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Transforming Health Care Through Information

Second Edition

With 11 Illustrations

Springer

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Robert T. Riley PhD
June 26, 1937–January 18, 2003

Bob Riley was not only one of the original editors of the first edition of *Transforming Health Care Through Information: Case Studies*, he was *the* managing editor! In that role he personally edited all the cases and ensured that they were more readable and had a sense of balance and humor.

Bob was a tenured faculty member at the University of Cincinnati, College of Business Administration, until he founded Riley Associates, a successful international consulting and training firm. He was nationally and internationally acclaimed for his presentations, his management development seminars, and his consulting skills. He authored several books and numerous articles on management and on managing technological change.

Bob was known for his humor, his constant quest for new knowledge, his ability to understand and solve problems, his ability to make friends, and his ability to teach others. Bob was active in the early stages of planning this book. Tragically on January 18, 2003, he lost his two-year battle with cancer. We miss his presence very much.

Nancy M. Lorenzi
Joan S. Ash
Jonathan Einbinder
Wendy McPhee
Laura Einbinder

To all those who realize that informatics
is transforming health care
and
to those who soon will

Series Preface

This series is directed to healthcare professionals who are leading the transformation of health care by using information and knowledge. Launched in 1988 as Computers in Health Care, the series offers a broad range of titles: some addressed to specific professions such as nursing, medicine, and health administration; others to special areas of practice such as trauma and radiology. Still other books in the series focus on interdisciplinary issues such as the computer-based patient record, electronic health records, and networked healthcare systems.

Renamed Health Informatics in 1998 to reflect the rapid evolution in the discipline now known as health informatics, the series will continue to add titles that contribute to the evolution of the field. In the series, eminent experts, serving as editors or authors, offer their accounts of innovations in health informatics. Increasingly, these accounts go beyond hardware and software to address the role of information in influencing the transformation of healthcare delivery systems around the world. The series will also increasingly focus on "peopleware" and the organizational, behavioral, and societal changes that accompany the diffusion of information technology in health services environments.

These changes will shape health services in the next millennium. By making full and creative use of the technology to tame data and to transform information, health informatics will foster development of the knowledge age in health care. As coeditors, we pledge to support our professional colleagues and the series readers as they share advances in the emerging and exciting field of health informatics.

Kathryn J. Hannah
Marion J. Ball

Preface

Thorough understanding of, and careful attention to, people and organizational issues are essential for successful healthcare information technology initiatives. Despite this, very few case studies about healthcare information technology—either successes or failures—have been published. For instance, the case collections at Harvard Business School and the Darden School of the University of Virginia contain virtually no cases about healthcare information technology. As a result, students and faculty have turned to other sources, though these vary considerably in content, length, format, and suitability for use in the classroom. One of the more frequently cited examples is Massaro's[1] description of a difficult order entry implementation. In 1995, Lorenzi and colleagues[2] published a book of case studies—the first edition of *Transforming Health Care Through Information*.

At the same time, rapid and groundbreaking developments in information technology, presentation, and processing have translated into an increased interconnection between business and policy issues and healthcare informatics. As a result, the value of informatics is becoming recognized outside traditional departments, and informatics trainees are assuming positions outside academic settings.

Case studies may be useful for many readers but are particularly valuable in the classroom where learners can become active participants in the learning process by experiencing thought-provoking discussions with their colleagues. The case study method uses reports of "real-life" experiences "to narrow the gap between theory and practice," pressing students to analyze real situations, come to conclusions, and defend these conclusions among their peers.[3] The purpose of the second edition of *Transforming Health Care Through Information* is to continue to fill this gap in the healthcare informatics literature.

Jonathan Einbinder

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To those who have waited for the publication of this book, we thank you for your continued interest and support.

Special acknowledgment is made to Marion Ball and Judith Douglas who were both instrumental in the inception of the first casebook on medical informatics and were encouraging of this new direction.

Special acknowledgment also is made to Laura Einbinder who so very capably managed the entire process. If not for Laura, this book would not have been published.

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Section I
Case Studies in Technological Change

Introduction

Nancy M. Lorenzi

Health care throughout the world is becoming increasingly complex. Almost every major economy in the world experiences the effects of the high cost of health care, and many, if not most, national and regional governments are in some stage of healthcare reform. However, the changes associated with health care are not easy to understand. They are complex, political, technical, and rapid, and there does not seem to be any end in sight. Neither those working within the healthcare system on a daily basis nor those on the outside seem to be able to comprehend the expansive changes. Furthermore, most people have very definite—and sometimes quite emotional—opinions about what should be done to improve the system.

For a variety of reasons, health care has traditionally been a "dabbler" in the information technology area. Many healthcare organizations are still functioning with information systems that by contemporary business standards are ludicrous for organizations of their size (i.e., as measured by "sales," capital investment, or number of employees). However, this situation is rapidly changing. These healthcare organizations are realizing that information technology is transforming health care.

Today, there is a greater need for information to support decision making both in clinical arenas and in administrative-financial arenas. Thus, the effective and efficient use of integrated information systems is crucial for healthcare organizations and their success. It is within this framework of change that we have assembled the case studies included in this book. We can use these case studies to peer into a variety of organizational windows and begin to see how people are addressing the issues of healthcare information technology in today's complex environment.

Why Cases?

A major question is, "How do we help those who will be responsible for managing technological change understand all the issues involved in the process?" Case studies offer us an opportunity to study a wide range of directions and actions being taken in institutions around the world to address the healthcare issues raised by the use of information technology.

The first case studies book on medical informatics was *Transforming Health Care Through Information: Case Studies* (Lorenzi, Riley, Ball, and Douglas). As part of the Springer-Verlag Computers in Health Care series, which addresses the practical side of healthcare informatics, this book provided access to previously unpublished case studies for use in management and educational settings and courses. Both instructors

and informatics students benefited from organizational case studies in healthcare informatics management.

Cases also give us an opportunity to learn from both the right things and the wrong things that others have done. Experience is a great teacher. However, if we rely only on our own experiences, we run into the issue highlighted by Mark Twain when he commented that the problem with the school of hard knocks is that its graduates are too old to hire. It is ideal if we can gain at least some insights from the experiences of others, thereby accelerating the learning process.

As we look at the implementation of changes—whether technological changes or system operation changes—we see several issues that must be considered in educating others about managing technological or systems changes. Five major issues that are difficult to convey to others but that are brought out by many cases are organizational change, implementation, economics, leadership and organizational and interpersonal conflicts.

Content Overview

Some casebooks include only cases, with no accompanying text. This book is divided into five major sections: change, implementation, economics, leadership, and conflict. Within each section is a brief, targeted introduction to a few key concepts, followed by cases related to the section topic. Some cases can apply to several different sections, as they illustrate a number of different points.

Change

The rate of change in virtually all organizations is escalating. However, this change is often not so exciting when you are on the receiving end. In fact, these changes may be downright threatening to many people. Therefore, the phrase *change management* has become fairly common, appearing in articles on management everywhere. Review the job ads in the *Wall Street Journal* or the Sunday edition of a major newspaper and notice the positions available for people skilled in change management.

What is change management? What is a change agent or a change management person? How does change management help people feel less threatened? How did it evolve, and why does everyone seem so fixated on it today? One reason for this fixation is a realization of the tremendous hidden costs involved in many informatics implementations. The initial cost of a system may be only the tip of the proverbial iceberg when implementing systems—even when the implementation is successful. Unless changes are managed well, the people costs, many of which are buried in other budgets, can skyrocket and dwarf the supposed cost of the system.

There are as many ways to introduce change in organizations as there are organizations themselves—the blend of people, prevailing philosophies, plans, and even pathos help create the mix for the overall change process. Change is usually planned within the context of specific needs, e.g., meeting competitive pressures or reassessing "what business should we be in?" The chapter for this section of the book will briefly cover some core change issues and will include cases that focus on the process and outcomes on introducing information systems into complex healthcare organizations.

Implementation

It is not always easy to know exactly why a particular group resists change. However, experience shows that intelligent application of a change model—coupled with a sound

technological implementation plan—leads to more rapid and more productive implementation of technology into organizations. The process can be expensive in terms of time and energy but nowhere near the cost of an expensive technical system that never gains real user acceptance.

The introduction to Section III of this book focuses on the challenges of current clinical information systems, such as determining the best ways to sell, design, implement, train for, and maintain the system. Some cases are success stories, whereas others deal with failed implementations, importantly addressing what and how things went wrong in the implementation process.

Change is difficult, but eventually it happens and systems are implemented. Stories about successful change continue to grow. Some change is smooth and some change is difficult, but nonetheless change happens. Several of the cases give an exposure to the individual styles and practices of some of today's top people in informatics implementation.

Economics

The true techie says, "If it can be done, it should be done!" The true bean counter says, "Show me a detailed cost-benefit analysis—and I don't want to see any of those phony soft benefits included!" In economic terms, today's optimal health informatics strategies lie somewhere between these two extremes. Healthcare systems everywhere are facing increased economic pressures; therefore, our informatics thrusts must recognize and adapt to these pressures.

Many healthcare organizations have been slow to realize just how critical information and its proper management are to the modern healthcare organization. As an example, hospitals in the United States typically spend 2 to 4 percent of their revenues on information systems, whereas other types of organizations typically spend 5 to 15 percent. Even in the late 1980s, there were still a few hospitals in the United States that could not produce an itemized, computerized bill on demand—let alone a revised one.

While computerization has lagged behind other industries in administrative areas, it has been even further behind in clinical areas. It is a general axiom of informatics that computers produce their greatest productivity benefits when they reach the hands of those on the "factory floor," i.e., the people in the system who actually produce the organization's goods or services.

Since all organizations must have an economic base for survival, the introduction to Section IV reviews some general economic perspectives, including current expenditures toward the changes, projected expenses, and projected economic value that the changes will add. The cases in this section will link financial issues with information systems today.

Leadership

Leaders are facilitators. They are individuals instrumental in guiding and directing the efforts of groups of workers toward achievement of the organization's goals and objectives. In addition to competition within the industry, today's health informatics leaders face tremendous political and time pressure. The range of the goals and objectives and the nature of leadership vary from organization to organization, but the effective performance of those in leadership positions is essential to the overall success of any organization. Similarly, weak or poor leadership can undermine projects and create lasting conflict.

Leaders have different styles. One style is not necessarily better than another, but it may fit the situation better. Some leaders are more capable of modifying their style depending on the situation, and such insight and flexibility are useful leadership traits. To lead, a person must have followers, and an important aspect of leadership includes the ability to take advantage of the capabilities of followers. An equally important aspect is the existence of a high level of trust between leaders and their followers.

Leaders, above all, articulate the vision of the organization and, to motivate those in the organization to strive to reach this vision, great leaders also make sure there is a strategy in place for propelling the organization toward that vision. The cases in Section V illustrate a wide range of leadership styles and strategies as well as different leadership philosophies concerning the value of planning, the approach to leading an organization with scarce resources, and the involvement of leadership in information technology rollout strategy.

Organizational and Interpersonal Conflict

All organizations create structures to enable their workers to accomplish the goals and objectives of the total organization. Some organizations are very hierarchical, others less so. There are also informal organizational links that aid or hinder accomplishment of the organization's goals and objectives.

The introduction to Section VI briefly reviews organizational and interpersonal conflicts and presents cases that are within the scope of this topic. It examines tensions that arise within power relationships and structures as well as between people. People differ in their value structures, personalities, talents, experience, and many other variables. As various professional groups and subgroups see their roles, status, procedures, and perhaps their incomes being "threatened" by change, the intergroup politics can become ferocious. In addition, rapid changes within information technology make it a volatile field, compounding the changes in health care. Several of the cases illustrate some very complex political forces at work within the organization.

The Cases and Their Authors

The people who wrote the cases for this book shared their thoughts, beliefs, and hopes—as well as their "battle scars." Their cases reveal the complexities that an organization faces when implementing technological systems by showing what actually occurs during the various implementation processes. This gives us a chance to see and feel the issues as the key implementers saw and felt them.

The writers of these cases represent many professions, including medicine, nursing, information systems, organizational development, business, public health, and education. They have taken time to explain their information systems issues, conveying both positive and negative developments. Reading these cases is an opportunity to discover what has happened in healthcare institutions and systems around the world.

As in the real world, these cases are "messy"—and this is intentional on our part. The cases do not conform to a standard format. The writers have followed different formats, varying from the traditional business case format to the traditional medical case format. All these approaches are legitimate, and they provide the reader with a look at how different groups in the healthcare arena present and consume information. Jargon is not always explained, and many undefined acronyms are used. Welcome

to the real world of informatics! As it turns out, a number of undefined elements do not really matter in analyzing the case; however, some do.

The cases described here are real. However, fictitious names are used in some cases, and some data or details may have been altered to protect the innocent—or perhaps the guilty. The lessons learned from these cases may help us to avoid making expensive, and perhaps even life-threatening, mistakes. Many of the authors are pioneers in their areas and had to develop their strategies with little to guide them. The hope is that this book will allow those who follow to learn from the experience of these pioneers.

These cases can be used either for classroom learning or in support of a self-learning process. The case authors have either witnessed or experienced the stress caused by the introduction of change, especially technological change. One of their goals is to reduce this personal and organizational pain for others. We hope that these real-life cases will be the catalyst (or the big stick!) that motivates the people responsible for introducing change to actually change their behavior.

Case Introduction

The case presented in Chapter 1 illustrates the richness of the case approach in understanding the complexities of introducing technological change into a healthcare organization. It provides an overview of the people who work within one organization and the problems and issues that the organizational leader faces in attempting to implement an information system. The people here are representative of those found in many healthcare organizations.

Three people wrote the case as part of the educational program at the University of Virginia. GEMINI is a prognostic information system designed to gauge the severity and risk of hospital mortality for critically ill adults. It can potentially enhance decision making by supplementing the information on which to base tests, treatments, and do not resuscitate (DNR) assessments. The case chronicles the failed implementation of the system at an academic medical center by presenting the perspectives of administrators, physicians, and house staff and the barriers that prohibited successful implementation. Lessons include the importance of a common organizational vision, effective advocacy by influential persons, regular communication of goals among levels, adequate allocation of resources for unanticipated shortcomings, sufficient technical training of staff, an appreciation for perceptions of need, and cultivation of an active association so that members of the organization feel vested in the success of the project.

It is one thing to be very successful in an organization when you have the luxury of personally controlling all aspects of the effort, including the external vendor. However, unless we are living a dream, this is generally not the case. The more typical challenge is how to appraise systems, people, and processes for technology implementations. How do you decide whom to put in charge, especially when no one comes close to your "ideal" criteria? Assume that you are the leader of this organization. Follow along and think about your decisions and your actions. What would you have done differently? What would you do to ensure organizational success?

1
GEMINI: The Life and Times of a Clinical Information System

Navid Fanceian and Lisa Shickle

Decision to Deimplementation

It was a gray day. The light sound of rain on the window gave the office a peaceful calm. Outside the door, music from the assistant's radio filled the office, creating a warm, pleasant ambience. But the thoughts of Dr. David Billings* weren't as peaceful, as he considered the opposing factions turning his confidence into doubt about his decision. Billings was the director of medical affairs for University Hospital (UH), a nationally known academic teaching hospital recognized as one of the top 100 and one of the top 25 major teaching hospitals in the United States. Billings was passionate about the distinction the hospital had earned and was apprehensive both about changing what had worked and about not adapting to remain competitive.

Dr. Billings was brought out of his reflective state by a new e-mail message activating an alert from his computer. Dr. John Cleary, codirector of the surgical intensive care unit (SICU) at the medical center, was requesting a meeting to complete the deimplementation of GEMINI. ". . . Good riddance to that system," Dr. Cleary concluded on a sour note. The message's matter-of-fact manner exemplified the negative perceptions about the project. It troubled Billings that a clinical information system with so much potential did not work at UH. Other institutions had successfully implemented GEMINI—why had UH failed to do the same? The potential benefits of the system were great, but the obstacles overwhelmed the medical center. "Was it the right choice to abandon GEMINI?" Billings whispered aloud. "What was the right choice?" Billings remembered a time when he was excited by the idea of installing GEMINI at the center and was much more hopeful about its potential.

GEMINI Advocate

Dr. Edward Morgan began a dialog with Billings in the early 1990s about the GEMINI system. Dr. Morgan was director of the SICU at UH between 1987 and 1998. In the early 1990s, he became aware of medicine's inevitable convergence toward evidence-based practice and a shift in focus from individual patient care to the care of larger populations. Providers were becoming increasingly conscious of the need for higher levels of quality and access as well as lower costs in competing in the market. In early letters to Billings, Morgan explained how he was convinced that GEMINI could

* In the interest of confidentiality, names and locations have been changed.

improve the performance of hospital intensive care units (ICUs) and provide a competitive edge.

GEMINI

GEMINI is a prognostic system designed to measure the severity of illness and risk of hospital mortality for critically ill adults. The development of GEMINI began in the late 1970s by researchers at Eaton University Medical Center and has undergone continuous refinement. The original GEMINI was introduced to the intensive care medicine community in 1979. The two components of the GEMINI prognostic system are (1) a score to provide initial risk stratification for patients within independently defined groups and (2) a predictive equation that uses the score and reference data on major disease categories and treatment location immediately prior to ICU admission to estimate the risk of mortality.[1] The GEMINI logic was developed, packaged, and marketed in the form of a proprietary clinical information system. GEMINI can provide real-time risk-of-mortality assessments for individual patients and requires dedicated data collection and entry during the first 48 hours of admission, with regular updates thereafter.

Most critically ill patients admitted for active treatment or monitoring are at a higher risk of mortality than non-ICU patients. It is a patient's severity of illness, either acute or chronic, and need for unique ICU treatments that most directly determine the need for, and potential benefit from, ICU services.[2] These factors are incorporated into GEMINI equations.

A primary strength of GEMINI derives from its ability to serve both as a clinical decision tool that measures the severity of illness and risk of various outcomes such as mortality and as an administrative tool for benchmarking adult ICUs. As many as forty hospitals in the United States, both community hospitals and those at major academic medical centers, as well as several hospitals of a major managed care organization based in California, have purchased this system in hopes of improving quality of care and lowering costs. Few risk and case-mix measurement systems rival the potential of GEMINI. The system utilizes a user-friendly graphical user interface (GUI) that eases training and increases the likelihood of acceptance.

Lobbying for GEMINI

Morgan used GEMINI scoring equations as an evaluation tool starting in the mid-1980s, shortly after UH's involvement as one of the original institutions in the GEMINI data set. He believed that output from the computerized GEMINI system would improve ICU care processes, support decision making, improve outcomes, and serve as a benchmarking tool. Morgan lobbied the administration for the purchase of GEMINI, arguing that it would potentially save substantial amounts of money. However, even Morgan's higher profile as SICU director gave him limited influence over hospital purchases.

To persuade the administration, Morgan pointed out that physicians would be able to better assess patient need for ICU beds, a limited and expensive resource. If physicians could sooner determine which patients are at low risk of mortality, they could move them out of the ICU sooner with minimal risk. Consequently, supplies and equip-

ment could be managed and utilized more resourcefully. He argued that recognizing the futility of treating terminally ill patients sooner could help expedite DNR (do not resuscitate) decisions and thus reduce the number of frivolous, expensive tests. Furthermore, through mechanisms of external benchmarking of ICU patients, Morgan believed that the hospital could decrease variation in care, enhance quality, and reduce costs.

With a new understanding of GEMINI's potential, Dr. Billings became a supporter and finally took action. Morgan's hopes were realized. Morgan and Billings shared a common passion for quality improvement and both appreciated the seemingly boundless potential, but the question remained whether others could be so easily persuaded.

Intensive Care Units

Since their inception in the 1960s, adult ICUs had rapidly grown to consume approximately 20 percent of hospital expenditures around the time that GEMINI was developed in 1981.[3] ICUs demand a high percentage of hospital resources (human, technological, and monetary), approximately twice as much as a typical hospital unit on a per-bed basis.* The significant investment of resources demanded by ICUs contributed to evaluations of the appropriateness of care across the United States in the early 1980s.

Patients are generally admitted to ICUs for one of three reasons: (1) an immediate need for one or more of more than thirty active life support therapies, (2) a perceived risk of the need for one of these therapies, or (3) a need for specialized nursing care unavailable in other units of the hospital. Patients often enter the ICU without a thorough analysis prior to admission, and ICUs are thus challenged to filter the large numbers of patients desiring intensive care to determine which patients most require their services. In addition, the drastic nature of the diseases and treatments of ICUs, as well as idiosyncratic patients and physicians, have resulted in a great variation in care and treatment style. Variation is arguably one of the greatest sources of waste in healthcare organizations because it may signify that processes are out of control or operating inefficiently. It prohibits widespread application of cost-effectiveness principles to decision making and potentially results in unnecessary or inappropriate treatments.

There are four adult critical care units at UH that could potentially benefit from GEMINI: (1) the medical intensive care unit (MICU), (2) the SICU**; (3) the neurology intensive care unit (NICU), and (4) the thoracic cardiovascular (TCV) postoperative unit. Each unit contains ten beds and contributes substantially to expenditures (and revenues) at the medical center.

Early Implementation Efforts

GEMINI *seemed* like a clear winner to Billings, so he decided to act quickly. He did not see any reason to delay the introduction of a system that could certainly help cut ICU lengths of stay and enable external benchmarking. In September 1997, all the

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* Anthony Freedman, Assistant Director of medical affairs, UL Medical Center.

** The SICU is an "open" unit, meaning that patients' primary care teams retain final decision-making authority regardless of recommendations by the intensive care group.

clearances had been granted, and implementation of GEMINI was scheduled to begin in late January 1998. It would cost the medical center approximately $330,000 (U.S.) to purchase the GEMINI system interfaces for three of its ICUs. GEMINI was an expensive clinical information system by most standards, costing nearly $110,000 for each ICU to cover the cost of the hardware (terminals) and license use of the system for ten beds. These figures don't include the cost of UH staff time. In addition, GEMINI Medical Systems, Inc., charged an annual maintenance fee of approximately $15,000 to $20,000.

Each ICU would receive one computer system with the GEMINI prognostic software preinstalled. A staff member from each unit would need to be assigned responsibility for data collection and entry. At Morgan's request, Billings set out to find a project manager. Billings had initially thought "who better than Morgan" to supervise the data activities, but Morgan had warned that with his responsibilities as SICU director, it would be difficult for him to oversee the project. "Also," Morgan added assuredly, "It might be good to pull in someone from one of the other intensive care units—we already know that *my* unit will be dedicated to the data collection activities . . ." Billings placed a call to his colleague and friend, Dr. Ronald Katz, director of the NICU. Dr. Katz agreed to speak with his nursing director in an effort to find a representative.

Within only 2 days, Dr. Katz responded to Billings, indicating that he had found someone, a practicing registered nurse, to manage the GEMINI implementation. "He does not have the best bedside manner—patients' families have been complaining to our nurses about him. But, he is knowledgeable about computers, knows the ICU environment, and should be able to handle the job. I think this is just what we need to solve both of our dilemmas," Dr. Katz mused. Billings thought for a moment to ask about the nurse's qualifications to manage such a project, but their relationship dissuaded him from questioning the recommendation. With that out of the way, Billings took advantage of the opportunity to wash his hands of the project and return to his other responsibilities. However, his problems with the system were only just beginning.

Tommy Whiting, a registered nurse in the NICU, assumed the position of project manager for the GEMINI implementation. He looked forward to the opportunity and did not mind the change. He even thought it might give him more free time during the day. Whiting enjoyed using computers and spent a great deal of time (including time at work) playing computer games and surfing the Internet.

GEMINI Implementation

Representatives from GEMINI Medical Systems, Inc., would visit UH for 3 days to install the computer systems and provide hands-on training. As GEMINI project director, it would be Whiting's job to supervise the collection and entry of data within the four intensive care units. He had been told that he must find a nurse (or nurses) in each unit to handle the data collection—the GEMINI questionnaire was entirely too complex for someone without a clinical background.

Finding volunteers in the ICUs was not an easy task. Soon after Whiting became project manager, Mary Stone from the SICU volunteered for data collection in her unit. He later discovered that the SICU director, Edward Morgan, had been the main reason that UH had purchased GEMINI and that Stone already had some GEMINI experience. Neither the NICU nor the MICU, however, seemed to have available (or interested) staff to assist with data collection.

Whiting reviewed a list of nurses who were unable to perform their normal job assignments because of injuries, illnesses, or other disabilities. After speaking with the personnel director, it was agreed that Whiting could approach these nurses to collect GEMINI data on a temporary basis until they were able to return to direct patient care. Whiting was sure that the data collection forms were fairly easy for nurses to understand and that it would not be difficult to train new nurses as needed.

Installation of the GEMINI systems in all three ICUs was completed in one day early in February 1998 without technical glitches. GEMINI Medical Systems, Inc., was able to connect the NICU GEMINI system to the NICU database to fill in preliminary patient data. Whiting, Stone, and three "sick leave" nurses gathered the next day to attend a formal GEMINI system training session. Training progressed smoothly, and GEMINI Medical Systems released its newly trained data collectors to begin their work.

Stone was excited to be in charge of data collection for the SICU. She had worked closely with Morgan for many years and shared his interests in quantitative analysis and quality improvement. She knew she would have to rearrange her day to accommodate the additional work required for GEMINI but was optimistic about the project. She was concerned, however, that the other nurses did not share her enthusiasm because they didn't seem engaged during the training sessions. Whiting was especially complacent, taking several breaks during the session. "I probably just have a bit of a head start since Morgan has shown me the GEMINI equations before," she reconciled.

July 1998—Problems Mount

Five months passed, and Stone could not believe the turn of events. It was now July, and the benefits of GEMINI had yet to be realized. Data collection for GEMINI was so much more time-consuming than she had ever imagined—she had been unable to leave the hospital at a reasonable hour since the project had started. Every time she tried to contact Whiting to arrange a meeting to discuss GEMINI issues, he was "unavailable." She had heard that he was not working additional hours to keep up with necessary data collection in the ICUs. "How is it possible that I am the only one feeling the burden of data collection?", she wondered. To top things off, Morgan had been replaced as SICU director, and the new directors, Dr. John Cleary and Dr. Anthony Knight were skeptical of GEMINI. The GEMINI project was Morgan's baby, but for Cleary and Knight, it was a thorn in their sides, taking away staff time and delivering minimal output.

"Why am I staying late collecting data when my boss doesn't even care?" Stone often asked herself. Not knowing where to turn, she had sent a letter to Billings a week earlier outlining all of the barriers she was encountering. She remembered Morgan's claim that Billings was supportive of the GEMINI project and that he agreed with Morgan that UH needed a system like GEMINI. Perhaps Billings would take some initiative to reinvigorate the GEMINI project. Instead, and unfortunately for Stone, her effort was fruitless—Billings' response was that the service center directors were supposed to have taken over and that there wasn't much he could do. When she approached the service center directors, they pointed to the ICU directors. Stone felt as though she was getting the runaround.

Billings became concerned about the problems with GEMINI after reading Stone's letter, but he also knew that new computer systems had a fairly steep learning curve. He sent her to the service centers, certain that they would listen to her—she probably just needed somewhere to "vent" her frustrations. He didn't hear from her for some time and assumed that everything had worked itself out.

Integration and Information Technology Issues

Many of the personnel problems with GEMINI stemmed from poor data collection and input into the system. These problems were the result of poor integration of the system's hardware and software with other hospital systems. The only exception among the four units was the NICU, which had bedside monitors to capture vital information. However, even these bedside monitors could eliminate only the data collection step and not the data entry step because there was no automated interface with the GEMINI system.

The hardware for GEMINI had been built by Sun Microsystems, resulting in two potentially major problems. First, the center did not have contracted support with Sun, meaning it had no coverage for maintenance of the terminals if they needed service. The second problem posed by the Sun terminals was that they did not integrate with other systems in the medical center.

Software Bugs

In October 1998, just 8 months after the installation, much to his surprise and chagrin, Billings received a letter from GEMINI Medical Systems, Inc., stating that GEMINI was not year 2000 (Y2K)-compliant and that they would bill the medical center should they want software upgrades. The systems and software that had been installed would not pass Y2K compliance, and GEMINI was not financially able to provide the needed upgrades. "Maybe I'd better check on what is going on," thought Billings as he realized the GEMINI problems were becoming more serious. After some investigation, he learned that Stone, after not getting any responses to her complaints, had reduced her data collection efforts. She had become ambivalent about GEMINI. "I decided that if no one cared, there was no reason for me to be driving myself crazy trying to collect all the data that is useless for its intended purpose," she explained to Billings. He sent e-mail messages to each of the ICU directors to determine their attitudes toward and usage of GEMINI. Billings thought that if their responses were anything like that of Stone, then perhaps they should cut their losses and move on. "There's no sense pouring more money into something that just isn't working," he concluded.

Unwilling Organization

The ICU directors replied to Billings by voicing their dissatisfaction with GEMINI. Many of the intensive care house staff did not embrace they system. Some were hesitant to expand their daily activities to include analysis of GEMINI output for each patient. Others were concerned that the GEMINI score would drive an impersonal wedge between doctors and patients. The physician's role could potentially change from that of treating patients regardless of diagnoses to one that included hesitation to consider whether further efforts were warranted before taking action. There was great fear that patients would be viewed as statistics. Many attending physicians shared the same sentiment as the house staff and were offended by the suggestion that a decision tool "knows more about a doctor's patients than he does."

However, GEMINI was not disagreeable to every physician. Dr. James Hill, a physician working in the ICU during the GEMINI implementation, saw virtue in the system. "With GEMINI, physicians are not subject to availability bias; in other words doctors