Re-engineering U.S. Health Care with Healthcare Information Technology – Promises and Peril

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Chairman, Center for Information Technology Leadership
Harvard Medical School
Information Systems In Healthcare

- Three Dilemmas: Provider, Purchaser, Patient
- US Health IT Policy – “Meaningful Use”
- Health IT – Promise and the Peril
- Discussion, Q&A
Unexplained variation, disparities in access and utilization, medical error, patient safety, and quality issues vex US Healthcare

- 18% of medical errors are estimated to be due to inadequate availability of patient information.
- Patient data unavailable in 81% of cases in one clinic, with an average of 4 missing items per case.
- Medical error the 8th leading cause of death
- 1 in 4 prescriptions taken by a patient are not known to the treating physician
- 1 in 5 lab and x-ray tests ordered because originals cannot be found
- 40% of outpatient prescriptions unnecessary
- Patients receive only 54.9% of recommended care
60% Variation In Medicare Resource Use Intensity For Equivalent Populations

SOURCE: Wennberg et. al. Annals Of Internal Medicine 2/18/03
Little Impact Of Spending On Quality

EXHIBIT 1
Relationship Between Quality And Medicare Spending, As Expressed By Overall Quality Ranking, 2000–2001

Overall quality ranking

1

11

21

31

41

51

3,000 4,000 5,000 6,000 7,000 8,000
Annual Medicare spending per beneficiary (dollars)


NOTE: For quality ranking, smaller values equal higher quality.
The Cost Conundrum: Atul Gawande, MD

"...driven primarily by local norms that tend towards heavier use of discretionary services – such as diagnostic testing and surgical versus less invasive interventions – for which there are no clear clinical guidelines." Peter Orszag, OMB Blog

http://www.whitehouse.gov/omb/blog/
Medical literature doubling every 19 years
- Doubles every 22 months for AIDS care
- 2 Million facts needed to practice
- Covell study of LA Internists:
  - 2 unanswered clinical questions for every 3 pts
    - 40% were described as questions of fact,
    - 44% were questions of medical opinion,
    - 16% were questions of non-medical information.

Covell DG, Uman GC, Manning PR.
Generally, with direct observation, or interview immediately after clinical encounters, physicians have approximately one question for every 1-2 patients

- Independent estimates: 0.6, and 0.62 Q/pt
- Holds across PCP and specialty care
- Holds across urban and rural

Gorman, 1995
Gorman and Helfand 1995
Errors in Ambulatory Care

- Clinical mistakes (knowledge or skills) 8%
- Prescription Errors (drug, dose, allergy, or interaction) 8%
- Missing values & charting 13%
- Abnormal labs, logistics and follow up 19%
- Other 8%
- Communication errors 24%
- Discontinuity of care errors including referral 20%

Susan Dovey, AAFP 2002
“What information consumes is rather obvious: it consumes the attention of its recipients.

Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.”

Changing clinician roles:
- From Omniscient Oracle... to Knowledge Broker.
Paper-based Medicine

- Prone to error
- Lots of information but no data
- Limited decision support, or measurement
- Does not integrate with eHealthcare...
- Will not transform healthcare
US healthcare is $1.7T, 16% GDP

- 5% in 1963; Industrialized societies average less than 10%
- Costs rising 7-9%/yr, expected to double in 10yr
- 25% of premium is for administrative overhead (limited value)

Public expenditure on healthcare now 43% of total (up 10% in past decade)

GM healthcare costs now $1500/automobile, most expensive component

Where will additional value be found in, or costs taken out of, the system?
Chart 3: Health expenditure per capita, USSPPP, 2002

Notes:
(1) Australia, Japan, Korea 2001; Turkey 2000.
(2) Netherlands: Public/private split of total health expenditure in unavailable.
Purchasing power parities (PPPs) provide a means of comparing spending between countries on a common base. PPPs are the rate of currency conversion that equalise the cost of a given ‘basket’ of goods and services in different countries.
The Cost of a Long Life

Average Life Expectancy

Per Capita Spending

Life Expectancy

Per Capita Spending (International Dollars)

http://ucatlas.ucsc.edu/spend.php
Determinants of Health and Their Contribution to Premature Death

- Purchasers are paying into a disease system rather than a wellness system

- 4% of health care dollar is spent on prevention and public health

Health Care Costs Concentrated in Sick Few

Distribution of Health Expenditures for the U.S. Population, By Magnitude of Expenditure, 1997

Average American consumers $6240/yr of healthcare, or $12,200 for the ave. family
- Health premiums rising 4x faster than salary over past 6 yrs
- 50% of personal bankruptcy due to healthcare costs
- 42% of the public have experienced medical error themselves or in their family (24% with serious consequences)

45M Americans lack Healthcare insurance
- 80M lack at some time during each year

Increasing exposure to tiered pharmacy plans, consumer directed care, define contribution plans... without transparency
- Absent reliable quality data
- No value-based choices
Americans Spend More Out-of-Pocket on Health Care Expenses, 2004

**Total health care spending per capita**

**Out-of-pocket spending per capita**

United States

Source: The Commonwealth Fund, calculated from OECD Health Data 2006.

a2003 Total Health Care Spending, 2002 OOP Spending

b2003 Total Health Care Spending, 2002 OOP Spending
### Majority of Americans Say Health Care System Needs Fundamental Change or Complete Rebuilding

<table>
<thead>
<tr>
<th>Percent reporting:</th>
<th>Only minor changes needed</th>
<th>Fundamental changes needed</th>
<th>Rebuild completely</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td><strong>Annual income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$35,000</td>
<td>11</td>
<td>51</td>
<td>38</td>
</tr>
<tr>
<td>$35,000–$49,999</td>
<td>13</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>$50,000–$74,999</td>
<td>16</td>
<td>51</td>
<td>31</td>
</tr>
<tr>
<td>$75,000 or more</td>
<td>19</td>
<td>52</td>
<td>28</td>
</tr>
<tr>
<td><strong>Insurance status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insured all year</td>
<td>18</td>
<td>52</td>
<td>29</td>
</tr>
<tr>
<td>Uninsured during year</td>
<td>10</td>
<td>44</td>
<td>45</td>
</tr>
<tr>
<td><strong>U.S. region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>13</td>
<td>51</td>
<td>35</td>
</tr>
<tr>
<td>North Central</td>
<td>16</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>South</td>
<td>15</td>
<td>51</td>
<td>33</td>
</tr>
<tr>
<td>West</td>
<td>21</td>
<td>48</td>
<td>29</td>
</tr>
</tbody>
</table>

Dilbert Wisdom...

DILBERT by Scott Adams

HERE’S WHAT I DON’T UNDERSTAND...

YOU JUST ASKED ME TO FOLLOW A PROCESS THAT HAS FAILED THIRTY TIMES IN A ROW

AND YOU KNOW IT.

WHAT POINT CAN THIS NO LONGER BE CALLED "OPTIMISM"?

WHEN IT SUCCEEDS?
"By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care."

President George W. Bush
State of the Union Address
January 20, 2004
President Obama signed into law the American Recovery and Reinvestment Act (ARRA)

Feb 17, 2009

- Title IV of Division B of ARRA amends the Social Security Act by establishing incentive payments to eligible professionals (EPs) and eligible hospitals to promote the adoption and meaningful use of interoperable health information technology and qualified EHRs.

- These provisions, together with Title XIII of Division A of ARRA, may be cited as the “Health Information Technology for Economic and Clinical Health Act” or the “HITECH Act.”
Medical error, patient safety, and quality issues
- 98,000 deaths related to medical error
- 40% of outpatient prescriptions unnecessary
- Patients receive only 54.9% of recommended care

Fractured healthcare delivery system
- Medicare beneficiaries see 1.3 – 13.8 unique providers annually, on average 6.4 different providers/yr
- Patient’s multiple records do not interoperate

An ‘unwired’ system
- 90% of the 30B healthcare transactions in the US every year are conducted via mail, fax, or phone
ARRA Background and Goal

- US Healthcare remains largely unwired, fragmented, variable in process and outcomes, with significant disparities, and unabated growth in expense
  - Despite increased efforts at improved quality, patient safety, cost containment, and HIT adoption
- HITECH Act (Health Information Technology for Economic and Clinical Health Act)
  - $19.2B net ($36B overall) over 6 years for HIT
  - Every American Citizen with EMR by 2014
- HIT adoption as a prelude to healthcare reform
- Healthcare reform as component of economic recovery
Bending the Curve Towards Transformed Health
Achieving Meaningful Use of Health Data

2009  2011  2013  2015

- Data capture and sharing
- Advanced clinical processes
- Improved outcomes

25
Medicare/Medicaid support for provider and hospital adoption of HIT

- Hospitals $2M (+/- depending on case mix and Medicare Part A inpatient bed days)
- Physicians potentially > $60K (+/- depending on case mix)
- Certified HIT (Certification Commission for HIT)
- “meaningful use”: eRx, healthcare information exchange, quality measures reporting
- Penalties for non-use after 2015
### Table 5: Medicaid Incentive Payout Schedule for Eligible Professionals

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>Medicaid EPs who begin adoption in</th>
</tr>
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<tbody>
<tr>
<td>2011</td>
<td>$21,250</td>
</tr>
<tr>
<td>2012</td>
<td>$8,500</td>
</tr>
<tr>
<td>2013</td>
<td>$8,500</td>
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<tr>
<td>2014</td>
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<tr>
<td>2015</td>
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<td>2016</td>
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<td>2017</td>
<td>$8,500</td>
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<tr>
<td>2018</td>
<td>$8,500</td>
</tr>
<tr>
<td>2019</td>
<td>$8,500</td>
</tr>
<tr>
<td>2020</td>
<td>$8,500</td>
</tr>
<tr>
<td>2021</td>
<td>$8,500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$63,750</td>
</tr>
</tbody>
</table>
Meaningful use divided into three stages

- Stage 1 only one currently defined, Stage 2 prior to 2013 and Stage 3 prior to 2015

Must use a certified EHR, which entails:

- A complete EHR, or set of EHR modules, that fulfill all of the meaningful use criteria

Two categories of providers

- Eligible Professionals
  - Hospital-based professionals are not allowed to receive incentive dollars
- Hospitals
Example

- Goal
  - 85% of patients with high blood pressure and cholesterol have it well controlled

- Advanced care processes
  - Use of evidence-based order sets
  - Monitoring and addressing medication adherence
  - Clinical decision support at the point of care
  - Patient outreach and reminders
  - Quality benchmarking and reporting

- Clinical data capture (can be queried and trended)
  - Systolic & diastolic blood pressure
  - Medication and Problem list
  - Laboratory tests and procedures
  - Prescription fill histories
HIT-Enabled Health Reform

Achieving Meaningful Use

2009

HIT-Enabled Health Reform

2011

2013

2015

Meaningful Use Criteria

HITECH Policies

2011 Meaningful Use Criteria
(Capture/share data)

2013 Meaningful Use Criteria
(Advanced care processes with decision support)

2015 Meaningful Use Criteria
(Improved Outcomes)
The evidence for and against HIT

- 55-83% decrease in hospital non-intercepted serious ADEs using CPOE
- 73% of outpatient drug interaction alerts led to change in prescriptions
- 22-78% increased adherence to preventive health reminders
- Fewer medical errors through computerized physician order entry and clinical decision support systems
- Savings of approximately $5000 using CPOE in hospital
- Reduced length of stay in critical care, and overall LOS with CPOE
- 15% overall reduced hospital fatality with HIT
- CDS in hospitals resulted in 16% fewer complications, and $538 less expense

Bates, JAMA 1998  
Gandhi, JGIM 2001  
Amarasingham R Arch Int Med 2009
5 mature CPOE sites surveyed, 2004-5

<table>
<thead>
<tr>
<th>Issue</th>
<th>Frequency (%)</th>
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<tbody>
<tr>
<td>work for clinicians</td>
<td>19.8</td>
</tr>
<tr>
<td>unfavorable workflow issues</td>
<td>17.6</td>
</tr>
<tr>
<td>never ending system demands</td>
<td>14.8</td>
</tr>
<tr>
<td>problems related to paper persistence</td>
<td>10.8</td>
</tr>
<tr>
<td>untoward changes in communication patterns and practices</td>
<td>10.1</td>
</tr>
<tr>
<td>negative emotions</td>
<td>7.7</td>
</tr>
<tr>
<td>generation of new kinds of errors</td>
<td>7.1</td>
</tr>
<tr>
<td>unexpected changes in the power structure</td>
<td>6.8</td>
</tr>
<tr>
<td>overdependence on the technology</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Campbell EM, Sittig DS et al., JAMIA 2006
How Does HIT Save Money?

- **EHR Effects**
  - Completeness, correctness, decision support, formulary, brand to generic, duplicate/redundant meds and tests, charge display
  - Workflow support, messaging (pt/provider), referral, A/R, team

- **CPOE Effects**
  - Reduction in hospitalization/LOS due to ADEs, clinical decision support

- **HIEI Effects**
  - Reduction in unnecessary and redundant tests and procedures
  - Labor cost savings

- **Telehealth Effects**
  - Reduction in patient transport, utilization of hospitals, and physician office visits

- **PHR Effects**
  - Administrative time savings
  - Reduction in hospitalizations and physician visit utilization
  - Improved medication safety
  - Reduction in redundant laboratory tests
Net US could save $150B with HIT adoption, or approximately 7.5% or US Healthcare Expenditure

- The Value of Ambulatory Computerized Order Entry (ACPOE)
  - $44B US nationally; $29K per provider, per year
- The Value of HealthCare Information Exchange and Interoperability (HIEI)
  - $78B/yr
- The Value of IT-enabled Chronic Diabetes Management (ITDM)
  - $8.3B Disease Registries; Advanced EHR $17B
- The Value of Physician-Physician Tele-healthcare
  - >$20B*
- The Value of Personal Health Records
  - Approx. $20B
Rates of Positive Survey Responses on the Effect of Adoption of EMRs, 2008

4% of physicians use fully functional electronic health records
13% use some form of basic electronic records

How can an EHR make a difference?

Structure → Process → Outcome

Adoption

Get an EMR and use it

We are here

Effective Use

Use key EMR features fully

Smart Use

Leverage EMR decision support

Meaningful Use
High Performance Medicine: Medication Safety

Summary: Impact on Serious Medication Error-Points in the Medication Administration Loop

- Transcription Errors (11%)
  - eMAR - 100% reduction

- Ordering Errors (49%)
  - CPOE & Decision Support - 55% reduction

- Dispensing Errors (14%)
  - Pharmacy Bar Coding - 67% reduction

- Administration Errors (26%)
  - eMAR/Bar Coding at bedside - 51% reduction

Patient

RN

Medication on Wards

Medication Admin Record

Pharmacist

MD

HMP:2
Assessment and recommendations generated from rules engine

- Lipids
- Anti-platelet therapy
- Blood pressure
- Glucose control
- Microalbuminuria
- Immunizations
- Smoking
- Weight
- Eye and foot examinations

No recent LDL measurement
Patient is on anti-platelet therapy

Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
Patient is due for Pneumovax (older than 65, no record of prior vaccination)
Patient is due for Influenza Vaccine (high risk medical condition)
Patient may be Current Smoker, not thinking of quitting. Last counseled on 10/10/06.
Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)
Medication Orders

Lab Orders

Referrals

Handouts/Education
Preliminary Results:
Smart Form On Treatment Analysis

- **Up-to-date BP result**: Control vs. Smart Form Used: <0.001
- **Change in BP therapy if above goal**: Control vs. Smart Form Used: 0.05
- **Up-to-date height and weight**: Control vs. Smart Form Used: 0.004
- **Change in therapy if A1C above goal**: Control vs. Smart Form Used: 0.006
- **Up-to-date foot exam documented**: Control vs. Smart Form Used: <0.001
- **Up-to-date eye exam documented**: Control vs. Smart Form Used: <0.001
- **# of deficiencies addressed**: Control vs. Smart Form Used: <0.001
Red, yellow, and green indicators show adherence with targets

<table>
<thead>
<tr>
<th>Measure</th>
<th>My Value (N)</th>
<th>Clinic Average (N)</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Inhibitor/ARB Management. % of patients on ACE inhibitor/angiotensin-receptor blocker</td>
<td>52% (55)</td>
<td>59% (1033)</td>
<td>&gt; 78%</td>
</tr>
<tr>
<td>BMI Documentation. % of patients with BMI documented</td>
<td>22% (23)</td>
<td>43% (839)</td>
<td>&gt; 78%</td>
</tr>
<tr>
<td>Smoking Status Documentation. % of patients with smoking status documented</td>
<td>18% (19)</td>
<td>32% (597)</td>
<td>&gt; 97%</td>
</tr>
<tr>
<td>Anti-platelet Management. % of patients on anti-platelet</td>
<td>81% (85)</td>
<td>79% (1473)</td>
<td>&gt; 94%</td>
</tr>
<tr>
<td>Beta-blocker Management. % of patients on beta-blocker</td>
<td>69% (72)</td>
<td>75% (1392)</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>Hospitalist Management. % of patients with hospitalist</td>
<td>27% (28)</td>
<td>50% (929)</td>
<td>&gt; 68%</td>
</tr>
<tr>
<td>Zero Defect Care: % of patients with zero deficiencies</td>
<td>75% (79)</td>
<td>72% (1352)</td>
<td>&gt; 82%</td>
</tr>
</tbody>
</table>

Zero defect care:
- Aspirin
- Beta-blockers
- Blood pressure
- Lipids

Targets are 90th percentile for HEDIS or for Partners providers
Introducing Patient Gateway - the fast, efficient, and secure way to reach your doctor’s office. Developed by Partners HealthCare System, Patient Gateway uses the power of the Internet, so you can renew prescriptions, request referral authorizations for specialist appointments, and access quality health and wellness information - at your convenience. With Patient Gateway, connecting with your doctor’s office has never been easier!

Enroll online today at: www.patientgateway.org

or

email us at: patientgateway@partners.org
Discrepancy

Details
More medication changes in visits after diabetes journal submission:

Grant RW et al. Practice-linked Online Personal Health Records for Type 2 Diabetes: A Randomized Controlled Trial. *Arch Intern Med.* 2008 Sep 8;168(16):1776-82.
“I conclude that though the individual physician is not perfectible, the system of care is, and that the computer will play a major part in the perfection of future care systems.”

Clem McDonald, MD NEJM 1976

Thank you!
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www.citl.org