Chapter 5

Medical Technology

Delivering Health Care in America
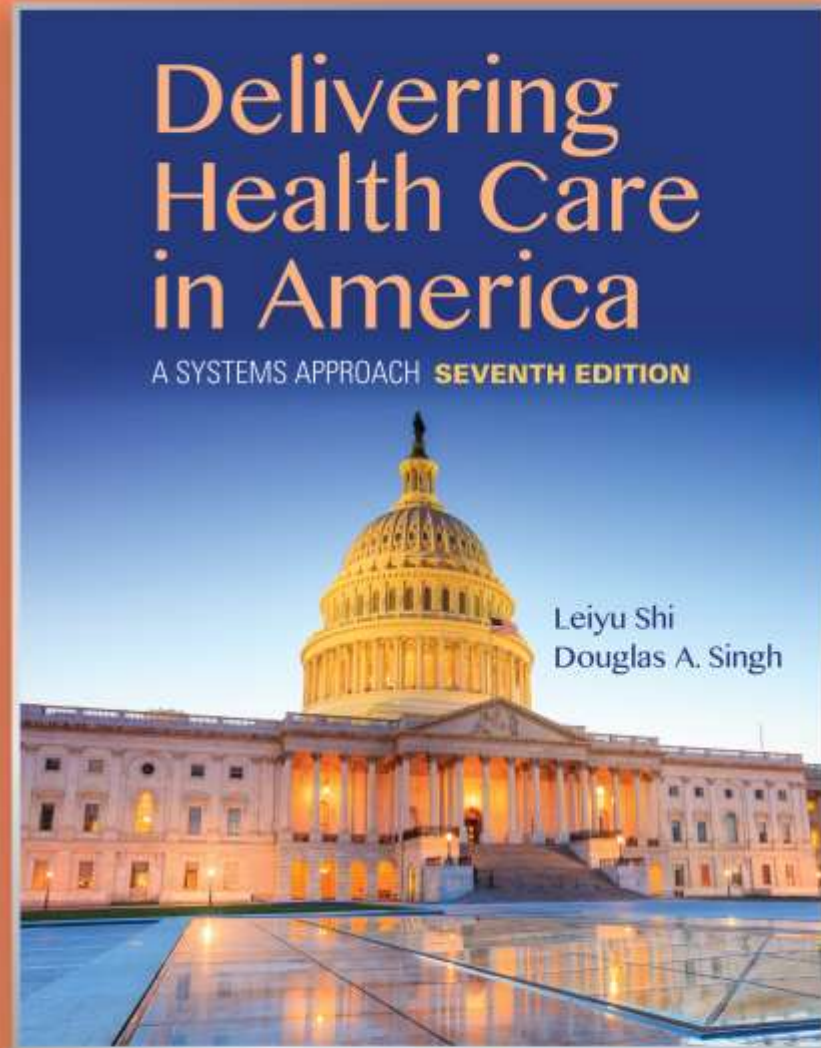
A SYSTEMS APPROACH **SEVENTH EDITION**

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Learning Objectives
(1 of 2)

- Role of medical technology in health care delivery

- Growing applications of information technology and informatics

- Aspects of telemedicine and telehealth

- Factors driving innovation, dissemination, and utilization of technology

Learning Objectives

- Government's role in technology diffusion

- Domestic and global impact of technology

- Directions of health technology assessment

- Status of medical technology under health care reform

Introduction

- Technology has been a blessing.
  - Reduction in complications and disability
  - Increased longevity
- Technology imposes a cost burden on society.
- Costly research is necessary.

Changes Triggered By Technology

- Raised consumer expectations.
- Changed the organization of medical services.
- Driven scope and content of medical training.
- Influenced status of various medical workers.
- Technology assessment is a growing activity.
- Raised complex social and ethical concerns.

What Is Medical Technology?

- Application of scientific knowledge to improve health and efficiencies
- Medical science benefited from developments
  - Chemistry, physics, engineering, and pharmacology

What Is Medical Technology?

- Nanomedicine is in its infancy.

- Nanotechnology manipulates materials on the atomic and molecular level.

Information Technology and Informatics

- Information technology
  – Transformation of data into useful information
- Three categories of IT applications
  – Clinical information systems
  – Administrative information systems
  – Decision support systems

- Health informatics
  - Application of information science
  - Improves efficiency, accuracy, and reliability
  - Requires the use of IT

Electronic Health Records and Systems

- Four components of an EHR system

    1. Collection and storage of health information on patients over time

    2. Immediate electronic access to person- and population-level information

    3. Availability of knowledge and decision support

    4. Support of efficient processes for health care delivery

Electronic Health Records and Systems

- Benefits and drawbacks of EHRs

- EHRs and quality of care

- Interoperability

- Health information organizations

- Adoption of EHRs

- Financial incentives under the HITECH Act

- Confidentiality under the HIPAA Law

- Smart card technology

Internet, E-Health, M-Health, and E-Therapy

- The Internet is often the first source of information a patient consults.

- Patients satisfied with their physicians rely less on the Internet.

- E-Health

- M-Health

- E-Therapy

- Virtual physician visits

Telemedicine, Telehealth, and Remote Monitoring

- Telemedicine versus telehealth
  - Telemedicine or distance medicine
    - Telecommunications technology for diagnosis and patient care when separated
  - Telehealth involves a variety of caregivers
- Characteristics of telemedicine
  - Synchronous or asynchronous
- Tele-ICU

Factors That Drive Innovation and Diffusion

- Anthro-cultural beliefs and values
- Medical specialization
- Financing and payment
- Technology-driven competition
- Expenditures on research and development
- Supply-side controls
- Government policy

Government's Role in Technology Diffusion

- Regulation of drugs, devices, and biologics
  - Regulation of drugs and evolution of the approval Processes
  - Drugs from overseas
  - Securing the supply chain
  - Regulation of medical devices and equipment
  - Regulation of biologics

Government's Role in Technology Diffusion

- Certificate of need
  - CON laws required hospitals to seek approval before acquiring major equipment or projects.

- Research on technology
  - AHRQ technology assessments are available to medical practitioners, consumers, and others.

- Funding for research
  - National Institutes of Health (NIH)

Impact of Medical Technology

- Impact on quality of care

- Impact on quality of life

- Impact on health care costs
  - Three main cost drivers of medical technology
    1. Acquiring the new technology and equipment
    2. Trained physicians and technicians to operate the equipment
    3. Special housing and setting requirements

Impact of Medical Technology

- Impact on access
  - Mobile equipment can improve geographic access.
- Impact on the structure and processes of health care delivery
- Impact on global medical practice
- Impact on bioethics
  - Technological change raises ethical and moral issues.

Assessment of Medical Technology

- Technology assessment or health technology assessment (HTA)

  - Examining and reporting properties of a medical technology used in health care

- Efficacy

- Safety

- Cost-effectiveness

- Cost-benefit

Assessment of Medical Technology

- Cost-effectiveness
- Four assumptions of a cost-benefit analysis
  - Problem or condition can be diagnosed.
  - Problem can be controlled or eradicated.
  - Benefit or outcome is assigned a dollar value.
  - Cost of intervention is determined in dollars.
- Quality-adjusted life year (QALY)

Directions and Issues in Health Technology Assessment

- Private-sector initiatives
- Need for coordinated effort
- Need for standardization
- Balance between clinical efficacy and economic worth

Seven Ethical Clinical Research Requirements

- Social or scientific value improving health or knowledge

- Scientifically valid and methodologically rigorous

- Fair selection of subjects in clinical trials

- Benefits and knowledge gained outweigh risks

- Independent review of methods and findings

- Informed, voluntary consent obtained

- Subjects' privacy protected, able to withdraw, and well-being maintained

Health Care Reform and Medical Technology

- ACA imposed a 2.3% excise tax on the sale of certain medical devices.

- Allowed FDA to approve "biosimilars."

- Developers of an original reference product are protected by law.

  - No biosimilar license can be granted until the reference product is licensed for 12 years.

Summary

- Medical technology has produced many benefits.

- Medical technology has increased longevity and decreased mortality around the world.

- Development and diffusion of technology are closely intertwined with its utilization.

- Health technology assessment has been focused on safety and efficacy.