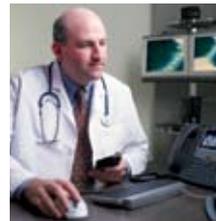




Making Connected Health a Reality



How Cisco Helps to Deliver the Vision

Healthcare organizations around the globe are beginning to realize that they will reap the benefits of information and communications technology (ICT) once they take the 'e' out of eHealth and it becomes integral to the delivery of healthcare.



Cisco® first experienced this phenomenon a decade ago as it worked with companies to revolutionize business and personal interactions by connecting people with the information they needed. Today, this 'connected' approach is being applied in the healthcare sector as organizations align technology and operational needs to support and streamline information flows.

A number of things are driving this transformation. Those who set and deliver the healthcare agenda are striving to manage many complex, interconnected issues, including the aging population, with a corresponding increase in chronic disease; the increasing sophistication and cost of treatments; the shift in treatment delivery, from invasive treatments performed in the hospital to more technical approaches delivered outside the hospital; and the increasing emphasis being placed on prevention as well as treatment, and on health rather than care.

In an attempt to improve information flow and knowledge, many healthcare providers have invested in technologies such as online order entry, electronic medical records, and picture archiving and communications systems (PACS). These applications usually support care within an organizational silo—such as a hospital—rather than being available across entire organizations and thereby creating an integrated network of care among physicians, health systems, and ancillary services such as laboratories and pharmacies.

The typical hospital has more than 300 applications in use on any given day, and many hospitals maintain separate networks for various functions and departments, adding cost and complexity. Compounding these issues is the fact that a person with a serious or chronic disease will typically see six to eight different clinicians in three to five different organizations.

Increasingly, however, healthcare providers understand that if they hope to optimize delivery of services and reduce medical errors—while they control spending against the backdrop of an aging population—there will have to be a radical change in the way things are done. They will need processes that are centered on patients, who more than ever can take an active role in deciding the most appropriate course of treatment for themselves.

Information technologies will play a key role in this transformation. To capitalize on technology investments now and in the future, healthcare organizations need an integrated IT network that helps diverse entities to collaborate and communicate effectively. They

need a community that will support a broader vision of interconnected and mutually dependent processes, shared information, and resources working seamlessly toward a common goal.

Bringing Connected Health into Focus

To advance this realization of Connected Health, Cisco has defined a number of segments of the health community—including hospitals, patients, clinicians, payers, and public health organizations. Around the world, Cisco has helped implement concrete examples that demonstrate the benefits of Connected Health for each of these segments. These benefits come from connecting processes, transactions, information, and knowledge across organizational boundaries.

Connected Hospital

Connected Health places the hospital within the extended ecosystem of care—from primary care facilities, to the pharmacy and outpatient treatments. It facilitates the sharing of timely, accurate information among the right people at the right time—regardless of the source. In doing so, it holds the promise of significant improvements in patient experiences and provider efficiency and effectiveness.

In northern France, for example, Arras Hospital introduced Cisco® IP telephony and wireless capabilities across its 18 sites, allowing staff to view, enter, or amend data directly, wherever they are. This access has transformed the way in which people work, often eliminating paperwork and duplication of effort. Any member of the clinical staff anywhere on the campus can view the results of blood tests through mobile devices such as a PDA or a tablet PC, significantly reducing the time previously spent finding and logging in at a terminal.

Doctors on ward rounds in the psychiatric unit can change a patient's medication at the bedside, instead of writing a new prescription. This means that doctors can accurately change medication immediately and can communicate to the pharmacy—at the point and time of

prescription—any patient allergies and previous poor reactions. This not only helps avoid errors in prescribing, it also improves the efficiency of dispensing drugs and maintaining inventories.

Connected Clinician

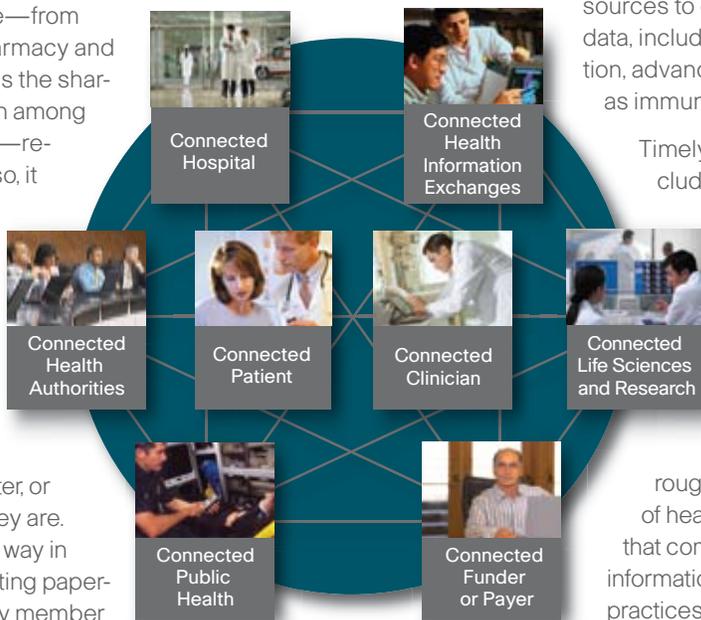
Those at the front line of medicine—the doctor and other primary caregivers—are typically those least supported by information technology. This is a critical gap, especially since decisions by the physician's practice ultimately trigger events, such as referrals and lab tests, that make up 60 percent of all healthcare costs.

For the clinician, becoming connected means having access to electronic patient information in a way that is convenient and meaningful. Clinicians can access essential information at the point of care and across the care continuum. A continuity of care record brings together a core set of information from various sources to create an online record of key patient data, including lab results, prescription information, advance directives, and health status such as immunization records.

Timely access to key information—including the latest medical knowledge and treatment—means that clinicians can avoid errors and guide patients more efficiently along their journey.

The Eastern Goldfields Medical Division of General Practice Ltd. covers about one third of Western Australia (an area roughly the size of Texas). The remoteness of healthcare practices in the region means that communicating patient and medical information between patients and healthcare practices was infrequent and cumbersome. A Cisco broadband IP network now bridges that geographical divide, with medical staff able to use secure e-mail, access the Internet at broadband speeds, and enjoy toll bypass (cheaper calls between sites) through IP telephony across the network.

Most important, clinicians now have direct access to medical and educational information. Radiology and pathology reports can be transmitted to them, while clinical images can be sent electronically to specialists for review. Other facilities include immunization



The Connected Health Community

Cisco Medical-Grade Network Solutions

and organ donor registry lookups as well as streamlined back-office processes with access to insurance and benefits information, as well as online claims and processing.

Connected Patient

In a traditional healthcare environment the patient is typically viewed simply as the person who receives treatment. In the Connected Health environment, however, patients can take an active role in their own well-being, because they have direct access to information and the ability to influence medical decisions. For example, they can take steps to prevent illness, or at least maximize their wellness, even if they suffer from chronic conditions such as diabetes or heart disease. Connected Health extends beyond previous concepts of preventive medicine or remote monitoring, touching patients before they need medical care.

In the United Kingdom, NHS Direct has grown since 1998 from a simple National Health Service telephone information and advice line into a sophisticated tool of patient empowerment. With call centers, an Internet channel, a digital TV service, and print media, it is developing an integrated multichannel model linked to other NHS online resources. NHS Direct is now improving all its channels, playing to the strengths of each in terms of content and services, while it forges a closer integration between them.

The steep increase in online use is the most striking indicator of success for NHS Direct's integrated approach. In mid-2004, NHS Direct call centers received between 500,000 and 600,000 calls a month, while NHS Direct Online got 600,000 to 700,000 unique user visits in the same period. Since then, call-center traffic has increased modestly, but the Website has more than doubled to 1.5 million users a month.

The use of NHS Direct has resulted in better access to services, informed patient choice, and greater financial efficiency. In 2007, the service will launch Health Direct to support proactive healthy living choices, initially using the Web, digital TV, and mobile text. In the future patients will be able to view their care records and link to further information on their condition, treatment, and choices through the Website's personal zone, HealthSpace. An associated facility—NHS LifeCheck—will allow patients to store

health and fitness assessments to create an online personal wellness record.

Creating the Foundation for Connected Health

The Cisco contribution to helping make real the vision of Connected Health comes from the understanding that by using intelligent networking to share vital health information, healthcare organizations worldwide can improve the safety, cost-effectiveness, and accessibility of care. Cisco can not only provide a secure communications infrastructure that helps the sharing of information—be it voice, moving images or data—across the entire continuum of care, it can also implement specific solutions to meet the needs of key areas of patient care and diagnostic support.

Cisco Medical-Grade Network

The foundation for Connected Health is the Cisco Medical-Grade Network, which hospitals around the world have deployed to support a range of complex, integrated, and mission-critical information flows. A Cisco Medical-Grade Network is the digital nervous system of a healthcare organization. It is designed to be an exceptionally secure and resilient infrastructure that self-monitors, self-defends, and self-repairs so that critical applications and data remain safe and accessible at all times.

It does this by being:

- **Resilient**—A highly reliable infrastructure with lifecycle support services that meet the network challenges and continually changing business requirements of healthcare.
- **Secure**—Provides secure access to and delivery of information (via network intrusion detection, firewalls, identity authentication), which helps healthcare providers comply with government regulations.
- **Responsive**—The single, converged network distributes information intelligently and maximizes the performance of applications and devices, to improve worker efficiency and patient care.
- **Interactive**—It connects various communications technologies (such as pagers, desktop computers, and tablet PCs) to facilitate greater collaboration and knowledge sharing among people wherever they are.

Importantly, the Cisco Medical-Grade Network provides a standards-based infrastructure that can be applied equally to a small departmental project or a greenfield site. It provides a framework that helps ensure that all pieces of the infrastructure, whenever they are implemented, will integrate with each other.

Such flexibility, combined with reduction of risk, delivers a proven solution for healthcare that is uniquely 'Just right, just in time', meeting today's needs while it builds for tomorrow's.

In Münsingen, Germany, the operating company Kreiskliniken Reutlingen rebuilt its Albklinik hospital, investing in an integrated, high-performance infrastructure based on Cisco Medical-Grade Network technologies in order to improve patient care and services.

The network carries all the hospital's data applications and its telephone services. Hospital personnel use both wired and wireless Cisco IP phones as well as other mobile devices, such as PDAs and laptops. With the network, staff can access a range of telephony and data services to remain in contact with patients or colleagues even when they are on the move.

The network has helped the hospital to progressively integrate its clinical and administrative systems. Innovations include computed tomography (CT, or CAT, scanning) via teleradiology (the electronic transmission of radiographic images and consultative text). In addition to the existing hospital information system, the network supports patients' electronic records, radiology systems, and computed tomography at three hospitals, which promotes the delivery of the same high-quality diagnostics service at all sites.

The improved integration of information, applications, and systems has reduced costs, saved time, and increased the efficiency of clinical and administrative staff. Improved access to medical data has raised the standard of patient care, and more effective communication between staff and patients has further improved the quality of care. Patient services have improved dramatically, strengthening Kreiskliniken Reutlingen's position in the fiercely competitive German healthcare market.

Creating a Responsive Environment: Cisco Medical-Grade Network Solutions

In collaboration with leading vendors of medical information technology, Cisco is building a portfolio of integrated solutions designed to meet the needs of healthcare organizations while helping to ensure interoperability between systems and thereby reduce risk.

Cisco Clinical Connection Suite

The Cisco Clinical Connection Suite comprises complementary components that connect clinicians, patients, and vital health information. Utilizing applications and medical devices from the industry's leading companies, Cisco Clinical Connection Suite helps clinicians and healthcare providers deliver significantly enhanced quality of care and services.

This integrated set of solutions provides:

- **Collaborative Care**—The solution dynamically connects the right people with patient information in order to improve the time-to-treatment ratio and to facilitate access to the right specialists wherever they are. Audio and videoconferencing can significantly reduce or even eliminate travel time.

In the Bay Area of California, the Alameda County Medical Center and San Francisco General Hospital present an innovative example of the concept of the connected patient. The two facilities serve populations that are among the most diverse in the country, with more than 50 percent of patients having limited English proficiency. It is critically important for patients to be able to communicate effectively with clinicians, and that communication can depend on visual cues as well as verbal ones.

Using IP telephony and videoconferencing, the two institutions have made far more efficient use of in-house interpreters. A mobile video terminal can be wheeled to a patient and a video call made to an interpreter, instead of the interpreter having to travel to the patient. Interpreter time per patient has decreased dramatically from an average of 37 minutes to 17 minutes, and estimates are that the San Francisco hospital alone is saving more than \$420,000 a year by being able to share interpreters. More important, the solution has eliminated patient waiting



time, with patients rating their overall satisfaction with the service at 2.9 (out of 3) as they can now communicate effectively with their clinicians through the interpreters.

- **Location-Based Services**—The solution uses WiFi-enabled active RFID tags to instantly locate tagged property (such as wheelchairs, beds, and intravenous pumps). Everyone—nurses and other clinicians, inventory managers, maintenance personnel, and security teams—can now make better use of the hours they formerly spent looking for equipment.

In Boston, Massachusetts, Beth Israel Hospital was experiencing equipment losses that totaled more than \$300,000 a year until it installed a Wi-Fi asset-tracking system. With this location-based tracking and visibility service from PanGo and Cisco, hospital staff could make more efficient use of critical equipment and people in an emergency room (ER) environment with 57 patient rooms.

Asset tracking has reduced equipment loss, and it has promoted far greater insight into the use of assets, improving work flow and patient care. Location and “status” information has been integrated at the nurse’s station in the ER, and an electronic dashboard tracks bed availability, work flow, and patients’ clinical progress. As a result, patients stay in the ER an average of 45 minutes less, a huge factor in reducing cost while improving both patient and staff satisfaction.

Cisco Connected Imaging

Made possible by the scalable, high-performance Cisco Medical-Grade Network, Cisco Connected Imaging powers the acquisition, processing, and delivery of high-resolution radiology images to clinicians who are collaborating in patient care.

The use of a shared infrastructure can greatly reduce costs, and it offers the further opportunity for specialized service providers to deliver Connected Imaging as a shared service, thereby changing the investment profile from capital expenditure to revenue expenditure, while spreading the costs over a greater number of customer organizations.

Connected Imaging even has the potential to change the fundamental healthcare model by making it possible to capture images

in one country and diagnose them in another, as part of a coherent and managed imaging environment. Currently, digital images are usually merely shipped from one facility to another.

Connected Imaging comprises four key components:

- **Image Acquisition**—Connected Imaging facilitates the secure acquisition and delivery of digital images to PACS. By maintaining the integrity of images and data, the solution safeguards patient confidentiality within a flexible environment into which other pieces—such as the radiology information system for scheduling and procedure tracking, or the hospital information system for sharing data such as admissions and billing—can be securely added. The result is more timely and accurate interpretation of images as clinicians—even in different organizations—can share images and diagnoses.

At the University of Texas, Houston, the M. D. Anderson Cancer Center is devoted exclusively to cancer care, research, education, and prevention. The center relies on a Connected Imaging solution from Cisco to meet the unique storage, transport, and access demands of diagnostic imaging. The solution supports ultrasound, CT scans, magnetic resonance images (MRIs), digital radiography, computed radiography, positron emission tomography scans, and other nuclear medicine imaging techniques.

The Connected Imaging solution optimizes the network for the archiving and rapid delivery of digital images to caregivers. By digitally archiving all radiology images and granting access to them over the network, the solution helps eliminate film storage and loss while it promotes collaboration by allowing multiple caregivers to view images simultaneously.

As demand for advanced imaging services quickly outpaces the supply of skilled radiologists, clinicians at M. D. Anderson can take advantage of skilled radiologists wherever they may be—even in other cities—through Connected Imaging’s remote consultation features. By effectively providing 24-hour-a-day reading capabilities, Connected Imaging helps speed diagnoses and accelerate life-saving treatments. The solution has supported the rapid growth from 175,000 to more than 400,000 exams annually. Built-in security features also make it easier for M. D. Anderson to maintain compliance with patient privacy laws, safeguard patient information, and protect imaging processes and results—both in transit and in storage.

- **Performance and Management**—Connected Imaging helps enable organizations to scale imaging services across the enterprise and beyond. Proven business continuity and data storage technologies and techniques both protect and make images available at the point of care.

The University of Rochester Medical Center is the heart of medical knowledge and expertise for central and upstate New York. It has implemented Cisco Connected Imaging to improve its PACS by providing secure, optimized image transport so that the health center can better manage its growing number of data-rich medical imaging files.



Working with Cisco, Kodak, and IBM, the team at the Rochester Medical Center is focusing on a seven-year technology roadmap, based on anticipated medical technology lifecycle, to address the network, PACS, and radiology information system. This approach anticipates every cost and calculates the total cost of ownership. Cisco Connected Imaging provides secure optimized image transport to meet the demand of PACS. Today, the system can easily manage CT body scans of 5,000 or more image slices.

- **Image Access**—Connected Imaging integrates diagnostic, clinical, and Web workstations into its assemblage of network, voice, and security technologies. Through this integration, medical personnel gain secure, multiplatform access to patient images—within the hospital or from remote locations. Cisco Connected Imaging also links caregivers through both wired and wireless technologies to facilitate instant collaboration, increased information sharing, and better patient care.

In Ontario, Canada, collaboration between the London Health Sciences Centre and St. Joseph's Health Care has shown what can be achieved with Connected Imaging. These institutions provide tertiary diagnostic imaging—X-rays, fluoroscopy, CT scans, MRI, ultrasound, and nuclear medicine—for 1.5 million people, served by 41 community hospital sites spread over an area of nearly 29,000 square kilometers.

A Cisco Medical-Grade Network and Connected Imaging form the basis of the new imaging department. Now when images are taken, they are immediately available for the diagnosing physician to see. Within minutes, the solution links the images with the physician's report and the patient's file. At the same time, the images are available to the doctors and other caregivers involved with the patient—whether in the emergency department, in surgery, in the family practitioner's office, or in the patient's community hospital.

- **Collaboration and Reporting**—Connected Imaging helps save precious seconds in emergency situations by facilitating instantaneous voice and data consultations among caregivers. It also facilitates e-learning, remote diagnosis, and knowledge sharing with globally distributed medical professionals. Connected Imaging expands the capabilities of PACS by eliminating messaging delays, adding patient context to PACS messaging, and extending the reach of the hospital and its staff through integrated audio/videoconferencing, video telephony, and online collaboration tools.

In Stockholm, Sweden, Karolinska University Hospital—the country's leading hospital—improved the delivery of its healthcare services by deploying a Cisco Medical-Grade Network and Connected Imaging solution. The solution helped hospital doctors and home-based medical specialists access, view, and share patient information quickly and securely, thus improving the efficiency and speed of diagnosis and treatment.

The Cisco Medical-Grade Network also supports multimedia applications that are helping to increase the sharing of medical

expertise within the hospital and globally. In addition to promoting the use of medical expertise across a wider geographic expanse, these collaboration tools will improve medical education and hasten the speed with which specialists can provide expert consultation and advice.

Why Cisco for Healthcare

The intelligent Cisco architecture delivers a comprehensive approach to healthcare that addresses the industry's primary concern: providing efficient, affordable, accessible health services. Cisco is the leader in healthcare connectivity for collaboration and a catalyst in transforming healthcare based on its industry innovation, participation, and collaboration.

- **Innovation**—Cisco has a 20-year proven track record deploying innovative network solutions and best practices that enable physicians, hospitals, clinics, and other healthcare and life science organizations to do things better
- **Participation**—Cisco is involved with international healthcare initiatives focused on improving access to healthcare information
- **Collaboration**—Cisco is working with healthcare industry leaders—including application, system and service providers, device manufacturers, and medical technology vendors—to connect the entire healthcare environment to a common information and communications infrastructure.

Improving Healthcare's Future with Connected Health

Across the globe, governments and healthcare systems have initiated broad healthcare improvement programs. For example, Canada Health Infoway is working to link clinics, hospitals, pharmacies, and other points of care by accelerating the development of a pan-Canadian network of interoperable electronic health record solutions.

Cisco is working with healthcare providers and decision makers around the world to support such programs, which require a secure, reliable, and increasingly interactive infrastructure to automate transactions and expedite the flow of healthcare data. In the United States, Cisco is a member of two of the four consortiums working with the U.S. Department of Health and Human Services on the prototype of the National Health Information Network, helping to create the architectures that will support information exchange across different regional healthcare markets.

The Cisco roadmap to Connected Health, supported by the Cisco Medical-Grade Network and its solutions, provides the means to achieve a collaborative, responsive, and secure backbone through which information can flow directly to the point of care. Through its vision of Connected Health, Cisco is helping to pave the way for a future in which all healthcare stakeholders can respond to patients more efficiently, expand preventive healthcare initiatives, and boost the overall health of communities.

For more information, contact your Cisco representative or reseller today, or visit us online: www.cisco.com/go/healthcare



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