Knowledge Technologies
To Improve Public Health

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Landmark Clinical Trials
AND THEIR CURRENT RATE OF USE

<table>
<thead>
<tr>
<th>CLINICAL PROCEDURE</th>
<th>LANDMARK TRIAL</th>
<th>CURRENT RATE OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flu Vaccine</td>
<td>1968</td>
<td>98.4% (2000)</td>
</tr>
<tr>
<td>Thrombolytic Therapy</td>
<td>1971</td>
<td>20% (2000)</td>
</tr>
<tr>
<td>Pneumococcal Vaccine</td>
<td>1977</td>
<td>53% (2000)</td>
</tr>
<tr>
<td>Beta Blockers after MI</td>
<td>1982</td>
<td>92.5% (2001)</td>
</tr>
<tr>
<td>Mammography</td>
<td>1982</td>
<td>75.5% (2001)</td>
</tr>
<tr>
<td>Cholesterol Screening</td>
<td>1984</td>
<td>69.1% (1999)</td>
</tr>
<tr>
<td>Fecal occult blood test</td>
<td>1986</td>
<td>20.6% (1999)</td>
</tr>
</tbody>
</table>


Speed of Innovation
in Health Care

- The speed of health care innovation is the percentage of eligible patients who will benefit from an evidence-based clinical procedure this year in comparison to last year.
- It can be estimated by dividing the difference between two utilization rates of the same procedure - separated by the largest time difference and coming from a consistent measurement source – with the number of years between them.
- For example, immunizing half of the eligible population in a given year and every eligible patient five years later means 10% annual speed of innovation for immunization.

Improvement in Patient Care
(Average speed of innovation: 2.39%/yr)

Global Area of Bt Cotton
(Average speed of innovation: 4.94% of cotton area/yr)

Knowledge and timber shouldn't be much used till they are seasoned.

Oliver Wendell Holmes
(1809-1894)
Productivity

- Productivity - real GDP per worker
- Labor productivity:
  The value of output per unit of labor input
- Calculation formula:
  Value of Outcome / Cost of Production

First Report on Health Care Productivity

“A certain woman, who had an issue of blood twelve years, had suffered many things of many physicians, and had spent all that she had, and was nothing bettered, but rather grew worse”

Mark 5:25-26

Substantiated Content in Diabetes Education Websites

(79 RCTs - 18 web sites)

- Searches for evidence: (i) targeted clinical area diabetes, (ii) randomised clinical trial, (iii) patient focused educational intervention tested versus control, and (iv) measurement of the outcome of care.
- Searches for European and American web sites: (i) academic health sciences center or a health web site recommended by them, (ii) comprehensive patient information on the web, and (iii) focus on diabetes.

Knowledge, if it does not determine action, is dead to us.

Plotinus (205 AD - 270 AD)

Actionable Knowledge!

Replicable Cause-effect Linkages to Make Things Happen

First Report on Health Care Productivity

“A certain woman, who had an issue of blood twelve years, had suffered many things of many physicians, and had spent all that she had, and was nothing bettered, but rather grew worse”

Mark 5:25-26

Rethinking Knowledge

- Demand: Most popular search topic on the Internet
- Culture: Public pressure for rationality and accountability
- Production: Doubling of NIH funding
- Dissemination: Transfer of research to practice
- Automation: Making sense of computerized patient data
Evidence

“People have a romantic relationship with their hospitals.”
Andrea Fisher (Green Party)
Federal Minister of Health
Germany, 1999

Quality of Evidence
(U.S. Preventive Services Task Force)

I. Evidence from at least one properly designed randomized controlled trial
II. Evidence from controlled trials without randomization
III. Evidence from cohort or case-control studies
IV. Evidence from multiple time series studies
V. Opinions of respected authorities or expert committees

Junk Food or Junk Information?
“This product contains olestra. Olestra may cause abdominal cramping and loose stool. Olestra inhibits the absorption of some vitamins and other nutrients.”
Warning label is required by FDA on all olestra-containing products.

Numerous accusations have been made since the FDA approval of olestra in 1996. Claims are that it can cause a variety of GI disturbances, including severe diarrhea.

Junk Food or Junk Information?

“... we were unable to demonstrate any increase in the frequency of GI symptoms when participants ate as many olestra potato chips as they cared to at one time.”


New Knowledge about Breast Cancer

“Cancer on the father’s side of the family doesn’t count.”

“Ovarian cancer in the family history is not a factor in breast cancer risk.”

“The most important thing in the family history is the number of women with breast cancer.”

Half of all women with hereditary risk inherited it from their father.
Ovarian cancer is an important indicator of hereditary risk, although it is not always present.
Age of onset of breast cancer is more important than the number of women with the disease.

Side-by-side Comparison for Health Smart Cards

<table>
<thead>
<tr>
<th>Period</th>
<th>Controlled Evidence</th>
<th>Health Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966-1985</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1986-1990</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1991-1995</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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**Actionable Knowledge**

When the patient condition and the clinical decision are incompatible clinicians need to be alerted.

**Medical Logic Module: Long acting benzodiazepine for elderly patient**

<table>
<thead>
<tr>
<th>Condition (IF)</th>
<th>Intervention (AND)</th>
<th>Warning (THEN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly, age &gt; 75 yrs, patients</td>
<td>Administration of long-acting benzodiazepine (flurazepam or triazolam)</td>
<td>&quot;Studies linked prescription of long acting benzodiazepines for elderly patients to significant sedation, falls, and hip fractures. Such prescription can be considered an error and prompt HCFA review.&quot;</td>
</tr>
</tbody>
</table>

**Information at the Point of Care**

**Patient Safety Modules**

<table>
<thead>
<tr>
<th>Project partners</th>
<th>Conditions</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saint Louis University, Missouri</td>
<td>Essential hypertension</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Asthma</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Depressive disorder</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General symptoms</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Other common diagnoses</td>
<td>11</td>
</tr>
<tr>
<td>Duke University, North Carolina</td>
<td>Childhood asthma</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Ear Nose Throat (ENT)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pediatric Rheumatology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Hydrocephalus</td>
<td>2</td>
</tr>
<tr>
<td>Cedars Sinai Medical Center, Los Angeles</td>
<td>Surgical Procedures</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Immunization</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Other pediatric conditions</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>79</td>
</tr>
</tbody>
</table>

**PATHOS: Pathways to Healthy Outcomes**

Paul M. Ellwood, M.D. - February 18, 2003 - Jackson Hole Group

- Objective #1 – An Overhauled Health System that can curtail medical inflation, increase productivity, improve quality, attack inappropriate and unsafe practices, and hasten the application of health advances that are well-grounded in science.
- Objective #2 – “Agreement to Share Knowledge (ASK)” positions patients to determine the direction of the health system by giving them more information, power and responsibility.
  
  To obtain coaching, upgrade personal health records, schedule appointments, receive alerts, warnings and test results, obtain decision support, prescription renewals, progress reports, and monitor various physiologic functions, etc.
- Objective #3 – Establish an Institute for Medical Practice and Consumer Technology (IMPaCT).
- Objective #4 – Health Insurance protection for all Americans.

**Specification for Healthy Eating**

(For the case of biotechnology)

- High in polysaccharides, starches, and low in monosaccharides and disaccharides
- Free from trans-unsaturated fatty acids
- Rich in soluble fibers like ß-glucan and pectin
- 2-3 g of plant sterols for the day
- Rich in omega-3 polyunsaturated fatty acids, specifically EPA and DHA
- Adequate in potassium, magnesium, and calcium
- Rich in antioxidant, like carotenoids and vitamin E
- Protein about 15% total energy or 50 to 100 g for the day
- Sodium chloride <6 g for the day
- Saturated fat <10% of energy
- Cholesterol <300 mg for the day
- Fat intake of 30% of total energy
- 20 to 50 g of soy protein for the day

Overall, prompting can improve preventive care performance by 13.1%.

<table>
<thead>
<tr>
<th>Table 3. Comparison of Various Prompting Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Computer prompting</td>
</tr>
<tr>
<td>Reminder</td>
</tr>
<tr>
<td>Telephone alerting</td>
</tr>
<tr>
<td>Alternative display</td>
</tr>
</tbody>
</table>


Mobile Health Care

The Citizen Health System
- 15.7 million people with diabetes <-> 11,500 certified educators
- Consortium of Aristotle University (Greece); University of Missouri (USA); Agilent (Italy); CardGuard (Israel); Regensburg University (Germany); University of Genova (Italy) - Funded by the European Commission
- Highly structured, diabetes educational content forwarded 2-3 times per week based on a patient-clinician contract (control group usual care)

Knowledge for Public Health
- Programs are speed, time, distance, calories, cardiovascular
- For cardiovascular exercise enter your weight and age – load will be adjusted to your target range

School of Public Health

Thank you!