Promote Adoption of Clinical Systems by Health Care Organizations in the UAE

Health Information Systems
Introduction

Benjamin Poku, DrPH, MPH
Assistant Professor, Higher Colleges of Technology

bpoku@hct.ac.ae
Ben.poku@yahoo.com
• Opportunity to thank HCT students, faculty, and administration for giving me an opportunity to be here.

• I have over twenty years of experience in health technology and very passionate about how to apply technology in public health research

• I have a doctorate degree in Public Health from Georgia Southern University in the US
Summary of Topics

• Relevance of Health Technology
• Health Technology (HT) defined
• Health Information Systems (HIS) planning framework.
• Adopting HT- Electronic Medical Records Adoption Model (EMRAM).
• Concept of Meaningful use and its implications for patient centered care.
• Barriers to clinical systems implementation
• Diffusion of Innovation Theory (Everett Rogers)
• Readiness for innovation- Big Data and Artificial Intelligence system.
Relevance of Health Technology

- Health care delivery is changing lives
- The quality, speed, accuracy, and efficiency of health care are increasingly being reviewed and studied as the global patient population grows and ages
- Health care is greatly enhanced using information technology
- When patient records are digitized, automated record operations become possible for the benefit of all stakeholders.
- Position Health organizations to unleash more potentials
- In addition, it creates readiness for current and future innovations that improves patient care such as Artificial Intelligence; Clinical Intelligence and Business Intelligence
The Electronic Medical Record (EMR)

- Studies by Institute of Medicine (IOM) in 1991 concluded computer-based patient records to be an essential technology to improve health care delivery.
- IOM report in 2000 (To Err Is Human) emphasized that human errors by health care professionals are causing between 44,000-100,000 avoidable death and recommended a solution - increase the safety of patient care through automation.
- Responds to this call for Health Technology or adoption of integrated clinical systems has accelerated over the years.
IOM studies also identified causes for problems in health care delivery (quality, cost, and access to care)

The reasons were identified as

- Growing complexity of science and technology, with delays between innovation and implementation in health care
- Increase in chronic illness burden
- Inadequate use of Health informatics
HIS consists of all components of computer systems used to manipulate health information, including:

- Software
- Hardware
- End-user devices connecting people to systems

Networks – the electronic connectivity between systems, people, and organizations (Local Area Networks (LANs), Wide Area Networks (WANs), Wireless LANs, Wireless WANS.)

Data that systems create and capture through the use of software. Data includes;
- Diagnostic / Procedure Data
- Big Data – ehrs, imaging, mobile, social media

These become the building blocks for all functions and applications.

Figure 3-11 Portable external hard drive
© Ruslan Ivantsov/www.Shutterstock.com

Figure 3-12 Desktop external hard drive
© Igor Grochev/www.Shutterstock.com
Figure 8-7 Point-to-Point Tunneling Protocol

© Cengage Learning 2013
Figure 5-1 Modern x-ray machine
© Tyler Olson/www.Shutterstock.com
Figure 5-6 Human brain scan from an MRI
© Donna Beeler/www.Shutterstock.com
Figure 5-3 Intensive care monitoring

© Edwin Verin/www.Shutterstock.com
Figure 8-6 RADIUS authentication

© Cengage Learning 2013
### HIS Framework (Anatomy or Architecture)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Patient/Provider/Clinical Care Activities</td>
<td>Clinical Reporting, Data Analytics, Outcomes Analysis</td>
</tr>
<tr>
<td>II</td>
<td>Institutional Business Activities</td>
<td>IV Business Reporting, Data Analytics, Key Performance Indicators Analysis</td>
</tr>
</tbody>
</table>

*Key: BI, business intelligence; CI, clinical intelligence.*
# HIS Planning Framework with examples of Software Applications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>- EHR, EMR, PHR, medical intranet</td>
<td>- Case mix analysis</td>
</tr>
<tr>
<td></td>
<td>- Outpatient systems</td>
<td>- Decision support systems</td>
</tr>
<tr>
<td></td>
<td>- Radiology, laboratory, pharmacy</td>
<td>- Quality analysis and reporting</td>
</tr>
<tr>
<td></td>
<td>- Transcription/Dictation</td>
<td>- Outcomes analysis</td>
</tr>
<tr>
<td></td>
<td>- Cardiology, ECG, ECHO</td>
<td>- Clinical Intelligence</td>
</tr>
<tr>
<td></td>
<td>- Maternity monitoring</td>
<td>- Data warehouse</td>
</tr>
<tr>
<td></td>
<td>- Home health</td>
<td>- External reporting:</td>
</tr>
<tr>
<td></td>
<td>- PACS for imaging</td>
<td>» Joint Commission, Leapfrog, CHART, other</td>
</tr>
<tr>
<td></td>
<td>- Surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- ICU systems, monitors, devices</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>- General financials</td>
<td>- Financial, supply chain, HR management reporting</td>
</tr>
<tr>
<td></td>
<td>- Patient accounting</td>
<td>- Cost accounting</td>
</tr>
<tr>
<td></td>
<td>- Contracts management</td>
<td>- Business intelligence, analytics</td>
</tr>
<tr>
<td></td>
<td>- HRMS/payroll</td>
<td>- Financial decision support</td>
</tr>
<tr>
<td></td>
<td>- Materials management/supply chain</td>
<td>- Enterprise data warehouse</td>
</tr>
<tr>
<td></td>
<td>- Credentialing</td>
<td>- Budgeting, financial modeling, and forecasting</td>
</tr>
</tbody>
</table>

Key: BI, business intelligence; CI, clinical intelligence; ECHO, echocardiogram; EHR, electronic health record; EMR, electronic medical record; ECG, electrocardiogram; HR, human resources; HRMS, human resources management system; ICU, intensive care unit; PACS, picture and archiving communication system; PHR, personal health record.
Research shows that adoption of clinical systems is seen worldwide as one method to improve the widening health care demand and supply gap.

The Healthcare Information and Management Systems Society (HIMSS) has developed an Electronic Medical Record Adoption Model (EMRAM).

The EMRAM has become a gold standard or model to gauge hospital EMR adoption.

Hospitals are scored in a national database.

Stages 0 – 7 indicate progressively higher and more clinically sophisticated uses of HIT.
The HIMSS Analytics Electronic Medical Record Adoption Model (EMRAM) incorporates methodology and algorithms to automatically score hospitals around the world relative to their Electronic Medical Records (EMR) capabilities. This eight-stage (0-7) model measures the adoption and utilization of electronic medical record (EMR) functions.
The Electronic Medical Record Adoption Model (EMRAM) measures the adoption and utilization of EMR functions required to achieve a near paperless environment that harnesses technology to support optimized patient care.
# EMR ADOPTION MODEL

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cumulative Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td>All Three Ancillaries Not Installed</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Ancillaries—Lab, Rad, Pharmacy—all Installed</td>
</tr>
<tr>
<td>Stage 2</td>
<td>CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology</td>
</tr>
<tr>
<td>Stage 4</td>
<td>CPOE, Clinical Decision Support (clinical protocols)</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Closed loop medication administration</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Physician documentation (structured templates), full CDSS (variance &amp; compliance), full R-PACS</td>
</tr>
<tr>
<td>Stage 7</td>
<td>Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP</td>
</tr>
</tbody>
</table>
EMRAM Model

Stages 0-1: Very basic automation of individual (Laboratory, Pharmacy, Radiology systems).

Stage 2: Ability to start bringing disparate data together.

Stages 3-6: Implementation of advanced clinical systems.

Stage 7: Ability to share or exchange data with external entities.
Challenges to adoption

• Adoption (not just implementation) of EHR faces many challenges.
  – Some are real and some are perceived.
  – Issues arising in the area of privacy and security as more consumers become engaged.
• Many barriers of adoption are being overcome by clinician and patient engagement.
Overcoming Clinician Resistance

• In hospital:
  – Process improvements and workflow changes have addressed many physician concerns.

• In office:
  – Physicians are primary decision maker, except potentially in a large practice.
Many patients understand and desire the efficiencies associated with the adoption of an EHR, but have issues with some aspects of automation of their information in regard to:

- Privacy
  - Confidentiality
  - Consent management
- Security
  - Identity theft
- Quality of information
Figure 7-1 Information security components

© Cengage Learning 2013
Figure 8-1 Cryptography process

© Cengage Learning 2013
Figure 8-4 Asymmetric (public key) cryptography

© Cengage Learning 2013
Figure 8-2 Symmetric (private key) cryptography
Figure 8-3 3DES
© Cengage Learning 2013
Business Challenges

- Healthcare is a business and faces many business-related challenges for EHR implementation:
  - Economic issues
  - Reduced reimbursement
  - Staffing shortages
  - Escalating costs for all aspects of operations
  - Limited access to capital
Addressing Business Challenges

- Federal incentives mitigating cost issues
- Upfront capital outlays mitigated by using incentives as collateral and using application service providers
- Contract negotiation with payers may help improve revenues based on better quality.
- Technological advances can make EHRs less costly (e.g. virtualization, cloud computing).
- Vendors more committed to being on-time and on-budget
- Creating shared value among users.
Leadership and Change

- EHR implementations display the following characteristics of their executive leadership:
  - Significant involvement in change
  - Strategic imperative
    - Not just financial return on investment
    - Value proposition is important
    - Health Technology as an intangible asset
  - Commitment not to automate what is not working in manual environment
  - Customer service and end-user orientation
Government’s role adoption – policies & Incentives

- Health Information Portability and Accountability Act (HIPAA) of 1996 build on CIA triad
  - Standards for electronic data
  - Privacy and security of protected health information (PHI)
  - Imposed penalties for noncompliance
Incentives - HIS and U.S. Government’s role in health care

• Under President George W. Bush
  – Established Office of the National Coordinator of Health Information Technology within Department of Health and Human Services (HHS), calling for 10-year plan to have EHRs for all Americans
Incentives - HIS and U.S. Government’s role in health care

• Under President Barack Obama
  – American Recovery and Reinvestment Act of 2009 (ARRA): Title IV – Health Information Technology for Economic and Clinical Health (HITECH) Act
    • Greatest stimulus of EHR adoption
    • Strategic plan for nationwide interoperable HIS
    • Health Information Policy Committee
    • Health Information Standards Committee
    • $25 billion in incentives for hospitals and physicians who adopt EHR systems and training for 60,000 HIS professionals
Meaningful Use

• Concept of “meaningful use” criteria for EHRs focused on achieving five health outcomes policy priorities:

  1. Improve quality, safety, efficiency, and reduce health disparities
  2. Engage patients and families in their health
  3. Improve care coordination
  4. Improve population and public health
  5. Ensure adequate privacy and security of patient health information
Table 8-2: Comparison of 2008 to 2015 EMRAM Scores for American Hospitals

<table>
<thead>
<tr>
<th>EMRAM Stage</th>
<th>2008 Q4</th>
<th>2010 Q4</th>
<th>2014 Q4</th>
<th>2015 Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 7</td>
<td>0.3%</td>
<td>1.0%</td>
<td>3.6%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Stage 6</td>
<td>0.5%</td>
<td>3.2%</td>
<td>17.9%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Stage 5</td>
<td>2.5%</td>
<td>4.5%</td>
<td>32.8%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Stage 4</td>
<td>2.5%</td>
<td>10.5%</td>
<td>14.0%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Stage 3</td>
<td>35.7%</td>
<td>49.0%</td>
<td>21.0%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Stage 2</td>
<td>31.4%</td>
<td>7.1%</td>
<td>5.1%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Stage 1</td>
<td>11.5%</td>
<td>7.1%</td>
<td>2.0%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Stage 0</td>
<td>15.6%</td>
<td>11.5%</td>
<td>3.7%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Total hospitals</td>
<td>5,168</td>
<td>5,281</td>
<td>5,467</td>
<td>5,462</td>
</tr>
</tbody>
</table>

Courtesy of HIMSS ANALYTICS
Hospital EMR Adoption

- As of Q1, 2015, 56% of all U.S. hospitals progressed past stage 4.
- Only 3.7% (197) of over 5467 hospitals have progressed to stage 7.
- Overcoming barrier to adoption:
  - High cost of systems – federal incentives
  - Data standards – EMRAM, HIPAA, Meaningful use
  - User unfriendliness of systems - user training
  - Lack of good communications - Tailored interventions.
Physician EMR Adoption – using the US as an example

• Most patient care in the U.S. occurs in physician offices.

• Of all care settings, they have the LEAST amount of automation due to the previously defined barriers to adoption.

• 96.4% hospitals have some form of an EMR; 62.8% of physician practices have EMR.
Additional Barriers to Adoption

• Lack of communications.
• Issues with spread of new ideas.
• Resistance to change.
• Lack of appropriate research to create an intervention for late adopters and laggards.
• Social/Political /Economic issues
Have you ever wondered why some technologies or ideas spread through our culture quickly and some never seem to catch hold?

This question has fascinated social scientist for over 100 years, but the science behind the question became fully developed with the work of Everett Rogers in the 1960s.
Rogers’ (1995) Diffusion of Innovation

- Everett M. Rogers

*Diffusion of Innovations* (1962-95)

- the process by which an innovation is communicated through certain channels over time among the members of a social system

Adopter Categories

- Innovators
- Early adopters
- Early/Late Majorities
- Laggards
Stages of adoption:

Awareness - the individual is exposed to the innovation but lacks complete information about it

Interest - the individual becomes interested in the new idea and seeks additional information about it

Evaluation - individual mentally applies the innovation to his present and anticipated future situation, and then decides whether or not to try it

Trial - the individual makes full use of the innovation

Adoption - the individual decides to continue the full use of the innovation
UAE Health care system

• According to a recent report published by Monitor Deloitte” in September 2, 2017.

• Dubai is transforming to become one of the smartest digital city in the world

• This technological innovation and vision 2020 will inevitable incentivize the emirates health technology infrastructure and network of health care providers in UAE
Future Trends – Big Data and Artificial Intelligence

- Research indicates that there are over 2.5 quintillion bytes of data created daily and 90% of all digital data created in last two years

- Big Three:
  - EHRs
  - Imaging
  - Mobile
Data Acronyms

- Big Data in Healthcare
- 3Vs
  - Velocity
    - Momentum & Acceleration (BYD, Mobile, Tablets)
  - Volume
    - Worldwide Healthcare: 70 Exabytes (3.3 T MP3s)
  - Variety
    - Personal devices, Mobile, social media
Big Three

• EHR
  – Duplication: primary care, specialist, hospital, post acute, rehab, relocation
  – Replication and infinite (likely) storage

• Imaging
  – 1 image = 200MB x 50B (worldwide) = 70 Exabytes
  – Granularity and acuity growing = even more volumes

• Mobile
  – Text, voice, images, security, devices
Clinical Intelligence

- Adoption of Health Technology position industries to unleash the clinical benefits of Big data and Artificial intelligence

- The Healthcare industry is still behind other industries such as transportation industry to unleash the potentials of big data using artificial intelligence (Clinical Intelligence - CI/Business Intelligence - BI)

- CI will ultimately apply set of theories, methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information for clinical purposes.

- CI’s analytical architecture, storage, retrieval and mining for clinical data can be possible if your organization is well positioned through integrated or automated health systems.
Questions

Any questions???
Future of Health Information Technology (HIT) – Artificial Intelligence

- Portability – EMR in your pocket.
- Virtual health care – be “seen” without need for physical exam.
- Future uses of technology in health care include:
  - Patients wearing computers to regulate and/or monitor (smart vests).
  - Embedded microchips.
- Systems improvements for complex information.
  - Healthcare business intelligence (BI) and clinical intelligence (CI)
  - Stakeholders who need BI and CI information to perform their jobs in the healthcare arena
  - Identify methods for receiving, organizing, storing, mining, and formatting data for BI and CI purposes
- **Artificial Intelligence will complement medical professionals in providing patient centered care**
References


References


• Silvestre AL, Sue VM, Allen JY. If you build it, will they come? The Kaiser Permanente model of online health care. Health Aff (Millwood). 2009; 28:334-44. [PMID: 19275988]
• Silvestre AL, Sue VM, Allen JY. If you build it, will they come? The Kaiser Permanente model of online health care. Health Aff (Millwood). 2009; 28:334-44. [PMID: 19275988]


References


References


Thank you

Benjamin Poku, DrPH, MPH
Assistant Professor, Higher Colleges of Technology

bpoku@hct.ac.ae
Ben.poku@yahoo.com
Thank You!

AWC Middle East Healthcare Information Summit