How Soon Will Physicians Be Wired?

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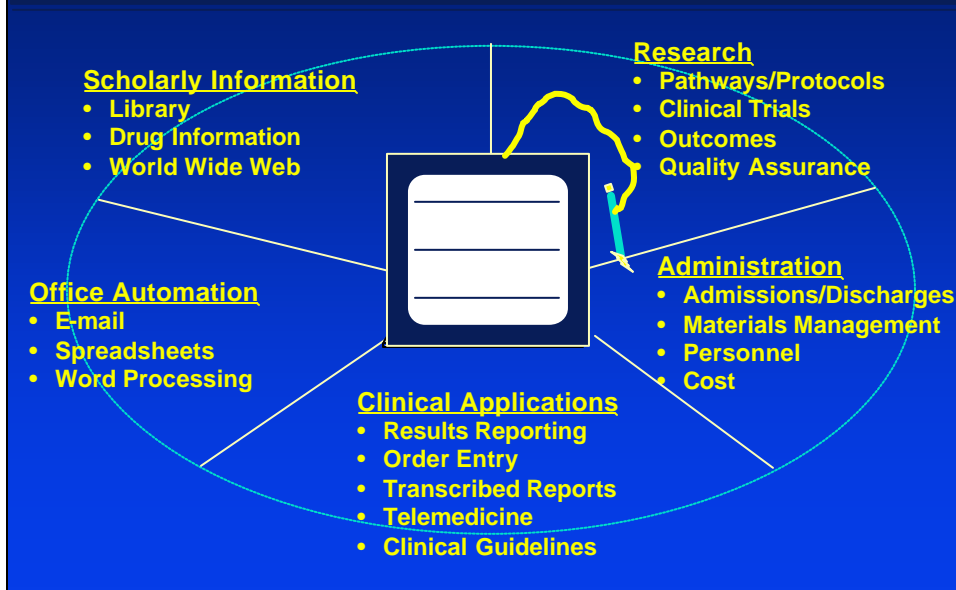**Columbia University**

Symposium on E-Healthcare Strategies
Sheraton Bal Harbour Beach Resort
Miami Beach, Florida
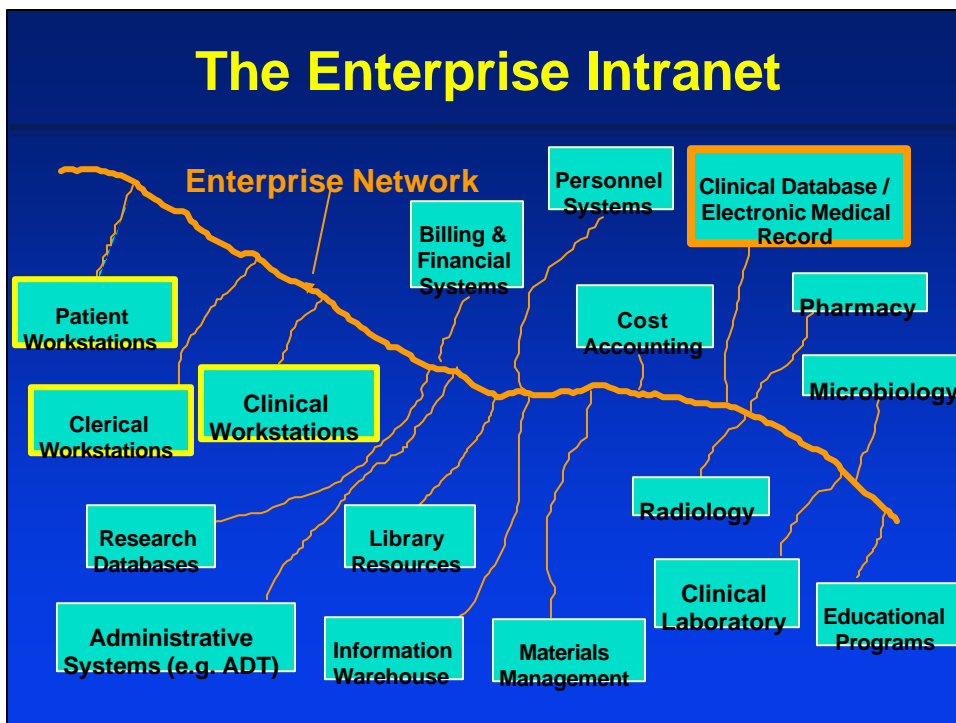**February 27, 2001**

Personal Experience

- **Academic pursuit of research and education in medical informatics**
- **Clinical practice of general internal medicine in academic teaching setting**
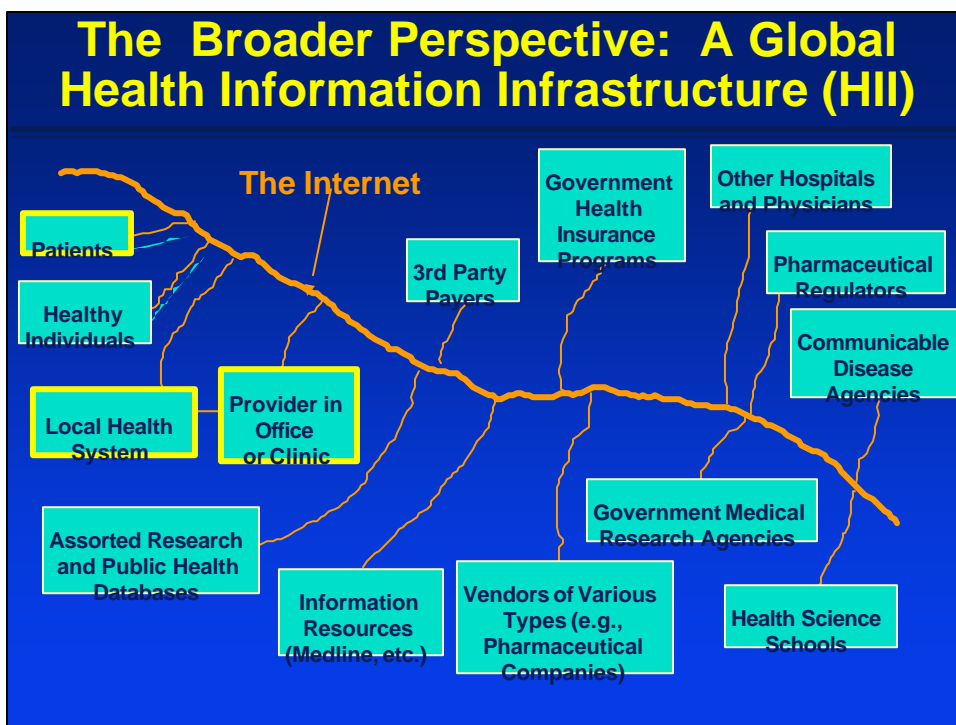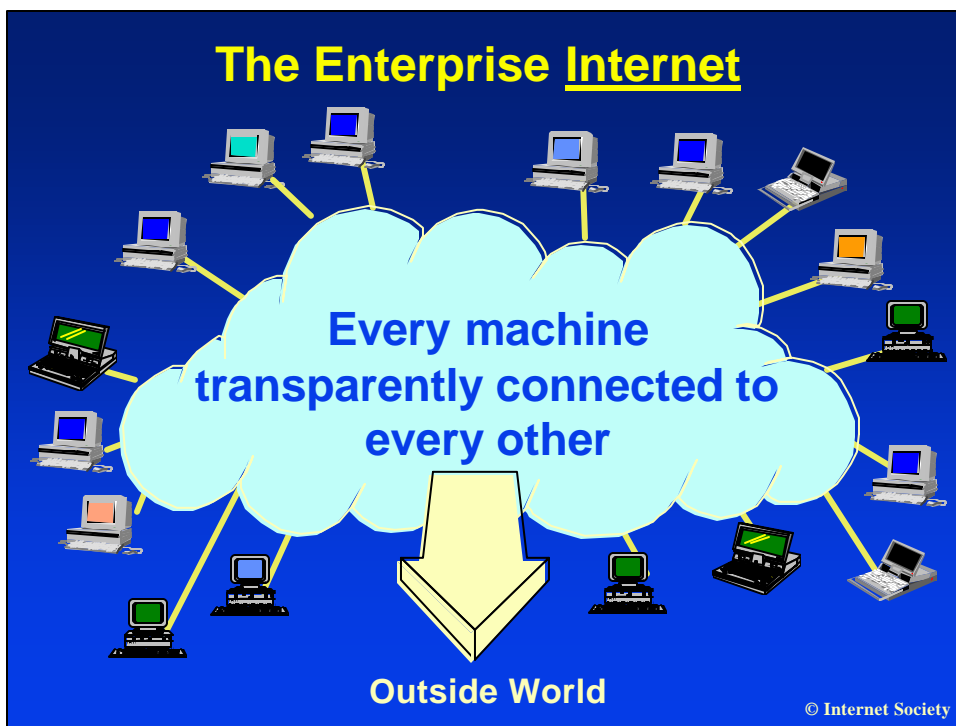- **The hard questions when I returned home after 6 hours in my clinic….**

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The Emerging Concept:
An Integrated Clinical Workstation

Scholarly Information
- Library
- Drug Information
- World Wide Web

Research
- Pathways/Protocols
- Clinical Trials
- Outcomes
- Quality Assurance

Office Automation
- E-mail
- Spreadsheets
- Word Processing

Administration
- Admissions/Discharges
- Materials Management
- Personnel
- Cost

Clinical Applications
- Results Reporting
- Order Entry
- Transcribed Reports
- Telemedicine
- Clinical Guidelines

The Enterprise Intranet

Enterprise Network

- Personnel Systems
- Clinical Database / Electronic Medical Record
- Billing & Financial Systems
- Patient Workstations
- Cost Accounting
- Pharmacy
- Clerical Workstations
- Clinical Workstations
- Microbiology
- Research Databases
- Library Resources
- Radiology
- Administrative Systems (e.g. ADT)
- Information Warehouse
- Materials Management
- Clinical Laboratory
- Educational Programs

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The Enterprise <u>Internet</u>

Every machine transparently connected to every other

Outside World

© Internet Society

The Broader Perspective: A Global Health Information Infrastructure (HII)

The Internet

Patients

Healthy Individuals

Local Health System

Provider in Office or Clinic

3rd Party Payers

Government Health Insurance Programs

Other Hospitals and Physicians

Pharmaceutical Regulators

Communicable Disease Agencies

Assorted Research and Public Health Databases

Information Resources (Medline, etc.)

Vendors of Various Types (e.g., Pharmaceutical Companies)

Government Medical Research Agencies

Health Science Schools

National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

National Research Council

Computer Science and Telecommunications Board

David D. Clark, Chairman
Marjory S. Blumenthal, Executive Director

http://www.cstb.org

Study Objectives

- **Define the _technical capabilities_ the Internet must provide to support health applications**

- **Identify likely health care _applications_ of the Internet and their demands for bandwidth, quality of service, security, access, etc**

- **Recommend an appropriate _strategy_ for implementing these capabilities in the Internet and Next Generation Internet**

- **Distinguish capabilities that are _unique to health_ applications from those more generally demanded of the Internet**

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Some Definitions

- *Bandwidth*: rate of transmission through a network
- *Latency*: time required to transmit data across the network (delay between time when a message is sent and received)
- *Availability*: "up time" of the network, including its individual links and services
- *Security*: composed of availability, confidentiality, and integrity considerations; ability to keep data from being maliciously or inadvertently lost or altered
- *Ubiquity*: a metric for the number and kinds of end users that a network can interconnect

Health Applications of the Internet

- **Healthcare may not be unique, BUT**
  - **Perhaps a unique set of complexities**
  - **Rapid changes in topology of organization**
- **Six major application areas identified:**
  - **Consumer Health**
  - **Clinical Care**
  - **Administrative and Financial Transactions**
  - **Public Health**
  - **Professional Education**
  - **Biomedical Research**

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Technical Needs Demanded by Health Applications of the Internet

Application Area	Bandwidth	Latency	Reliability	Security	Ubiquity
Consumer Health	++	+	++	++++	++++
Clinical Care	++++	+++	++++	++++	++
Health care financing	+	+	+++	++++	++
Public Health	+	+	+++	+++	++
Health education	+++	++	++	+	+++
Biomedical research	++++	+++	++	++	++

NOTE: Plus signs (+) denote the relative importance of the technical feature within the application domain

The Market Won't Wait for Internet to Become "Clinical Grade"

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General Findings

- **Most current visible applications are consumer-oriented Web sites**
- **Potential of ubiquitous connectivity is great:**
    - **More informed public**
    - **Improved provider-provider and patient-provider communications**
    - **Enhanced clinical decision support**
    - **Improve health outcomes and ability to measure those outcomes**

General Findings (cont'd)

- **Health applications do not differ qualitatively in their demands for network services from e-commerce and other industries**

- **Current Internet technologies and functionality are insufficient for some health related applications, and economics are adverse**

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Technical Findings: Bandwidth

- **Medical 'data objects' vary in size by 6 orders of magnitude, and clinical bandwidth usage is 'bursty'**

- **Increasing bandwidth does not substitute for quality of service guarantees**

- **Broadband technologies that allocate bandwidth asymmetrically upstream and downstream (e.g., cable modems, DSL) are well suited for entertainment but not for real-time health applications**

- **Needed: symmetric upstream and downstream links or economical dynamically reconfigurable bandwidth ('bandwidth on demand')**

Technical Findings:
Quality Of Service (QOS)

- **Some health applications demand strong QOS guarantees**
  - **Sustained, available, end-to-end bandwidth**
  - **Low latency and jitter**
- **QOS models exist but are not widely deployed**
  - **Some ISPs offer QOS within their own network**
  - **Differentiated service and Integrated service protocols have been standardized, but not deployed**
  - **Lack of QOS is major driver of private networks**

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Technical Findings: Security

- **Security elements for health applications often exceed those of e-commerce**

  – **Personal safety can be at risk in health care -- integrity and availability requirements are high**

  – **Strong authentication and secure transmission is more important than for commerce models that incorporate fraud as a cost of business**

Organizational Issues

- **Health care is diverse and decentralized -- "trillion dollar cottage industry" with no unified voice on technology issues**
- **Paucity of reliable information on costs and benefits of Internet applications in operational settings**
- **Unknown effects of Internet on relationships between patients, providers, and healthcare organizations**
- **Unknown personnel requirements for healthcare organizations to develop and implement Internet applications**
- **New organizational policies and procedures are needed (for example, e-mail between providers and patients)**

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Public Policy Issues

- **Nontechnical factors impede innovation**
  - **State-based licensure and malpractice liability**
  - **Lack of robust payment mechanisms**
  - **Lack of implemented federal regulations on privacy and security**
  - **Protection of intellectual property**
- **Access disparities need to be addressed**
  - **The Digital Divide amplifies health care inequities**
  - **Near-term remedies -- schools, libraries, kiosks -- ill suited to health needs**

Recommendations of the Report

- **Technical capabilities**

- **Demonstrations and evaluations**

- **Educational measures**

- **Policy issues**

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Policy Issues

- **The Department of Health and Human Services should more aggressively address the broad set of policy issues that influence the development, deployment, and adoption of Internet-based applications in the health sector**
  - **Provide strategic leadership for Internet-related efforts**
  - **Convene public/private bodies on Internet and health**
  - **Explore cross-cutting issues affecting agencies**
  - **Encourage information sharing among agencies**
  - **Advance the national debate on IT issues in health**
  - **Create organizational structures to ensure that policy issues are addressed**

"Networking Health: Prescriptions for the Internet"

- **Full report, with recommendations, was released by the National Academies of Science on February 23, 2000**

- **You may full information regarding the final report from the CSTB web site:**
  http://www.cstb.org/

- **Full report, in book format, is available from the National Academies Press:**
  http://www.nap.edu/catalog/9750.html

Panel on Transforming Health Care

Final Report

President's Information Technology Advisory Committee (PITAC)

http://www.itrd.gov/ac

February 8, 2001
Sherrilynne Fuller, Co-Chair
Edward H. Shortliffe, Co-Chair

Overall Goal

- **Develop an IT research strategy and rationale to enable the "Transforming the Practice of Health Care" vision of the PITAC February 1999 report**

- **Inspired by the vision statement in the 1999 report (see web site for text of report)**

Summary of Meetings

- **Briefings and conference calls with individuals from:**
  - National Library of Medicine
  - Agency for Healthcare Research and Quality
  - National Cancer Institute
  - National Institutes of Health
  - National Center for Research Resources
  - Food and Drug Administration
  - National Science Foundation
  - Centers for Disease Control
  - National Center for Health Statistics
  - Office of the Assistant Secretary for Planning and Evaluation (DHHS)
  - Office of the Secretary of HHS

Context for the Report

- **One goal of our Nation should be a healthy population – this is key to attaining other important national goals such as quality of life, a sound economy, and national security. IT can play a crucial role in achieving these goals economically and efficiently.**

- **Biological research in the new century is an information creation, management, and analysis task. The mandatory role for IT in biomedicine is now unquestioned.**

- **IT can also help provide better feedback loops for connecting providers, policymakers, and patients with late-breaking research and discussions about clinical decision-making policy.**

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Findings

- **The U.S. lacks a broadly disseminated and accepted national vision for information technology in health care.**

- **Critical, long-term research, technology, and policy issues need to be addressed if we are to realize the potential of information technology to improve the practice of health care.**

- **The introduction of integrated decision-support systems that can proactively foster best practices requires enhanced information-technology methods and tools.**

Findings

- **Achieving the potential of information technology to improve health care will be constrained until we develop a larger cadre of researchers and practitioners who operate at the nexus of health and computing/communications.**

- **The biomedical community, including the Federal research agencies, has tended to rely on information technology innovations that are produced by investments in other parts of Government.**

- **The role and management of information technology in the Department of Health and Human Services has several limitations, which must be addressed if the health care community is to benefit from the promise of the information age.**

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Recommendations

- **Establish pilot projects and Enabling Technology Centers to extend practical uses of information technology to health care systems and biomedical research.**

- **Provide a scalable national computing infrastructure to support the biomedical research community that includes the biomedical-computing equivalent of DOE's Accelerated Strategic Computing Initiative (ASCI) program.**

- **Congress should enact legislation that assures sound practices for managing personally identifiable health information of any kind.**

Recommendations

- **Establish programs to increase the pool of biomedical research and health care professionals with training at the intersection of health and information technology.**

- **DHHS should outline its vision for using information technology to improve health care in this country and subsequently devote the necessary resources to do the basic information technology research critical to accomplishing these goals in the long term.**

- **DHHS should appoint a senior information technology leader to provide strategic leadership across DHHS and focus on the importance of information technology in addressing pressing problems in health care.**