Overview

I. Changing environment, new opportunities
II. The C.I.A. of healthcare’s future
III. Impacts for higher education of healthcare professionals

Questions for the Future of Health Care

Source: Bio IT Coalition
http://www.bioitcoalition.org

- Will we be able to predict and prevent diseases such as cancer, diabetes, Alzheimer's and more?
- How will economic regions grow as technologies and science create new medical products and ways to manage patient information?
- How will scientists and others from complementary fields communicate to create new ways of treating and managing diseases?
- How will physicians work with patients in the future?
- How will new medical breakthroughs be funded and developed?
- How will the regulatory realities change to accommodate the burgeoning number of new medical products?
- How will we create a strong, well-educated workforce to support the bio/medical IT industry of the future?
Why Teams of Leaders?

“The revolution in information technology and in information and knowledge management contributed to the generation of actionable information and actionable knowledge required to address critical problems of national and global health care. Yet, despite expectations, e-based approaches are far from fulfilling the dream of equitable and universal access to health across the globe. A dramatically new approach is needed if health care is to be brought “among the people”.

Dag von Lubitz, MedSMART Inc, FUSA
New Model of Healthcare Delivery

Technology and Teams of Leaders will mean care moves from clinical settings to community-based settings to the home. With the PATIENT at the center of the system, it doesn’t matter where you enter.

Different Kinds of Data & Data Sources

But again, the patient is still at the center – the data is tied to and focused on the patient and his or her care, not the health care provider or organisation.

Emergency Operations Center Model

Issue of monitoring different types of events and evaluating significance:
- One-off events that may forecast trouble (e.g., contagious disease or bioterrorism)
- Public health crises
- Chronic disease populations

Health Care Trends Overview

<table>
<thead>
<tr>
<th>From</th>
<th>Future Trends</th>
<th>To</th>
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</thead>
<tbody>
<tr>
<td>Programmed</td>
<td>Business Model</td>
<td>Integrated &amp; Authorised</td>
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<tr>
<td>Invasive</td>
<td>Diagnosis &amp; Treatment</td>
<td>Value-based, Preventive Image Based</td>
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<tr>
<td>Proactive Centric</td>
<td>Nursing</td>
<td>Patient Centric</td>
</tr>
<tr>
<td>Centred - Hospital</td>
<td>Monitoring</td>
<td>De-Centred - Shift to Community</td>
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<tr>
<td>On-site Ivy</td>
<td>Approach</td>
<td>Personalised Medicine</td>
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<tr>
<td>Therapeutics / Diagnostics / Genetics</td>
<td>Tools</td>
<td>“Theranostics”</td>
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<tr>
<td>Treating sickness</td>
<td>Objectives</td>
<td>Preventing sickness - “Wellness”</td>
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Source: Field & Sullivan
II. THE C.I.A. OF HEALTHCARE’S FUTURE

Collection

Includes:

• Development and implementation of data collection models
• Determination and application development for critical aspects of data set usability, e.g.
  – Weather data – elimination of “noise” (unwanted data)
  – Terrorist communication – fast search for certain communication patterns
  – Genome research – structuring algorithms
  – Disease-specific data – anonymity/privacy
• Design and creation of data warehouses
• Etc.

Collection, Integration, Application

Collection considerations

Data privacy
Data accuracy
Data set size
Data filtering
Analysing speed
Critical requirements of the data
Quality & scope of data sources
Rate of updating
Inconsistency detectors
Homogeneity
Quantitative
Qualitative
Categorical
Data Types
Granularity – time, cohort, etc.
Structured/unstructured
Integrating common ontologies
Database Schemas
Metadata
Navigability
etc.
Integration

- Analysis
- Transformation
- Modeling, visualization
- Identify patterns and trends

Application

- Communicate results and conclusions
- Provide information to support decision making
- Identify false assumptions, provide correct validated information
- Make recommendations for changes
- Identify need for further data collection, integration and application
Analytics

Prescriptive
ADVANCED
ANALYTICS

Predictive

Business
Intelligence

Degree of Complexity

Stochastic Optimization
How can we achieve the best outcome including the effects of variability?

Optimization
How can we achieve the best outcome?

Predictive modeling
What will happen next if...?

Forecasting
What if these trends continue?

Simulation
What could happen...?

Alerts
What actions are needed?

Query/drill down
What exactly is the problem?

Ad hoc Reporting
How many, how often, where?

Standard Reporting
What happened?

Competitive Advantage

JMG 2011.11

III. IMPACTS FOR HIGHER EDUCATION OF HEALTHCARE PROFESSIONALS

Educational model for future healthcare professionals

Biomedical and Health Analytics

Information Technology & Health-Related Data/Information

Business

Healthcare

Finance

Public Health

Medical Research

Forensics

Other

Healthcare Administration

Clinical Practice

Character

Context

Comprehension

Communication

Community

Creativity

Contribution

Foundational Skills*
Possible Overall Curriculum Model

<table>
<thead>
<tr>
<th>Majors</th>
<th>Concentrations</th>
<th>Minors</th>
<th>Open Electives</th>
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Possible Healthcare Curriculum Model

<table>
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<tr>
<th>CLINICAL</th>
<th>NON-CLINICAL</th>
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Particular Issues for Future Healthcare Professionals

1. Need for advanced information/knowledge management and technology use training for ALL health care professionals
   - the level of practical user comfort
   - level of computer literacy among healthcare practitioners

2. Need to develop a new generation of health care analytics professionals
   - new generation of specialists familiar with advanced computing methods, and their application in handling extensive Information Management/Knowledge Management demands created by the wide range of healthcare-related disciplines

3. Need to develop health care professionals with collaboration skills, critical thinking, mental flexibility and adaptability
   - roots in active learning, collaborative learning
   - learning process is experiential rather than didactic
   - routine exposure to sudden, unpredictable scenario changes

"We cannot always build the future for our youth, but we can build our youth for the future."
— Franklin D. Roosevelt