

Challenges in Healthcare Communications

How Technology Can Increase Efficiency, Safety, and Satisfaction

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July 2008



Cisco Internet Business Solutions Group (IBSG)

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Introduction

Healthcare delivery is a high-touch undertaking that requires interaction among all stakeholders within the healthcare ecosystem. Interpersonal communication is a key part of this interaction and can be transformed by the intelligent use of technology.

When we discuss connections in healthcare, we frequently think of data connections—connecting physicians and other clinicians to patient data; connecting diagnostic testing facilities to physicians' offices, and physicians' offices to hospitals; connecting provider facility to payer (health plan or government authority); or connecting provider facility to public health departments. The critical role that communications play among people in healthcare is often neglected in this conversation. Human beings require communication both for information exchange and for affective content that may accompany the information, such as nonverbal signals like facial expressions or body language.

Technology can be applied in various ways to facilitate communication in the highly collaborative and mobile environment that is healthcare. This paper discusses the current barriers to communicating effectively in healthcare and how the limitations of technologies used for communication contribute both to inefficiency and adverse events. It also lays a foundation for innovative solutions and how they can benefit patients and healthcare providers.

Problems Created by Inefficient Communications

The Right Connection Could Save Billions of Dollars

In clinical care we often discuss the critical need to have information about the right patient delivered to the right clinician at the right time. What is not discussed is the critical need for clinicians to connect and communicate with the *right person* about the *right patient* at the *right time*. The inability to do so results in countless wasted hours and untold delays in the delivery and throughput of patient care. The financial cost of communication inefficiencies to U.S. hospitals alone exceeds US\$10 billion annually,¹ and likely contributes to personnel shortages, staff and patient dissatisfaction, and medical errors.



Cultural Differences

Presenting new technologies is challenging when dealing with an industry entrenched in using the same telephone, fax, and pager systems for decades. Many problems in healthcare stem from the industry clinging to these outdated methods of communication, without understanding the benefits brought about by newer solutions. For example, electronic pagers, which have been abandoned by most industries, are still the core device for hospital communications. While physicians extensively use a mobile core phone outside the hospital, these phones are often banned from being used inside, despite evidence that in most areas of the hospital this technology is safe.² Email is often discouraged for clinical communication for security reasons, and more advanced technologies such as instant messaging, videoconferencing, group teleconferencing, or web-based collaboration are almost unheard of in clinical care—despite evidence that proves the effectiveness and safety of these technologies in healthcare.

Pilot Highlights Benefits of Secure Messaging

The idea of patients communicating with their physicians via the Internet may soon become standard operating procedure. Cisco conducted a pilot with the Palo Alto Medical Foundation (PAMF) using 500 Cisco employees to test the effectiveness of secure messaging in physician-patient interactions. The PAMF Online Messaging pilot offered a secure, e-health service that let users communicate electronically with PAMF nurses and physicians when they need them. The pilot showed that physician-patient messaging helped reduce the number of hours employees spent seeking treatment for nonurgent, routine care, thereby increasing worker productivity. Users also reported spending less time waiting in physicians' offices, with a corresponding decrease in interaction with office staff and greater satisfaction overall with the office-visit experience. Upon completion of the study in 2006, Cisco estimated a 4-to-1 return on investment for companies whose employees use secure messaging to interact with their physicians to manage their health.

While physicians have found newer tools such as email useful, they are typically used only in limited situations and not commonly employed to communicate with patients. The reasons for physicians' reluctance to use e-communication with patients include concerns about malpractice litigation, fears of being barraged with emails, and the absence of a model that reimburses them for consulting with patients electronically.

Communication Breakdown

Communication in healthcare fails for many reasons: necessary personnel cannot be identified or located; they may not be available or may not respond in a timely manner; or the communication channel of choice may not be well suited to the task at hand—for example, e-communication such as email should not be used for time-sensitive issues such as a patient having a heart attack, or in situations that require a dense exchange of information. Pagers, for instance, are more appropriate for time-sensitive issues, while telephones, in-person or videoconferencing meetings, or web-based collaboration tools are more efficient options for exchanging dense information, such as detailed case reports. Because case reports require much discussion among physicians, using email only slows down the discussion process.

Failures also happen when the person initiating communication does not choose the optimum channel to accommodate the recipient, but rather to accomplish his or her own goals expeditiously. For example, a nurse might page an intern for a nonurgent issue just to ascertain that the issue was reported during her shift. Doing so may force the intern to leave a patient's bedside just to respond. Interruptions are common in healthcare and quite disruptive. One study shows that more than half of the time, pages received by first-year medical residents were considered nonurgent and frequently interrupted the care interns were delivering to a patient at the time.³

Frequently, inappropriate communication choices may be made because the hospital lacks other satisfactory communication channels. In a study of communication patterns in a hospital in which electronic communication tools were not available, people were successfully contacted only 74 percent of the time, typically using just telephone and paging systems.⁴ The study also indicates that about one-fourth of the calls were associated with determining who needed to be contacted for a specific situation.

Productivity and Safety at Risk

The inability to contact the right person quickly also creates inefficiency among staff and affects patient care. In a survey of communication among hospital nurses, which was part of a study commissioned by Cisco, Forrester Research found that the majority of nurses felt that they would save 30–60 minutes per workday—time they could spend caring for patients directly—if they had instant access to experts. Eighty-four percent felt that the time they spent trying to reach people had a direct impact on patient care because of delays and time spent away from patients, while 65 percent estimated that they spent upward of 20 minutes each day trying to contact people, with many spending well over an hour.⁵

The Cisco Internet Business Solutions Group (IBSG) developed a conservative economic model based on this data. The model suggests that more than \$3.4 billion in nursing productivity across the United States—in excess of \$1.7 million in nursing productivity per 500-bed hospital—is lost annually to communication delays.⁶ Add the costs associated with other personnel, particularly physicians, and nursing productivity costs likely exceed tens of billions of dollars.

Hospitals are ill-equipped to shoulder the burden of these inefficiencies. One reason is the nursing shortage in the United States: hospitals report an 8 percent vacancy rate of registered nurses (more than 100,000 nurses)⁷; it is estimated that there will be a shortage of more than 1 million nurses by the year 2020.⁸ Another reason is that many hospitals are suffering financially—the American Hospital Association reports that 25 percent of U.S. hospitals are losing money, and those not struggling are experiencing thin margins.⁹

Poor communications also affect patient safety. The Joint Commission, a U.S.-based organization charged with improving the safety of healthcare delivery worldwide, examined sentinel events* as a way of understanding dangerous medical errors.¹⁰ In its analysis of more than 4,000 sentinel events, The Joint Commission found that two-thirds were attributed to communication problems, more than any other root cause.¹¹

Resources Working Together

Barriers to implementing modern technologies stem not only from outdated technology infrastructures and a conservative industry culture, but also from a lack of interoperability among databases and applications. For example, numerous directories, on-call databases, and coverage lists must be able to work together to streamline the process of identifying the proper contact.

Understanding how human interactions take place in the practice of medicine and what this means on a personal basis are further explored in the following illustrative, three-part story about “Sophia Martelli.”

Part 1: Getting Help at the Moment of Need

Sophia Martelli, a 77-year-old woman, is hospitalized at Memorial Hospital for congestive heart failure. She is weak and needs assistance getting out of bed. At 10:05 p.m., Sophia needs to use the commode and initiates a call for help using the nurse call button by her bedside. The ward clerk is away from the nurse station and does not hear the call. At 10:15 p.m., Sophia calls the station again; this time she reaches the clerk. She explains her problem through the remote microphone in her room. The clerk asks Sophia who her nurse is, but Sophia cannot remember. The clerk looks up a specific name, assuming that it is the correct name of the nurse assigned to Sophia, and initiates an overhead page at 10:20 p.m.

The clerk, however, is unaware that she called the wrong nurse and goes about her work. At 10:30 p.m., Sophia calls the clerk again, becoming angry at the delay. The clerk realizes her error and pages the covering nurse, who arrives at the patient’s room at 10:35 p.m., horrified to find Sophia sprawled on the floor and in pain because she attempted to reach the commode without assistance. Sophia subsequently was found to have fractured her hip from the fall and required hip replacement surgery (which resulted in further complications during her hospitalization), followed by a month-long stay in a rehabilitation facility. She was unable to return home and was transferred to a nursing home. Her family filed a malpractice suit against the hospital.

* A sentinel event is an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. Serious injury specifically includes loss of limb or function. The phrase “or the risk thereof” includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome. Such events are called “sentinel” because they signal the need for immediate investigation and response.

Part 2: Who Are You Going to Call?

Two days after Sophia's hip surgery, she experienced pain at the incision site and a fever. After examining Sophia, the nurse went to the nurses' station to call the covering physician, referring to a handwritten list of names to find who she believed was the right doctor. The doctor she paged did not respond, so the nurse paged other physicians on the list. Eventually, one of the doctors called her back, but explained that she was not responsible for Sophia and suggested that the nurse page a different physician who might be covering. The physician, a hospitalist, called back and eventually checked in on Sophia. He recommended that Sophia be seen by an orthopedic surgeon. He paged the surgeon, whose name was in Sophia's medical record. Ten minutes later and after no response, the doctor determined that the surgeon was not available and paged the covering surgeon, not knowing he was in the middle of surgery and unable to respond. Two hours and several pages later, the covering surgeon called back and agreed to see Sophia.

The covering surgeon ordered a CT scan to pinpoint Sophia's problem. Sometime later, the radiologist paged the surgeon to discuss his findings. The surgeon informed the hospitalist that the joint appeared free of infection. Because of Sophia's multiple medical conditions, the hospitalist wanted to consult with an infectious disease specialist. He looked up names in the physician directory, calling each one sequentially, leaving either a message or initiating a page. After 20 minutes, he reached a specialist who was making rounds at a different hospital; the specialist agreed to see Sophia later that day. After the exam, he ordered some tests and prescribed medication. Unbeknownst to the doctors, another infectious disease specialist was at Memorial Hospital the entire time and could have seen and treated Sophia five hours earlier.

Part 3: Sophia's Hospital Discharge Goes Awry

When Sophia was admitted to Memorial Hospital, a special working group was formed to develop a plan for her discharge or transfer from the hospital to another facility. This planning takes place for every elderly patient, and for all patients who have multiple or complex medical problems. The team varies by patient and over the course of the hospitalization, but comprises different combinations of:

- Primary care (outpatient) physician
- Primary hospital-based physician
- Primary hospital nurse
- Medical specialists
- Social worker
- Discharge planning coordinator
- Insurance company representative or case manager
- Physical and/or occupational therapist
- Patient
- Patient's family or caregivers

In Sophia's case, the plan was to send her home with a visiting nurse and other home services. Sophia's hip fracture, however, prohibited her discharge. The team, which included nearly everyone on the above list, did not meet until five days after Sophia was hospitalized—arguably five days too late. They hastily discussed her various issues and coordinated a plan with Sophia and her family. Because their meetings were face to face, not everyone was able to attend, including Sophia's cardiologist. When the team was unable to obtain input from key participants during regular meetings, they would either proceed without relevant input or appoint someone to obtain the input—usually via a page, phone call, or email—and report back to the group, often not until the following meeting. Discharge planning activities escalated leading up to the day of Sophia's release. Unfortunately, the rehabilitation hospital that the team recommended for Sophia did not have an available bed when she was ready to be discharged, forcing them to scramble to find a different facility.

Because of the delay in arranging her transfer, Sophia stayed in the hospital two more days, costing the hospital more than \$2,000. Unfortunately, Sophia later developed a cardiac complication that could have been avoided had the discharge planning team involved her cardiologist.

The discharge planning process failed, in large part, due to a lack of communications among the team and a limited number of communication tools. The busy and highly mobile nature of healthcare workers makes it difficult to conduct in-person meetings or use other synchronous channels of communication. Despite this, most hospitals remain stubbornly committed to using only face-to-face meetings and telephone calls, requiring participants to be available at a particular time to communicate. These limitations are unacceptable in the frenetic and unpredictable hospital environment. Hospitals must provide other options for collaboration.

Types of Communication

Many types of communication take place among clinicians, and among clinicians and patients. Before we can understand what went wrong in Sophia's case, we must understand the various types of interactions that take place in healthcare. A number of interactions exist based on the participants and the tasks. Although healthcare delivery is ideally patient-centric, in practice it is clinician-centric because clinicians participate in more varied types of communication than do patients.

The types of communication and tasks in which clinicians partake include providing direct care to patients; collaborating about patient care within or among institutions; discussing test results with other staff; and working with administrative staff, public health departments, and other organizations.

Communication Channels

Many communication channels are used in healthcare, each with different properties. These channels may be synchronous or asynchronous, mobile or fixed, secure or nonsecure. Because of this, participants must decide which channel best suits the issue about which they need to communicate.

Synchronous channels such as telephones and face-to-face meetings allow both parties to communicate at the same time, enabling information to flow freely in real time. Synchronous channels are ideal when discussing time-sensitive issues and exchanging dense information. It is not always convenient, however, for a patient and physician to schedule time to communicate using synchronous channels because they can lead to delayed care, telephone tag, and frustration—when these channels fail to connect, some healthcare issues remain unaddressed. Yet, generally only pagers and synchronous communications are available for patient-physician communication.

Asynchronous channels such as email, fax, and blogs enable each party to communicate when it is convenient. These channels may be used safely for issues that are nonurgent or time-sensitive. Because time is not a factor when using asynchronous channels, both patient and clinician can be more reflective in their messaging.^{12, 13} Asynchronous channels, however, should not be used for medical emergencies or time-sensitive issues.

Another characteristic of communication channels is whether they are fixed (connected to a wire) or mobile. Thanks to advances in technology, many communication channels that were once fixed are now wireless, such as telephones and text messaging.

Table 1 defines the types of communication channels in use today.

Table 1. Characteristics of Current Communication Channels

Channel	Synchronous	Fixed/ Mobile	Comments
Face-to-face	Yes	N/A	
Telephone	Yes	Either	
Fax	No	Fixed	
Text Messaging (SMS)	No	Mobile	Requires mobile phone
Instant Messaging	Yes	Either	Can use mobile phone-based client
E-messaging	No	Mobile	Includes email, secure email, and web messaging
Videoconferencing	Yes	Usually Fixed	May require special equipment
Web-based, Real-time Collaboration	Yes	Usually Fixed	May include shared workspace, which may be used asynchronously
Electronic Paging	No/Yes	Mobile	Usually requires asynchronous communication (such as a telephone call-back), but alphanumeric pages are useful in conveying information in real time (but usually without real-time response)
Overhead Paging	No	Mobile	Often requires asynchronous communication (such as a telephone call-back)
Web-based Posts or Blogs	No	N/A	

Source: Cisco IBSG Healthcare Practice, 2008

Benefits of Communication Technologies in Healthcare

Technology can be applied in various ways to aid communications among physicians, and among physicians and patients, as well as to facilitate collaboration.¹⁴ They include:

Web-based messaging. Web-based messaging^{15, 16} uses a secure web server to which users log in. Once authenticated, users can send messages to designated recipients. When users have a message waiting in their secure web-based in-box, the system sends the recipients an unencrypted email, informing them that they have a message and inviting them to log in to read it. This method ensures that no clinical information is sent in a nonsecure email message, which can be intercepted or misdirected.

Presence servers. Adding a presence server to the network allows hospitals to track information about personnel availability, the communications device(s) through which they can be reached, and when they can be reached. For example, a physician might prefer to discuss patients by email for nonurgent issues and by pager for urgent ones. Or, a user's communications preference might be location-based. That is, a physician may prefer to be paged when she is in the hospital, called on her office phone when she is in that location, or contacted via her cell phone. In addition to availability, a presence server might contain information about who is covering for a person who is not available.

Presence status is maintained both manually and using computer-based rules, which may incorporate data such as staff schedules or a user's physical location. (The latter is possible via location-tracking systems.) Server-based rules also enable software applications to route certain calls to covering staff automatically. For example, wireless IP communicators and presence servers can be implemented as part of a nurse call system to route patient calls to the correct nurse, unlike the traditional system used in Part 1 of Sophia's case.

As part of a unified communications system infrastructure, presence servers improve productivity by helping users connect with colleagues efficiently.

IP video telephony. An on-demand, IP-based system can help hospitals provide innovative patient services such as language interpreters. Typically, hospitals maintain a small staff of healthcare interpreters on-site. Unfortunately, specific interpreters are often not available when needed. When this happens, healthcare providers rely on family members, nonmedical staff, or a fee-based voice-translator service. As a last resort, medical staff may try to provide care without the benefit of understanding the patient. Through an IP video phone at the patient's bedside, the patient and clinician can communicate using a trained interpreter—who may be located offsite—with the added benefit of video, which enhances the interpretation by exposing facial gestures and body language. This type of system may be more cost-effective than maintaining a staff of in-house interpreters for every language needed.

Interpreters Connect Patients with Doctors Over Automated IP Network

Language barriers compromise patients' understanding of their disease and their treatment advice, increase the risk of complications, and make it harder for doctors to understand symptoms. The Health Care Interpreter Network (HCIN) of Northern California was created to provide interpreter services to participating hospitals, and covers most languages outside of English. The network is a call center based on video and voice-over-IP technology, offering nearly 400 hospital staff rapid access to trained interpreters. Responses to a call for an interpreter average 22 seconds, and no response takes longer than three minutes. The service is available 24 hours a day. Not only have patient satisfaction and quality of care improved, but so have the productivity of medical staff, cost-per-minute charges for interpreters, and the capacity of the interpreter program at participating hospitals.

Cisco TelePresence takes these kinds of video capabilities a step further by creating a live, "face-to-face" meeting experience over the network. It combines life-size, ultra-high-definition video images (720p and 1080p), spatial audio, and interactive elements to create the feeling of being "in person" with participants in remote locations.

Web-based collaboration. In a web-based environment, medical staff can perform tasks such as sharing data or images from a patient record or collaboratively developing a comprehensive patient discharge plan. Communicating through a unified communications environment allows for seamless transition among various channels by, for example, starting with a phone call, transitioning to a videoconference, and finally working in a web-based collaboration space.

The following example further illustrates this point: a radiologist reading an MRI clicks on a link on the PACS (picture archiving and communication system) screen, which launches an application that provides presence information about the ordering physician. If the ordering physician prefers to be contacted first by mobile phone, the radiologist can call the physician by clicking on the link. After discussing the patient's MRI, the doctors may wish to review the images together in a web-based collaboration session.

Certain types of communication tools, notably telephones and web-based collaboration applications, permit more than one party to communicate. Tools exist today that allow users to invite others to join a communication session on an as-needed basis. For example, one user may start a web-based collaboration session with two people and later invite another person to attend by using the computer mouse to click on his or her name, "dragging" the name from the online directory into the collaborative workspace.

The Right Solution for Sophia's Situation

The examples above are just some innovative options healthcare workers can use to communicate effectively. Now, let us examine how some of these options, and others, could have improved Sophia's situation.

Part 1

Nurse call-related incidents are common and contribute greatly to patient dissatisfaction and adverse events because most nurse call systems require a human intermediary. Mobile IP communicators and appropriate call-routing servers could have been used to provide a direct, wireless communications link between Sophia and her nurse, with automatic call routing to connect Sophia to whichever nurse was responsible for her at any given time. In an IP-based nurse call system, Sophia could have contacted the right nurse through the nurse's mobile IP-communications device using existing nurse call hardware, IP phones, or service panels located at Sophia's bedside. Hands-free functionality permits nurses to reply even when they are occupied with another task and unable to call back.

IP telephones provide functionality above and beyond simple voice communication. Through a wireless network, wireless devices can display information such as telephone directories, patients' clinical information, or even signals from biomedical monitoring devices. Remote patient monitoring—transmitting physiological data through mobile communicators—permits some degree of remote-patient assessment as well, but likely would not obviate the need to attend to the patient.

Wireless Network Improves Hospital Communications and Patient Care

The emergency department at the Children's Hospital at Westmead in Sydney, Australia sees 26,000 patients per year, and timely delivery of information to relevant caregivers is important. Westmead wanted to improve the quality and efficiency of care delivery. Through a multi-industry collaboration led by the Cisco Internet Business Solutions Group, including Intel and Vocera, the hospital installed a comprehensive wireless network. It then deployed mobile notebook computer carts that clinicians could wheel anywhere in the emergency department to access patients' electronic medical records wirelessly. With online, real-time access to patient files anywhere in the ward, clinicians can make better-informed decisions about patients and enter their observations into a notebook at the patient's bedside. This ability reduces the need to leave the patient's room to enter data about the patient's condition into a PC at the nurses' station.

Westmead also implemented an integrated voice-over-IP communications system that reduced the amount of time spent locating colleagues. By wearing a voice-controlled badge on their uniform lapel, in their pocket, or around their neck, hospital staff can speak with one another simply by saying the name of the person they wish to contact, which triggers a call to the recipient's badge. The badges detect the location of users based on their proximity to wireless access points in the hospital. The wireless network ensures that the right information gets to the right caregiver in a timely manner. An economic analysis showed that the system paid for itself after one year and will be deployed throughout the hospital.

Part 2

Interoperable databases would have eliminated the multiple steps used to contact the right person to attend to Sophia, thereby avoiding frustrations, delays, and further medical complications. Most of the information that the clinicians needed to attend to Sophia was kept in paper lists or within the minds of individuals. Had the hospital computerized this information, finding the right information would not have taken so long.

Computerizing databases, however, is not enough. One hospital with which IBSG worked had five separate online directories (and numerous handwritten lists on both paper and whiteboards at nursing stations) that were used to look up physician names; some of the information could have been incomplete or contradictory. These directories included:

1. Phone
2. Pager
3. On call (who is on call for a particular service)
4. Coverage (who is covering an individual patient)
5. Specialist

Clearly, the existence of multiple directories is inefficient. Integrating them makes it easier for clinicians to locate appropriate personnel efficiently. These databases can also be dynamic and provide cross-referencing and detailed searches. For example, a nurse caring for Sophia could have opened a directory to look up all of the physicians involved with her care at a given time, filter out the orthopedic surgeon caring for her, and find the orthopedist covering at the time. Alternatively, the nurse could have conducted a search to find all orthopedists or only those who were on call. In addition, an integrated database could have interfaced with a presence server to further streamline access.

Part 3

Unified communications technology would have given Sophia's discharge planning team access to a full spectrum of communication tools, enabling them to collaboratively develop Sophia's release and streamline the discharge planning process. These tools—including web-based collaboration spaces such as Lotus Notes, and videoconferencing—augment overhead and electronic pages, phone calls, faxes, emails, notes in patient medical records, and more informal paper-based communications. Because communication channels are chosen based on the task at hand and user preferences and availabilities, providing more options makes it feasible for all relevant parties to participate in the planning process and invite others to participate as needed.

Conclusion

Contacting the right clinician for the right task at the right time is critical in healthcare. So is choosing the right tool by which to communicate. Although medical technology has evolved, the tools with which clinicians communicate today are decades old. Now, with a greater variety of communication options from which to choose, users can pick the most appropriate technology for a given situation.

The benefits of these options can be enhanced with tools that enable users to identify easily whether intended recipients are available and through which means, permitting rapid connection through a variety of channels, and allowing parties to transition smoothly from one channel to another. By harnessing the power of the panoply of communication options without introducing additional complexity to an already complicated and frenetic environment, unified communications offers tremendous benefits to patients, clinicians, staff, and healthcare providers.

Healthcare providers are urged to expand their thinking about the role communication technology plays in healthcare. They must review their current communication challenges, and then deploy advanced technologies and solutions to assess their impact. Institutions that fail to recognize and address their challenges will continue to experience the same obstacles and frustrations that have plagued the healthcare industry for decades, leading to tens of billions of dollars in excess costs to U.S. hospitals and a negative impact on patient care.

Based on conservative estimates from IBSG, unified communications technology can eliminate 85 percent of this waste, saving \$1.5 million in nursing productivity for a typical 500-bed hospital. Additional benefits will result from enhanced physician efficiency, improved patient safety, streamlined patient discharges, and increased patient and family satisfaction.

Endnotes

1. Cisco IBSG analysis, 2008.
2. "Use of Mobile Phones in Hospitals," Derbyshire S.W.J., Burgess A., *British Medical Journal*, October 14, 2006.
3. "The Sounds of the Hospital: Paging Patterns in Three Teaching Hospitals," Katz M.H., Schroeder S.A., *New England Journal of Medicine*, 1988, Vol. 319, No. 4, pp. 1585–1589.
4. "Communication Behaviours in a Hospital Setting: an Observational Study," Coiera E., Tombs V., *British Medical Journal*, February 28, 1998.
5. "Unified Communications Industry Study," Forrester Research, Inc., 2006.
6. Cisco IBSG analysis, 2008.
7. "Imported Care: Recruiting Foreign Nurses to U.S. Health Care Facilities," Brush B.L., Sochalski J., Berger AM Health Affairs, 2004, Vol. 23, Number 3, pp. 78–87.
8. National Center for Health Workforce Analysis, Bureau of Health Professions, Health Resources and Services Administration, 2004 (<ftp://ftp.hrsa.gov/bhpr/workforce/behindshortage.pdf>).
9. "Health and Hospital Trends," American Hospital Association Annual Survey, 2007.
10. www.jointcommission.org/SentinelEvents/
11. www.jointcommission.org/SentinelEvents/Statistics/
12. "Guidelines for the Clinical Use of Electronic Mail with Patients," Kane B., Sands D.Z., *Journal of the American Informatics Association*, 1998, Vol. 5, pp. 104–11.
13. "Electrons in Flight—Email Between Doctors and Patient," Delbanco T., Sands D.Z., *New England Journal of Medicine*, 2004, Vol. 350, pp. 1705–07.
14. "Electronic Communication and Collaboration in a Health Care Practice," Safran C., Jones P.C., et al, *Artificial Intelligence in Medicine*, 1988, Vol. 12, pp.137–51.
15. "Web Messaging: A New Tool for Patient-Physician Communication," Liederman E.M., Morefield C.S., *Journal of the American Medical Informatics Association*, 2003, Vol. 10, pp. 260–270.
16. "PatientSite: Patient-Centered Communication, Services, and Access to Information," Sands D.Z., Halamka J.D., *Consumer Informatics: Applications and Strategies in Cyber Health Care*, Nelson R., Ball M.J., Springer-Verlag, 2004.

More Information

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