



Intel® Across Healthcare

Driving computing innovation for billions of people worldwide

FACING THE WORLD'S HEALTHCARE CHALLENGES

Around the globe, healthcare decision-makers struggle daily with tighter budgets, rising costs, worker shortages, an explosion of data—all as technology advances at a breakneck pace and the business and regulatory landscape shifts beneath their feet.

The future looks even more daunting. Health is intrinsically linked to quality of life, yet demographic trends threaten both. An aging and more urbanized global population is experiencing a rise in chronic conditions such as obesity, diabetes, lung disorders, and Alzheimer's disease, amplifying the demand for access to quality, affordable care. The higher expectations of the Baby Boom generation will further strain healthcare resources.

As demand increases, the supply of traditional healthcare workers shrinks. The United States alone is projected to face a shortage of 124,000 physicians by the year 2025¹, and the projections are even more sobering for many other countries, particularly in Africa.²

Meanwhile, the cost of care continues to rise. In the United States, health insurance premiums far outpace the rate of general inflation,³ and the same pattern is seen throughout the world.⁴ Based on demographic trends, the proportion of GDP allocated to medical expenses is bound to increase.

Healthcare Megatrends

Of the many megatrends facing healthcare systems, **global aging** may have the greatest impact on the future of care. By 2050 in the developed world, more than 416 million people will be at least 60 years old, a 58 percent increase over the 2009 level. In less developed regions, this age group will more than triple over the same period, reaching 1.6 billion.⁵ This shift from a younger to older population signals an imperative to redesign the healthcare workforce and equip families with new technologies to care for loved ones.

The greying of the global population is a key driver of **payment reform** and **coordinated care megatrends**, as governments around the world respond with hundreds of billions of dollars in reforms, including

investments in health information technology (IT), also termed "eHealth." In 2010, two flagship initiatives were launched as part of the European Union's "Europe 2020" strategy for smart, sustainable and inclusive growth. The Digital Agenda for Europe includes a number of targeted eHealth actions and goals in support of dignified and independent living. The Innovation Union strategy introduces the concept of a pilot European Innovation Partnership on active and healthy aging. In the United States, nearly \$20 billion in financial incentives has been allocated for doctors and hospitals that use healthcare IT. By some measures, China is leading the way with plans to build 3,000 digital hospitals and retrofit 640,000 clinics by the end of 2015.

With Intel's commitment to technology innovation and the collaboration of healthcare partners worldwide, we are helping drive tomorrow's solutions for improving quality, affordability and accessibility of healthcare globally.

The traditional, costly fee-for-service model is on the decline. Increasingly, governments and private insurers are migrating from paying for volume to paying for value of services. We're also seeing a shift from solo practices to **collaborative, coordinated care**—a team-based model aimed at improving care quality in an era of rising demand and shrinking resources. Care coordination is particularly important for patients with multiple chronic illnesses.

Meanwhile, the spirit of discovery races forward. Thanks to rapid improvements in computing power, the cost of genome sequencing has plunged from \$100 million U.S. dollars per genome a decade ago to less than \$1,000 today. We will see a shift from population-based healthcare to **personalized medicine**—targeted diagnostics and treatments based on each person's history and genetic profile. Although fraught with complexity, this megatrend could one day revolutionize what it means to be a doctor or patient.

Intel's Vision for Healthcare

Tomorrow's healthcare challenges demand innovation across the spectrum of care. Intel Corporation's vision is to deliver innovative computing technologies and solutions that will improve healthcare quality and access while reducing unnecessary costs for billions of people worldwide.

Intel innovations have been powering the healthcare industry for more than 40 years. Intel architecture (IA) delivers performance, security and a seamless experience so that people can collaborate for better health.

Intel teams work with governments, healthcare organizations, and technology innovators worldwide to build tomorrow's health IT tools and services.

Place-shifting and Skill-shifting

Sustainable healthcare requires a "place-shift" from expensive hospitals and specialty care to the home and community. In an era of doctor and nurse shortages, we also need to "skill shift," giving responsibility for some care traditionally delivered by doctors and nurses to community health workers, family members, and patients, who will need training in their new roles, and a way to connect with one another.

Healthcare Technology Solutions

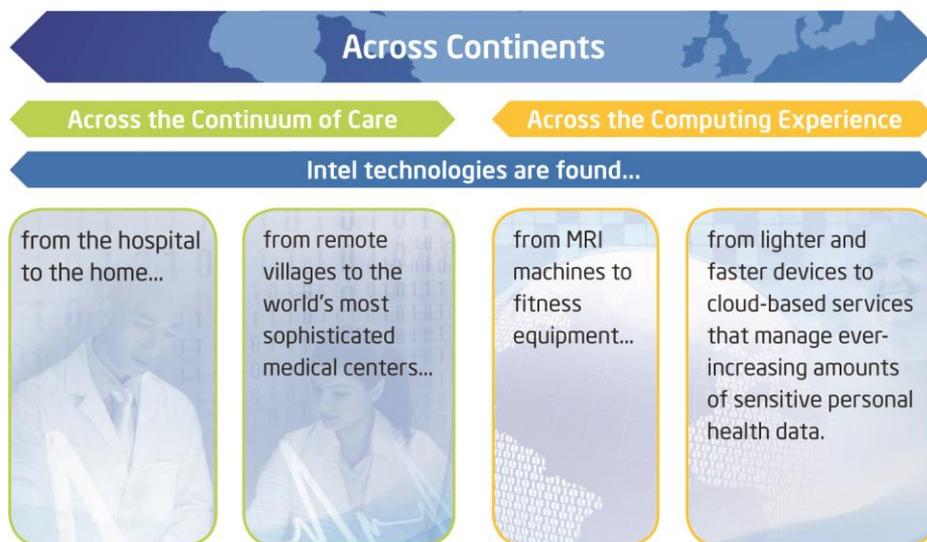
Intel is building smaller and faster processors, enabling manufacturers to build lighter tools with longer battery life. Intel powers new mobile form factors—the next generation of Intel Ultrabooks™, tablets and smart phones that will be used in the hospital, clinic and home.

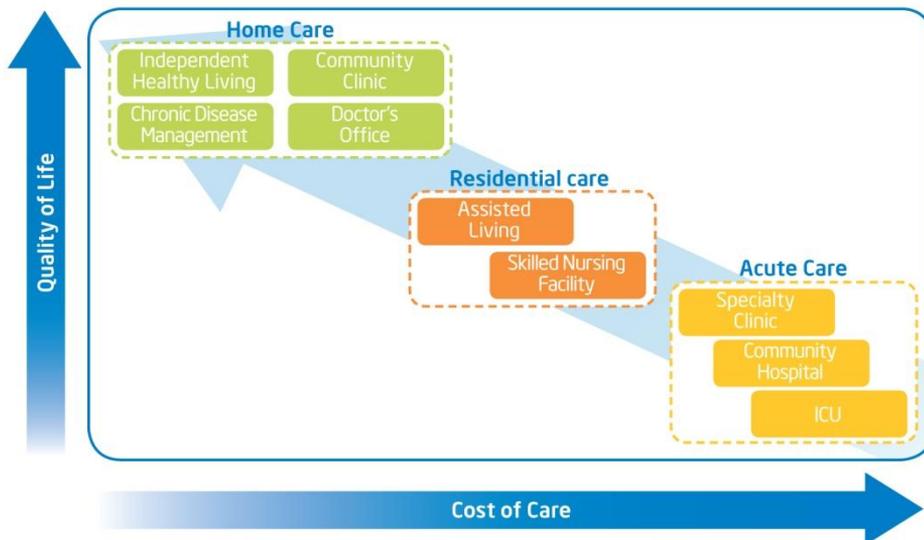
Care Innovations™, Intel's joint venture with General Electric Company through its GE Healthcare Division, produces a range of home health devices to help caregivers, family members and patients coordinate care and support independent living.

Intel speeds up data processing in a wide range of medical imaging and devices from MRI and CT equipment to fitness

consoles. Intel also is advancing cloud computing and the data centers that host electronic health records (EHRs) and health information exchanges (HIEs). We've created a hybrid cloud solution that enables doctors in small practices to adopt EHR technology by minimizing upfront costs and the technical complexity of data storage. We're also delivering high-performance computing clusters to usher in next-generation genomics for personalized medicine.

With the trends toward increased clinical mobility and cloud-based services, privacy and security are critical priorities. Intel advises IT decision-makers on how IA-based technologies can support their needs for privacy and security of patient information and compliance with local regulation of healthcare information. Intel offers a range of hardware-assisted security technologies, including accelerated encryption, anti-theft, identity protection, malware detection, and remote management of PCs, laptops and devices. Intel engineering also extends to software solutions, such as Intel® Expressway Service Gateway, a middleware solution for securing and integrating healthcare data.





Intel Strategy: “Shift Left” to distributed, personal health. Need a health infrastructure and workforce strategy that skill-shifts and place-shifts care to the home and community, whenever possible and appropriate.

People-Centered Research and Development

To drive innovation, Intel conducts ongoing research. Our goal is to examine how the computing experience—every solution that Intel delivers, from microprocessors embedded in medical devices at the bedside to technology in the clinic, hospital, home and cloud—will enable the care continuum over the next decade.

Intel teams of ethnographers conduct people-centered research to understand the everyday lives of people on the front lines of giving and receiving care. Our social scientists have completed fieldwork in more than 1,000 homes and more than 250 hospitals and clinics across 20 countries. We study doctors and nurses, hospitals and clinics, and patients at home, work and play around the world. This research—employing business, technology and usability experts—helps identify technology requirements and innovations that can support new care models.

While Intel’s ethnographers focus on people, our R&D labs explore what’s next in technology. Intel engineers are investigating a range of new technologies to advance healthcare.

Global Collaboration

Intel is a thought leader and trusted advisor to governments and healthcare partners around the world, collaborating on care redesign, business models and policy changes to achieve successful healthcare transformation. Intel is working on health reform and public policy in more than a dozen countries, collaborating with governments to address critical issues such as payment reform and the adoption of IT standards for healthcare.

Intel teams recently helped to pilot a telemedicine network in rural Mexico that connects doctors and nurses in urban centers with patients in rural areas. The system supports transmission of high-definition video and audio in real time, and it allows remote physicians to gather data from medical devices in the local rural clinic, such as CT scanners, x-rays and heart monitors. Doctors are using the system to perform exams, diagnose, and develop treatment plans, bringing a lifeline to people in rural communities.

Another major effort is focused on educating healthcare workers. Beginning in Sri Lanka, the Intel World Ahead program launched a mobile computing platform that delivers interactive, multimedia healthcare training and educational content. This is the start of a **program to train 1 million health workers by 2015** in emerging markets including Bangladesh, Brazil, India, and Nigeria. The platform, distributed free of charge, is designed to address the critical shortage of healthcare workers in developing countries, where health facilities and faculty are in short supply and Internet access is not always possible. The content can be uploaded from a thumb drive or transferred from another PC when an Internet connection is not available.

INTEL HAS LAUNCHED STRATEGIC INITIATIVES TO TACKLE THE GLOBAL CHALLENGES IN HEALTHCARE.

Age-Friendly Cities: Age-friendly city initiatives bring together local ecosystem players, services providers and the community to define how information technology can enable a set of services to provide quality of life and peace of mind for older people. Intel recently began this initiative in China, collaborating with the federal government and several ecosystem players. The collaboration will create blueprints and proofs of concepts that demonstrate how to connect information technology building blocks for city-wide services infrastructure to serve the growing population of people over age 60.

Coordinated Care: This initiative is focused on developing technologies and solutions to power emerging collaborative care models. The objective is to drive a secure, seamless Intel computing foundation for innovation, from

devices to the cloud, so that healthcare teams and patients can share, learn, and collaborate both within and outside of clinic walls. Intel is focusing particularly on new models for coordinated primary care to meet the global challenge of improving healthcare quality and access for growing and aging populations, while managing healthcare costs.

Mobile Healthcare Workers: The future of healthcare is mobile. Through this initiative, Intel will deliver IA-based mobile solutions for healthcare clinicians and healthcare workers. The goal is to provide a great user experience, including compelling form factors, leading-edge security to protect personal health information, and enterprise-level manageability to maintain devices easily. The mobile solutions will provide improved performance, enabling quick access, imaging, and coordination. Ultimately, these solutions will improve collaboration and workflow, leading to greater efficiency and a higher quality of care for people worldwide.

Compute for Personalized Medicine:

The cost of genome sequencing, once the key barrier to personalized medicine, is rapidly declining below the \$1,000 per person threshold that will enable widespread adoption. The challenge now is how to manage the explosive growth of “big data.” This initiative will explore how to accelerate the build-out of this ecosystem on Intel architecture.

Consumer Wellness: Intel has researched and invested in consumer wellness ecosystem development, including the Continua Health Alliance for health device interoperability and Dossia for individually controlled personal health records. This commitment extends to innovations in Intel’s own employee wellness benefits. Globally, Intel teams continue to explore next-generation technologies and applications to promote personal well-being.

Conclusion

While IT will play a critical role in advancing healthcare, the biggest hurdle is not technology but imagination and culture. Meeting the world’s healthcare challenges will require a sea change in how we think about care—how it is delivered, who provides it, and how it is reimbursed. The changes required to healthcare institutions, government policies, providers and

patients cannot be underestimated. In our work with healthcare partners around the world, we have found that change management is one of the biggest challenges.

Information technology has the power to transform healthcare as it has transformed virtually every other industry. With Intel’s commitment to technology

innovation and the collaboration of healthcare partners worldwide, we are helping drive tomorrow’s solutions for improving quality, affordability and accessibility of healthcare globally.

For more information, visit us at www.intel.com/healthcare

¹ Michael J. Dill and Edward S. Salsberg, “The Complexities of Physician Supply and Demand: Projections Through 2025,” Association of American Medical Colleges, Center for Workforce Studies, November 2008, <https://members.aamc.org/eweb/upload/The%20Complexities%20of%20Physician%20Supply.pdf>

² Richard M. Scheffler et al, “Forecasting the global shortage of physicians: an economic- and needs-based approach,” Bulletin of the World Health Organization, July 2008, 86:516–523, <http://www.who.int/bulletin/volumes/86/7/07-046474.pdf>

³ Kaiser/HRET Survey of Employer-Sponsored Health Benefits, 1999-2011. Bureau of Labor Statistics, Consumer Price Index, U.S. City Average of Annual Inflation (April to April), 1999-2011. Bureau of Labor Statistics, Seasonally Adjusted Data from the Current Employment Statistics Survey, 1999-2011 (April to April). <http://facts.kff.org/chart.aspx?ch=2515>

⁴ In 95% of 37 countries participating in a 2011 survey by Towers Watson, insurance costs—a key component of medical inflation—exceeded the general inflation rate. Towers Watson, “2011 Global Medical Trends,” Survey Report, 2011, <http://www.towerswatson.com/assets/pdf/3585/Towers-Watson-Global-Medical-Trends-Svy-Rpt.pdf>

⁵ “World Population to Exceed 9 Billion by 2050,” United Nations Press Release, March 11, 2009, <http://www.un.org/esa/population/publications/wpp2008/pressrelease.pdf>

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