Can Clinical Informatics Improve the Affordability and Quality of Health Care?

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Cedars-Sinai Health System
Disclosure: Stanson Chairman of Board
Exhibit 1. Health Care Spending as a Percentage of GDP, 1980–2013

* 2012.

Notes: GDP refers to gross domestic product. Dutch and Swiss data are for current spending only, and exclude spending on capital formation of health care providers.
Source: OECD Health Data 2015.
## Exhibit 9. Select Population Health Outcomes and Risk Factors

<table>
<thead>
<tr>
<th>Country</th>
<th>Life exp. at birth, 2013ᵃ</th>
<th>Infant mortality, per 1,000 live births, 2013ᵃ</th>
<th>Percent of pop. age 65+ with two or more chronic conditions, 2014ᵇ</th>
<th>Obesity rate (BMI&gt;30), 2013ᵃ,c</th>
<th>Percent of pop. (age 15+) who are daily smokers, 2013ᵃ</th>
<th>Percent of pop. age 65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>82.2</td>
<td>3.6</td>
<td>54</td>
<td>28.3ᵉ</td>
<td>12.8</td>
<td>14.4</td>
</tr>
<tr>
<td>Canada</td>
<td>81.5ᵉ</td>
<td>4.8ᵉ</td>
<td>56</td>
<td>25.8</td>
<td>14.9</td>
<td>15.2</td>
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<tr>
<td>Denmark</td>
<td>80.4</td>
<td>3.5</td>
<td>−</td>
<td>14.2</td>
<td>17.0</td>
<td>17.8</td>
</tr>
<tr>
<td>France</td>
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<td>3.6</td>
<td>43</td>
<td>14.5ᵈ</td>
<td>24.1ᵈ</td>
<td>17.7</td>
</tr>
<tr>
<td>Germany</td>
<td>80.9</td>
<td>3.3</td>
<td>49</td>
<td>23.6</td>
<td>20.9</td>
<td>21.1</td>
</tr>
<tr>
<td>Japan</td>
<td>83.4</td>
<td>2.1</td>
<td>−</td>
<td>3.7</td>
<td>19.3</td>
<td>25.1</td>
</tr>
<tr>
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<td>46</td>
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<td>18.5</td>
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<td>30.6</td>
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<td>14.2</td>
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<td>2.4</td>
<td>43</td>
<td>10.0ᵈ</td>
<td>15.0</td>
<td>15.6</td>
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<tr>
<td>Sweden</td>
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<td>2.7</td>
<td>42</td>
<td>11.7</td>
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</tr>
<tr>
<td>Switzerland</td>
<td>82.9</td>
<td>3.9</td>
<td>44</td>
<td>10.3ᵈ</td>
<td>20.4ᵈ</td>
<td>17.3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>81.1</td>
<td>3.8</td>
<td>33</td>
<td>24.9</td>
<td>20.0ᵈ</td>
<td>17.1</td>
</tr>
<tr>
<td>United States</td>
<td><strong>78.8</strong></td>
<td><strong>6.1ᶜ</strong></td>
<td><strong>68</strong></td>
<td><strong>35.3ˢ</strong></td>
<td><strong>13.7</strong></td>
<td><strong>14.1</strong></td>
</tr>
<tr>
<td>OECD median</td>
<td>81.2</td>
<td>3.3</td>
<td></td>
<td>23.3</td>
<td>18.9</td>
<td>17.8</td>
</tr>
</tbody>
</table>

ᵃ Source: OECD Health Data 2015.
ᵇ Includes: hypertension or high blood pressure, heart disease, diabetes, lung problems, mental health problems, cancer, and joint pain/arthritis. Source: Commonwealth Fund International Health Policy Survey of Older Adults, 2014.
ᶜ DEN, FR, NETH, NOR, SWE, and SWIZ based on self-reported data; all other countries based on measured data.
ᵈ 2012, ˢ 2011.
Factoids

- 250,000 fatal medical errors in the US/year
- Patient mortality rates are lower for women physicians
- 80% to 90% of health care costs influenced by physician/provider decisions
- 1/3 of health care spend may be waste
- 10% health care spend over-treatment
- $31 billion federal subsidy for EHRs

Eliminating Waste in US Health Care

Donald M. Berwick, MD, MPP; Andrew D. Hackbarth, MPhil

Author Affiliations

Doctors hail House vote to repeal, replace SGR

BY ALICIA GALLEGOS in Top News Stories on March 26th, 2015

Physicians are lauding passage of legislation by the House of Representatives to repeal the Medicare Sustainable Growth Rate formula (SGR) and replace it with an alternative system that would raise physician payments and focus on value-based performance. The bill also reauthorizes the Children’s Health Insurance Program (CHIP) for 2 years.

By a vote of 329-37, the House on March 26 passed H.R. 2, the Medicare Access and CHIP Reauthorization Act. The legislation builds on H.R. 1470, the SGR

Senate Passes Historic SGR Repeal Bill By Vote of 92-8

— Measure now heads to President Obama, who has said he will sign it.
Health System Challenges

- Value-based care - reimbursement
  - Medicare
    - Inpatient losses
    - MACRA
    - Medicare Advantage
  - Commercial insurance
    - Risk-based payments
    - ACOs
    - Narrow networks
    - Bundles
SATURDAY, APRIL 19 AT 9 PM

Billy Crystal 700 Sundays
50 Things Your Smartphone Replaced (Or Will Replace In The Future)

- Camera
- Cam-recorder
- Radio
- Portable Music Player
- eBook Reader
- Calculator
- Voice Recorder
- GPS
- Flash Light
- Leveler
- Scanner
- Compass
- Portable Gaming Device
- Game Console Controller
- Barcode Scanner
- Credit Card Scanner
- USB Thumbdrive
- Portable Video Player
- Walkie Talkie
- Traditional Landline Phone
- Clock/Alarm Clock
- Wrist Watch
- Timer
- Books

- Calendar
- Notepad/Sketchpad
- Newspaper
- Photo Album
- Contact List/Phone Book
- Board Games
- Watching Movies
- Land-line Internet
- Checking eMail
- Surfing Internet
- Video Chatting
- Thermostat
- Measuring Tapes
- Guitar Tuner
- Light Meter
- ATM/Debit/Credit Cards
- Airline Tickets
- Business Cards
- Remote Controller
- Car Keys
- Paper Money/Coins
- Cable TV
- Laptops
- Communication Skills
Decision Support

Lowered accident claims

Mercedes 16%
Acura 15%
Decision Support
## What works?

### Predictors of Success

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automatic provision of decision support as part of workflow</strong></td>
<td>112</td>
</tr>
<tr>
<td>Provision of decision support at the time and location of decision making</td>
<td>15</td>
</tr>
<tr>
<td>Provision of recommendation rather than just an assessment</td>
<td>7</td>
</tr>
<tr>
<td>Computer-based generation of decision support</td>
<td>6</td>
</tr>
</tbody>
</table>

Choosing Wisely
American College of Emergency Physicians

Five Things Physicians and Patients Should Question

1. Avoid computed tomography (CT) scans of the head in emergency department patients with minor head injury who are at low risk based on validated decision rules.

Minor head injury is a common reason for visiting an emergency department. The majority of minor head injuries do not lead to injuries such as skull fractures or bleeding in the brain that need to be diagnosed by a CT scan. As CT scans expose patients to ionizing radiation, increasing patients’ lifetime risk at an early age, they should only be performed on patients at risk for significant injuries. Physicians can safely identify patients with minor head injury in whom it is safe to not perform an immediate head CT by performing a thorough history and physical examination following evidence-based guidelines. This approach has been proven safe and effective at reducing the use of CT scans in large clinical trials. In children, clinical examination in the emergency department is recommended for some patients with minor head injury prior to deciding whether to perform a CT scan.

2. Avoid placing indwelling urinary catheters in the emergency department for either urine output monitoring in stable patients who can void, or for patient or staff convenience.

Indwelling urinary catheters are placed in patients in the emergency department to assist when patients cannot urinate, to monitor urine output for patient comfort. Catheter-associated urinary tract infection (CAUTI) is the most common hospital-acquired infection in the U.S., and can be prevented by reducing the use of indwelling urinary catheters. Emergency physicians and nurses should discuss the need for a urinary catheter with a patient and/or their caregivers, as sometimes such catheters can be avoided. Emergency physicians can reduce the use of indwelling urinary catheters by following the Centers for Disease Control’s guidelines for the use of urinary catheters. Indicators for a catheter may include output monitoring for critically ill patients, renal or urinary obstruction, at the time of surgery and trauma patients. When possible, alternatives to indwelling urinary catheters should be used.

3. Don’t delay engaging available palliative and hospice care services in the emergency department for patients likely to benefit.

Palliative care is medical care that provides comfort and relief of symptoms for patients who have chronic and/or incurable disease. Hospice care is palliative care for those patients in the final five months of life. Palliative care should ensure patients are discharged from the emergency department with chronic or terminal diseases, their families, in conversations about palliative care and hospice services. Early referral from the emergency department to hospice and palliative care services can benefit patients, resulting in both improved quality and quantity of life.

4. Avoid antibiotics and wound cultures in emergency department patients with uncomplicated skin and soft tissue abscesses after successful incision and drainage and with adequate medical follow-up.

Cuts and soft tissue infections are a frequent reason for visiting an emergency department. Some infections, such as abscesses, become walled-off and form pus under the skin. Opening and draining the abscess is the appropriate treatment; antibiotics offer no benefit. Even in abscesses caused by Methicillin-resistant Staphylococcus aureus (MRSA), appropriately selected antibiotics offer no benefit. If the abscess has been adequately drained and the patient has a well-functioning immune system, antibiotics are not needed or the result will not alter clinical management. Additionally, culture of the abscess is not needed or not cost-effective. CT scans have risks and cost a lot. CT scans use radiation, which can increase the risk of cancer. Children, especially infants, have greater risks because their brains are still developing. Services in the ER cost a lot, because of fees for doctors, services, and facilities. A CT scan can add over $2,600 to your costs.

5. Avoid instituting intravenous (IV) fluids before doing a trial of oral rehydration therapy in uncomplicated emergency department cases of mild to moderate dehydration in children.

Many children who come to the emergency department with dehydration require fluid replacement. To avoid the pain and potential complications of an IV catheter, it is preferable to give these fluids by mouth. Giving a medication for nausea may allow patients with nausea and vomiting to accept food replacement early. This strategy can eliminate the need for an IV. It is best to give these medications early during the ED visit, rather than later, in order to allow time for them to work optimally.

Avoid unnecessary treatments in the ER
A discussion with the doctor can help you make the best decision

It can be hard to say “No” in the emergency department. But talking with your emergency room (ER) doctor may help you avoid costly testing. That’s why the American College of Emergency Physicians lists three common procedures you should know about:

- CT scans of the head for minor injury
- Urinary catheters
- Antibiotics and cultures for abscesses

CT scans of the head for minor injury. A CT scan uses X-rays to create a picture of the brain. If your head injury is not serious, a CT scan does not give useful information to the doctor. A medical history and physical exam help the doctor determine if your injury is minor. This can help you avoid a CT scan.

**You may need a CT scan if you have dangerous symptoms, such as:**
- An injury your doctor can see or feel
- Becoming unconscious
- Changes in mental state or alertness
- Ongoing vomiting or a bad headache

If you take a blood thinner, such as warfarin (Coumadin®), you are more likely to bleed. So you may need a CT scan, even for a minor injury.
Examples

1. Don’t place, or leave in place, urinary catheters for incontinence or convenience or monitoring of output for non-critically ill patients (acceptable indications: critical illness, obstruction, hospice, perioperatively for <2 days for urologic procedures; use weights instead to monitor diuresis).

   Increased morbidity, mortality, costs

2. Don’t prescribe medications for stress ulcer prophylaxis to medical inpatients unless at high risk for GI complications. According to published guidelines, medications for stress ulcer prophylaxis.

   Increased nosocomial pneumonia, C difficile, costs

3. Avoid transfusions of red blood cells for arbitrary hemoglobin or hematocrit thresholds and in the absence of symptoms of active coronary disease, heart failure or stroke.

   Increased morbidity, mortality, costs
Cedars-Sinai Alerts Its Docs to *Choosing Wisely*

*June 5, 2014*

With a focus on stimulating physician and patient conversations, there is perhaps no more appropriate environment in which the *Choosing Wisely®* campaign could take hold than the examining room. Cedars-Sinai Health System has taken an important step in ensuring these conversations happen by becoming the first system in the nation to incorporate dozens of specialty society campaign recommendations into its electronic medical records (EMR) system.
Choosing Wisely: Don’t use benzodiazepines or other sedative-hypnotics in older adults as first choice for insomnia, agitation or delirium. 

(American Geriatrics Society)¹, ², ³

Hyperlink: Choosing Wisely – American Geriatrics Society

Information for Patients: Use of Sedatives in Elderly Patients

Reasons for override:

- sleep disorder
- end of life care
- withdrawal / DT
- non-drug options failed
- peri-procedural anesthesia

note: CDS alert displays using Epic’s native best practice alerts; Epic does not allow use of actual screenshots
Choosing Wisely

≈ alerts 250 per day
About 2.5% of total alerts
Choosing Wisely: Don’t transfuse more units of blood than absolutely necessary. *(Society for Hospital Medicine)*

Information for Patients: Blood Transfusion for Anemia in the Hospital

Reasons for override:
- Active blood loss
- Hemoglobinopathy
- Subarachnoid hemorrhage
- Chemotherapy

Highlighted in the image:
- likely appropriate
- likely unnecessary
- order placed
- order cancelled

Targeted alerts integrated into workflow with closed loop analytics

Note: CDS alert displays using Epic’s native best practice alerts; Epic does not allow use of actual screenshots.
Crimson reports 17% reduction in blood utilization while CMI increased by 14%.

* 2015 is projected from 6 months of data

** 2015 Case Mix Index (CMI) value is from January-June data
Cancelled orders

*If you trigger the same alert 10 times, do you order and cancel or anticipate the alert?*

*If you have already explained the test/procedure to the patient, do you cancel or wait and not order the next time?*

*Does not account for educational impact*

Reduced rate of ordering/inappropriate orders avoided

*Harder to measure*

- *Interrupted time series design*
- *Inappropriate orders avoided design*
- *Adjusted ordering rates*
Followed Rates Vs. Educational Impact

• Work flow and backtracking
  – Blood tests
  – MRI
  – Colonoscopy
  – PAP smears
What About Patients?

An initiative of the ABIM Foundation
What About Patients?

Advice from Consumer Reports

Tips for better sleep

- **Exercise.** Physical activity helps people sleep better. But avoid vigorous activity for several hours before bedtime.
- **Keep a routine.** Try to go to bed and wake up at about the same time every day, even on weekends.
- **Try not to eat right before bedtime.** Eat three hours or more before going to bed.
- **Avoid caffeine after 3 p.m.** Some people need to avoid caffeine even earlier.
- **Limit alcohol.** Alcohol causes sleepiness at first, followed by wakefulness.
- **Create the right environment.** Keep the bedroom peaceful. And avoid mental excitement before bedtime.
Case Study

- PVCs prevalent – 40% to 70% of population
- Transient atrial fibrillation, SVT
- Old studies - Non-selective antiarrhythmic treatment can increase mortality
  - SPAF – Atrial fibrillation
  - CAST - PVCs

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**Don’t order continuous telemetry monitoring outside of the ICU without using a protocol that governs continuation.**

Telemetric monitoring is of limited utility or measurable benefit in low risk cardiac chest pain patients with normal electrocardiogram. Published guidelines provide clear indications for the use of telemetric monitoring in patients which are contingent upon frequency, severity, duration and conditions under which the symptoms occur. Inappropriate use of telemetric monitoring is likely to increase cost of care and produce false positives potentially resulting in errors in patient management.
Nurse Staffing Ratio

- Cardiac monitoring 1:4
- Regular 1:5
• What changes physicians behavior?
• RCT
• Peer comparison feedback
• Accountable justification
Physician Feedback

Physician Choosing Wisely performance

• Average 0.74% ignored Choosing Wisely alerts/1,000 orders
• Range 0% to 8.77% ignored/1,000 orders

Example: 0.53%
Choosing Wisely Performance Rate
Physician - Reproductive Endocrinology

<table>
<thead>
<tr>
<th>alerts / day</th>
<th>total alerts</th>
<th>total orders</th>
<th>alerts / order</th>
<th>percentile (all)</th>
<th>percentile (Reproductive Endocrinology only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.516</td>
<td>16</td>
<td>529</td>
<td>0.03</td>
<td>2.86 th</td>
<td>20 th</td>
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</table>

**alert summary**

<table>
<thead>
<tr>
<th>alert</th>
<th>triggered</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>LYME DISEASE</td>
<td>6</td>
<td>18%</td>
</tr>
</tbody>
</table>

*Don’t test for Lyme disease as a cause of musculoskeletal symptoms without an exposure history and appropriate exam findings.*

view trigger orders

inappropriate ordering of Lyme disease tests
Case Study

inappropriate vitamin-d screenings - before
January 2014

inappropriate vitamin-d screenings - after
May 2014
Direction

- Attention to workflow
- Suggestions/nudges during documentation
## Evolution of CDS: Towards Precision Medicine

<table>
<thead>
<tr>
<th>Today</th>
<th>Tomorrow</th>
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</thead>
<tbody>
<tr>
<td>![Database Icon] uses <strong>structured EMR data</strong></td>
<td>uses structured + <strong>unstructured</strong> data (via NLP/ML) from <strong>various sources</strong></td>
</tr>
<tr>
<td>![Network Icon] uses <strong>rules-based</strong> approach</td>
<td>uses <strong>rules-based + AI-based</strong> (ML) approach</td>
</tr>
<tr>
<td>![Exclamation Mark] <strong>episodic</strong>: delivered in response to specific provider actions</td>
<td><strong>episodic + surveillance</strong>: delivered whenever and wherever clinical circumstances change</td>
</tr>
</tbody>
</table>
Mission

- Patient care
- Teaching
- Research
Impact on Physicians in Private Practice

• More residents/fellows joining physician organizations

Competency in value-based care
Vascular Surgeon Response

• Physician did not agree with a guideline
• Contacted subspecialty society
• Guideline changed

Society for Vascular Surgery
View all recommendations from this society

Released January 29, 2015; updated July 1, 2016

Avoid use of ultrasound for routine surveillance of carotid arteries in the asymptomatic healthy population.

The presence of a bruit alone does not warrant serial duplex ultrasounds in low-risk, asymptomatic patients, unless significant stenosis is found on the initial duplex ultrasound.

The presence of asymptomatic severe carotid artery disease in the general population yields a risk of neurologic events which is <2%. Even in patients who have a bruit, if no other risk factors exist, the incidence is only 2%. Age (over 65), coronary artery disease, need for coronary bypass, symptomatic lower extremity arterial occlusive disease, history of tobacco use and high cholesterol would be appropriate risk factors to prompt ultrasound in patients with a bruit. Otherwise, these ultrasounds may prompt unnecessary and more expensive and invasive tests, or even unnecessary surgery. In general population-based studies, the prevalence of severe carotid stenosis is not high enough to make bruit alone an indication for carotid screening. With these facts in mind, screening should be pursued only if a bruit is associated with other risk factors for stenosis and stroke, or if the primary care physician determines you are at increased risk for carotid artery occlusive disease.
"Complex but empirically validated algorithms will be embedded in EHR systems as decision support tools to assist in everyday patient care. Those management algorithms will evolve and be modified continuously in accordance with inputs from ongoing clinical observations and from new research. Clinical decision support algorithms will be derived entirely from data, not expert opinion, market incentives, or committee consensus."

Why???
"Of course it's hard. It's supposed to be hard. If it were easy, everybody would do it. Hard is what makes it great."