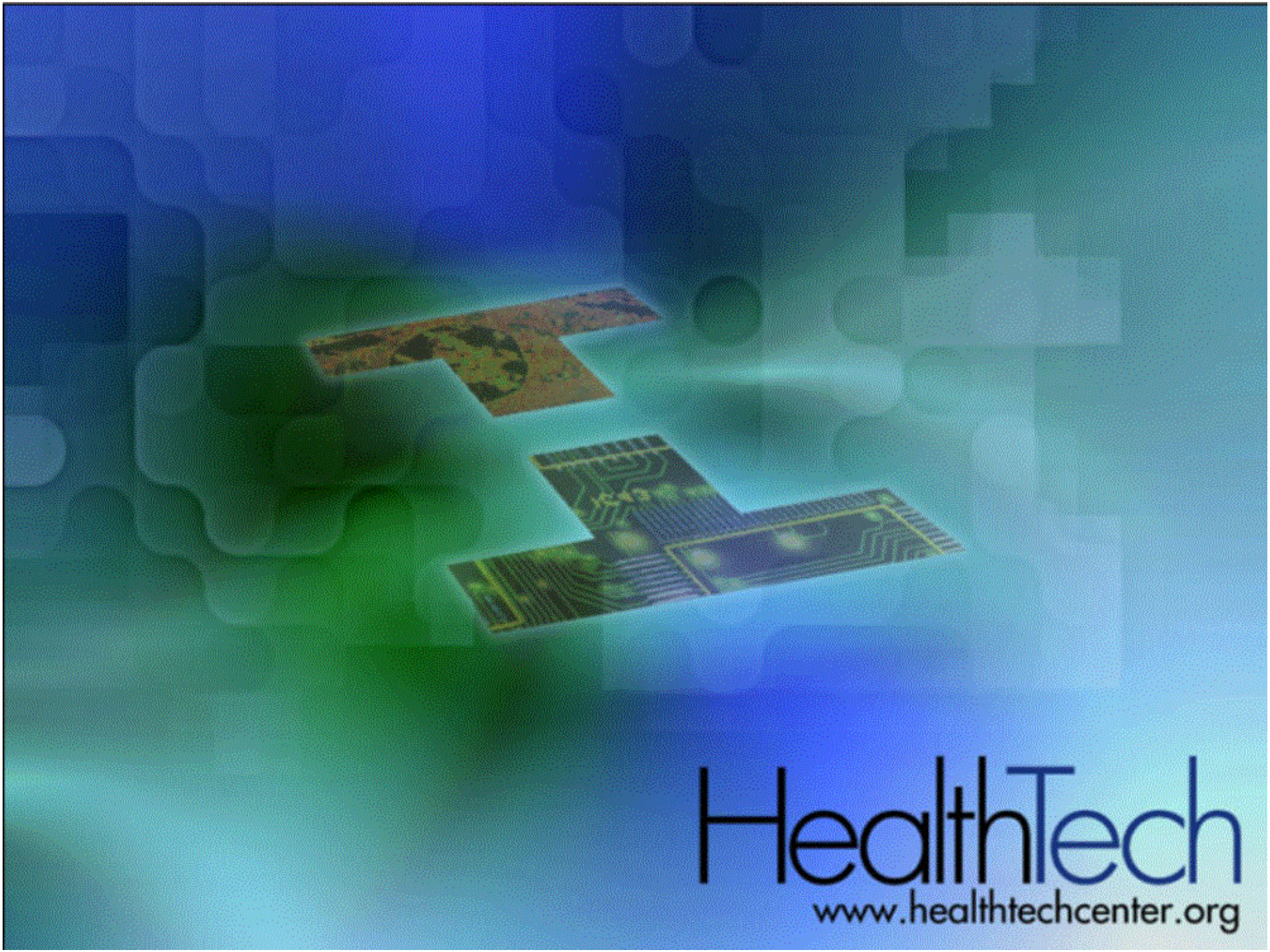
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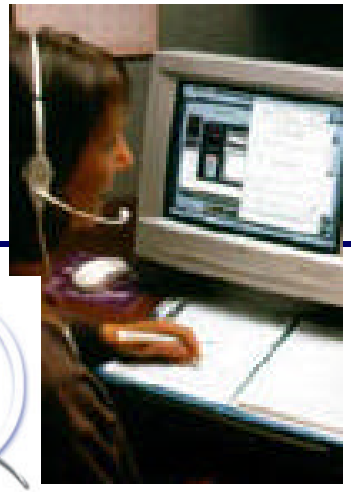
www.healthtechcenter.org




How New Technology Will Transform Health Care

Molly Joel Coye, MD, MPH
Health Technology Center

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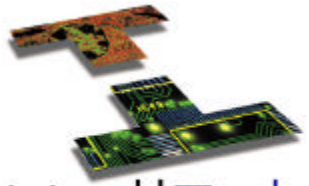
Eight challenges and a question

The challenges:

- Interoperability
- Wireless security
- Defined benefit - 80 million health plans
- Infrastructure strategies - the Big Three
- Industry sharing of data
- Investment and operating capital - the California challenge
- Chronic disease monitoring - reimbursement barriers
- *Clinical devices, biotechnology and pharmaceuticals converge with IT*



Interoperability: Physician Group Use of the Internet for Core Business and Clinical Functions

- Start with information technology:

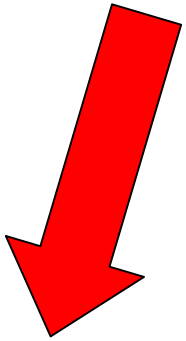
  will physicians continue to resist Internet applications?

- Challenge myths - look for:

  critical issues in forecasting

  strategic levers to speed adoption

- Research key questions, disseminate broadly



SURVEY: Medical Group Use of the Internet

by the Health Technology Center, Institute for the Future, PWC

fielded by Harris Interactive - March 2001

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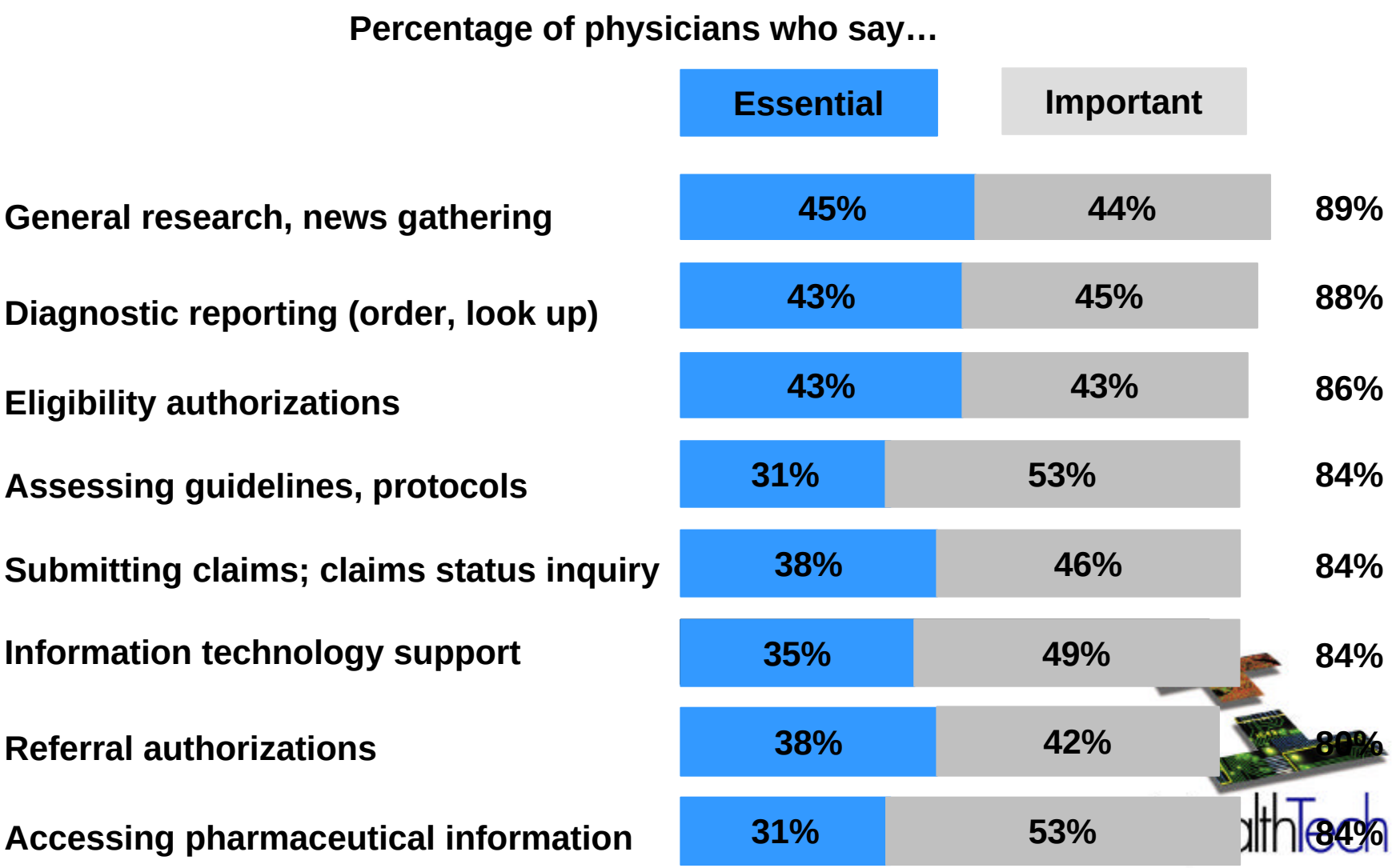
30% use at least one Internet-enabled application for core business and clinical functions

General medical research and news	71%
Access guidelines or protocols	50%
Submitting claims and claims status inquiry	35%
Diagnostic reporting (order or lookup data)	34%
Access pharmaceutical information	34%
Information technology support	31%
Communicate with patients (by email)	29%
Eligibility authorizations	29%
Purchase medical products	29%
Referral authorization	24%
Receive payments, earned remittance	21%
Electronic medical records	19%
Data analysis	18%
Document patient encounters	10%
Order and verify prescriptions	7%

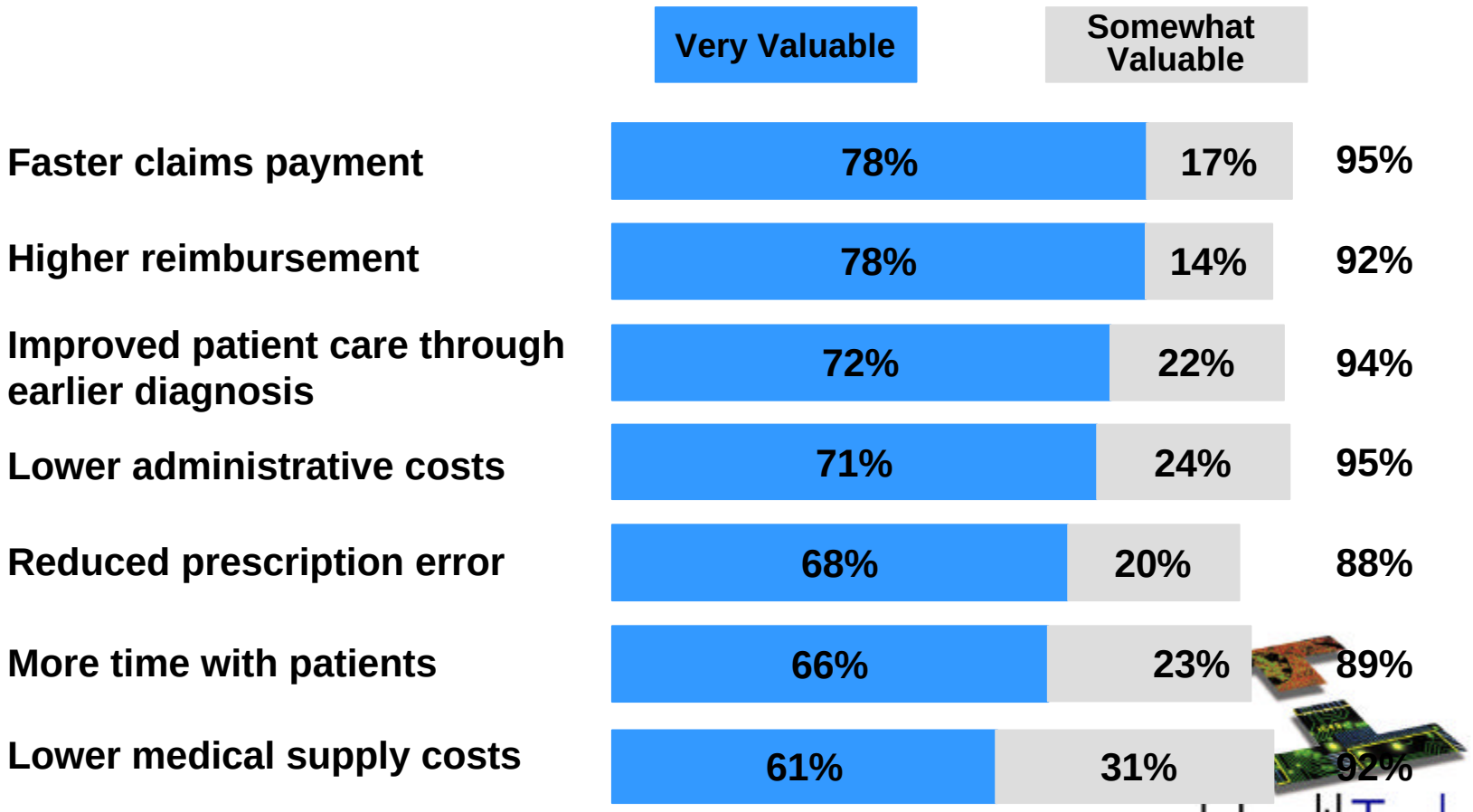
n = 215

Over 80% agreed Internet applications were essential or important



Value of Internet-enabled services

Percentage of physicians who say…



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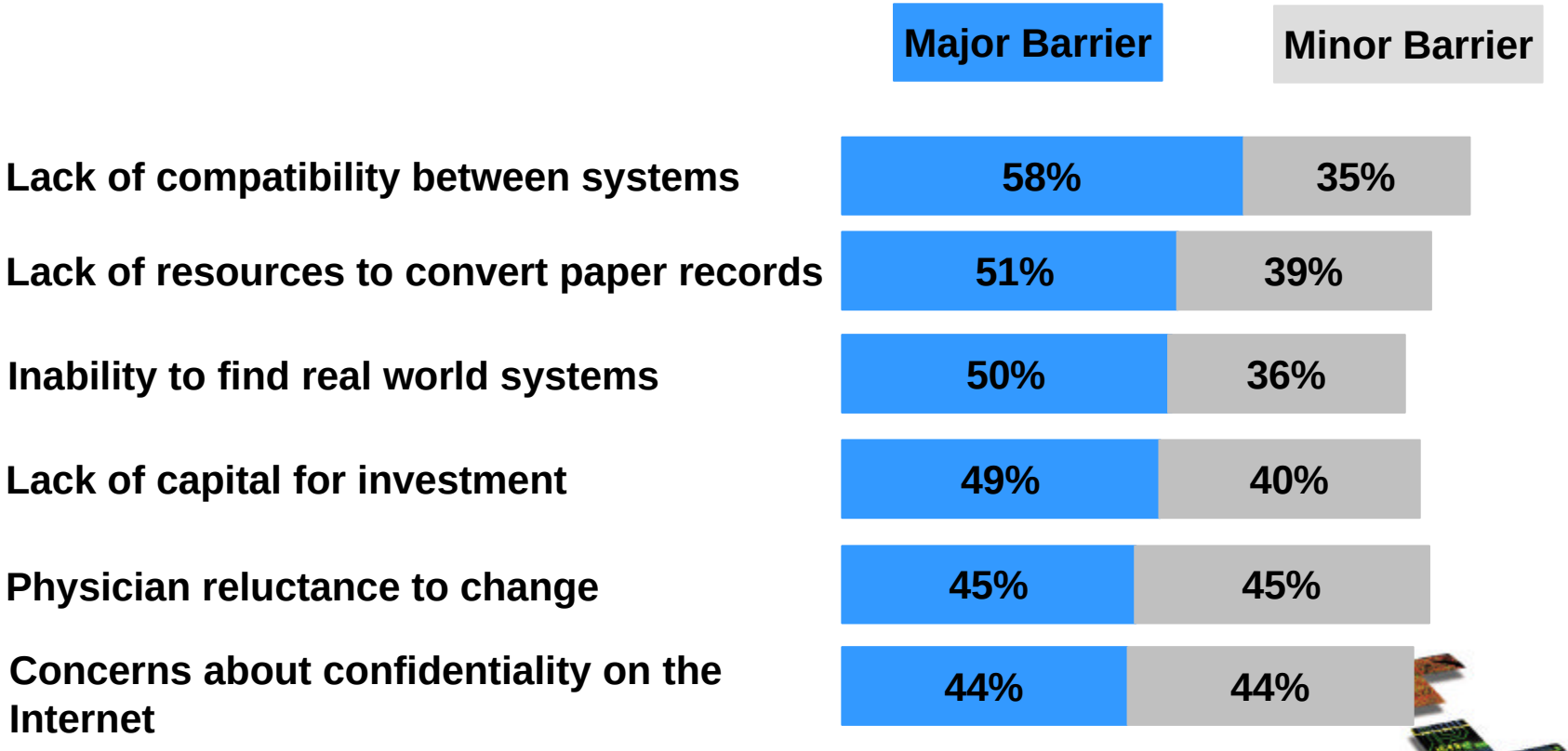
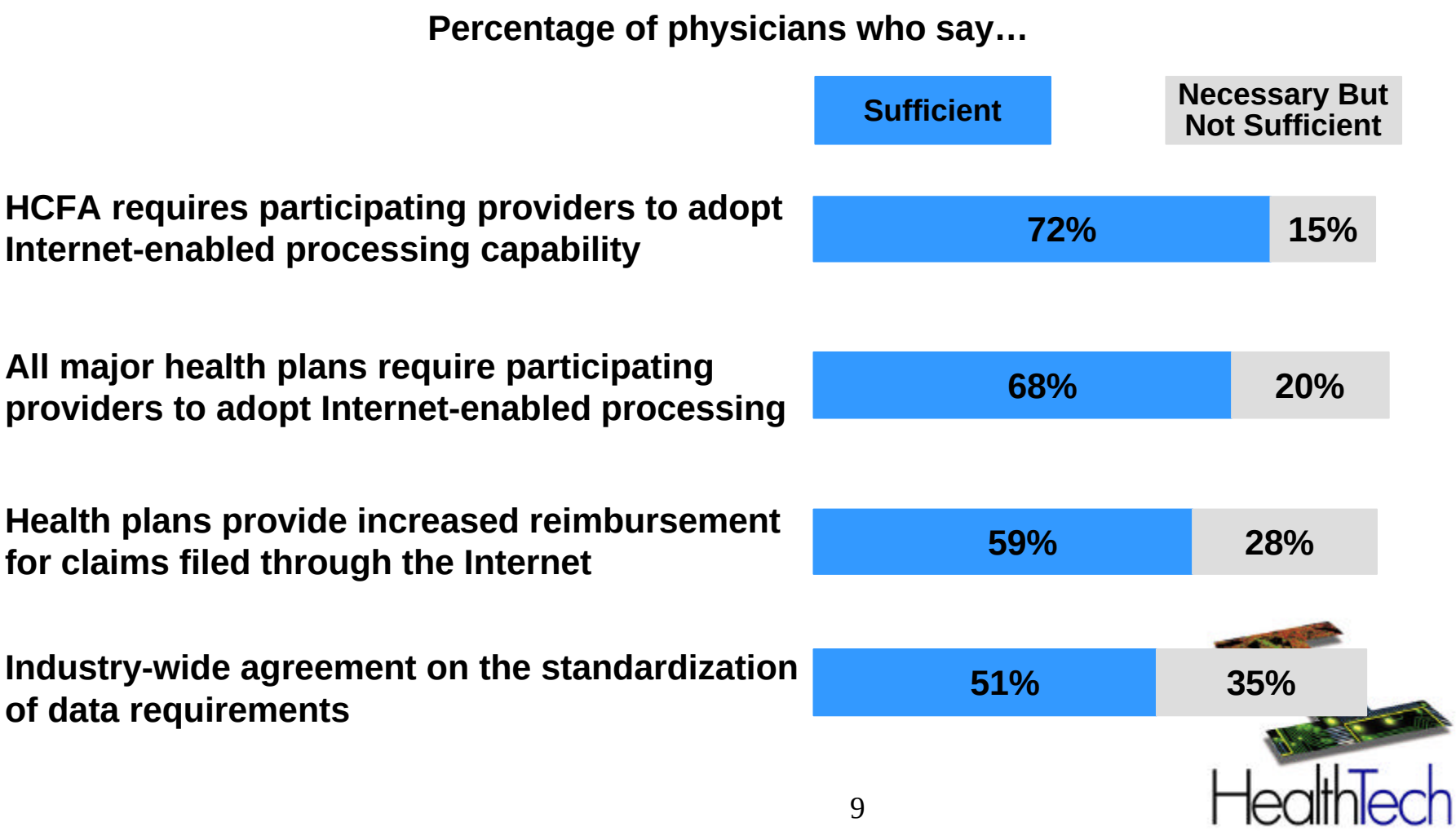
Physicians identified six barriers to broad-scale adoption of internet services

Percentage of physicians who say…



Action by HCFA and major health plans would trigger rapid adoption



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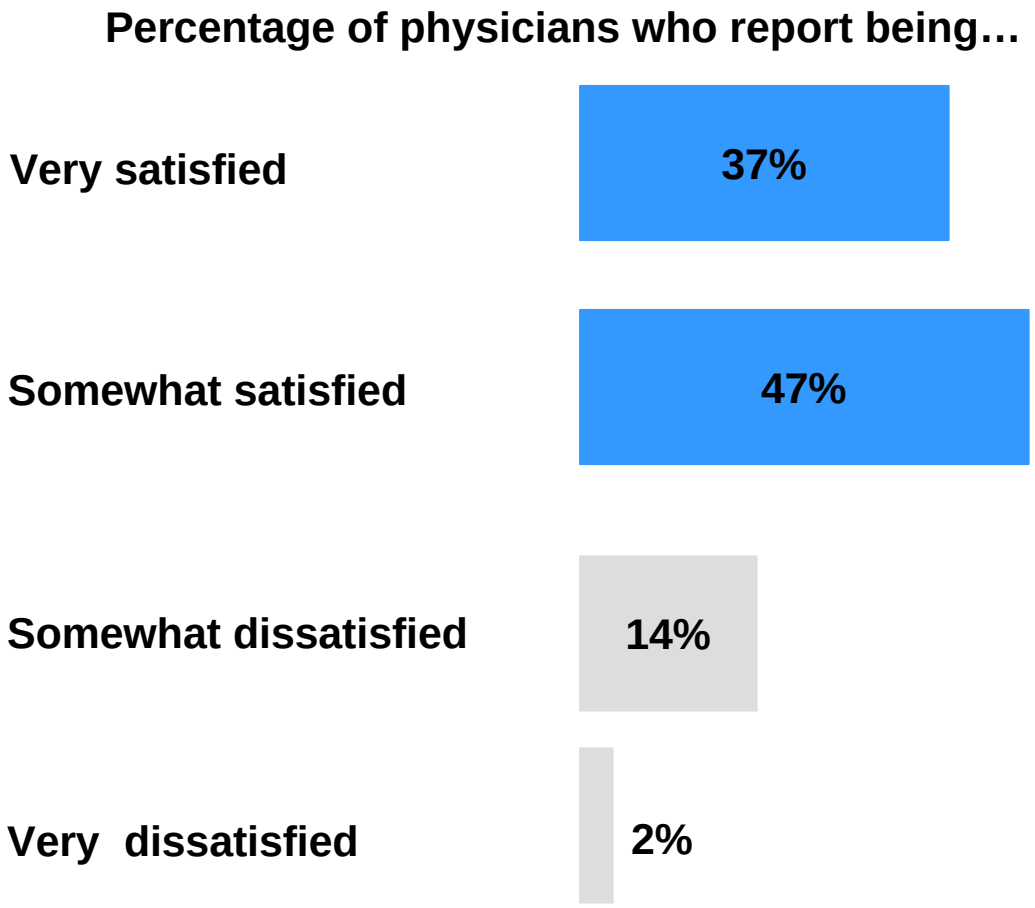
85% of surveyed physicians are satisfied with their current practice organization



Productivity and the e-Physician

	Dr. Old	Dr. New
Visits	27	6
Time	10”	30”
E-mail Time	0	4 hours
E-mail Contacts	0	40
Pts/Day	27	46
Contacts/1000	2.25	3.83

You can lead a horse to water ..

but how do we get physicians to drink?

Challenges ahead: wireless security

Patient safety will drive IT investments. Healthcare is a dispersed, fragmented sector. Wireless will be critical to effective connectivity and data sharing.

Wireless systems are subject to all the security issues of wired systems, but face separate challenges in addition:

- transmit data over open airwaves - vulnerable to interception
- easily stolen
- shared public infrastructures - currently impossible to control, ensure consistent levels of security

Three general areas of security concern:

- message privacy – ensure data secure during transit, usually with cryptography
- authentication – ensure identity of all users, usually with certificates or passwords
- device security – ensure protection of data stored on mobile devices, usually with combination of password protection and data encryption

Public interest in solving these questions

- eHealth Initiative
- California Healthcare Foundation
- Markle Foundation - consumer trust
- September 11 changes the entire landscape

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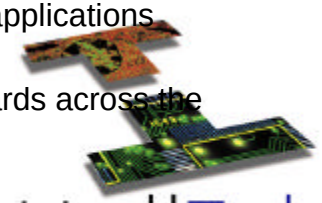
Challenges ahead:
Infrastructure strategies - the Big Three

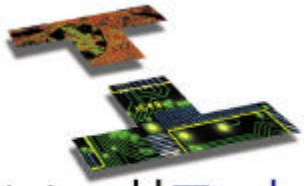
- **Closed Proprietary Network (CPN) Strategy**
  - deployment, access and use confined within a particular health care system
    - interconnected information systems connected by (LAN) and (WAN) technologies
  - use common communications system and shared resources (e.g. applications, data storage) of a single processor or server farm
  - methodology by which network devices are connected include twisted-pair wire, coaxial cables, and fiber optic cables; some networks also via radio waves

- **Public Internet II Strategy**
  - network currently evolving through work of over 180 U.S. universities w/ industry and government to
    - promote development of next generation Internet infrastructure
    - foster the development of common network tools
    - demonstrate the utility of widely deployed advanced network applications
    - significantly greater bandwidth, support for large number of concurrent users
    - Internet II - Health Science Initiative established to create and advance health applications hampered by traditional Internet technology
    - use of Internet II will require the adoption and deployment of information standards across the entire industry

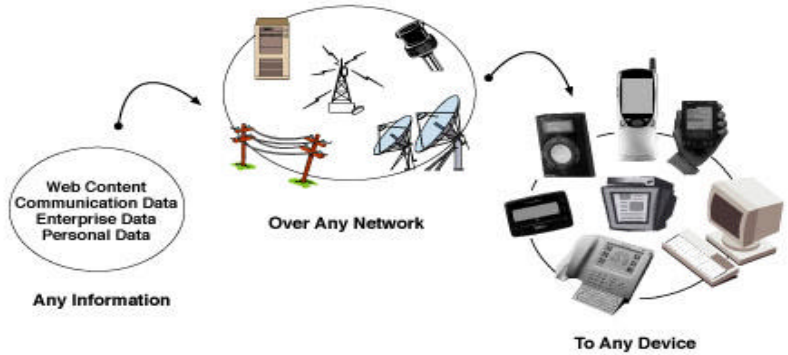


Infrastructure strategies - the Big Three

- **Utility Network Strategy**
  - building an internet-enabled web services and applications model
    - for the health care industry
    - using a private, secure network
  - like other utility models for electricity, natural gas
    - individuals and/or organizations subscribe to the utility for services
    - restrictions and/or qualifications would be required of users for healthcare
  - network utility model enables all data and files to be placed on the Net and simultaneously available to different types of devices
  - specific platforms in development to offer software and services to support enterprise integration and development
    - common interface implementation
    - interoperability among different software applications
    - built-in security and authentication measures
    - products in this area: Microsoft's Dot Net strategy, planned for release in 2002, and Sun's Java 2 Enterprise Edition (J2EE), currently available



Challenges ahead: Industry sharing of data



- ISAC model - Information Sharing and Analysis System (ISAS)
  - In January 2000, the National Coordinator for Security, Infrastructure Protection, and Counterterrorism designated the NCC-ISAC as the ISAC for telecommunications. The NCC-ISAC will **facilitate voluntary collaboration and information sharing** among its participants gathering information on vulnerabilities, threats, intrusions, and anomalies from telecommunications industry, government, and other sources. The NCC-ISAC will **analyze the data** with the goal of averting or mitigating impact upon the telecommunications infrastructure. Additionally, **data will be used to establish baseline statistics and patterns and maintained to provide a library of historical data**. Results will be sanitized and disseminated in accordance with sharing agreements established for that purpose by the NCC-ISAC participants.
  - financial services, energy exist
  - healthcare extension?
- eHealth Initiative (www.ehealthinitiative.org)
  - Memorandum of Agreement with CDC, November 2001
  - bridges and patches to link healthcare systems to public health infrastructure
  - collect close to real time information, pool and mine
- Patient Safety Institute
  - provider level data sharing

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Challenges ahead:
Chronic disease monitoring - reimbursement ?

- California has clearly been the pioneer
  - chronic disease monitoring
    - devices: HealthHero, Alere
    - management: LifeMasters
  - new treatment modalities
    - Glucowatch
    - Inhale
- Similar to other forms of quality improvement - not yet a business case
  - CMS interest in framework for reimbursement
  - Alere pilot in rural states
- Extensive telemedicine infrastructure in California

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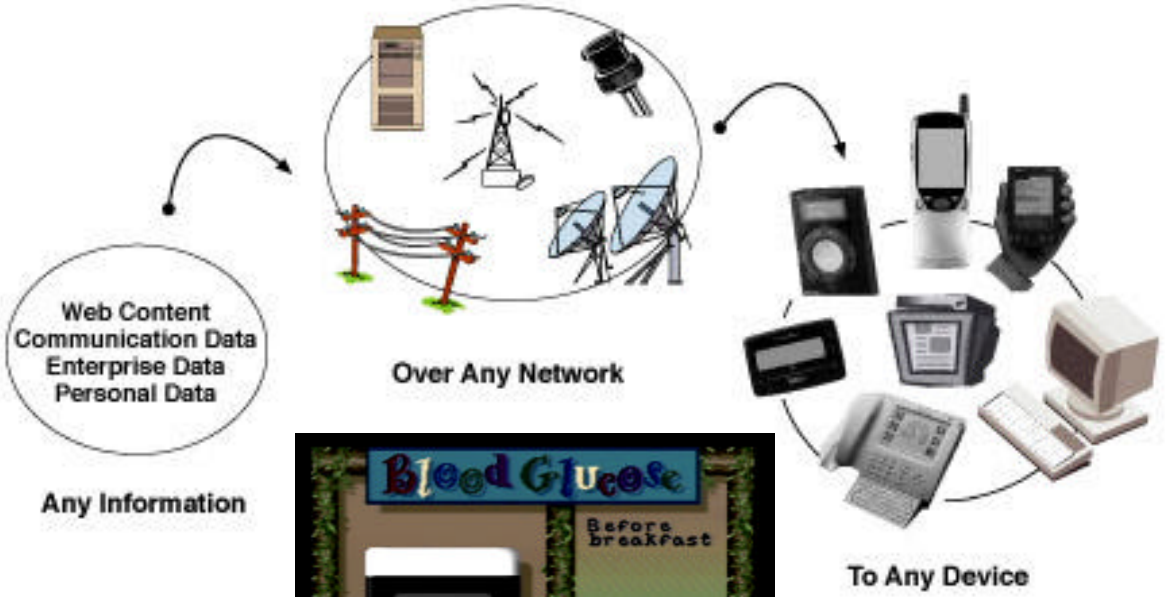
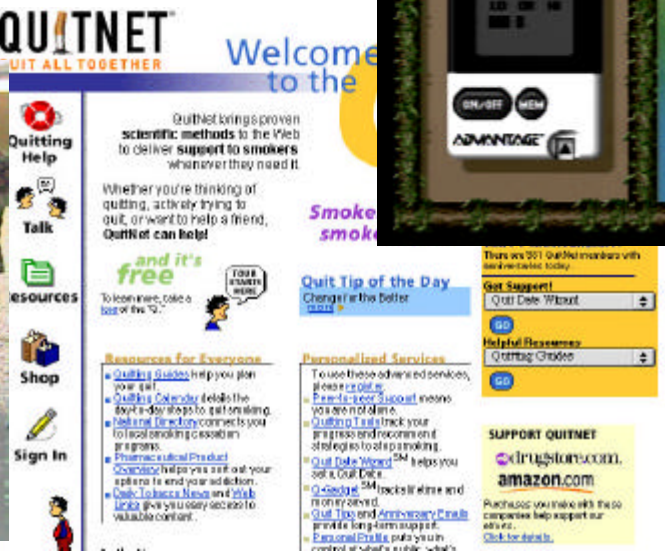
Examples of the challenges ahead ...

- Inhaled insulin
- Genetic testing
- Sensors
- ICU in a gurney
- Hepatic dialysis
- Ubiquitous LVAD





Challenges ahead: Clinical devices, biotechnology and pharmaceuticals *converge with IT*

Organ Assistance and Substitution

- In the next two to five years, the novel organ assistance and substitution devices most likely to be developed and reach the market include
  - bioartificial liver assist devices that utilize live hepatocytes
  - an artificial lung known as an intravenous membrane oxygenator (IMO) that will perform short-term rescue in patients with acute respiratory distress (Hattler Respiratory Catheter)
  - an artificial retina that will restore limited sight in blind patients with retinal diseases
  - implantable, closed-loop artificial pancreas systems

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Table II-1:
Targeted Clinical Conditions: OAS Technologies

Category	Diseases/Conditions
Artificial Retina	Retinitis Pigmentosa (RP) Age-related Macular Degeneration (AMR)
Bioartificial Liver	Acute and Chronic Liver Failure - Hepatitis - Alcoholic Liver Disease - Toxins
Bioartificial Kidney	Acute and Chronic Renal Failure - Diabetes - High Blood Pressure - Glomerulonephritis
Total Artificial Heart/ Ventricular Assist Device	Acute and Chronic Heart Failure - Congestive Heart Failure (CHF) - Coronary Heart Disease (CHD)
Artificial Lung	Acute and Chronic Pulmonary Failure - Chronic Obstructive Pulmonary Disease (COPD); primary causes are chronic bronchitis and emphysema - Cystic Fibrosis - Primary Pulmonary Hypertension
Artificial Pancreas	Diabetes Mellitus - Type I - Type II - Gestational Diabetes
Artificial Bowel Sphincter	Severe Fecal Incontinence

OAS - Forecasts

- Monitoring of patients with OAS devices will be a central component of their care
  - built-in data capture and transmittal
  - clinical centers implanting or using the devices will support these functions, monitoring
    - functioning of the device
    - clinical status of the patients
- In next 3-5 years, Internet transmission of monitoring data will become common, but remote control or adjustment of devices will be unlikely because of concerns about reliability and the push by developers for self-regulatory devices
- In 5-8 years, wireless data transmission will become more practical as privacy and confidentiality are resolved

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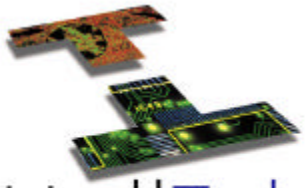
Sensors for Monitoring - Forecasts

- In the next 2-5 years, sensors for monitoring will affect
  - diabetes
  - congestive heart failure
  - asthma
  - COPD
  - sleep disorders
- Smart Sensors - continuously monitor a value (signal) and initiate a therapeutic response
  - closed-loop insulin pumps
  - heart monitor to activate drug release in CHF
  - cardiac pacemaker to regulate heart using real-time pressure and oxygen saturation readings from multiple sites in the body

Sensors - Applications

- Biometric Monitoring - continuous measurement of biometric indicators with implantable or noninvasive devices
  - portable bed unit with integrated sensors capable of ICU monitoring functions
  - clothing embedded with sensors
  - wristwatch-like devices
- Point-of-Care Testing - analytical testing at the site of care
  - continuous readings of blood gases, chemistries, lactate in trauma victims
- Environmental Monitoring - screening for pathogens in various care settings
  - biosensors to detect the presence of pathogens
  - automatic detectors of airborne bacteria within ventilation systems
  - hand-held biosensors identifying pathogens carried by health workers or visitors



Sensors - Quality Issues

- Sensors for monitoring in chronic disease - physician resistance
- Vital sign monitoring devices - implanted and noninvasive
  - require clinician access to data stored within the device and on a server
  - data stored within the monitoring device will require specific equipment to interrogate the device when the patient arrives for an emergency room or outpatient visit because of an acute disease-related episode
  - for patient data that have been downloaded to a server for storage and management, restricted access will prevent all clinicians from reviewing the patient's disease history
  - limited access ensures confidentiality of patient data but also acts as a barrier for the clinician in assessing treatment for an acute episode in the patient's chronic disease

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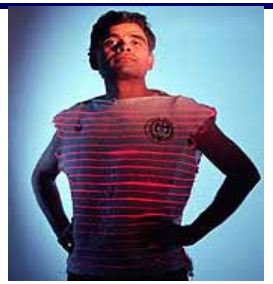
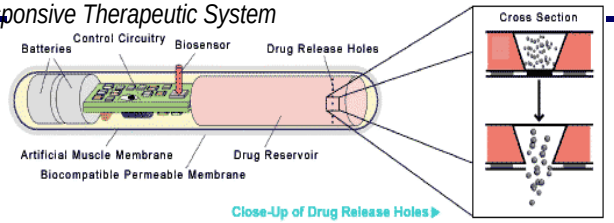
Sensors for Monitoring: Technology Timeline

Sensatex's *Smart Shirt*



Smart clothes developed

ChipRx's *Schematic of a Self-Regulating Responsive Therapeutic System*



Long-term implantable glucose monitor developed

Long-term implantable glucose monitor FDA approved

Long-term implantable glucose monitor becomes community standard

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Noninvasive continuous glucose monitor developed

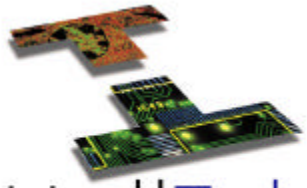
Noninvasive continuous glucose monitor FDA approved

Smart clothes become "accepted therapeutic choice"

Noninvasive continuous glucose monitor becomes community standard

Smart clothes FDA approved

Cygnus' *GlucoWatch Biographer*



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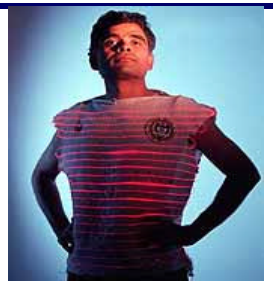

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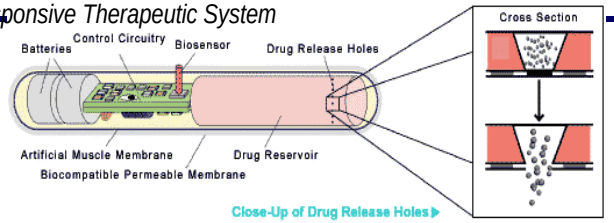

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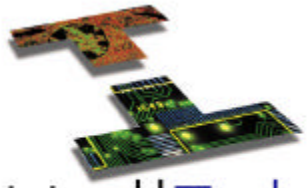

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The Perfect Storm

New HCFA quality standards
New purchaser demands

New technologies

New consumers

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The Vision

Advance the use of new technologies to make people healthier

Founding Partners:

VHA
Kaiser Permanente
Sutter Health
Premier
Wellpoint Health Networks
Group Health of Puget Sound
Providence Health System
PeaceHealth System

Mills Peninsula Health System
Institute for the Future
Milbank Fund
ECRI
CareScience
Ascension Health
TCE/CAPH
HRET (AHA)

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Will health systems lead?

- It's not the technology, stupid
  - but having a bead on the future helps
- It's the culture
  - leadership
  - collaboration
  - focus on the patient and the consumer
  - real improvement
    - measureable
    - palpable
- Leading systems search for innovation, big ideas, futurism
  - execution is everything
  - systems capacity for leadership and execution - where will we find it?
    - Health plans
    - Large delivery systems

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