Can information technology improve healthcare quality and help save lives?

Yes. Healthcare solutions built on Intel® computing and communications products are the perfect prescription.

intel.com/go/healthcare
Meeting challenges and expanding opportunities for quality healthcare:

Intel® technology powers mobile solutions—from tablet and notebook PCs to wireless handhelds—enabling anywhere, anytime life-saving decisions.
It's described by some as a critical condition: A global shortage of healthcare providers means doctors and nurses alike must treat more patients than ever before. As a result, other caregivers are required to take on tasks traditionally performed by physicians and registered nurses. Expanded treatment teams require greater levels of collaboration and enhanced quality control processes and systems. For example, medication delivery errors and mistakes caused by expanded manual entry of patient data are among leading causes of preventable medical complications. Today, many healthcare organizations are finding that wireless technology can dramatically increase the productivity of scarce medical personnel, while reducing multiple data entry needs and errors.

Healthcare providers must also address rising demand for better quality care, an aging patient population, greater access to care, and secure access to consolidated patient information from any point of care. At the same time, the Internet has placed medical information and related cost data at the fingertips of patients—allowing them to become more savvy healthcare consumers, while holding providers accountable for services, expenses, and results.

A new healthcare information technology (IT) infrastructure must incorporate and integrate existing technologies that may include homegrown applications. This new IT infrastructure will have to provide the flexibility to share data while providing services across multiple networks. Equally important, it must add new applications and industry IT standards that are not tied to the constraints of legacy or proprietary systems.

**How Intel Cures These Symptoms**

Intel® architecture-based healthcare solutions are uniquely positioned to respond to these seemingly contradictory challenges—to enhance patient quality, improve access to care, and contain costs—to ultimately help healthcare providers make life-saving decisions. Intel® technology addresses both quality and cost issues for a broad range of healthcare segments and IT infrastructures. Intel computing platforms power everything from demanding database servers, to high-performance desktop and tablet PCs, to cutting-edge wireless and mobile medical devices.

**A Strategic Focus on 3 Key Areas**

Intel’s next-generation technologies deliver powerful, cost-saving solutions in three critical areas of concern for healthcare providers: Mobile Point of Care (POC) solutions, Secure Patient Framework (SPF) solutions, and Homecare solutions.

**1. Mobile Point-of-Care (POC) Solutions**

Patients, physicians, nurses, administrators and other caregivers are constantly in motion. Their patients' health and safety is directly affected by critical medical decisions—such as diagnosis, medication, surgery, rehabilitation and other therapies. Decisions that are often made on the move. And yet these mobile personnel do not always have access to a desktop or workstation that can provide the most current patient information where they need it most—where they are treating the patient at the "point of care." Accessing patient histories, lab data, radiological imaging, medication schedules and physician orders usually means finding a dedicated workstation or stationary desktop. Paper files and x-ray films must be literally carted around from imaging lab to exam room to surgery to recovery—and can be easily lost or misplaced.

Mobilizing these essential clinical decision support system (CDSS) tools greatly improves the care experience for providers and patients alike. Extending medical and patient data to emergency rooms, elevators and satellite clinics, emergency vehicles and ambulances, as well as the bedside means fewer errors and delays, faster turn-arounds, and improved patient safety.

**Why Intel Technology Is Important**—Nowhere is the evolution of mobile information retrieval and delivery more visible than in wireless technologies. Wireless connectivity has advanced in a veritable explosion of lightweight, portable devices such as personal digital assistants (PDAs), tablet and notebook PCs, and mobile POC applications.

Intel offers a wide range of solutions that “connect the dots” for mobile POC information delivery. The latest
mobile offering, Intel® Centrino™ mobile technology for
notebook and tablet PCs, combines breakthrough perform-
ance and built-in wireless LAN capability1 with innovative
low-power technologies to deliver high-bandwidth data
transfers, cable-free mobility and extended battery life.

Behind the scenes, Intel architecture enables:

• Big power in small packages, such as ultra-lightweight
notebooks and tablet PCs built around Intel® Centrino™
mobile technology to support high-resolution radiologi-
cal and magnetic resonance imaging, and PDAs using
Intel® Personal Internet Client Architecture (Intel® PCA)
for healthcare providers on the move;

• On-demand retrieval and delivery of up-to-date patient
records and other CDSS data via scalable servers built
with Intel® Itanium® 2 processors, and XML-/HL7-based
data integration;

• Adoption of secure, high-speed wireless LAN solutions
featuring Intel Centrino mobile technology-based note-
book and tablet PCs for mobile POC locations—such
as ambulatory wings, emergency rooms and patient
admitting.

With mobile and wireless POC solutions, doctors, nurses,
emergency medical technicians and physical therapists
are freed from the burden of tracking down elusive but
critical information, giving them more time to do what
they do best—care for patients.

Success at University Hospital Jena—Nurses at University
Hospital Jena in Thueringen, Germany, received a mobile
computing upgrade from their Hewlett-Packard® iPAC*
handhelds to Fujitsu Siemens tablet PCs built on the
Mobile Intel® Pentium® III Processor - M. With these mobile
PCs, nurses can now access all relevant patient informa-
tion delivered to the patient POC instead of having to go
to a centrally located PC in each ward. In addition, the
tablet PCs’ more powerful microprocessors give nurses
interactive connectivity (data pull and push), reducing
time-consuming manual data entries. Because they spend
less time on administrative tasks, nurses spend more time
with patients. In turn, the hospital has increased patient
capacity while maintaining high-quality standards of care.

2. Secure Patient Framework (SPF) Solutions

One of healthcare’s top challenges today is updating and
managing a mountain of patient information—including
medical images, patient histories, prescriptions, physi-
cian orders and other vital information—spread across
multiple departments. Information retrieval is often ham-
pered by differences in data handling systems and lack
of integration among departmental networks. The lack
of real-time information can easily result in poor clinical
decision-making, low-quality patient care and frustrated
caregivers.

A medical-records IT infrastructure built on Intel archi-
tecture transforms IT “silos” into a scalable and stable
computing platform. This secure patient framework
(SPf) is more responsive to doctors and other authorized
users, while delivering accurate, up-to-date information
to the POC.

An SPF provides the integration and reliability needed
to streamline decision-making processes, consolidate
electronic records and deliver critical data to a range
of medical device platforms—in less time and, more
importantly, with fewer errors.

Why Intel Technology is Important—Solutions enabled
by an SPF depend on a balanced, distributed computing
IT infrastructure of powerful mobile handhelds and PCs,
high-speed networks and reliable database server archi-
tectures. Starting with enterprise servers powered by
Intel Itanium 2 processors and applications servers on
Intel® Xeon™ processors, healthcare providers can consoli-
date medical records from many sources. Then, an end-
to-end SPF easily and safely extends patient information
to authorized caregivers via mobile POC devices and
applications. An infrastructure built on Intel architecture
also provides a powerful platform for enterprise applica-
tions such as back-end billing, supply inventories, phar-
macy orders and insurance claims.

The advantages of SPF solutions include both improved
patient care and higher business process efficiencies via:
Reducing Manual and Redundant Data Entry

How does IT help healthcare providers accrue savings on a day-to-day basis? One answer is automating order and other data entries, so the same information doesn’t have to be entered twice, or more. That way, insurance claims-processing, lab-test and patient-record systems can seamlessly transfer information without waiting for manual handoffs. For example, when a patient changes doctors or hospitals, their lab results often don’t follow them. Experts say this sort of unnecessary duplicate testing costs billions of dollars every year.

Other savings are realized in terms of quality of care. When accurate and up-to-the-minute patient information is accessible at the point of care, doctors and nurses save valuable time otherwise devoted to locating charts, waiting for lab results or researching treatment outcomes. And in healthcare, time impacts both the quality and cost of patient care.

Success at Clalit Health Services—Clalit, a leading healthcare provider in Israel, needed to revamp its sprawling computer network, which served 24,000 doctors, nurses, pharmacists and administrators spread throughout 14 hospitals and 1,400 clinics. They desperately needed an integrated IT infrastructure that could centrally collect and process data from many sources while simultaneously providing complete access to qualified users across the network. Of course, the development had to be done with minimal disruption to current operations.

Their solution was an integrated Mobile Point of Care (POC) platform on Intel® architecture that users could access through numerous wireless handheld devices, notebooks and workstations. Advanced authorization, authentication and encryption would secure the network. An Intel® Xeon™ processor-based server cluster cut response times from minutes to seconds—a triumph in an industry where saving time can result in saving lives. Clalit’s solution highlights how an end-to-any solution all built on Intel architecture helps address true integration in the healthcare industry.

“Using the Intel® architecture, we reached a combination of a fast, reliable and standardized solution for our data processing needs; a reasonable Total Cost of Ownership; and a very fast implementation. For the first time, we can supply large-scale, reliable online data to users all over the organization.”

—Gadi Gilon, CIO, Clalit Health Services

• Improved mobile POC by making real-time information available to providers anytime, anywhere;

• Improved quality of patient care by reducing medical errors through automated order entry and alerting systems;

• Improved cash flow through streamlining and accurately coding claims processes;

• Improved profitability by direct capture of billable service and supply charges;

• Improved patient satisfaction through online viewing and self-management of the healthcare process.

Success at the University of São Paulo—On July 14, 2003, Intel and the University of São Paulo jointly inaugurated two new projects linked to implementing a national database on all pediatric oncology patients in Brazil. The main database objective was to develop a healthcare information technology infrastructure that would allow medical professionals to standardize cancer treatment protocols administered to young patients.

Using servers built on Intel Itanium 2 processors and running the Linux® operating system, the pediatric oncology database consolidates and maintains detailed patient records. The system also handles specific data mining activities for research as well as statistical data quantification. The second project facilitates building systems to record second medical opinions as well as virtual medical backgrounds.

3. Homecare Solutions

With an aging population, the number of chronic illnesses requiring treatment is inexorably rising. Homecare solutions that help meet the increasing demand on worldwide
healthcare systems are becoming progressively more important—solutions that extend the mobile POC beyond the walls of hospitals and clinics and into the home.

These emerging solutions will soon enhance the quality of care while containing costs, as patients are able to perform more early problem-detection and self-treatment while living at home. As a result, homecare solutions will reduce hospital admissions and stays, as well as simple visits to the doctor’s office.

Why Intel Technology is Important—Intel helps extend mobile POC solutions into the home with a range of computing technologies. For example, Intel offers the raw computing horsepower needed for in-home monitoring and treatment, and the communications technologies for seamless remote connectivity with the caregiver’s centralized IT systems. Developers are now designing digital homecare solutions built on Intel architecture, including:

- Smart homes equipped with devices such as glucose meters, vital sign monitors and emergency alert systems—wireless devices that allow medical professionals to remotely monitor a patient’s breathing, heart rate and blood pressure among other things;

- Web Services that give in-home care providers, such as licensed nurse practitioners (NPs), access to online records, test results, interactive connectivity (data pull and push) and emergency response capabilities through Intel processor-based notebook PCs, tablet PCs and even PDAs;

- Consumer-friendly Web Services for medication reorders, online scheduling, e-mail chats with doctors, telemedicine and disease management.

Endless Possibilities in Healthcare R & D

Intel is committed to the healthcare industry. Take, for example, its joint research with various U.S. associations into homecare-based solutions, such as sensors and technologies that can detect the progression of diseases. The Alzheimer’s Association and Intel Corporation have announced a research program to spur development of in-home technologies to help people with Alzheimer’s disease. The Everyday Technologies for Alzheimer Care (ETAC) consortium plans to fund more than US $1 million in research over the next three years.

As Intel scientists and engineers, working with independent developers and systems integrators, press ahead with new and extended applications of remote/wireless technology, they will continue to transform the delivery of medical care by putting more next-generation IT tools and technology in providers’ hands. Some of these tools will include readable x-rays transmitted over broadband, legible electronic prescriptions, and tiny, integrated voice-activated devices that provide always-available communications to healthcare workers—a welcome improvement to paging. With mobile online access to medical records, lab data, radiology, ordering systems and sophisticated decision support, providers will have a powerful tool to standardize treatment practices, improve patient care outcomes and streamline operations.

Intel® Solution Services for Developers and Integrators

To optimize the performance of healthcare solutions, Intel delivers a range of software developer tools and support services that expedite healthcare application development and maximize the effectiveness of Intel® processor-powered systems.

Intel® Solution Services is a global consulting organization that applies Intel’s technical knowledge base through a worldwide network of Intel® Solution Centers to optimize the performance of healthcare applications and solutions on Intel® architecture. Solution Services include infrastructure optimization, application porting, enterprise architecture and management services, and migration services.

Intel compilers include C++ and Fortran compilers for Microsoft* Windows* and the Linux* operating systems. All Intel compilers support the OpenMP standard and auto-parallelism to simplify and accelerate the development of threaded applications and optimize their performance on Intel processor-based systems.

Intel Performance Libraries expedite development, reduce costs and increase application performance by providing a wide range of functions optimized for Intel processors. The Intel® Math Kernel Library (MKL) provides linear algebra, Fast Fourier Transform and vector math functions for financial, scientific and engineering software—many with built-in parallelism. The Intel® Integrated Performance Primitives (IPP) library contains multimedia functions to speed image and signal processing.
It’s What’s Inside That Counts

The performance and affordability of Intel computing platforms—combined with widely available solutions from a multitude of software, hardware and systems integrators—make them the ideal choice for complex healthcare applications. Integrated healthcare solutions built on open standards-based Intel architecture drive true collaboration and real-time decision-making in healthcare organizations—ultimately allowing healthcare providers to spend less time managing paperwork and data flow and more time delivering higher-quality healthcare.

Inside handheld devices—Intel® Personal Internet Client Architecture (Intel® PCA) combines powerful multimedia processing performance and power management features in extremely compact packages. Intel PCA application processors with Intel® XScale™ technology are perfect for wireless PDAs, wireless application protocol (WAP) phones, scanners and other handheld systems that can be used to quickly reference medical libraries when diagnosing patients and prescribing treatment.

Inside tablet and notebook PCs—New Intel® Centrino™ mobile technology enables a wide range of powerful tablet PCs and thin-and-light notebooks. Breakthrough performance, wireless LAN connectivity1 and large screens make these platforms ideal for wireless x-ray image inspection, detailed medical record review, patient data trend analysis and other critical, bandwidth-intensive mobile POC applications. Validation with industry-leading security solutions ensures patient information remains private and secure.

Inside desktop PCs—The Intel® Pentium® 4 processor powers high-performance desktop applications. This powerful processor is based on Intel NetBurst® microarchitecture, which allows it to easily handle such bandwidth-intensive packages as radiological imaging and MRI visualization software that enables physicians to make better-informed healthcare decisions.

Inside application servers—The 32-bit Intel® Xeon™ processors give healthcare providers fast, reliable access to medical and patient data via high-availability applications running on departmental and communications servers—from anywhere, anytime. They provide the high bandwidth, multimedia processing and content personalization performance that are essential for enabling today’s and tomorrow’s mobile POC solutions.

Inside the database—The 64-bit Intel® Itanium® 2 processors provide powerful compute engines for the largest enterprise applications and database systems, supporting multiple operating system and database options. Extensive error detection and correction on all major data structures and an advanced machine check architecture provide intelligent error management and recovery of complex platform errors, preventing medical and patient data loss, corruption and downtime. The result is a processor ideally suited to compute-intensive applications such as large EMR (electronic medical record) databases and diagnostic image archives.

Inside the network—Intel® Internet Exchange Architecture (Intel® IXA) network processors are specially designed for the fast data speeds and intense packet inspection requirements of wireless access points, enterprise routers, switches and Virtual Private Network (VPN) gateways.

Better Technology for Better Care

All across the healthcare industry, medical facilities are turning to innovative technology solutions for a new infusion of affordable IT performance, operating efficiency and cost savings. Intel delivers advanced technology for mobile POC solutions that enable better quality healthcare, greater access to care and secure access to consolidated patient information from almost anywhere. And one after another, clinics, hospitals, emergency response units, and research facilities are finding that solutions powered by Intel technology deliver measurable results and extend their IT infrastructures’ scalability and reliability. It’s a perfectly timed convergence of need and capability made possible by Intel’s commitment to industry-leading technology research and innovation.

Find out what an increasing number of healthcare providers have already discovered: That healthcare IT solutions built on open industry standards—and Intel computing platforms—are just what the doctor ordered.

For More Information

To learn more about how Intel technology is helping the healthcare industry, visit Intel on the Web at www.intel.com/go/healthcare
Intel products are not intended for use in medical, lifesaving, life-sustaining, critical-control or safety systems, or in nuclear facility applications.

*Wireless connectivity and some features may require you to purchase additional software, services or external hardware. Availability of public wireless LAN access points limited. System performance measured by MobileMark* 2002. System performance, battery life, wireless performance and functionality will vary depending on your specific hardware and software configurations.

Copyright © 2003 Intel Corporation. All rights reserved. Intel, the Intel logo, Intel Inside, Intel Centrino, the Intel Centrino logo, Intel NetBurst, Intel Xeon, Intel XScale, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation and its subsidiaries in the United States and other countries.

*Other names and brands may be claimed as the property of others.

Printed on recycled paper with soy-based inks. Printed in the U.S.A./0703/2.5K/KG/HOP
Order Number: 253563-001