Update in Medical Informatics
(Non-Systematic Review & Random papers that we found…)

PCC Ojai, California
June 2015

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Bill Galanter, Senior Associate CHIO, University of Illinois Hospital and Health Sciences System
Review Methodology

"Medical Informatics Applications"[Mesh] OR "Medical Informatics"[Mesh] OR "clinical informatics" 5/1/14-4/30/15 & JOURNALS +English +Humans

10534→NOT Diagnostic Imaging [MESH]→5842→Reviews 656

561 Clinical Trials
Journals

Appl Clin Inform
BMC Med Inform Decis Mak
Comput Inform Nurs
Int J Med Inform
J AMIA
J Clin Bioinforma
J Innov Health Inform
J Med Internet Res
J Med Syst
Med Inform (Lond)
Review Methodology

561 Trials

Am J Health Syst Pharm
Anesthesiology
Ann Surg
Annals of Emergency Medicine
Annals of Family Medicine
J GIM
J Hosp Med
JAMA
JAMA Psychiatry
JAMA Psychiatry
JAMA Int Med
Lancet
New Engl J Med
Pediatrics
Pharmacotherapy
Plos Med
Plos One
Published Research in Clinical Informatics

- Asthma
- Bipolar
- Clin Inf

Year:
- 2006
- 2008
- 2010
- 2012
- 2014

Graph showing trends in research publications from 2006 to 2014.
The “Talk/Study or T/S” Ratio®

Patient Protection and Affordable Care Act

T/S = Papers/Trials


® W. Galanter & C. Banas 2014
Midway between politics/policy and medicine

Patient Protection and Affordable Care Act

Log (T/S®)

ICD
Clin Informatics
Asthma


UNIVERSITY OF ILLINOIS
Hospital & Health Sciences System
Changing medicine. For good.

© W. Galanter & C. Banas 2014
What’s in the Research Corpus

Simple Word Counting (SWC)
What’s in the Research Corpus

Buzz

- Population Health
- Meaningful Use
- ICD-10
- Affordable Care Act
- Return on Investment
What’s in the Research Corpus

Methods

- controlled trial
- randomized controlled trial
- quality-adjusted life years or QALY
- Propensity
- case series
- retrospective analysis
- non-inferiority or noninferiority
What’s in the Research Corpus

Topics

- medication or drug
- Phone
- Adherence
- Web-Based
- Decision Support
- patient safety
- telemedicine
- Ontology
- genomics
What’s in the Research Corpus

Topics (continued)

- tablet
- decision aid
- Shared Decision Making
- Personalized medicine
- Medication reconciliation
- informed decision making
- Problem List
What’s in the Research Corpus

Who

- Physician and doctor: 1400
- Nurse: 1200
- Pharmacist or PharmD: 1000
- Chief financial officer: 200
• Unintended consequences of EHR technology
  • The death of radiology rounds
  • Reduced socialization around the physical chart
  • 39x overdose in antibiotic administration when EHR defaulted to mgs/kg instead of mgs
<table>
<thead>
<tr>
<th>Sulfamethoxazole-trimethoprim (BACTRIM DS, SEPTRA DS) 800-160 mg tablet 6,160 mg of trimethoprim</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New</strong></td>
</tr>
<tr>
<td>Modified from: <a href="#">sulfamethoxazole-trimethoprim (BACTRIM DS, SEPTRA DS) 800-160 mg tablet 160 mg of trimethoprim</a></td>
</tr>
<tr>
<td><strong>Edit Clinical Information</strong></td>
</tr>
<tr>
<td><strong>Order dose</strong>: 160 mg/kg of trimethoprim</td>
</tr>
<tr>
<td><strong>Admin dose</strong>: 6,160 mg of trimethoprim (38.5 tablet)</td>
</tr>
<tr>
<td><strong>Weight</strong>: Actual (38.6 kg)</td>
</tr>
<tr>
<td>160 mg/kg of trimethoprim x 38.6 kg (Weight as of Tue Sep 10, 2013 0900)</td>
</tr>
<tr>
<td>= 6,176 mg of trimethoprim x 1 tablet/160 mg of trimethoprim</td>
</tr>
<tr>
<td>= 38.5 tablet x 160 mg of trimethoprim/tablet (rounded to the nearest 0.5 tablet from 38.8 tablet)</td>
</tr>
<tr>
<td>= 6,160 mg of trimethoprim</td>
</tr>
<tr>
<td>= 160 mg/kg of trimethoprim</td>
</tr>
<tr>
<td><strong>Route</strong>: Oral</td>
</tr>
<tr>
<td><strong>Frequency</strong>: Every 12 Hours Scheduled</td>
</tr>
<tr>
<td><strong>For</strong>: Until discontinued</td>
</tr>
<tr>
<td><strong># of doses</strong>:</td>
</tr>
<tr>
<td><strong>1st dose</strong>: Today 2130</td>
</tr>
<tr>
<td><strong>Last dose</strong>:</td>
</tr>
<tr>
<td><strong>Scheduled times (adjusted):</strong></td>
</tr>
<tr>
<td>9/10/2013 2130</td>
</tr>
<tr>
<td>9/11/2013 0900, 2100</td>
</tr>
<tr>
<td><strong>Indications</strong>: PNEUMONIA</td>
</tr>
<tr>
<td><strong>Order questions</strong>:</td>
</tr>
<tr>
<td><strong>Suspected Pathogen</strong>: (no response given)</td>
</tr>
<tr>
<td><strong>Admin instructions</strong>: (none)</td>
</tr>
<tr>
<td><strong>Products to dispense</strong></td>
</tr>
<tr>
<td><a href="#">Sulfamethoxazole 800 mg-Trimethoprim 160 mg Tablet</a></td>
</tr>
</tbody>
</table>
Wachter key points

"An important step is admitting that there is a problem, toning down the hype, and welcoming thoughtful criticism, rather than branding critics as Luddites."

"Unleashing the power of computerization depends on two keys...the technology itself, but also changes in the workforce and culture."

Wachter, The Digital Doctor
Healthy Discussion on ListServ:
40 additions to the thread 3.22-3.23

• A lot of discussion on usability and adoption and MU
  • MU, with its current reliance on highly prescribed process measures with a closely linked certification program - has unintentionally contributed to less than ideal usability”
  • Rich brought up a great point about Coding & MU requirements. It's the "rules of the game" and those rules need to be changed so that vendors and clinicians can work on excelling at a different game.

• His anecdote about the antibiotic mismatch is certainly tragic and heartbreaking, but it's not like these sorts of errors started with the advent of EMRs

• It is just such an easy shot to point out of the failure of EHR and tap all those doctors that are angry. In my mind it is a day late and a dollar short. It’s very easy through the retrospectoscope to make the diagnosis. What is harder is to be the person that does the work.

• …tells a very incomplete and misleading “ugly story” about health IT as villain and physicians as victims. In reality, we are all actors and we have the responsibility to use our tools wisely and work with those who build them…
Open Season (again) on HIT

Health Information Technology

Physicians feel EMRs 'waste' too much time, study finds
Written by Akanksha Jayanthi (Twitter | Google+) | September 09, 2014

RESEARCH LETTER

Use of Internist’s Free Time by Ambulatory Care Electronic Medical Record Systems
Physicians complain about the time costs and other effects of electronic medical records (EMRs).\(^1\)\(^-\)\(^3\) In a small survey,\(^4\) family practice physicians reported an EMR-associated loss of 48 minutes of free time per clinic day \(P < .05\). We collaborated with the American College of Physicians (ACP) to revise the instrument from this study and surveyed the ACP’s national sample of internists to determine the extent of this problem.

Why Some Providers Are Opting Out of Meaningful Use
Lea Chatham February 25th, 2015

JAMA, Sept 2014
Tools of our tools?

The electronic health record

Are we the tools of our tools?

- Rails against EHRs in the realm of resident education, note writing, patient interaction
- The evils of templates, click lists, and copy-forward
- Blames the EHR and it’s creators without really giving thought to how we got here....

Ober, The Pharos (Alpha Omega Alpha) publication, Winter 2015
Health Information Technology and Victory

Robert L. Wears, MD, PhD*

*Corresponding Author. E-mail: wears@uff.edu or r.wears@imperial.ac.uk, Twitter: @wears_r.

You are here: Home > Meaningful Use. Born, 2009, Died, 2014?

Meaningful Use. Born, 2009, Died, 2014?

by BOB WACHTER on NOVEMBER 13, 2014 in HEALTH POLICY, INFORMATION TECHNOLOGY, PAY-FOR-PERFORMANCE, UNCATEGORIZED

5,149 VIEWS TO DATE

The policy known as Meaningful Use was designed to ensure that clinicians and hospitals actually used the computers they bought with the help of government subsidies. In the last few months, though, it has become clear that the policy is failing. Moreover, the federal office that administers it is losing leaders faster than American Idol is losing viewers.

Transition slide for our colleagues from the Pacific Northwest....

SHOULD I HAND THIS TO YOU

OR STEP BACK 5 YARDS AND THROW IT FOR NO REASON

~ 10^9 data points in a 3D set (Patient)x(Time)x(Concepts)
Concepts determined through coded data as well as NLP of >10 million notes

Primary Concepts: GERD, MI, PPI, H2 Blocker

NOT a regression Analysis. Looked for sequences associated with an event i.e. PPI then MI (a + Sequence)

Use of PPI & H2 compared to controls, somewhat like propensity analysis

PPI with 16% increased association (95%CI 1.09–1.24) with MI. H2 Blocker not associated with MI

Type II DM N=100

16 PCP Reviewers using review tool “QNOTE”
“clear, complete, concise, current, organized, prioritized, and sufficient information”

Before EMR
After EMR
5 years later

All patients with DM II
Study: Dilaudid Administration Directly Correlates with High Patient Satisfaction; Narcan Not so Much
Impact of clinical decision support preventing the use of QT-prolonging medications for patients at risk for torsade de pointes

Atsushi Sorita,1 J Martijn Bos,2 Bruce W Morlan,3 Robert F Tarrell,4 Michael J Ackerman,2,5,6 Pedro J Caraballo7

• Mayo study
• Scanned all QT data in search of patients with QTc longer than 500ms
• That sends a message to doc to document Prolonged QTc in the Problem List
• If Prolonged QTc on list AND ordering a potentially dangerous drug as defined by First Data Bank -> ALERT

Alert

Prolonged QT: Drug-Diagnosis Interaction Alert

Patient has “prolonged QT” in the problem list and you are ordering a drug that could increase the risk of torsade de pointes.

Drug(s) with a risk of torsade de pointes:
- Amiodarone 200 mg Tab 1 TABLET PO DAILY
- Citalopram 20mg Tab 1 TABLET PO DAILY

Drug(s) with a possible risk of torsade de pointes:
- Levofloxacin 750 mg IV Q24H x3 Days

Consider other risk factors:
The medication profile in CPOE HAS drug(s) that prolong the QT interval.

Drug(s) with a risk of torsade de pointes
- Haloperidol Tab 1mg PO Q8H

For more information, search for “QT” within AskMayoExpert.

Please direct comment and questions on this alert to: xxxx@xxxx.xxx
The results? 14% reduction in risky meds to these patients

• 2 phases a silent phase to gather data then an active phase with face up alert

• Measured orders that actually made it all the way to administration
People still need their psych meds....

- Zofran
  - 94% -> 58%
- Haldol
  - 98% -> 88%
- Quetiapine
  - 95% -> 92%
- Levofloxacin
  - 97% -> 73%
- Tacrolimus
  - 95% -> 79%

Room for improvement?

- Problem List based is that appropriate? QTc prolongation can be transient
- Utilize most recent QTc as calculated by telemetry?
  - VCU is experimenting with this currently
Transition Comedy Slide....

OH, TEXTING ON YOUR PHONE AND IN 10/10 PAIN

NO DILAUDID FOR YOU!
Effect of a smartphone application incorporating personalized health-related imagery on **adherence** to antiretroviral therapy: a randomized clinical trial. Perera AI, Thomas MG, Moore JO, Fazes K, Petrie KJ. *AIDS Patient Care STDS.* 2014 Nov;28(11):579-86

RCT (N=28) HIV+ on ART, 3-months “augmented” smartphone reminders vs. traditional smartphone reminders
Effect of a smartphone application incorporating personalized health-related imagery on adherence to antiretroviral therapy: a randomized clinical trial. Perera AI, Thomas MG, Moore JO, Fazes K, Petrie KJ. *AIDS Patient Care STDS.* 2014 Nov;28(11):579-86

RCT (N=28) HIV+ on ART, 3-months “augmented” smartphone reminders vs. traditional smartphone reminders

<table>
<thead>
<tr>
<th>Table 1. Differences Between the Active Control Group and Intervention Group with Regard to Adherence Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active control (n=11)</strong></td>
</tr>
<tr>
<td><strong>M (SD)</strong></td>
</tr>
<tr>
<td>MARS score</td>
</tr>
<tr>
<td>Prescribed doses taken (%)</td>
</tr>
<tr>
<td>Pharmacy dispensings (%)</td>
</tr>
<tr>
<td>HIV viral load (log10 copies/mL)</td>
</tr>
</tbody>
</table>

MARS, Medication Adherence Report Scale.
“The crazy part is that I think I can do better, way better,” joked Kershaw, soaked in champagne. “I can probably shave the note by another ninety percent. Gives me something to shoot for going forward, you know?”
3 page perspective piece in the NEJM regarding how EHRs can help advance the “learning health system”

“Physicians struggle to apply new medical knowledge to their own patients, since most evidence regarding the effectiveness of medical innovations has been generated by studies involving patients who differ from their own…”

5 attributes

- Ensure patient groups being compared are similar (DATA STANDARDS are a MUST)
- Analyses need to be automated without losing validity (propensity scoring models)
- Analyses should be repeated in rapid cycles
- Software should be usable / facile
- Results of analysis should be easily digestible

A ‘Green Button’ For Using Aggregate Patient Data At The Point Of Care

- Almost a response to the NEJM perspective piece regarding big data and new thinking for targeted patient care
- A theoretical framework for the “learning health care system”
- Expands upon the notion of “Blue Button” and “Infobuttons”
- Traditional Clinical Trials are expensive, difficult to pull off, and may not be applicable to your patient
- Big data makes registries and large scale retrospective studies possible
- Green button would allow for a pull creation of personalized cohorts of retrospective observational data
The Green Button

• Gives examples of Operationalizing the button
  • Pediatric SLE scenario – do we anticoagulate?
  • Alarm parameters – individualized to patient and disease state
    • Reduce alarm fatigue and false positives

• Policy and Ethical Implications
  • Data should be de-identified (HIPPAA)
  • Role for IRB in such a new world?
  • Patients have a moral obligation to contribute to improving quality and value (just as providers do)

Longhurst et al, “A ‘Green Button’ For Using Aggregate Patient Data at the Point of Care” Health Affairs, July 2014
Transition comedy slide....

• +1 to Dr. Longhurst for posting this pic in an AMDIS thread on the merits of ICD-10 and what the next steps should be.....

RCT, DM II, N=600

I'm afraid you missed a pill Dave. I can't let you do that.

RTC, N=900, Pediatric Asthma, Controller Rx (ICS)

Tx: Automated calls, context based response using speech recognition and EMR data (Med, Refill Hx, Name of prescriber, Family Names)

- Welcome Call
- Refill Call
- Tardy Refill Call

Figure 2. Medication Possession Ratio

- Intervention (n=452)
- Usual care (n=447)
Transition Comedy Slide...

New readmission prevention strategy?

ER Places Bowl Full of Percocet in Waiting Room, Lowers Visits

Jan 31, 2014

HANOVER, NJ – Local emergency medicine physicians have developed a ground breaking way to reduce the number of patients they will see during a shift. The new policy mimics a common Halloween tradition: leave a bowl full of candy outside with a sign that says ‘Take One’-allowing one to get drunk and not be bothered by children.
Checklists as a form of CDS

1. The Joint Commission Journal on Quality and Patient Safety
   Methods, Tools, and Strategies
   Reductions in Invasive Device Use and Care Costs After Institution of a Daily Safety Checklist in a Pediatric Critical Care Unit
   Rod Tarrago, MD; Jeffrey E. Nowak, MD; Christopher S. Leonard; Nathaniel R. Payne, MD


2. Use of Electronic Medical Record—Enhanced Checklist and Electronic Dashboard to Decrease CLABSIs

Pageler et al, Pediatrics; Vol 133, No 3, Mar 2014
• Trial on Paper first (novel idea)
• Then move to fully electronic fulfilled on rounds
• Impressive improvements
  • Reduction in CVC days
  • Reduction in Abx usage
  • Reduction in lab testing
  • Improved ETCO2 use

• Line necessity documentation went thru the roof
• Port needle change frequency increased
• CLABSI rate went from 2.6/1000 days to 0.7/1000 days
Question for LPCH...

• What happened after the conversion?
• What happens to innovators after a rip-and-replace?
Transition wisdom slide... Boiling the Frog

• Words of Wisdom from Halamka
  • http://www.informationweek.com/healthcare/leadership/healthcare-it-leadership-boiling-the-frog/d/d-id/898877

N=8500

Randomized cluster-crossover design

Synchronous non-interruptive CDS using Health-System and City Immune Information System (IIS)

76.2% vs 73.8%; P = .027

Abs Benefit 2.4%

NNT 40

N=660

Randomized Children needing 2\textsuperscript{nd} Flu Vaccine

Educational SMS vs. Reminder SMS vs Routine

Abs Benefit 15.6%
NNT ~6

\( P < .001 \)
Patient access to medical records and healthcare outcomes: a systematic review

Traber Davis Giardina,¹,² Shailaja Menon,¹ Danielle E Parrish,² Dean F Sittig,³ Hardeep Singh¹

• Systematic literature review on the impact of PHRs on the IOM STEEEP domains

• Indexed MESH search from 1970-2012
  - Yielded 27 studies (20 RCTs)
  - Evaluated using QSRF tool

• Examples include:
  - A1C improvement/LDL/BP
  - Adherence
  - Recall of Medical Information
  - Psychosocial health outcomes
  - Accuracy of the Medical Record
  - Perceived Usefulness of Access

Giardina et al, J Am Med Inform Assoc 2014; 21
Patient Access....

- Patient access does NOT increase patient anxiety
- Evidence for improvements was scarce.....

- PHR use may be a marker for characteristics related to better health outcomes, and providing access alone is unlikely to be sufficient to improve outcomes for all types of patients

Giardina et al, J Am Med Inform Assoc 2014; 21
Why bring this up?

• This paper will be very different in 1-2 years
• This analysis is around “old” technology, old portals.....

THIS TOOK AN ACT OF CONGRESS...
Happened last week.....
The Healing Power of Your Own Medical Records

By STEVE LOHR   MARCH 31, 2015

Steven Keating, a doctoral student at M.I.T.’s Media Lab, collected and researched his own patient data, which led to the discovery of a brain tumor. He is shown in front of an image of radiation backscatter from his brain during therapy. Erik Jacobs for The New York Times
Research

The OpenNotes initiative began as a yearlong experiment to investigate patients and doctors’ attitudes about sharing a visit note. At the end of the year, 99% of patients wanted to continue sharing visit notes and no doctor asked for the notes to be turned off. Read the findings, published in the Annals of Internal Medicine.

Now we are undertaking a series of research activities designed to help us understand how shared notes might evolve in the future and their potential role in improving health care nationally.

We’re examining issues of:

- **Patient safety**: Can shared notes help patients spot and correct errors in their medical records?
- **Medical education**: What do we need to teach residents to ensure their notes are effective tools for patients and colleagues?
- **Caregiver access**: How can shared notes help patients’ caregivers optimize care?
- **Mental health**: How can open notes help mental health patients? All of Beth Israel Deaconess Medical Center’s psychiatrists and some of its social work team are now piloting open access to mental health notes with a select group of their patients.
More articles coming next year (or two)?

The Effect of Clinical Decision Support for Advanced Inpatient Imaging

Andrew K. Morarity, MD, Chad Klochko, MD, Matthew O’Brien, MD, Safwan Halabi, MD

Morarity et al, J Am Coll Radiology, 2015
Questions?