

Technology Disrupting Healthcare Delivery

What Clinicians Need to Know

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More Patients Per
Provider:

ACA

Fewer Primary
Care Providers

Aging Population

Increased Services:
Greater Complexity
Opportunity
Liability
Patient Preference

Defined by:

Rules/Regulations/
Reimbursement
Patient / Provider
Communication
Legacy Technology
Provider Comfort
Competing Needs

FACTORS FOSTERING DISRUPTION
CURRENT HEALTHCARE SYSTEM

DISRUPTION:
**INDUSTRIAL
REVOLUTION:
SHIFTS IN
ECONOMY
AND
LABOR**

**1st Industrial Revolution
(IR):** water and steam
power to mechanize
production.

4th IR: Fusion of technologies
blurring the lines between
the physical, digital, and
biological spheres.

2nd IR: electric power to
create mass production.

3rd IR: electronics and
information technology to
automate production.

SIGNIFICANCE TO
HEALTHCARE:

BULLET TRAIN SPEED
TECHNOLOGICAL
EXPANSION
INFLUENCING
HEALTHCARE DELIVERY
AND SYSTEMS.

DRIVEN BY
INCREASING
AVAILABILITY &
INTERACTION

WITH EXTRAORDINARY
TECHNOLOGIES

ONGOING
SYSTEMS
TRANSFORMATION

DISRUPTIVE CHANGE FOR HEALTHCARE
THE 4TH INDUSTRIAL REVOLUTION

Quadruple Aim



Shifts
Desired
Endpoints

DISRUPTION
HEALTH
SYSTEMS
DELIVERY:
COMPETITION
OR
PARTNER?

- **Apple, Microsoft, Samsung and Google**
 - **Products**
 - **patient wearables**
 - **healthcare products**
 - **homecare medical devices**
 - **Marketing opportunity**
 - **analytics capabilities**
 - **collection of individual personal data**
 - **capturing population health data**



GOALS FOR HEALTHCARE TECHNOLOGY



Clinicians and Researchers need to know...

Healthcare Informatics Learned in Early Education (Undergraduate)

- Basic data management
- eHealth
- Patient personal technologies
- Telehealth

4th IR Care requires knowledge and use of modern health information technology (Graduate)

- Furthering Science
- Patient Centered Care
- Efficiency/Systems Improvement
- Safety/Ethics
- Return on Investment

HEALTHCARE INFORMATICS

DNP COMPETENCIES

- 1 **Scientific Underpinnings for Practice**
- 2 **Organizational and Systems Leadership** for Quality Improvement
- 3 **Clinical Scholarship and Analytical Methods** for Evidence-Based Practice
- 4 **Information Systems/Technology and Patient Care Technology** for the Improvement and Transformation of Health Care
- 5 **Health Care Policy** for Advocacy in Health Care
- 6 **Inter-Professional Collaboration** for Improving Patient and Population Health Outcomes
- 7 **Clinical Prevention and Population Health** for Improving the Nation's Health
- 8 **Advanced Nursing Practice**

Augmented Reality

Virtual Reality

Robotics

**Artificial Intelligence/
Deep Learning**

3D Printing

Tissue Engineering

**Gene Editing
Next Generation Sequencing**

Portable Diagnostics

Natural Language Processing

Cybersecurity

Advanced M-Health

**Predictive Analytics/
Big Data**

Nutrigenomics

Chatbots

Digital Tattoos

T-Apps

Blockchain

**DISRUPTING HEALTHCARE
EXPLODING INFORMATICS OPPORTUNITIES**

TOP STRATEGIES
EMERGING
“VIRTUAL”
PRACTITIONERS
AND
RESEARCHERS



ADVANCED MOBILE HEALTH

- Estimated **260,000** Healthcare Mobile Apps

- **Practitioner**

- Evidence Based References
- Clinical Decision Support
- Digital Tools

- **Patient**

- Patient/Provider Communication
- Patient Trackers/Generated Data
- Self Care Management

- **Researcher**

- Population Health Solutions
- Big Data Analytics
- Disease Prediction/Treatment

- **Administrator**

- Financials
- Organizational Planning
- Security

Systems Redesign

- Predictive
- Realtime

Precision Health

- Disease
- Individual Patient

Patient Level Data

- Interoperability
- Patient Generated Data-
 - Automated
 - Self care management
- Genomic Sequencing

Data Systems Interoperability

- Smart on FHIR
- Blockchain
- Accessible
- Actionable

DATA ANALYTICS

HEALTHCARE ANALYTICS /BIG DATA

Big Data 3Vs

- High volume
- High velocity
- Highly Variable

Diagnostics

**Preventative
Medicine**

**Precision
Medicine**

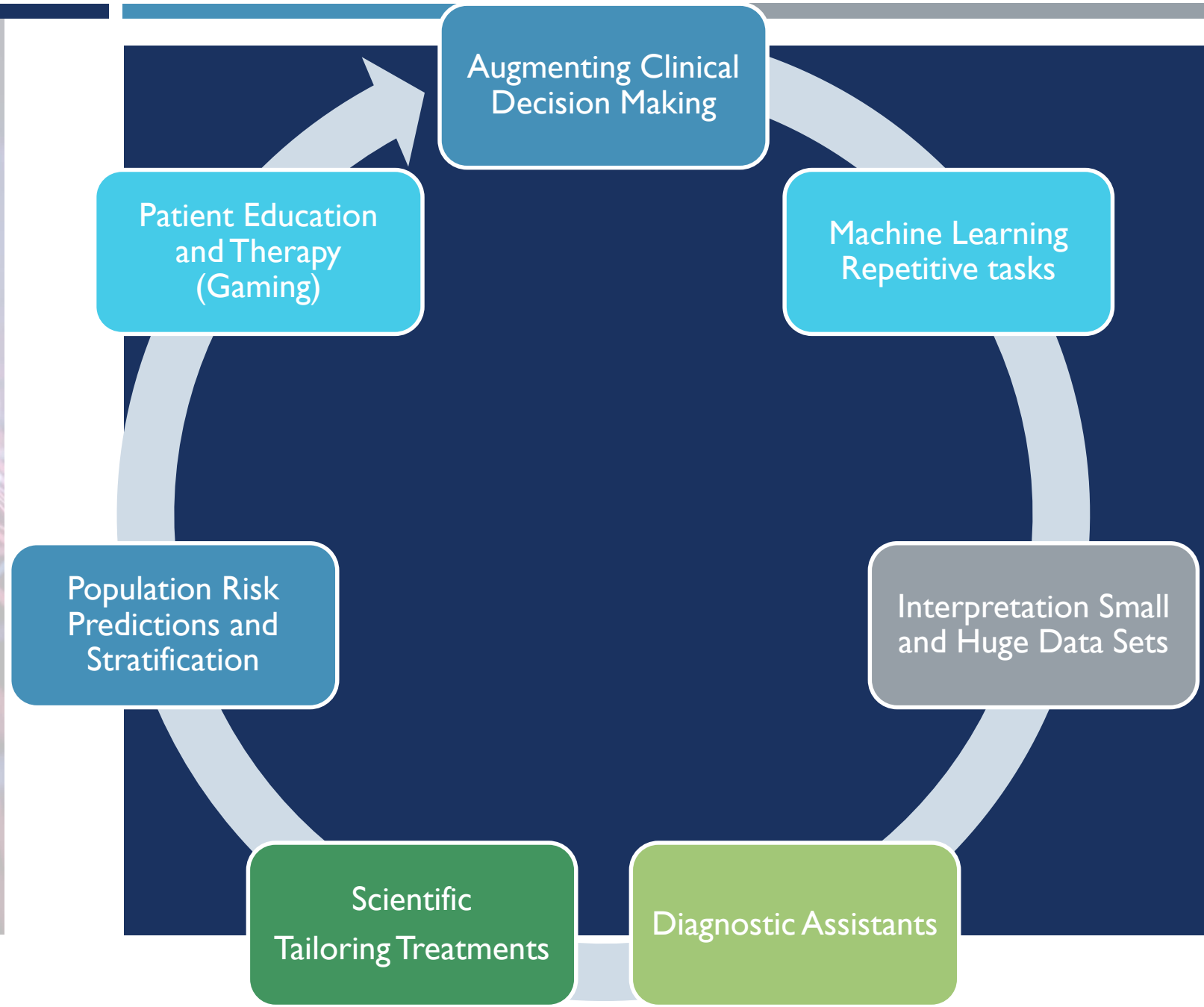
Research

**Adverse
Medication
Events**

Cost Control

**Population
Health
Management**

ARTIFICIAL INTELLIGENCE



Artificial Intelligence

DECISION MANAGEMENT

Engines that insert rules and logic into AI systems and used for initial setup/training and ongoing maintenance and tuning. Used in a wide variety of enterprise applications, assisting in or performing automated decision-making

DEEP LEARNING PLATFORMS

A special type of machine learning consisting of artificial neural networks with multiple abstraction layers. Currently primarily used in pattern recognition and classification applications supported by very large data sets.

BIOMETRICS

Enable more natural interactions between humans and machines, including but not limited to image and touch recognition, speech, and body language.

ROBOTIC PROCESS AUTOMATION

Using scripts and other methods to automate human action to support efficient systems processes.

TEXT ANALYTICS AND NLP

Natural language processing (NLP) uses text analytics. Speeds data searching and understanding. Analyzes sentence structure and meaning, sentiment, and intent through statistical and machine learning methods.



Natural Language Generation: Producing text from computer data. Used to develop reports and provide information for healthcare data analysis.



Speech Recognition: Transcribe and transform human speech into format useful for computer applications. Currently used in interactive voice response systems and mobile applications.



Virtual Agents: simple chatbots to advanced robotic systems networking with humans. Provide automated services in facilities and provide patient support and data capture. Often often used in smart home technologies.



Machine Learning Platforms: Providing algorithms, APIs, development and training toolkits, to design, train, and deploy models into applications, processes, and other machines. Currently used in a wide range of applications involving prediction or classification.



AI-optimized Hardware: Graphics processing units (GPU) and appliances specifically designed and architected to efficiently run AI-oriented computational jobs. Currently primarily making a difference in deep learning applications.

VIRTUAL & AUGMENTED REALITY



- **3D Environment**
- **Education**
 - **Procedures**
 - **Patient Experience**
- **Therapy**
 - **Demonstration/Practice**
 - **Learning Environment**
 - **Networking**

Individual factors:

- **Prior Knowledge Professionalism**
- **Communication Skills**
- **Knowledge Synthesis**



Resources:

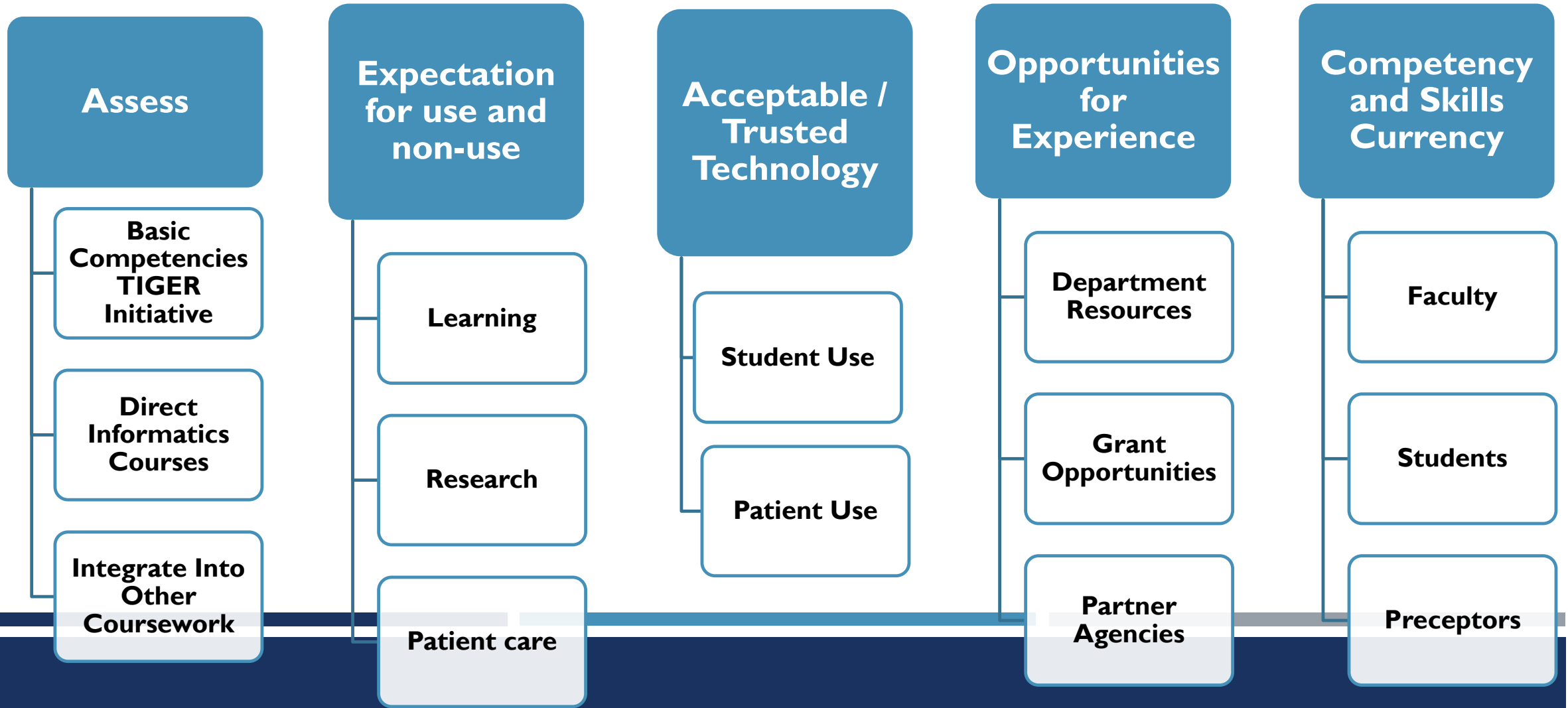
- Faculty**
- Time**
- Technology**
- Partnerships**



Legal/Ethical

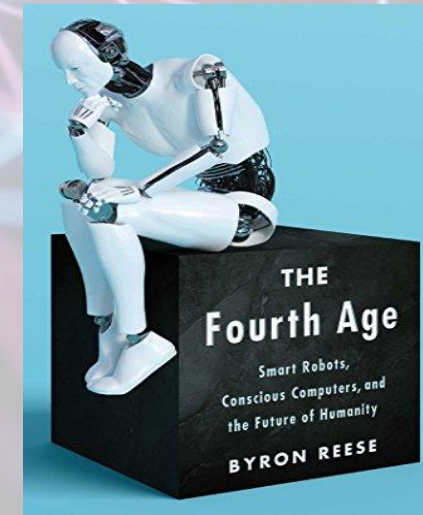
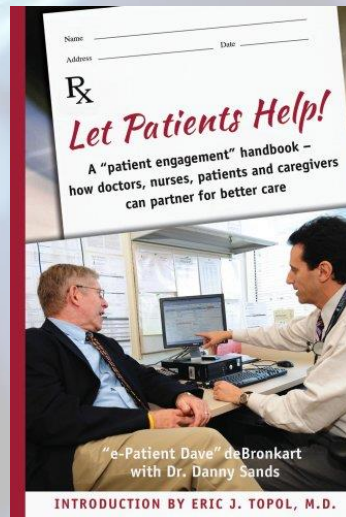
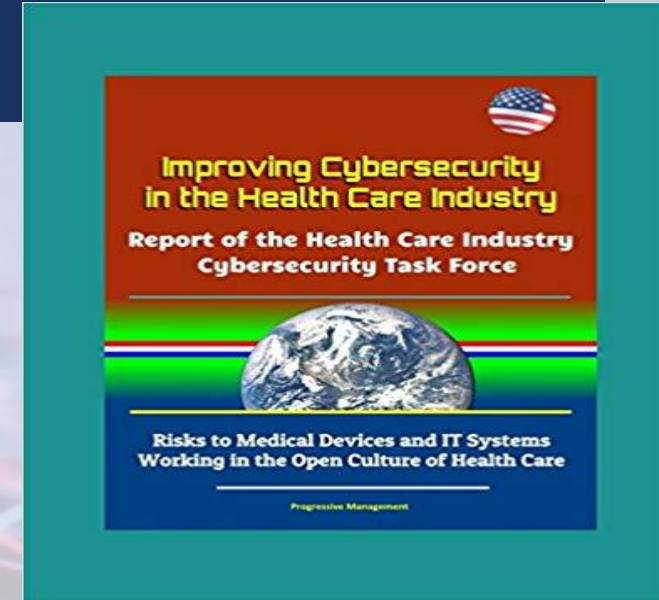
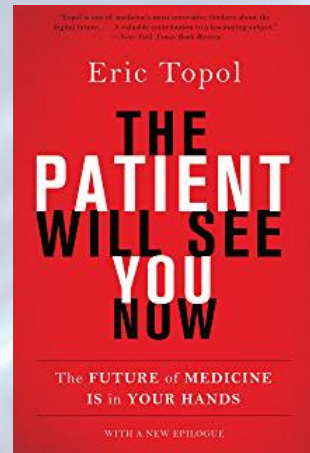
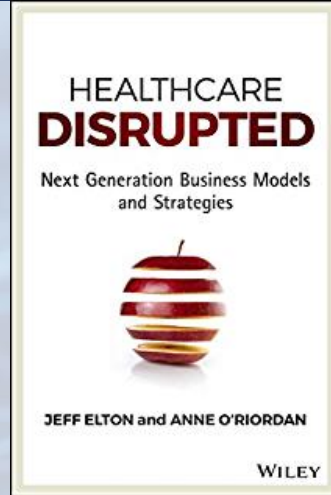
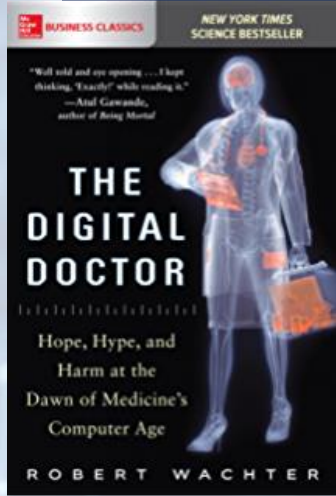
- **State and Federal**
- **HIPAA Compliance**
- **Potential for Malpractice**

MEETING INFORMATICS LEARNING NEEDS



COORDINATED PLAN FOR USING INFORMATICS IN EDUCATIONAL PROGRAM

BOOKS OF INTEREST



INFORMATICS JOURNALS

- **Health Informatics Journal**
 - <http://journals.sagepub.com/home/jhi>
- **Healthcare IT News**
 - <http://www.healthcareitnews.com>
- **Health Data Management**
 - <https://www.healthdatamanagement.com>
- **American Medication Informatics Association**
 - <https://www.amia.org/>
- **Online Journal of Nursing Informatics**
 - <https://www.ojni.org/>
- **International Journal of Medical Informatics**
 - <https://www.journals.elsevier.com/international-journal-of-medical-informatics/>
- **Journal of Innovation in Health Informatics**
 - <https://hijournal.bcs.org/index.php/jhi>
- **Journal of Medical Internet Research**
 - <https://www.jmir.org/>
- **JMIR Research Protocols**
 - <https://www.researchprotocols.org/>
- **Interactive Journal of Medical Research**
 - <https://www.i-jmr.org>
- **JMIR mHealth and uHealth**
 - <https://mhealth.jmir.org/>
- **JMIR Public Health and Surveillance**
 - <https://publichealth.jmir.org/>
- **JMIR Mental Health**
 - <https://mental.jmir.org/>
- **JMIR Human Factors**
 - <https://humanfactors.jmir.org/>

INFORMATICS JOURNALS

- **JMIR Serious Games**
 - <https://games.jmir.org/>
- **JMIR Human Factors**
 - <https://humanfactors.jmir.org/>
- **JMIR Medical Education**
 - <https://mededu.jmir.org/>
- **JMIR Rehabilitation and Assistive Technologies**
 - <https://rehab.jmir.org/>
- **Medicine 2.0**
 - <https://www.medicine20.com/>
- **JMIR Diabetes**
 - <https://diabetes.jmir.org/>
- **JMIR Cancer**
 - <https://cancer.jmir.org/>
- **JMIR Biomedical Engineering**
 - <https://biomedeng.jmir.org/>
- **Journal of Healthcare Information Management**
 - <http://www.himss.org/jhim>
- **Journal of Informatics Nursing**
 - <https://www.ania.org/publications/journal>
- **Journal of Health & Medical Informatics**
 - <https://www.omicsonline.org/health-medical-informatics.php>

INFORMATICS EDUCATION WEBSITES

- **Agency for Healthcare Research Quality**
 - <https://www.ahrq.gov/professionals/education/index.html>
- **American Nurse Informatics Association**
 - <https://www.ania.org/education>
- **.GOVAmerican Medical Informatics Association**
 - <https://www.amia.org/education>
- **HealthData.Gov**
 - <https://healthdata.gov>
- **Health IT**
 - <https://www.healthit.gov/topic/health-it-resources/health-it-curriculum-resources-educators>
- **TIGER**
 - <http://s3.amazonaws.com/rdcms-himss/files/production/public/FileDownloads/tiger-report-informatics-competencies.pdf>

QUESTIONS?



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