a couple of years later, a nearby competing institution, with a similar plan and timetable for a CT-ICU, had still not succeeded in opening.

PSI accumulated stakeholders, like Hartman’s cardiothoracic units, over the course of several years beginning in 2007, and it established programs for units located throughout the 14 hospitals that now comprised the NS-LIJ Health System. The system itself, during the first decade of the century, assumed its present shape and, on an organizational basis, consolidated its identity. With more than 2,600 full-time physicians, residents, and fellows, and 6,000 community physicians, it became the nation’s third-largest nonprofit, secular health system, as measured by beds; it was the fourteenth largest, based on patient revenue; and its research arm was the Feinstein Institute. Today it is the largest health system in New York State.

In response to demand from within the various NS-LIJ hospitals, PSI programs and staff expanded rapidly; by 2009 the institute had moved again and was physically housed with CLI. Soon it contemplated a further expansion effort that would involve creating an entirely new simulation space, together with a clinical skills center for teaching and assessment with standardized patients. The magnitude of that next incarnation owed in part to the fact that, beginning in 2011, PSI would take on another role—and an integral one—when institutional collaboration with Hofstra University established, from the ground up, a new 4-year medical school.

FURTHER EXPANSION AND OPENING TO MEDICAL EDUCATION

This is not the place to discuss in any detail the founding of the Hofstra-North Shore-LIJ School of Medicine, but several aspects deserve attention in passing—first, because plans for the school impacted PSI in terms of the shape of the fourth expansion in 5 years, and, in addition, because its complementary educational philosophy could help impart synergy to the health system as a whole.

Creating the medical school represented a response to a national call for more physicians in the United States; it was to be the first new one to open in New York State in 40 years. The proposed school’s collaborative business structure, if not unique, was uncommon. Universities are the sole proprietors of the great majority of the country’s medical schools and, through contractual arrangement with hospitals, they create internship and residency structures. By contrast, the Hofstra-North Shore-LIJ School of Medicine would be owned by its own health system, which offered the nearly unique opportunity to create a
curriculum that made both creative use of the clinical services and drew upon faculty in clinical positions within it.

The school’s corporate structure reflected the health system/university collaboration: Lawrence G. Smith, to become dean of the school, was also executive vice president and physician-in-chief of NS-LIJ; David Battinelli, to become dean for medical education, also served as the system’s chief medical officer. To help develop the curriculum and its underlying conceptual foundation, between 2008 and 2010 they visited more than a dozen universities and medical schools in the United States and in Europe.

The result—the school opened its 4-year program in 2011—was an innovative curricular design, drawing upon models for contemporary business and law schools that inject real-world experience into the classroom from the first days of matriculation. The Hofstra-North Shore-LIJ School of Medicine dispensed with the traditional “two-by-two” model (basic science for 2 years, then 2 years of clinical medicine), which had become standard in medical schools during the 1970s and, although often criticized, has since been subject to only piecemeal reform. In place of this older structure, Smith and Battinelli developed a curriculum that propelled students into clinical work from the start. At the same time they entirely dispensed with classroom lectures, multiple choice exams, and intra-student competition. They abjured letter grades in favor of a pass-fail system that provided students with consistent evaluation and longitudinal tracking of achievement. This radical revision of the curriculum, which at the same time was consonant with much current academic thinking concerning medical education (Cooke, Irby, O’Brien, Carnegie Foundation for the Advancement of Teaching, & Ebrary Inc., 2010; Miller, Moore, Stead, & Balser, 2010; O’Connell & Pascoe, 2004), also aligned in multiple ways with the underlying principles of experiential learning that shaped PSI (Hirschman Miller & Battinelli, 2010).

So PSI, prior to the school’s inaugural class in 2011, underwent a further expansion. Gallo and colleagues supervised construction. Although sheer size is no guarantee of quality—one competent simulation center noted in the literature measured approximately the size of a storeroom closet—they were provided with an additional 30,000 square feet, for a total of 45,000, making it one of the largest (Olympio, 2009). It included hospital rooms, surgical suites, control booths, and debriefing rooms arranged in modular fashion, equipped for audio and video recording and immediate playback; there was also an operating room with multiple cameras. In line with contemporary logistics, there were classrooms, small group rooms, a library, and “breakout spaces” (Horley, 2008), and an innovation café. Located within PSI was the new Clinical Skills Center for simulation with standardized patients. Overall, the larger institute could now respond to both the requirements of the new medical school and growing demand from the health system. Underscoring its strategic importance, Barbara DeVoe continued as director but was also promoted to Vice President for Interprofessional Learning and Education. Designed for efficiency and flexibility, the center opened in 2010.
Playing salient roles in both learning and assessment, PSI became for the students an integral part of the medical school, with the Center for Learning and Innovation designated as the school’s West Campus. Simulation activities included extensive learning of clinical skills with standardized patients and high-fidelity simulation activities, but it also provided structures for curricular learning and for regular assessment. Students worked in teams and the institute also served as the place where through simulation they learned substantial aspects of basic science, including pathophysiology and pharmacology. Concomitant exposure to clinical scenarios in simulated environments represented an effort to inculcate habits of reflective practice early in a student’s introduction to the culture of health care (Boutin-Foster, Foster, & Konopasek, 2008; Schön, 1983).

**CULTURE OF SAFETY**

The concept of a “culture of safety” was present but not fully defined in *To Err Is Human*, a document no less consistently cited in the literature today than was Abraham Flexner’s 1910 report on medical education over much of the 20th century (Cooke, Irby, Sullivan, & Ludmerer, 2006). The authors explicitly referenced “culture” though they did not discuss what it meant in depth, probably owing to their broad charge to describe, for a wide audience, the stark state of affairs in health care. But the implications that flowed from recommendations in *To Err Is Human* were concrete and clearly stated (Kohn et al., 2000). Health organizations were in principle to “create a learning environment” to use simulation “whenever possible” and to “develop a working culture in which communication flows freely regardless of authority gradient” (p. 178). Feedback mechanisms had to be implemented and the success of CRM techniques in surgery and emergency medicine meant that “they should be more widely applied” (p. 179).

Building a health system that was imbued with those principles, however, and actually creating a genuine culture of safety was something else. It called for concrete steps and tasks that ranged across all clinical domains. Although much discussed from various angles in the contemporary literature, that task has proved long in the making (Chassin, 2013). Together with the other groups, organizations, and institutes that have come together over the first decade of the 21st century to advance patient safety through simulation, PSI forms part of a larger movement (Bradley, 2006). On a macro scale, this effort to create a culture of safety, with specific aims and standards, is developing rapidly. The Society for Simulation in Healthcare (SSH)—one of several such organizations—was established in 2004 with fewer than 200 members; by 2012 there were more than 3,000 (Gaba, 2013).

Viewed from its conceptual foundation and in terms of its design with respect to the larger organization that became the NS-LIJ Health System, PSI also represented an early 21st-century example of *systems integration* (Dunn, Deutsch, Maxworthy, Gallo, & Dong, 2013). A concept that refers to focused engineering approaches that globally impact the way an organization functions, systems integration readily applies to contemporary health care, owing
to the multiple interconnected components of institutional providers; indeed, SSH includes it as an accreditation standard for organizations.

From its inception, PSI was conceived as a strategic means to use education to enhance both quality of care and patient safety throughout a large and expanding health care system. As a distinctive model, it is too soon to quantify its advantages or, indeed, judge its ultimate success, but its rapid establishment and growth can be understood as closely linked to engaging the goals of learning and the aspirations of CLI, the corporate university, and its parent organization. Historically, those goals and objectives should be understood as themselves the contingent outcome of rational decisions to suffuse the multihospital system and its human resources with concrete, culture-driven commitments to patient safety and to the transformative role of adult education and experiential learning.

NOTE

In addition to citations referenced below, this chapter is based on interviews the author conducted with David Battinelli, MD (11/26/2012; 10/4/2013); Barbara DeVoe, RN, DNP, FNP-BC, (12/13/2012; 9/11/2013); Kathleen Gallo, PhD, MBA, RN, FAAN (10/10/2012; 12/2/2012; 9/4/2013); Alan Hartman, MD (3/7/2013); and Lawrence G. Smith, MD, MACP (10/16/2012).

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