Emerging Information Technologies in Health Care

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Kaiser Permanente

Largest private integrated health care system in the U.S.

- **9M** members
- **17K** physicians
- **173K** employees
- **37** hospitals
- **611** clinics
- **37M** office visits a year
- **3K** clinical research studies
- **$50B** revenues

**EHR**: Largest, most advanced implementation in the nation

**PHR**: nearly **6M** members signed up
Garfield Innovation Center

- Opened 2006 near OAK
- 37,000 sq ft warehouse
- Space design, workflow simulation, technology testing
- Full-scale med-surg ward, L&D, OR, ED, NICU
- Home environment
- Pt Room of the Future
- Open prototyping space
- 48,000+ visitors from over 42 countries
Operating Room of the Future
Home Environment
Health Care in Crisis

- Demand increasing
- Costs increasing
- Reimbursements decreasing
- Health care worker shortages
- Incentive misalignment
Current Approaches

- Automate best practices
- Integrate health care across care delivery ecosystem
- Use data-driven analytics
- Move care to less expensive venues
- Move care to lower-tier workers
- Engage and empower the consumer
- Create new incentives
- Develop technology-enabled care delivery models
Telemedicine and Telehealth

Virtual Health Care
Four Virtual Care Models

Live Video Consultation
Synchronous
Saves travel time
Improves access
Patient convenience
Everyone must show up at the same time

Store & Forward
Asynchronous, send photo or video
Saves travel time and more efficient
Improves access
Patient convenience
Impersonal

Remote Monitoring
Monitoring of data
Generates alerts for early intervention
Saves travel time and more efficient
Patient convenience
Requires engagement

Guided Self Service
Personalized guidance
Health education
Preventive care
Social networks
Self management
Requires engagement
What’s Required?

Care Coordination
Common Best Practices
EHRs & Health Info Exchange
Accountability Framework
Reporting Mechanisms

- Hospitals
- Clinics
- Ancillary Services
- Payers
- Doctors
- Nurses
- Regulators
- Pharmacies
- Labs
- Suppliers

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Telemonitoring Hubs and Sensors

1. HR, motion, skin temp, sweat
   - © Basis
2. Skin glucometer
   - © Dexcom
3. Wireless pulse oximeter
   - © iHealth Labs
4. Galvanic skin response (GSR)
   - Q Sensor © Affectiva
5. Mobile ultrasound
   - © Mobisante

- Home hub © Honeywell
- Cell hub © Tunstall
- Care Innovations Guide © Care Innovations
- Weight, body fat, BMI © Withings
- HR, motion, skin temp, sweat © Basis
- iPhone glucometer © IBGStar
- Clip-on pediatric otoscope © CellScope
- Skin glucometer © CellScope

Products not endorsed by KP
Mobile Search
Mobile Browsing
Mobile Voice Calls
Mobile Messaging
Mobile Video Conferencing
Mobile Location-Based Services
Mobile Context-Aware Services
Mobile Office
Mobile Music & Book Library
Mobile Banking
Mobile Commerce
Mobile Payment

**Mobile Health**

Mobile Social Networking
Mobile Gaming
Mobile Image Recognition
20,000+ Consumer Medical Apps

Products not endorsed by KP

1. OneHealth
2. MyDiabetes
3. Pillboxie
4. RunKeeper
5. JEFIT
6. Depression Connect
7. Med Helper Pro
8. HealthPrize
9. EyeChart
10. MyNetDiary

OneHealth
MyDiabetes
Pillboxie
RunKeeper
JEFIT
Depression Connect
Med Helper Pro
HealthPrize
EyeChart
MyNetDiary
Professional Apps

1. AirStrip Cardiology
2. Visible Body
3. WellDoc Diabetes Manager
4. Mobisante
5. MedCalc
6. Epocrates
7. VisualDx
8. Isabel
9. DrawMD
10. SwiftPayMD

Products not endorsed by KP
KP Apps

• Mobile EHR
  – See your lab results
  – Send a message to your doctor
  – Refill your prescriptions
  – Book an appointment

• Portfolio of mobile apps

• Mobile app development group
Big Data and Analytics
Data Sources

Health Plan Members

EHR & IT Systems

Internet

Organizations

Devices & Sensors

New Biodata

Biomedical Research
Nature of Health Care Data

- **20% Structured**
  - Traditional business intelligence analytics

- **80%+ Unstructured**
  - Clinical notes, monitoring data, imaging, surveys, email, phone calls, photos, videos, location, context

- **Highly complex**
  - Multiple regulated silos, lexicons, differences in accuracy, integrity, availability, reliability, usability
Use Cases

**Care Delivery**
- Decision support
- Real-time monitoring in hospital and home
- Personalized medicine
- Comparative effectiveness research
- Workflow optimization
- Cost and quality analytics

**Operations**
- Business analytics
- Marketing and supply chain analytics
- Fraud and breach detection
- Payment and pricing models
- Health economics research

**Public Health**
- National and regional patient registries
- Biosurveillance
- Preventive health analytics
- Data mining for new multimodal approaches to major public health issues

**Research**
- Biomedical research literature
- Clinical trial analytics
- Predictive modeling for drugs and devices
- Genomics, biodata
- Analysis of disease patterns to plan future R&D investments
Scanning the Future
Environmental Computing

1. VS sensing at a distance © Kai Medical
2. SleepClock © Renew
3. Car drowsiness sensor © Nissan
4. Seat pressure ID - Adv. Inst. of Industrial Tech (Japan)
5. Under-mattress activity and VS sensing © EarlySense
6. imPulse EKG monitor © Plessey (UK)
7. Interactive glass mirror display © Corning

Products not endorsed by KP
Wearable Sensors

1. BodyMedia FIT activity sensors © KP
2. Activity sensor © Fitbit
3. Sensor patches © Proteus / Avery Dennison
4. Earbud sensor for VS © Valencell
5. Pendant personal emergency response system © Philips Healthcare
6. Fabric sensors detect movement, HR, T, moisture © Exmovere
7. Wireless activity sensor stickers © Green Goose
8. Nike+ shoe with embedded sensors © Nike

Products not endorsed by KP
Medication Adherence

1. Med reminder watch © Cadex
2. Pill dispenser © SentiCare
3. MagneTrace necklace © MagneTrace
4. GlowCap pill bottle cap © Vitality
5. Med adherence app © Pill Phone
6. Proteus Raisin microchip pill © Proteus
7. Xhale SMART tracer system © Xhale

Products not endorsed by KP
Robots

1. Hector the robot © CompanionAble
2. Smartpet robot dog © Bandai
3. Legally blind driver in self-driving car © Google
4. mPower 100 © Myomo
5. Hector the robot © CompanionAble
6. Telepresence robots © VGo
7. eLEGS by Berkeley Bionics © Zimbio
Natural Interfaces

1. Kinect MIDI interface © Microsoft
2. Nintendo Wii © Nintendo
3. Wii casualty © PrimeSense
4. Tobii eye gaze tracking system © engadget
5. Gaze tracking © Tommy Strandvall
6. Electrical signal speech recognition © NASA
Augmented and Virtual Reality

1. Vuzix AR Smart Glasses prototype © engadget
2. Golden-I AR glasses © Motorola
3. Molecular drug modeling © Roche
4. Burn surgery under VR anesthesia © Univ. Washington
5. VR multi-user simulation training © Forterra
6. Real-time sign translation © Word Lens
7. Google Glass © Google

Products not endorsed by KP
Next-Gen Technology

1. Skin sensor © MC10
2. Wristband interface © NEC
3. Brain-car interface, Emotiv EEG © Free University of Berlin
4. EEG interface © Neurosky
5. Tongue drive © Georgia Tech
6. MIT bio-electronic ocular implant © engadget
Lessons Learned

• New technologies rarely stand alone
• Innovation is often driven by strategic considerations rather than a traditional business case
• Organizations may be limited in how rapidly and in what sequence they can absorb a series of new technologies
Q & A

THE WORLD OF MEDICINE AS WE KNOW IT WILL END SOON