AMDIS – Annual Literature Review
July 2017 – June 2018

June 21, 2018

Colin Banas MD

Review Methodology (unchanged)

Hmmm. What cool things did I read this year? What helps me fall asleep. Where can I find my jokes.
I don't have enough to do being a CMIO…

- PubMed weekly hits on CDS, MU, Longhurst ☺ , etc.
- Table of contents emails from journals
- When you guys start going nuts on the listserv
- Twitter (follow me to follow the people I follow @colinbanas_VCU)
- Other randomness
- My focus tends to settle on systematic reviews and big themes of the year, not always pure research

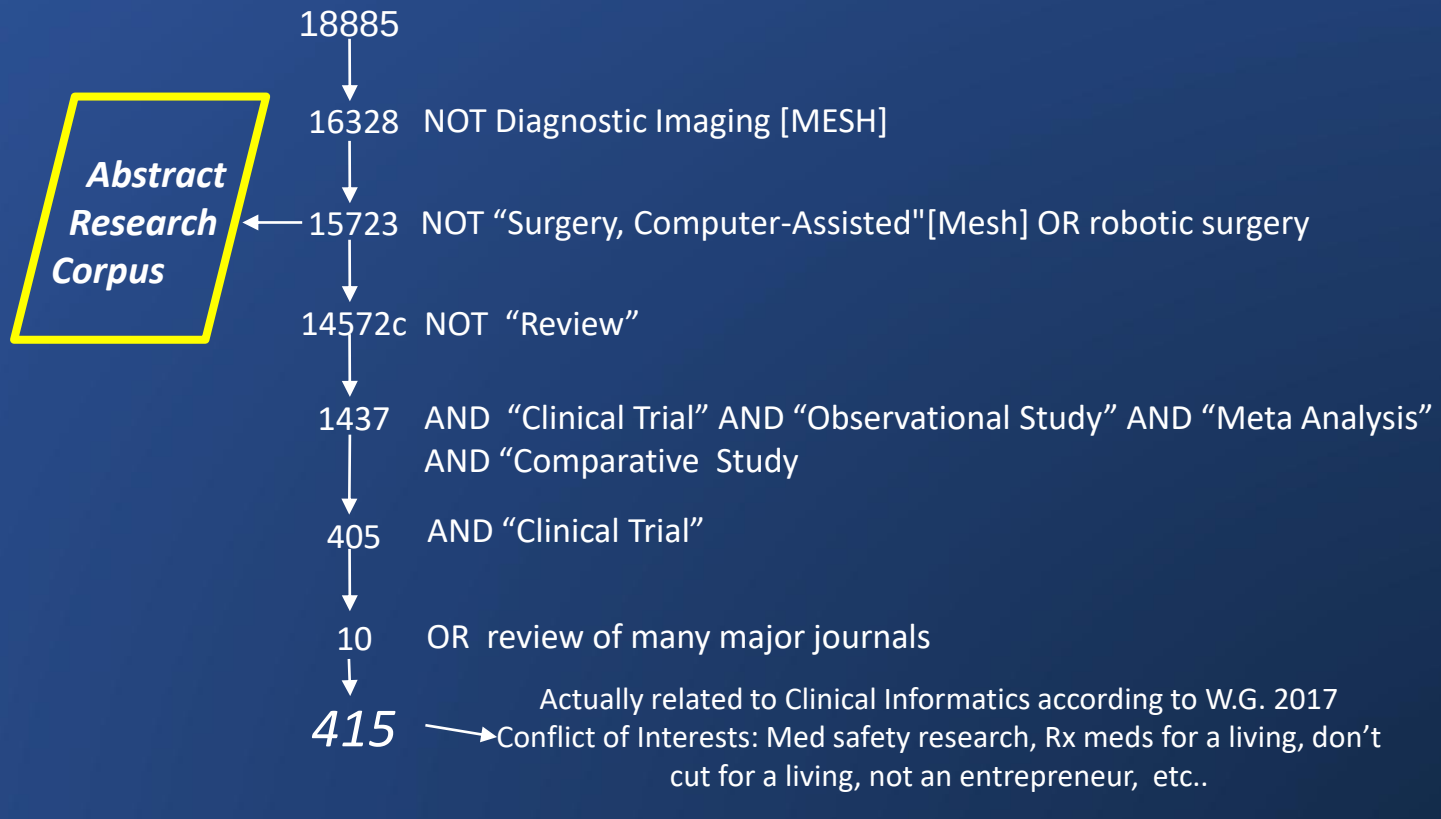
I'm bored, interested in unnecessarily complex methodology

VCU Health

University of Illinois Hospital & Health Sciences System
Changing medicine. For good.

AMDIS

Final Paper Review Methodology




JIB
JAB

So I’m flying Solo…..

- Clinical Decision Support
- Update on cool tech
  - Machine Learning / AI
  - APIs
  - Wearables
- Patient Reported Outcomes and Engagement
- The evils of the EMR and why they are the cause of physician burnout

So it’s all about what I like

- Articles about Meaningful Use – just the really positive ones…..
- Hot Topics in the News
  - Ransomware
  - Students and the EMR
  - CMS
- And much more!

Basically I want to be able look back at this deck and see what was going on in our field in 2017-2018

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Interventions to Reduce the Overuse of Imaging for Pulmonary Embolism: A Systematic Review

Simon Deblois, MA, MSc[1]*, Carl Chartrand-Lefebvre, MD, MSc, FRCP[2,3], Kevin Toporowicz, MD[2], Zhongyi Chen[2], Luigi Lepanto, MD, MSc, FRCP[1,3]

- Systematic review aims to summarize evidence associated with interventions designed to reduce the overuse of imaging in the ED and hospital wards

- Literature review: 2814 articles initially chosen, and narrowed down to 17 studies

- 8 of the studies assessed CDS interventions, including CPOE prompts
  - They show use of electronic CDS is associated with between 8.3 and 25.4% reduction in imaging following intervention
  - Rise in diagnostic yield ranged from 3.4 to 4.4%, with appropriate rise in ordering ranging from 18-19%
- 7 studies included education, policies, and training
  - 3 showed impact on compliance with guidelines, 2 showed a decrease in imaging use, one showed a significant impact on radiation exposure
- 2 studies focused on patient safety
  - Neither showed a statistically significant reduction in mortality, complications from thromboembolism or bleeding events, or any adverse events at 3 months follow-up

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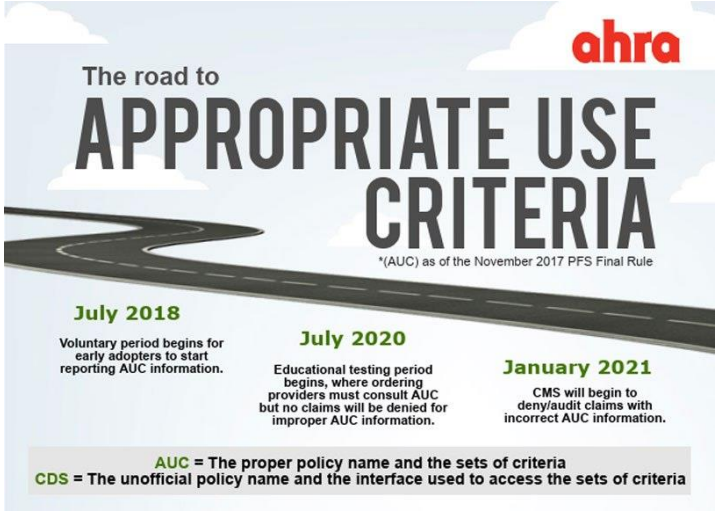
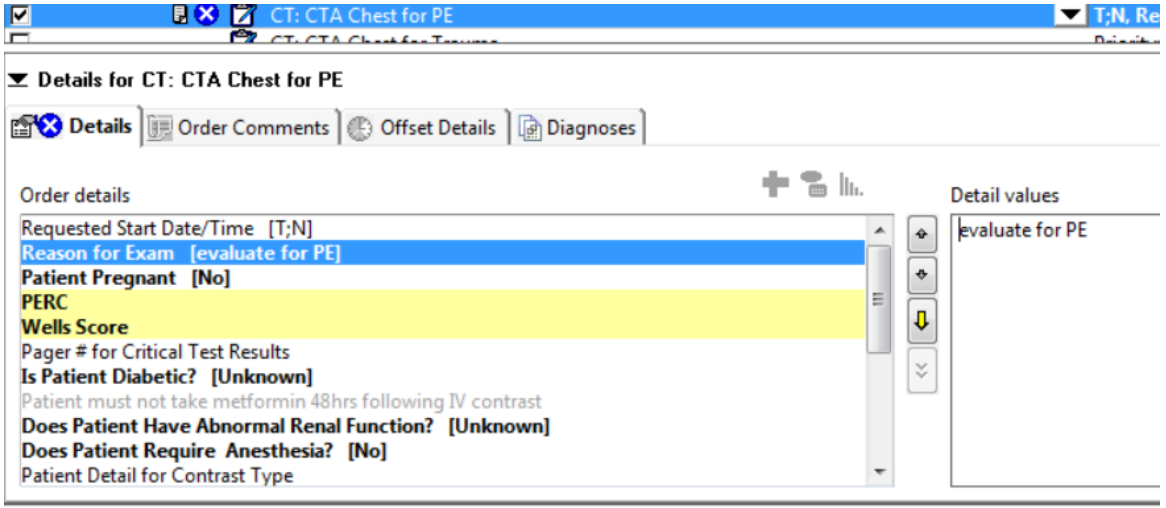
Journal of Hospital Medicine

Results

- Significant decrease in charges and estimated costs of medical care within 90 days of initial presentation to ED in patients that underwent CTPA –
- Median cost at 30 days to control group was $1274 compared to $934 in those with the intervention





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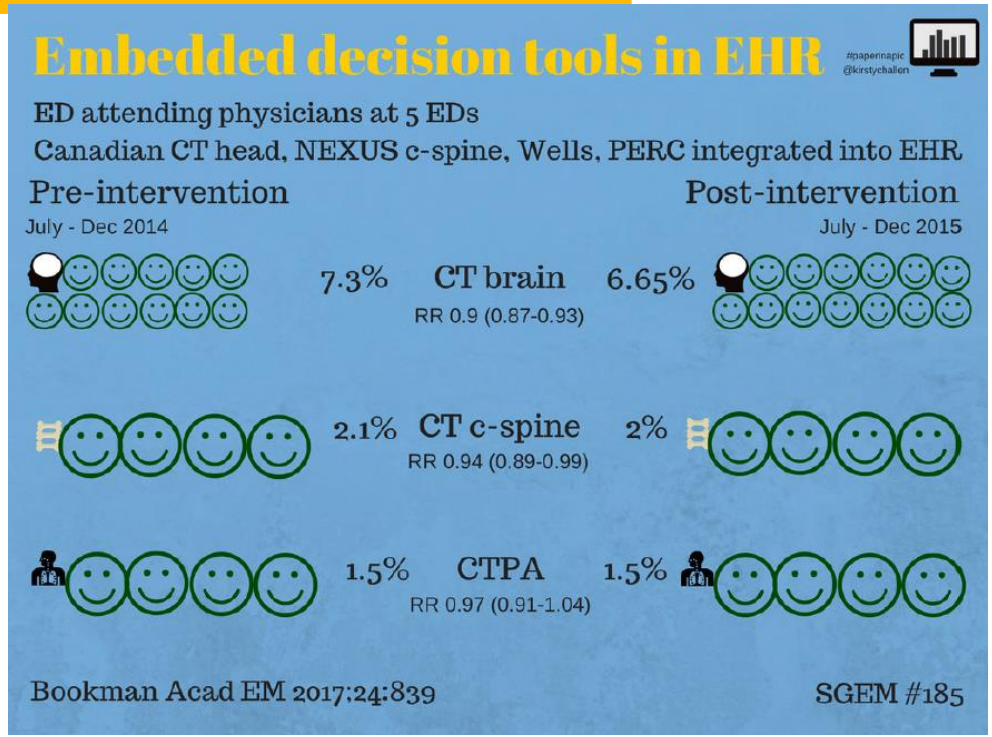
Hot off the Press: Embedded Clinical Decision Support in Electronic Health Record Decreases Use of High-cost Imaging in the Emergency Department: EmbED study.

Discussing: Bookman K, West D, Ginde A, et al. Embedded Clinical Decision Support in Electronic Health Record Decreases Use of High-cost Imaging in the Emergency Department: EmbED study. *Academic Emergency Medicine.* 2017;24:839-845.

- I think this is what PAMA legislation was trying to achieve but the solutions I've seen do not really do this well….
- Also not quite as impressive as would have been hoped



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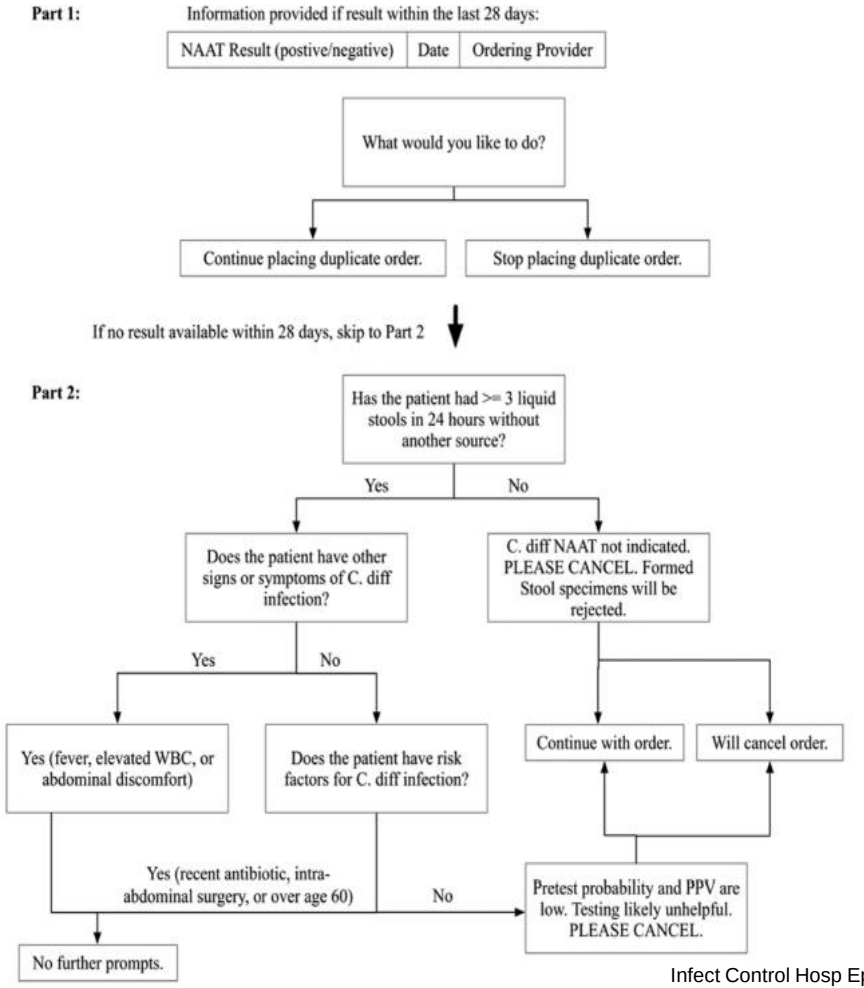

Infect Control Hosp Epidemiol 2018;1–4

Reduced *Clostridium difficile* Tests and Laboratory-Identified Events With a Computerized Clinical Decision Support Tool and Financial Incentive

Gregory R. Madden, MD;[1] Ian German Mesner, MS;[2] Heather L. Cox, PharmD, BCPS-AQID;[1,3] Amy J. Mathers, MD;[1,4] Jason A. Lyman, MD, MS;[5] Costi D. Sifri, MD;[1,6] Kyle B. Enfield, MD[7,8]

- UVA intervention using Epic and logic branching during the time of ordering

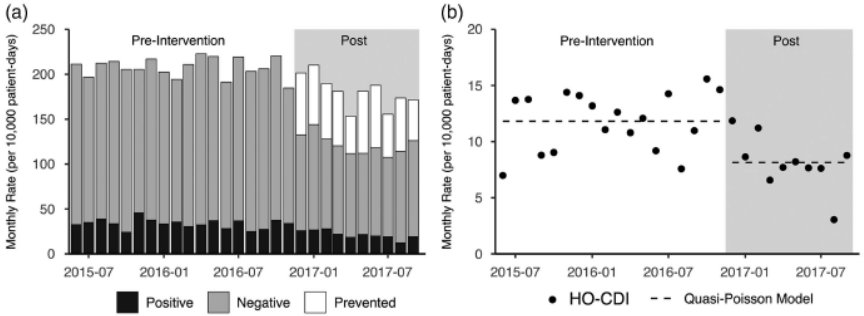

FIGURE 2. Monthly *C. difficile* tests and hospital-onset *C. difficile* infection (HO-CDI) laboratory-identified (LabID) events detected with CCDS tool pre- and postintervention. (a) Monthly rates of test results. (b) Trends of monthly HO-CDI rates over the same period. The dotted line depicts predicted values using the quasi-Poisson model.

- 41 % fewer tests ordered
- 31% fewer HealthCare onset C. Diff

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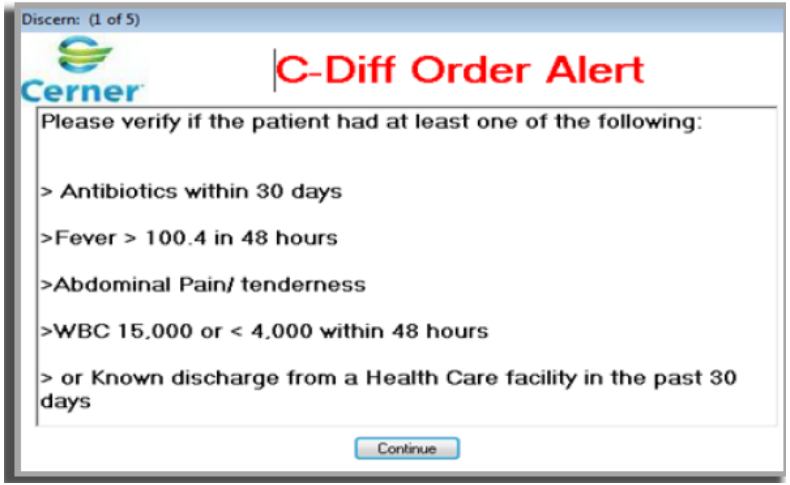
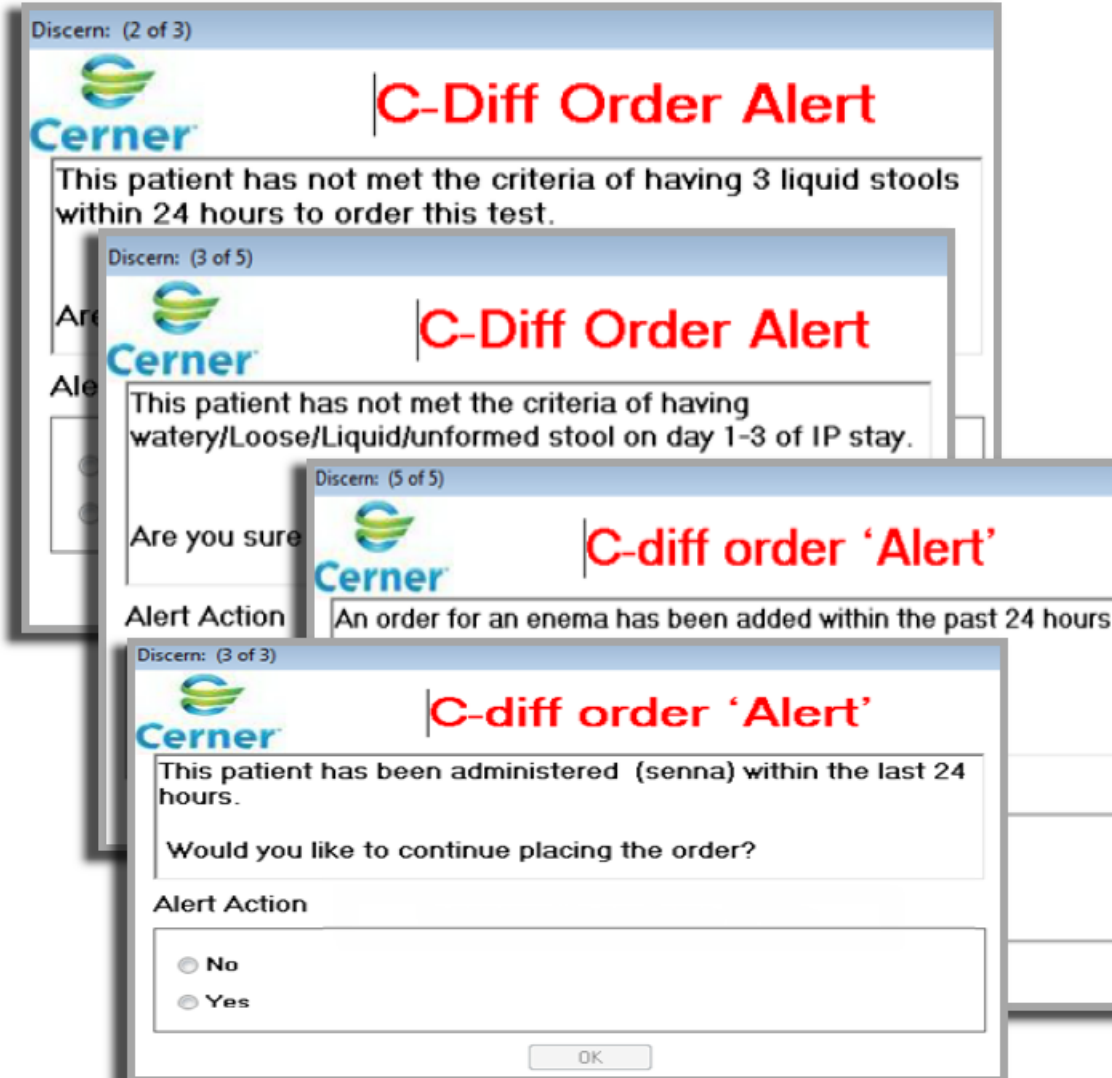
Infect Control Hosp Epidemiol 2018;1–4

The VCU Experience (what happens when you abdicate chairing the committee)





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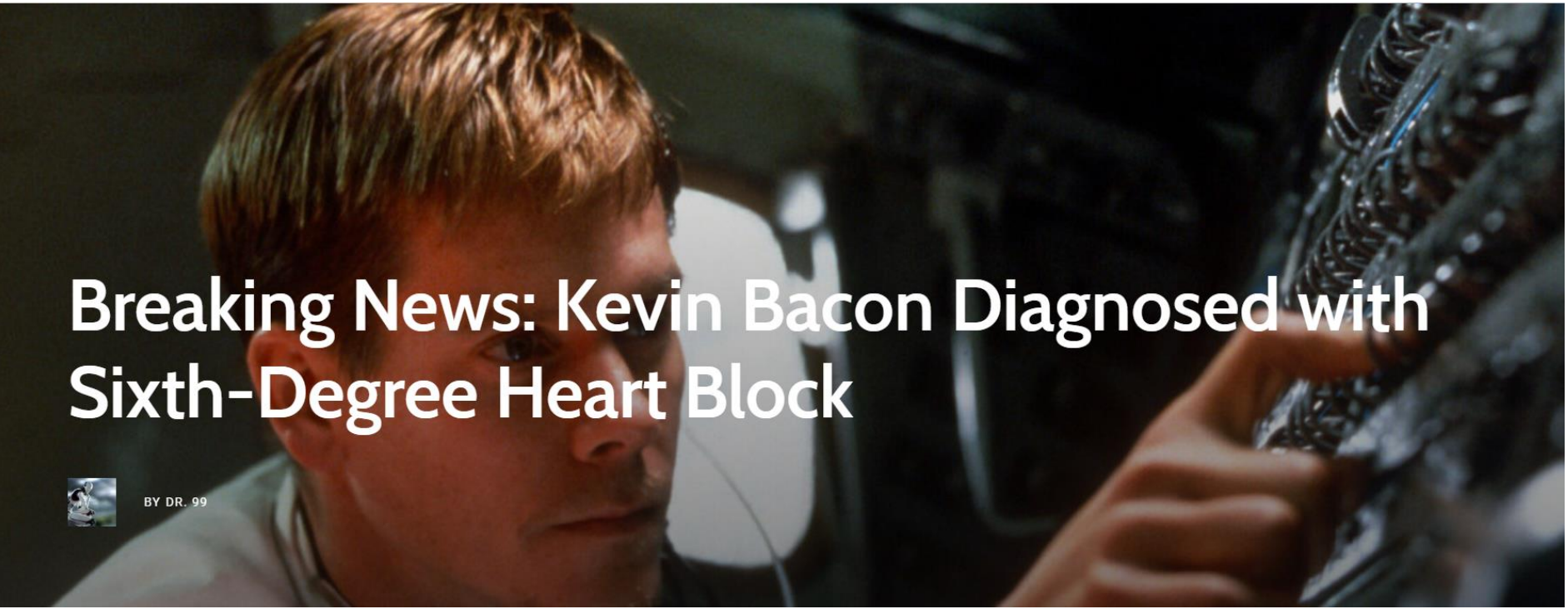
Transition Comedy Slide



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VIEWPOINT

Big Data and Machine Learning in Health Care

Andrew L. Beam, PhD

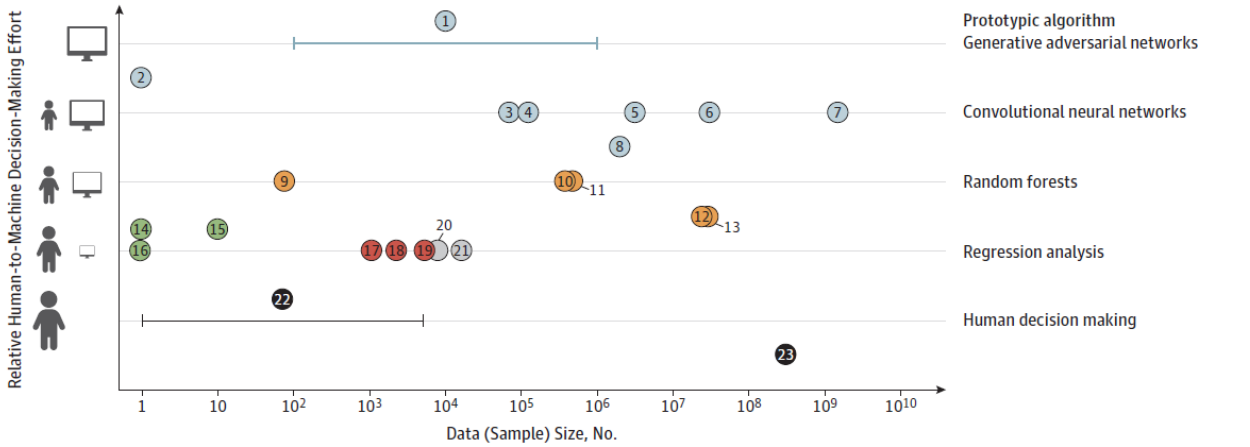
Nearly all aspects of modern life are in some way being spectrum (#19 in the **Figure** and Supplement). Many

JAMA April 3, 2018 Volume 319, Number 13

JAMA

Great perspective on the progression of decision making – man, man + computer, computer only

Figure. The Axes of Machine Learning and Big Data



Deep learning

1. Generative adversarial networks (2014)
2. Google AlphaGo Zero (2017)
3. ATM check readers (1998)
4. Google diabetic retinopathy (2016)
5. ImageNet computer vision models (2012-2017)
6. Google AlphaGo (2015)
7. Facebook Photo Tagger (2015)
8. Prediction of 1-y all-cause mortality (2017)

Classic machine learning

9. Diffuse large B-cell lymphoma outcome prediction by gene-expression profiling (2002)
10. EHR-based CV risk prediction (2017)
11. Netflix Prize winner (2006)
12. Google Search (1998)
13. Amazon product recommendation (2003)

Expert AI systems

14. MYCIN (1975)
15. CASNET (1982)
16. DXplain (1986)

Risk calculators

17. CHA_2DS_2-VASc Score for atrial fibrillation stroke risk (2017)
18. MELD end-stage liver disease risk score (2001)
19. Framingham CV risk score (1998)

Randomized Clinical Trials

20. Celecoxib vs nonsteroidal anti-inflammatory drugs for osteoarthritis and rheumatoid arthritis (2002)
21. Use of estrogen plus progestin in healthy postmenopausal women (2002)

Other

22. Clinical wisdom
23. Mortality rate estimates from US Census (2010)

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npj | Digital Medicine

www.nature.com/npjdigitalmed

ARTICLE OPEN

Scalable and accurate deep learning with electronic health records

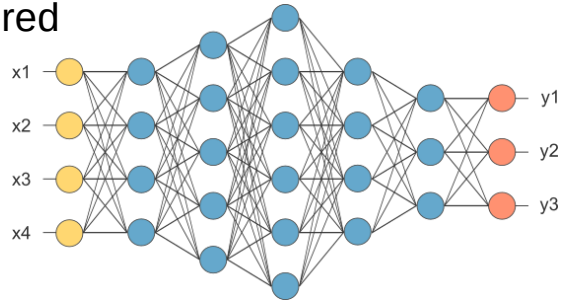
Alvin Rajkomar[1,2], Eyal Oren[1], Kai Chen[1], Andrew M. Dai[1], Nissan Hajaj[1], Michaela Hardt[1], Peter J. Liu[1], Xiaobing Liu[1], Jake Marcus[1], Mimi Sun[1], Patrik Sundberg[1], Hector Yee[1], Kun Zhang[1], Yi Zhang[1], Gerardo Flores[1], Gavin E. Duggan[1], Jamie Irvine[1], Quoc Le[1], Kurt Litsch[1], Alexander Mossin[1], Justin Tansuwan[1], De Wang[1], James Wexler[1], Jimbo Wilson[1], Dana Ludwig[2], Samuel L. Volchenboum[3], Katherine Chou[1], Michael Pearson[1], Srinivasan Madabushi[1], Nigam H. Shah[4], Atul J. Butte[2], Michael D. Howell[1], Claire Cui[1], Greg S. Corrado[1] and Jeffrey Dean[1]

- UCSF and UCM 4 years worth of patient records in a linear raw format using a FHIR standard
- Applied deep learning / neural networks to the raw record to compare predictions against traditional methods
- 47 Billion data points considered
- Included free-text

Google

Why?

- Traditional methods require highly curated datasets and….
- Our datasets are rarely highly curated
- Deep learning doesn't require this level of "pre-work", the neural network learns on the fly



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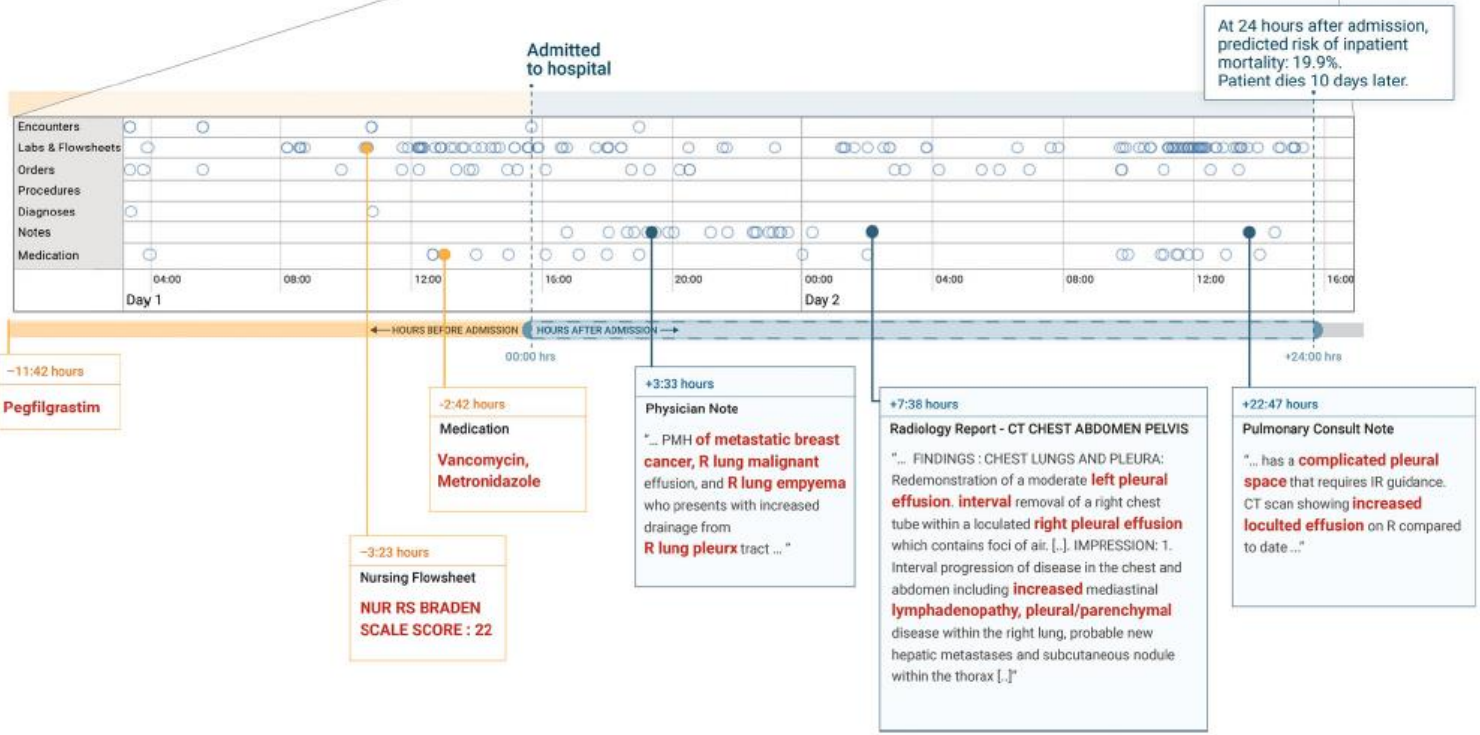
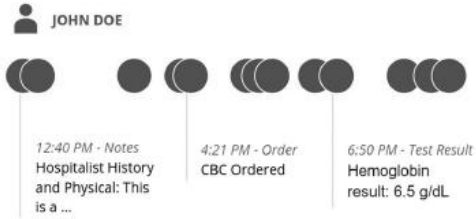
npj Digital Medicine (2018) 1:18 ; doi:10.1038/s41746-018-0029-1

Patient Timeline



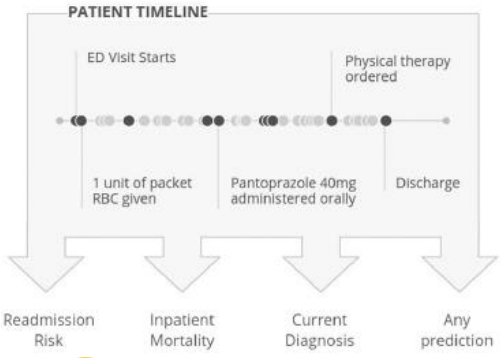
1

Health systems collect and store electronic health records in various formats in databases.



2

All available data for each patient is converted to events recorded in containers based on the Fast Healthcare Interoperability Resource (FHIR) specification.



3

The FHIR resources are placed in temporal order, depicting all events recorded in the EHR (i.e. timeline). The deep learning model uses this full history to make each prediction.

Results

- *Outperformed* traditional modeling methods across the board
  - In-hospital mortality
  - 30 day readmission
  - Prolonged LOS
  - Final discharge diagnoses

npj Digital Medicine (2018) 1:18 ;
doi:10.1038/s41746-018-0029-1

Natural Language–based Machine Learning Models for the Annotation of Clinical Radiology Reports[1]

- Journal of Radiology
- Focuses on generating clinical labels for a large fund of radiology reports with an emphasis on scalability and generalizability
- Mount Sinai rad reports 2010-2016 for 96,000 Head CTs

- Labels to be studied required an interrater agreement of 0.60 or greater; ultimately 55 were selected, with 20 of those being categorized as critical findings

- Several non-radiology texts used to characterize the lexical and semantic structure of radiology reports prior to analysis

This is the use of NLP to help create the dataset which would then be used to teach the image interpretation

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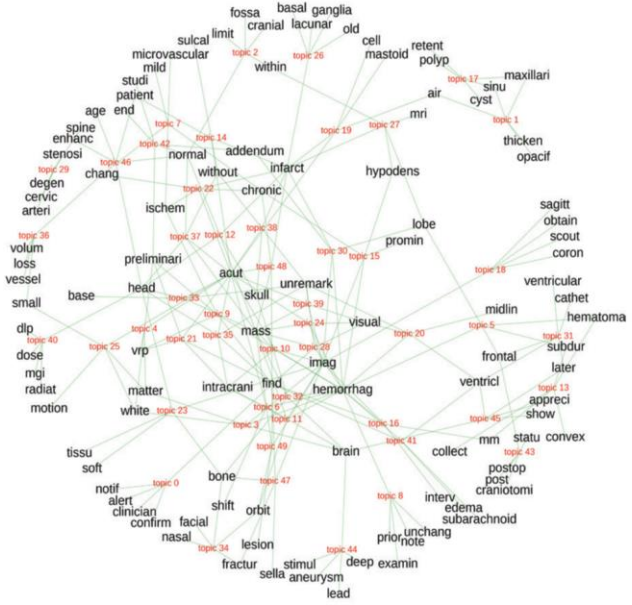
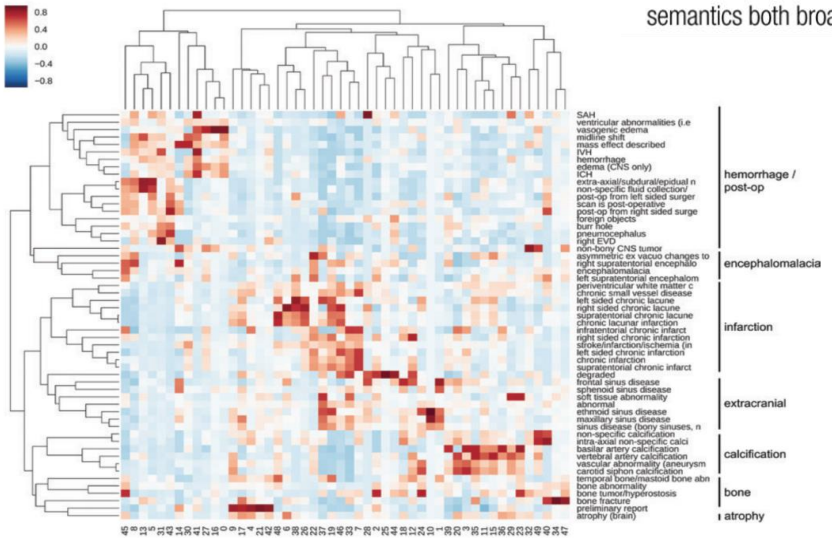
https://doi.org/10.1148/radiol.2018171093

Figure 4



a.

Figure 4: The Latent Dirichlet allocation topic models provide a highly transparent means of document classification. **(a)** Each topic is illustrated in red text, and lines are drawn to each of the five words most commonly associated with that topic. Certain common words were shared by multiple topics (eg, "acute"), and these words appear more centrally on the diagram. **(b)** Each box represents the average relative weight of a topic (bottom axis) in reports that were positive for a given label (right axis); red = relatively high weight, and blue = relatively low weight. Labels are sorted vertically so that labels with more similar topic weight distributions appear in proximity to each other. When used to assign average topic weights to reports, topics can be readily demonstrated to have captured the underlying clinical semantics both broadly and in specific cases.



b.

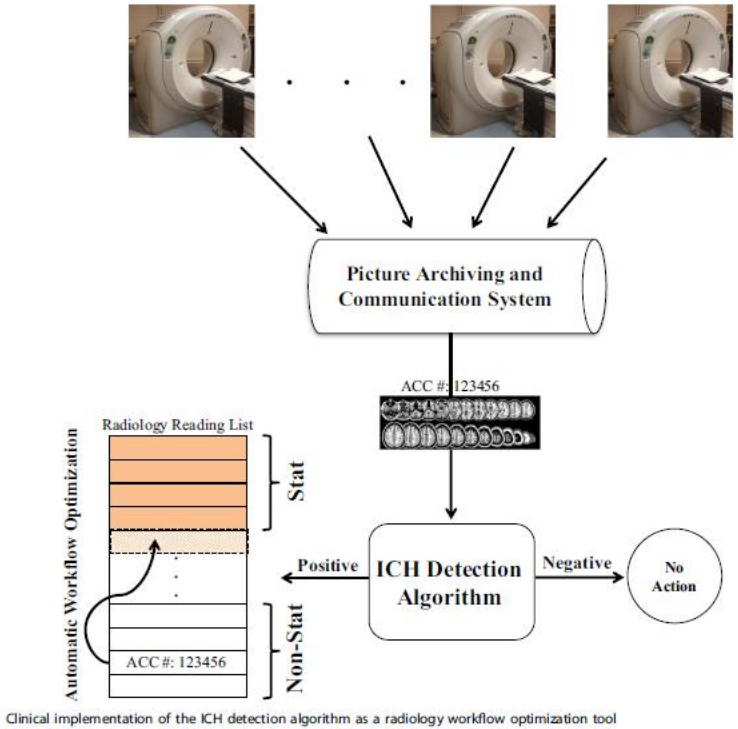
centrally on the diagram. **(b)** Each box represents the average relative weight of a topic (bottom axis) in reports that were positive for a given label (right axis); red = relatively high weight, and blue = relatively low weight. Labels are sorted vertically so that labels with more similar topic weight distributions appear in proximity to each other. When used to assign average topic weights to reports, topics can be readily demonstrated to have captured the underlying clinical semantics both broadly and in specific cases.

ARTICLE OPEN

Advanced machine learning in action: identification of intracranial hemorrhage on computed tomography scans of the head with clinical workflow integration

Mohammad R. Arbabshirani[1], Brandon K. Fornwalt[1,2], Gino J. Mongelluzzo[1], Jonathan D. Suever[1,2], Brandon D. Geise[1], Aalpen A. Patel[1,2] and Gregory J. Moore[1]

- Digital Medicine
- Geisenger – 50,000 head CTs used for neural network training
- Against 10,000 validation set
- Used the output to prioritize the queue



Clinical implementation of the ICH detection algorithm as a radiology workflow optimization tool

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npj Digital Medicine (2018) 1:9 ; doi:10.1038/s41746-017-0015-z

Stanford | News

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NOVEMBER 15, 2017

Stanford algorithm can diagnose pneumonia better than radiologists

Stanford researchers have developed a deep learning algorithm that evaluates chest X-rays for signs of disease. In just over a month of development, their algorithm outperformed expert radiologists at diagnosing pneumonia.

BY TAYLOR KUBOTA

Stanford researchers have developed an algorithm that offers diagnoses based off chest X-ray images. It can diagnose up to 14 types of medical conditions and is able to diagnose pneumonia better than expert radiologists working alone. A paper about the algorithm, called CheXNet, was published Nov. 14 on the open-access, scientific preprint website arXiv.

arXiv.org > cs > arXiv:1711.05225

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Computer Science > Computer Vision and Pattern Recognition

CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning

Pranav Rajpurkar, Jeremy Irvin, Kaylie Zhu, Brandon Yang, Hershel Mehta, Tony Duan, Daisy Ding, Aarti Bagul, Curtis Langlotz, Katie Shpanskaya, Matthew P. Lungren, Andrew Y. Ng

(Submitted on 14 Nov 2017 (v1), last revised 25 Dec 2017 (this version, v3))

We develop an algorithm that can detect pneumonia from chest X-rays at a level exceeding practicing radiologists. Our algorithm, CheXNet, is a 121-layer convolutional neural network trained on ChestX-ray14, currently the largest publicly available chest X-ray dataset, containing over 100,000 frontal-view X-ray images with 14 diseases. Four practicing academic radiologists annotate a test set, on which we compare the performance of CheXNet to that of radiologists. We find that CheXNet exceeds average radiologist performance on the F1 metric. We extend CheXNet to detect all 14 diseases in ChestX-ray14 and achieve state of the art results on all 14 diseases.

Subjects: **Computer Vision and Pattern Recognition (cs.CV)**; Learning (cs.LG); Machine Learning (stat.ML)
Cite as: **arXiv:1711.05225 [cs.CV]**
(or **arXiv:1711.05225v3 [cs.CV]** for this version)

Submission history

From: Pranav Rajpurkar [view email]

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Harvard Business Review

INNOVATION

AI Will Change Radiology, but It Won't Replace Radiologists

by Thomas H. Davenport and Keith J. Dreyer, DO

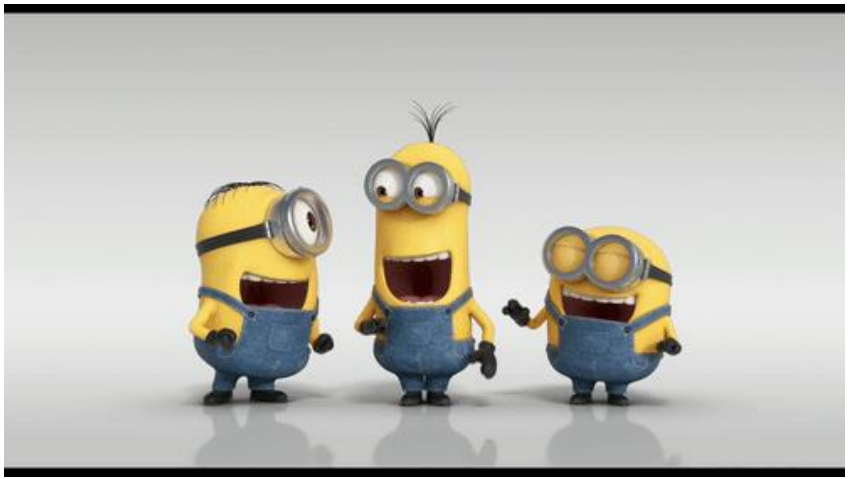
MARCH 27, 2018

SA-CME

Artificial Intelligence and Machine Learning in Radiology: Opportunities, Challenges, Pitfalls, and Criteria for Success

James H. Thrall, MD, Xiang Li, PhD, Quanzheng Li, PhD, Cinthia Cruz, MD, Synho Do, PhD, Keith Dreyer, DO, PhD, James Brink, MD

- Well damn……
- Turns out Radiologists actually do a lot more than simply read films
- "AI Augmented" workflows; i.e. triaging of studies
- Let the doctors be doctors



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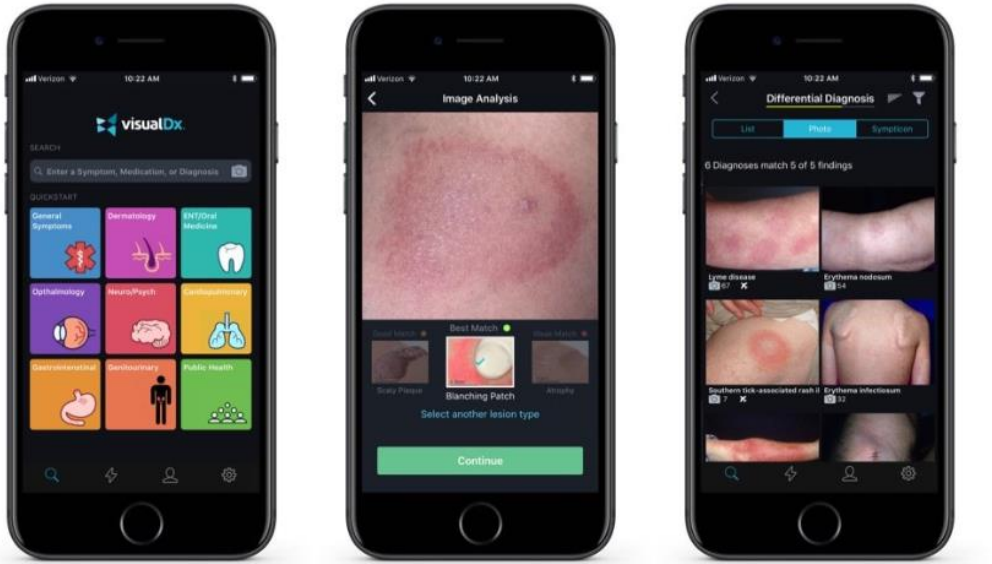
https://hbr.org/2018/03/ai-will-change-radiology-but-it-wont-replace-radiologists

Apple CEO Tim Cook gave a shout-out to a $100-per-year app for doctors — here's what it does

Kif Leswing
Nov. 19, 2017, 8:30 AM 87,722



Visual Dx

http://www.businessinsider.com/visualdx-machine-learning-app-for-skin-diagnosis-ceo-interview-2017-11

Smart detection of atrial fibrillation†

Lian Krivoshei[1,4‡], Stefan Weber[2‡], Thilo Burkard[3], Anna Maseli[1], Noe Brasier[1], Michael Kühne[5], David Conen[1], Thomas Huebner[6], Andrea Seeck[6], and Jens Eckstein[1*]

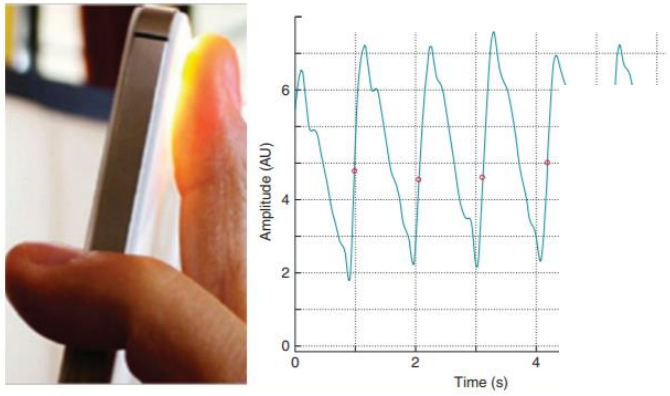


Figure 1 iPhone on index finger tip with resulting pulse wave signal of a patient with AF.

- Uses the camera to obtain a pleth
- 95% Sensitivity and Specificity in identifying A-fib from Sinus
- Finally….. Now what's next?

Join the Apple Heart Study.

In partnership with Stanford MEDICINE

Apple has created an innovative research study using data from Apple Watch to accelerate discovery in heart science. Its goal is to improve the technology used to identify an irregular heart rhythm, known as arrhythmia. The more people who get involved, the greater the potential benefit.

Join the study

Learn more ›

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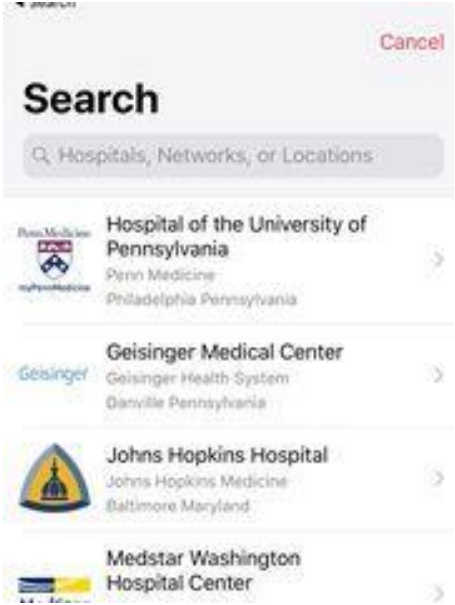
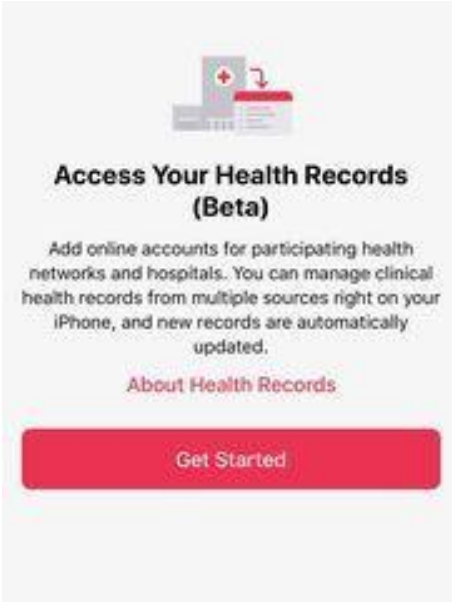
EP Eurospace

I tried Apple's improved Health app. Here's what I found

Edward C. Baig, USA TODAY Published 6:00 a.m. ET Jan. 26, 2018 | Updated 2:21 p.m. ET Jan. 29, 2018



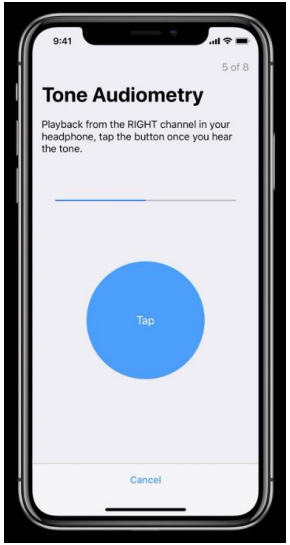


https://www.usatoday.com/story/tech/columnist/baig/2018/01/26/tried-apples-improved-health-app-heres-what-found/1067871001/

Apple adds movement disorder API, plus speech, hearing, and vision tests, to ResearchKit framework

Implications for Parkinson's Disease patients etc.

Also ENT implications



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https://www.programmableweb.com/news/apples-new-researchkit-movement-disorder-api-can-be-used-to-monitor-parkinsons-symptoms/brief/2018/06/06

Accuracy of Heart Rate Monitoring by Some Wrist-Worn Activity Trackers

TO THE EDITOR: Cadmus-Bertram and colleagues' study (1) suggests that some wrist-worn activity trackers perform similarly to electrocardiography at rest but that none was as accurate as electrocardiography during moderate exercise (1). We agree that additional research is needed before these monitoring devices can be deemed useful for clinical advice or trials. In fact, most consumers are probably unaware of potential inaccuracies and may experience health risks related to

Annals of Internal Medicine

- Not so fast ?
- High School project that partnered with Dean Sittig
- Still often up to 5% difference in manual vs Fitbit recorded values
- Do we need tighter standards ? More transparency to patients?
- Or is it indeed “close enough” for clinical use?

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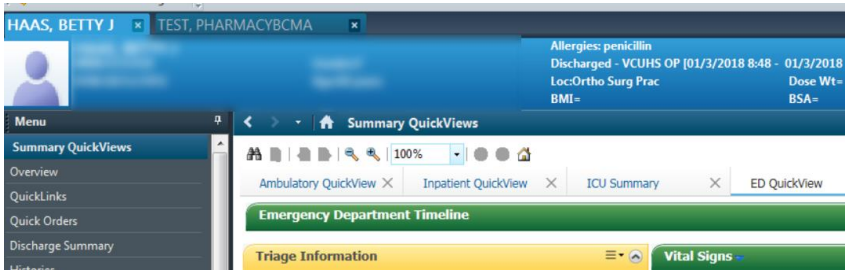
doi:10.7326/L17-0379

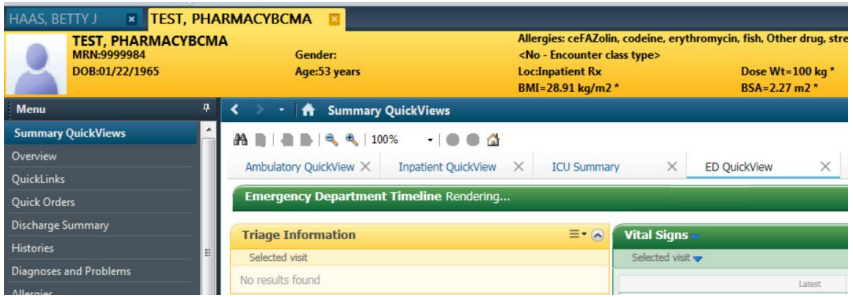
Transition Comedy Slide

A national survey assessing the number of records allowed open in electronic health records at hospitals and ambulatory sites

Jason S Adelman,[1,2,3] Matthew A Berger,[4] Amisha Rai,[3] William L Galanter,[5] Bruce L Lambert,[6] Gordon D Schiff,[7] David K Vawdrey,[2,3] Robert A Green,[2,3] Hojjat Salmasian,[2,3] Ross Koppel,[8] Clyde B Schechter,[9] Jo R Applebaum,[3] and William N Southern[10]

- JAMIA
- Survey of 167 inpatient and outpatient facilities designed to allow multiple patient records to be open at once
- 3 buckets of use
  - Restricted = 1 record open
  - Hedged = 2 records open
  - Unrestricted = 3 or more records open





A lot of us assisted on this via ListServ

VCU Health

Journal of the American Medical Informatics Association, 24(5), 2017, 992–995
doi: 10.1093/jamia/ocx034

Table 1. Organization-configured number of records allowed open in EHR systems vendor-designed to open multiple records at once

Study facilities	Unrestricted (≥3 records) (%)	Restricted (1 record) (%)	Hedged (2 records) (%)	Total EHRs
Inpatient	38 (41.8)	37 (40.7)	16 (17.6)	91
Outpatient	36 (47.4)	27 (35.5)	13 (17.1)	76
Overall	74 (44.3)	64 (38.3)	29 (17.4)	167

"The Office of the National Coordinator for Health Information Technology states that data can be entered "incorrectly into the electronic record due to multiple records being open."

"In its Patient Identification SAFER Guide,11 the agency recommends restricting "the number of patient records that can be displayed on the same computer at the same time to one, unless other patient records are opened as 'Read Only' and are clearly differentiated."

This recommendation also appears in a Joint Commission Sentinel

Event Alert, Safe Use of Health Information Technology.

VCU Health

Journal of the American Medical Informatics Association, 24(5), 2017, 992–995
doi: 10.1093/jamia/ocx034

Brief Communication

Effect of number of open charts on intercepted wrong-patient medication orders in an emergency department

Thomas G Kannampallil,[1] John D Manning,[2,3] David W Chestek,[2,3] Jason Adelman,[7] Hojjat Salmasian,[7,8] Bruce L Lambert,[9] and William L Galanter[4,5,6]

- JAMIA
- UIC, interrupted time series analysis of wrong patient medication orders in an ED from 2010-2016 (~50k visits per year)
- This is a retrospective analysis of a natural experiment
- Measured going from 4 charts to 2 charts and then back to 4 charts

- Using retract and reorder as a methodology (RAR)
  - Clinician orders something and within 10 minutes cancels it and orders the exact same thing on a different patient
  - Also followed up with an interview and chart reviews

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Journal of the American Medical Informatics Association, 0(0), 2017, 1–5
doi: 10.1093/jamia/ocx099

- Statistically didn't make a difference
- But…. They didn't do all the way down to 1 chart
- So use this data as you wish

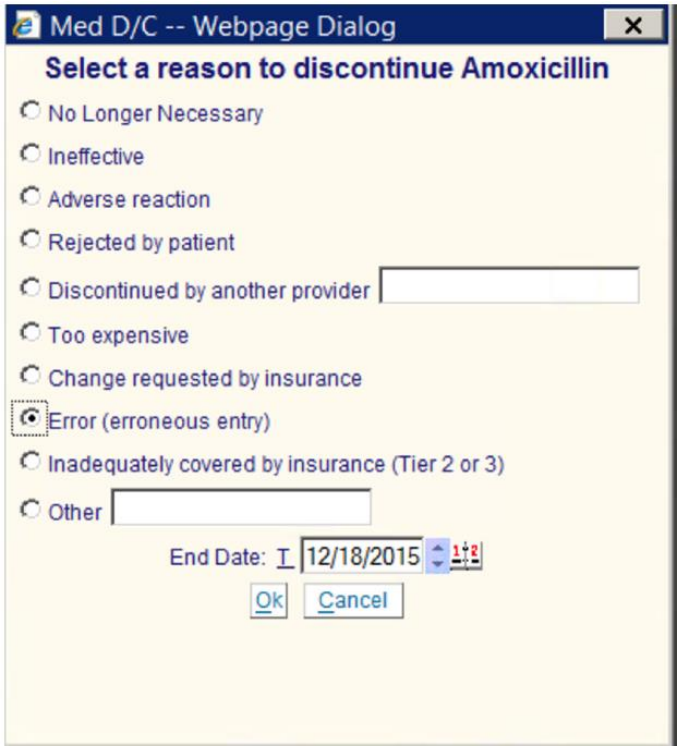
VCU Health

Journal of the American Medical Informatics Association, 0(0), 2017, 1–5
doi: 10.1093/jamia/ocx099

Outpatient CPOE orders discontinued due to 'erroneous entry': prospective survey of prescribers' explanations for errors

Thu-Trang T Hickman,[1] Arbor Jessica Lauren Quist,[1,2] Alejandra Salazar,[1] Mary G Amato,[1,3] Adam Wright,[1,4,5] Lynn A Volk,[5] David W Bates,[1,4,5] Gordon Schiff[1,4]

- 4 months of medication orders, 2 million
- 1100 cancellations during that time
- Cancelling provider was then surveyed when they had selected "Erroneous error"
- In the vein of RAR methodology, technically this is just the "retract" portion



VCU Health

Hickman T-TT, et al. BMJ Qual Saf 2017;**0**:1–6.
doi:10.1136/bmjqs-2017-006597

Table 2 Top reasons provided by survey responders for discontinuing medications with the reason 'Error (erroneous entry)'

Category	N (% of errors)
Patient: medication ordered for wrong patient	60 (27.8)
Drug: ordered wrong drug	40 (18.5)
Drug: duplicate order	31 (14.4)
Drug: ordered wrong formulation or dosage form (extended release, and so on)	25 (11.6)
Dose: ordered wrong dose or strength	22 (10.2)
Drug: ordered drug that was inappropriate or contraindicated (by lab, disease, age or pregnancy)	8 (3.7)
Dose: dose or strength not included or missing on medication order	8 (3.7)
Other	31 (10.1)

- Wrong patient ~30% !!!!
- Wrong drug - 19%
- Duplicate Order – 14%

- Oxycodone was top drug for formulation problems (SR vs IR) postulated as the reason

Usability and Human Interface opportunities abound

? How many charts do they allow

Further studies not possible – Epic conversion since then

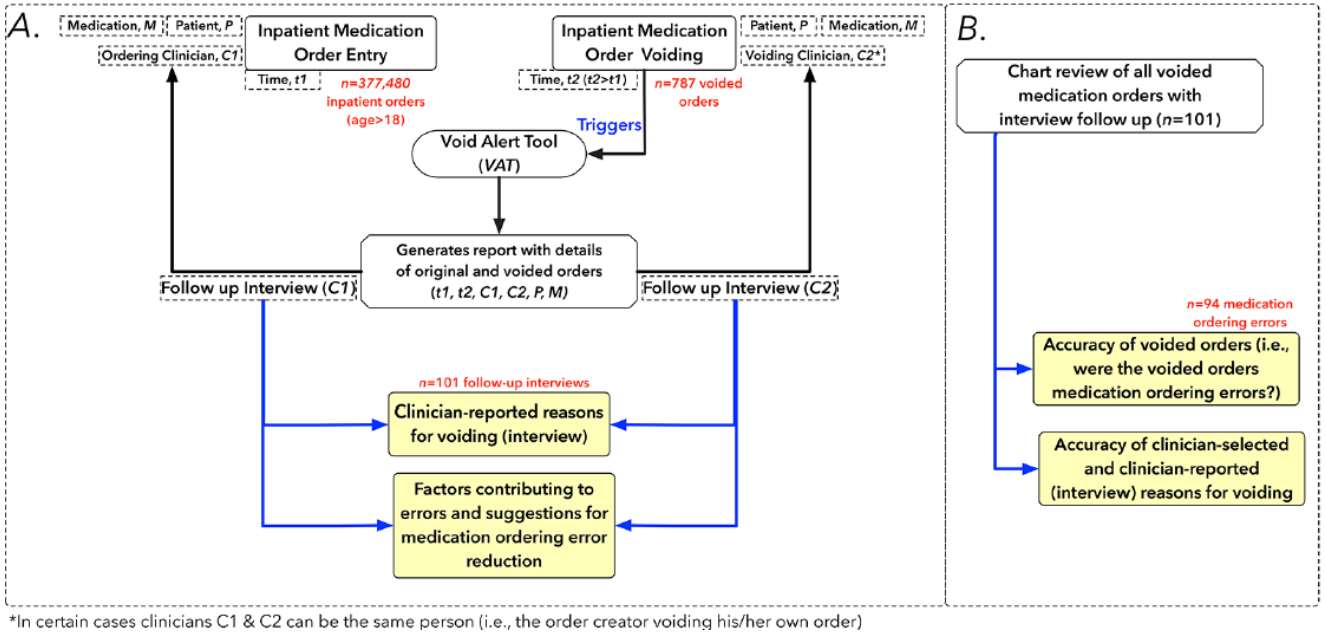
VCU Health

Hickman T-TT, et al. BMJ Qual Saf 2017;**0**:1–6.
doi:10.1136/bmjqs-2017-006597

Reasons for computerised provider order entry (CPOE)-based inpatient medication ordering errors: an observational study of voided orders

Joanna Abraham,[1] Thomas G Kannampallil,[2] Alan Jarman,[1]
Shivy Sharma,[1] Christine Rash,[3] Gordon Schiff,[4] William Galanter[3,5,6]

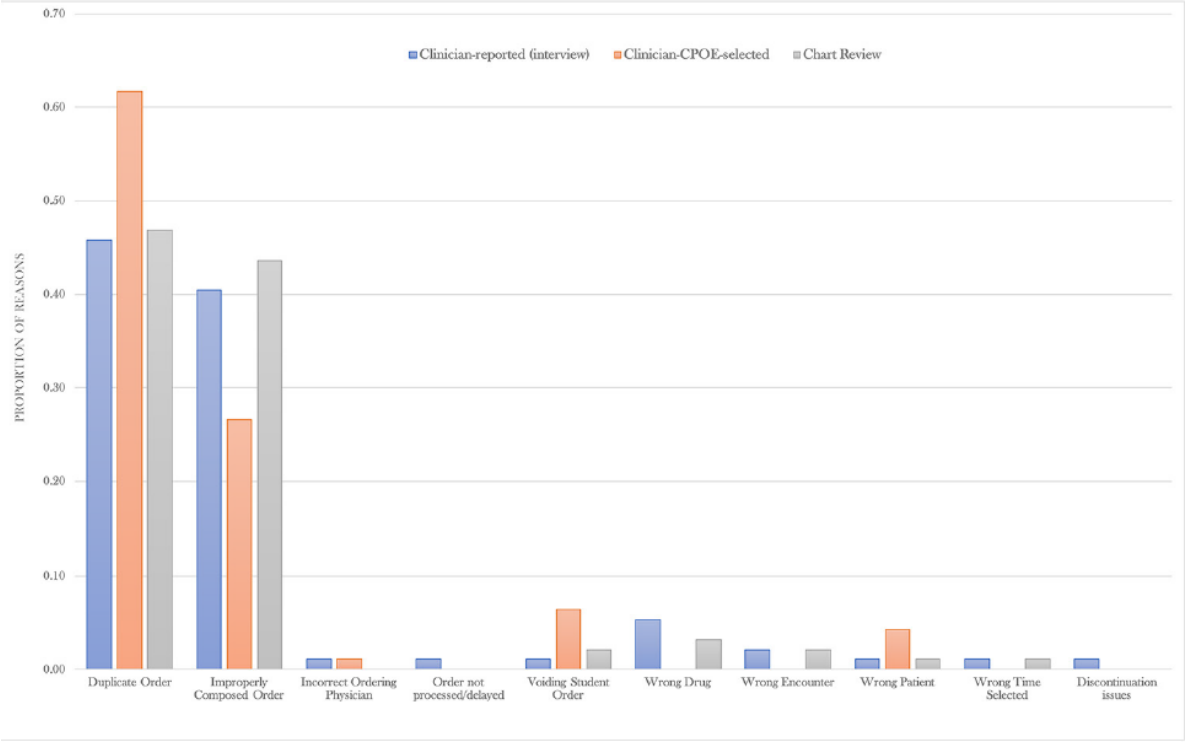
- BMJ
- Void an INPATIENT order and you need to declare a reason (and get an interview and a chart review)
- Nice buckets of rationale for medication voiding
- What are the underlying causes of voiding?



*In certain cases clinicians C1 & C2 can be the same person (i.e., the order creator voiding his/her own order)

VCU Health

Abraham J, et al. BMJ Qual Saf 2017;**0**:1–9.
doi:10.1136/bmjqs-2017-006606



Dup Order, Improper Composed, Wrong Doc, Wrong Drug, Wrong Encounter, Wrong Patient, etc

- The reason selected is only ~50% accurate when confirmed – not surprised
- Duplicate orders lead the pack
- Improperly composed orders (points to usability, ordersets, sentences, the basics)
- The notion of the “intentional violation” was discussed
- *Should institutions be studying this type of data as means of self improvement*
- *Should the voiding “codeset” be standardized across vendors / industry – although would it mater ?*

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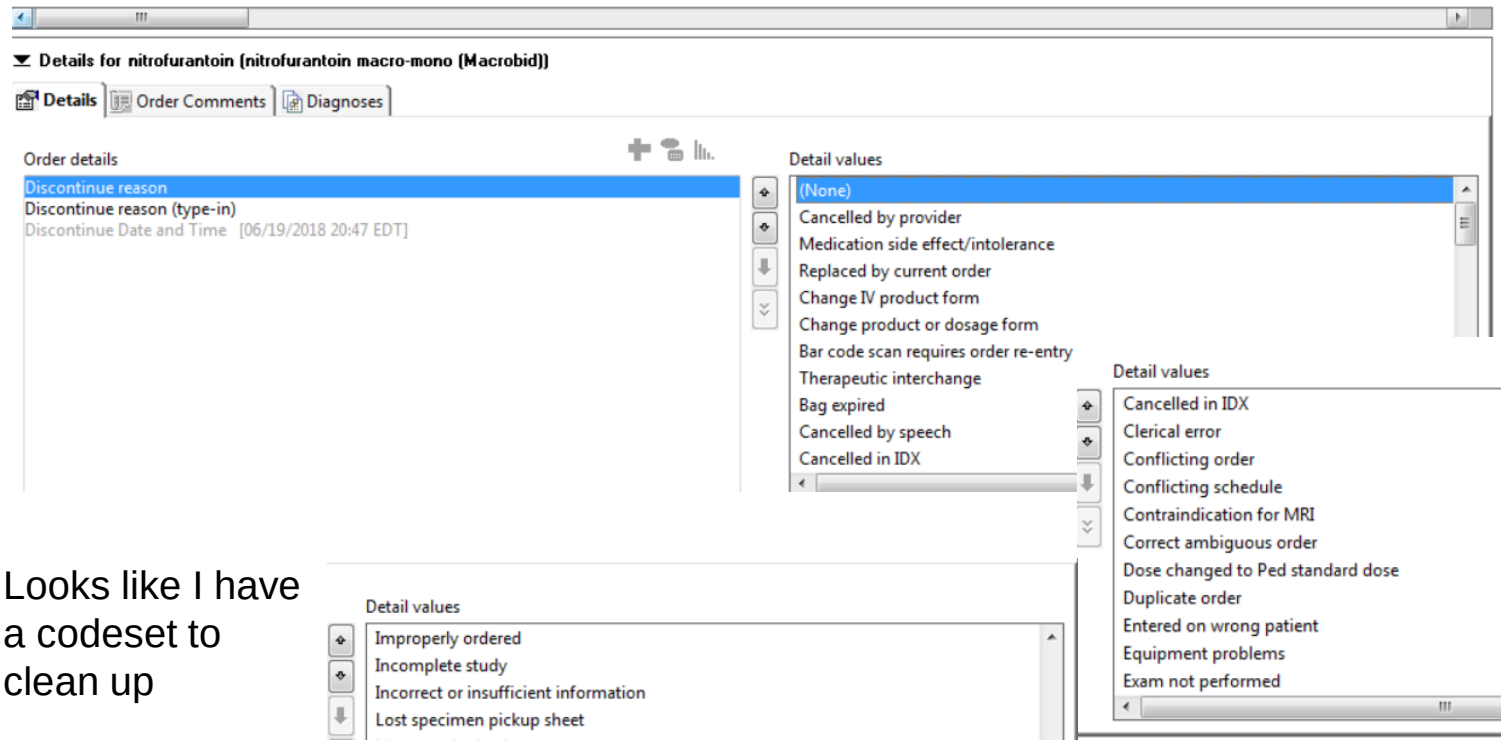
Abraham J, et al. BMJ Qual Saf 2017;**0**:1–9.
doi:10.1136/bmjqs-2017-006606



Looks like I have a codeset to clean up

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Using EHR Data to Detect Prescribing Errors in Rapidly Discontinued Medication Orders

Jonathan D. Burlison[1] Robert B. McDaniel[1] Donald K. Baker[2] Murad Hasan[1] Jennifer J. Robertson[1]
Scott C. Howard[3] James M. Hoffman[1,4]

- ACI Study
- St. Jude's data of 30 days worth of cancelled medication orders within 120 minutes of initially being placed, inpatient and outpatient
- Did it in July….. (new interns)
- Off 305 of these orders, 147 errors identified !!!!

- Duplicate orders most common
- Trainees (residents) had highest rate of errors…. ? The July effect ?

Error type	*n*	%
Duplicate order	45	31
Wrong route	22	15
Wrong drug	21	14
Ordered incorrectly	14	10
Wrong dosage form	9	6
Underdose	8	5
Overdose	5	3
Wrong frequency	4	3
Wrong patient	1	1
Other	18	12

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Applied Clinical Informatics Vol. 9 No. 1/2018
Using EHR 84 Data to Detect Prescribing Errors Burlison et al.

Retract and Re-order / Voiding / Cancelling

- Interesting new metric in EHR usability and errors
- What the heck is going on with all of the duplicates? Did we all turn off Dup Checking for a bunch of stuff (we did…. because it's obnoxious)
- Standardization in the industry? (the codeset, VCU clearly leads the way)
- Managing this metric? (much like we "manage" multum ?)

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Transition Comedy Slide

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EHRs are Evil and are causing you to burnout

10/24/2017

Medical EconomicsEHR

Why are EHRs still so terrible?

October 23, 2017
By Keith Aldinger, MD

Editor's Note: *Welcome to Medical Economics' blog section which features contributions from*

New York Times May 16, 2018 – Abraham Verghese

The New York Times Magazine THE HEALTH ISSUE

HOW TECH CAN TURN DOCTORS INTO CLERICAL WORKERS

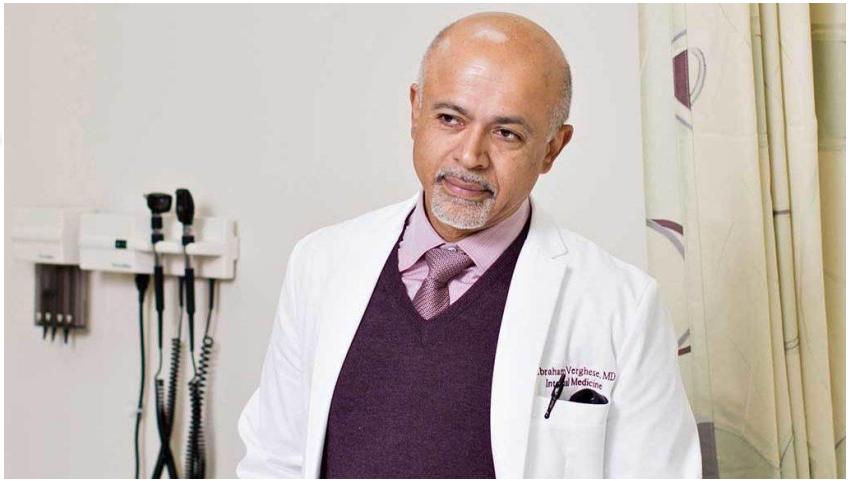
THE THREAT THAT ELECTRONIC HEALTH RECORDS AND MACHINE LEARNING POSE TO PHYSICIANS' CLINICAL JUDGMENT — AND THEIR WELL-BEING.

BY ABRAHAM VERGHESE
ILLUSTRATION BY ERIK CARTER

MAY 16, 2018

"Even if the E.H.R. is not the sole cause of what ails us, believe me, it has become the symbol of burnout."

Pretty harsh indictment of the EHR, not sure it was entirely fair, but it sure was colorful



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Harvard Business Review

TECHNOLOGY

To Combat Physician Burnout and Improve Care, Fix the Electronic Health Record

by Robert Wachter and Jeff Goldsmith

MARCH 30, 2018

- Harvard Business Review

Take Back the Record

- Paint a picture of the patient
- Typing and pointing and clicking must go
  - Nods to usability and subtlety to clinical decision support
- AI must make the clinical systems smarter
- Turn us from prisoners into advocates

Comment from our own Joe Schneider:

“Burnout is a function of much more than technology… we shouldn’t get the idea that we can fix it simply by switching technology.”

Electronic Health Records: a "Quadruple Win," a "Quadruple Failure," or Simply Time for a Reboot?

Michael Hochman, MD, MPH

The Gehr Family Center for Implementation Science, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA.

- Journal General Internal Medicine
- Video recordings of 217 encounters
- Average visit 20 minutes
- Clicked mouse 216 times
- 746 keyboard clicks
- 8.9 minutes of gazing at the screen

- Retain the good – legibility, remote access, patient access, e-prescribing, certain reminder functions
- Re-master the rest around the needs of the clinicians *not the billers and administrators*

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Brief Communication

Changes in hospital bond ratings after the transition to a new electronic health record

Dustin McEvoy,[1] Michael L Barnett,[2,4] Dean F Sittig,[3] Skye Aaron,[4] Ateev Mehrotra,[5] and Adam Wright[4,6]

- Good news ! If you're thinking of switching (or recently made the transition) your bond rating won't be affected !!

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Annals of Internal Medicine

IDEAS AND OPINIONS

Physician Burnout in the Electronic Health Record Era: Are We Ignoring the Real Cause?

N. Lance Downing, MD; David W. Bates, MD, MSc; and Christopher A. Longhurst, MD, MS

- Annals of Internal Medicine
- Are U.S. documentation requirements a driver of the national dissatisfaction with the EHR ?
- Can we compare ourselves with some international colleagues?
- Is it simply the easiest to label the EHR as the cause of the burnout?

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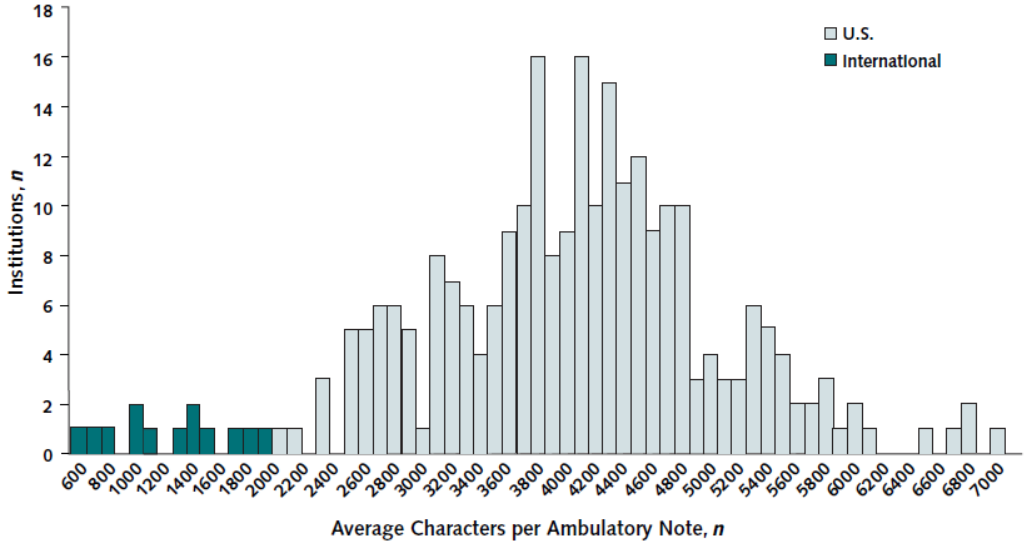
Figure. Average characters per ambulatory progress note in U.S. and international health systems.



- Since HITECH was enacted the length of US notes have DOUBLED
- In the same EMR (Epic) US notes are 4x the length of international counterparts

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Indeed, the EHR vendors that benefited from the federal stimulus have disproportionately focused on developing robust financial and compliance features, perhaps at the price of usability. However, U.S. hospitals demanded these features in search of financial sustainability ***in a market with seemingly insatiable needs for documentation.***

RESEARCH LETTER

PHYSICIAN WORK ENVIRONMENT AND WELL-BEING

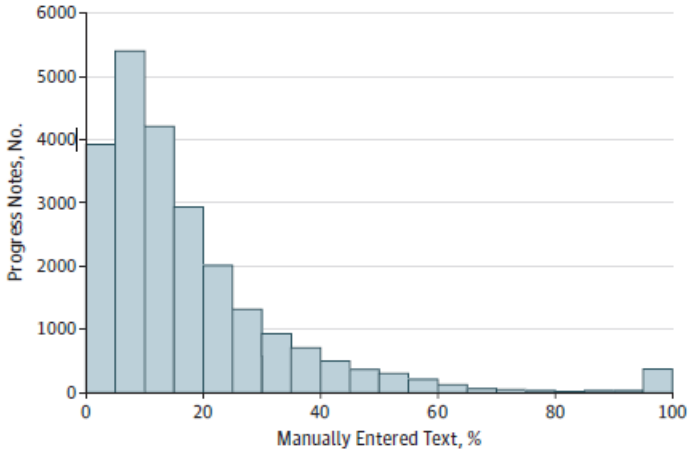
Characterizing the Source of Text in Electronic Health Record Progress Notes

- Used a new EHR tool that distinguishes manual, imported, and copied text in hospital progress notes with character-by-character granularity

- Less than 1/5th of the note is “manually entered”

- Surprised?

Figure. Number of Progress Notes With a Given Percentage of Manually Entered Text



Distribution of progress notes for all clinician types with a given percentage of manually entered text.

HIMSS-AMDIS Joint Letter on Clinician Burden

Ms. Seema Verma
Administrator
Centers for Medicare & Medicaid Services
US Department of Health and Human Services
Baltimore, MD 21244-1850

Donald Rucker, MD
National Coordinator for Health Information Technology
US Department of Health and Human Services
Washington, DC 20201

Dear Administrator Verma and Dr. Rucker:

On behalf of the Healthcare Information and Management Systems Society (HIMSS) and the Association of Medical Directors of Information Systems (AMDIS), we are pleased to provide written comments on the Patients Over Paperwork Initiative, specifically focused on ideas to help reduce the burdens placed on clinicians. We look forward to initiating a dialogue with the Centers for Medicare and Medicaid Services (CMS) on how our organizations can contribute to the discussion around alleviating clinician burden and advancing our healthcare system towards the goal of value-based care system.

HIMSS-AMDIS Joint Letter: sections

- Leverage Information and Technology, Now and in the Future
- Addressing Burden Issues Strengthens the Push Toward a Learning Health System
- *Build Momentum Toward Team-Based Care by Placing a Greater Emphasis on Reporting from the Entire Clinical Staff*
- Proposed Changes in Quality Reporting and the Promoting Interoperability Program are a Step in the Right Direction
- Reuse and Repurpose Data from Other Sources to Minimize Reporting Requirements
- *Simplify E/M Coding and Documentation Requirements*

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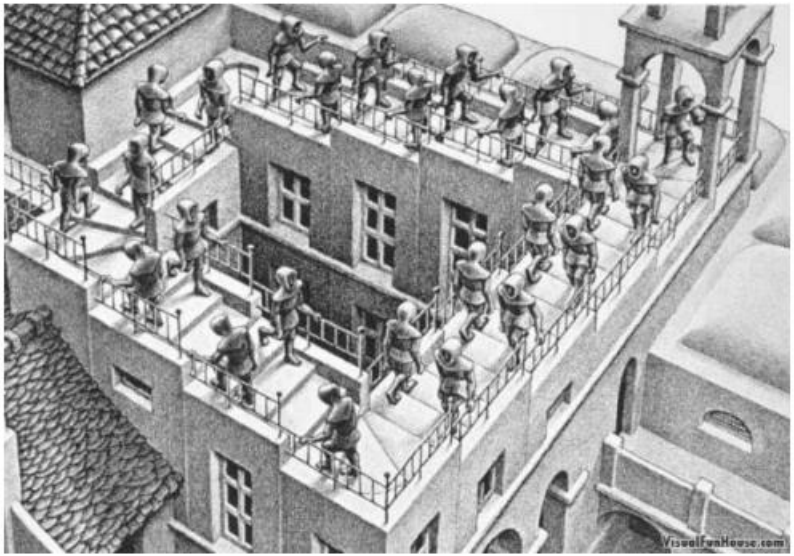
HIMSS

Association of Medical Directors AMDIS of Information Systems

Transition Comedy Slide



Pathology and Radiology Reports Recommend Correlation with Each Other, Endless Loop Ensues

BOSTON, MA – The ICU team of a local area hospital had struggled for ...

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eGEMs
Generating Evidence & Methods to improve patient outcomes

Framework To Guide The Collection And Use Of Patient-Reported Outcome Measures In The Learning Healthcare System

Patricia Franklin, MD, MBA, MPH;[i] Kate Chenok, MBA;[ii] Danielle Lavalee, PharmD, PhD;[iii] Rebecca Love, MPH, RN;[iv] Liz Paxton, MA;[iv] Courtney Segal, BA;[iii] Erin Holve, PhD[v]

- 38 organizations successful with Patient Reported Outcomes, interviewed and aggregated to distill best practice
- PROM supports
  - Patient Care Decisions
  - Quality Improvement Initiatives
  - Payer mandates
  - Population Health

- Nods to interoperability needs
- Standardization needs
  - PROMs become standard and shared data elements

I guarantee you're all being challenged with this, this is an excellent framework to organize the process and structure

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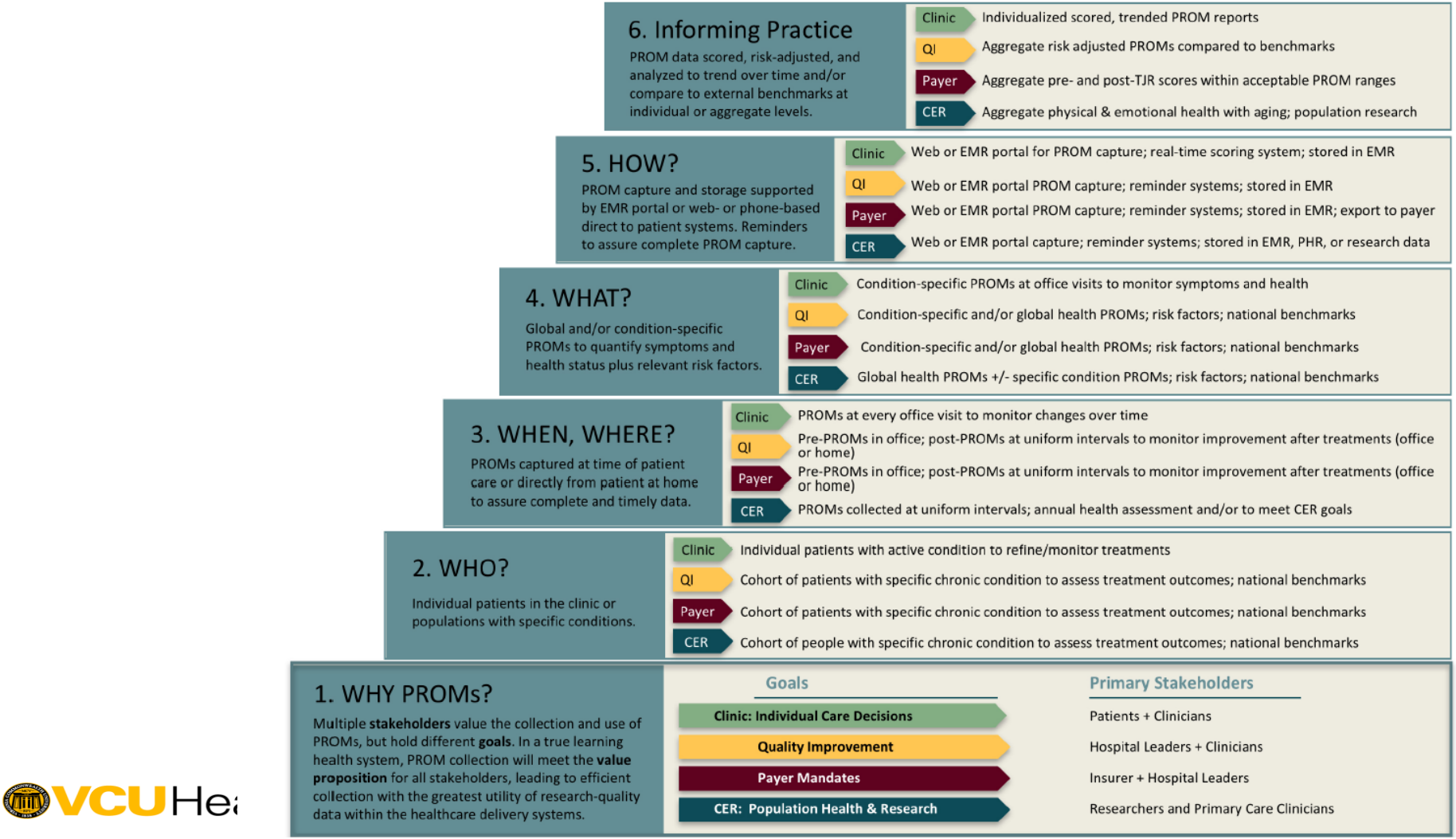

6. Informing Practice
PROM data scored, risk-adjusted, and analyzed to trend over time and/or compare to external benchmarks at individual or aggregate levels.
Clinic
Individualized scored, trended PROM reports
QI
Aggregate risk adjusted PROMs compared to benchmarks
Payer
Aggregate pre- and post-TJR scores within acceptable PROM ranges
CER
Aggregate physical & emotional health with aging; population research
5. HOW?
PROM capture and storage supported by EMR portal or web- or phone-based direct to patient systems. Reminders to assure complete PROM capture.
Clinic
Web or EMR portal for PROM capture; real-time scoring system; stored in EMR
QI
Web or EMR portal PROM capture; reminder systems; stored in EMR
Payer
Web or EMR portal PROM capture; reminder systems; stored in EMR; export to payer
CER
Web or EMR portal capture; reminder systems; stored in EMR, PHR, or research data
4. WHAT?
Global and/or condition-specific PROMs to quantify symptoms and health status plus relevant risk factors.
Clinic
Condition-specific PROMs at office visits to monitor symptoms and health
QI
Condition-specific and/or global health PROMs; risk factors; national benchmarks
Payer
Condition-specific and/or global health PROMs; risk factors; national benchmarks
CER
Global health PROMs +/- specific condition PROMs; risk factors; national benchmarks
3. WHEN, WHERE?
PROMs captured at time of patient care or directly from patient at home to assure complete and timely data.
Clinic
PROMs at every office visit to monitor changes over time
QI
Pre-PROMs in office; post-PROMs at uniform intervals to monitor improvement after treatments (office or home)
Payer
Pre-PROMs in office; post-PROMs at uniform intervals to monitor improvement after treatments (office or home)
CER
PROMs collected at uniform intervals; annual health assessment and/or to meet CER goals
2. WHO?
Individual patients in the clinic or populations with specific conditions.
Clinic
Individual patients with active condition to refine/monitor treatments
QI
Cohort of patients with specific chronic condition to assess treatment outcomes; national benchmarks
Payer
Cohort of patients with specific chronic condition to assess treatment outcomes; national benchmarks
CER
Cohort of people with specific chronic condition to assess treatment outcomes; national benchmarks
1. WHY PROMs?
Multiple stakeholders value the collection and use of PROMs, but hold different goals. In a true learning health system, PROM collection will meet the value proposition for all stakeholders, leading to efficient collection with the greatest utility of research-quality data within the healthcare delivery systems.
Goals
Clinic: Individual Care Decisions
Quality Improvement
Payer Mandates
CER: Population Health & Research
Primary Stakeholders
Patients + Clinicians
Hospital Leaders + Clinicians
Insurer + Hospital Leaders
Researchers and Primary Care Clinicians

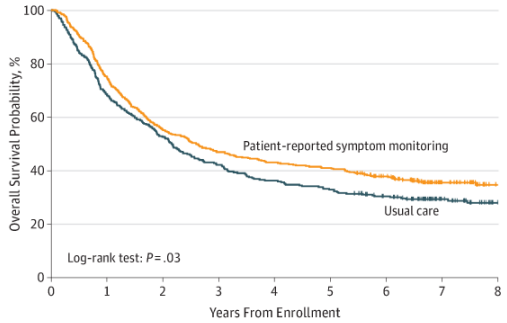
RESEARCH LETTER

Overall Survival Results of a Trial Assessing Patient-Reported Outcomes for Symptom Monitoring During Routine Cancer Treatment

Symptoms are common among patients receiving treatment for advanced cancers,[1] yet are undetected by clinicians up to half the time.[2] There is growing interest in integrating electronic patient-reported outcomes (PROs) into routine oncology practice for symptom monitoring, but evidence demonstrating clinical benefit has been limited.[3]

- JAMA
- RCT assessing patient reported symptoms against usual care in metastatic solid tumor patients

Figure. Overall Survival Among Patients With Metastatic Cancer Assigned to Electronic Patient-Reported Symptom Monitoring During Routine Chemotherapy vs Usual Care



Crosses indicate censored observations. Enrollment in the patient-reported symptom monitoring group was enriched for a preplanned subgroup with low baseline computer experience as part of a feasibility substudy with a 2:1 randomization ratio in that subgroup (N = 227) and a 1:1 ratio in the computer-experienced subgroup (N = 539), yielding 441 participants in the patient-reported symptom monitoring group, and 325 in the usual care group. With a minimum follow-up of 5.4 years, median follow-up was 6.9 years (interquartile range, 6.5-7.7) for the electronic patient-reported symptom monitoring group and 7 years (interquartile range, 6.6-8.1) for the usual care group.

Patient portal use and hospital outcomes

Adrian G Dumitrascu,[1] M Caroline Burton,[2] Nancy L Dawson,[3] Colleen S Thomas,[4]
Lisa M Nordan,[5] Hope E Greig,[6] Duaa I Aljabri,[5] and James M Naessens[5,7]

- AMIA
- 2 years worth of data from Mayo Jacksonville; measuring patient portal utilization DURING the hospitalization
- Looking for effect on Outcomes, Mortality, Readmission
- OpenNotes institution – patients can see inpatient and outpatient notes at Mayo as well as usual things such as lab results

- 20% of their patients with accounts did access the portal during their stay
- Those that acces typically younger (58 vs 62); more often on a medical service, more liver disease (?), and higher severity of illness

AND…..

No difference. Surprised?

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Journal of the American Medical Informatics Association,
0(0), 2017, 1–7
doi: 10.1093/jamia/ocx149

Recalibrating Privacy Protections to Promote Patient Engagement

Ameet Sarpatwari, J.D., Ph.D., and Niteesh K. Choudhry, M.D., Ph.D.

- Existing HIPPA and security requirements hinder personalization and engagement
- Some health systems have gone as far as to have their own form waiving the strictness
- Maybe allow patients to “opt-in” to the strictness; similar to how we are doing health information exchanges
- Dicey territory but a needed national conversation

Charting Complication: Hospitalist Develops Stage 4 Sacral Decub

BOSTON, MA – Hospitalist Sofia Candelaria was simply being a good hospitalist by spending ...

Transition Comedy Slide

HOSPITAL EHRS

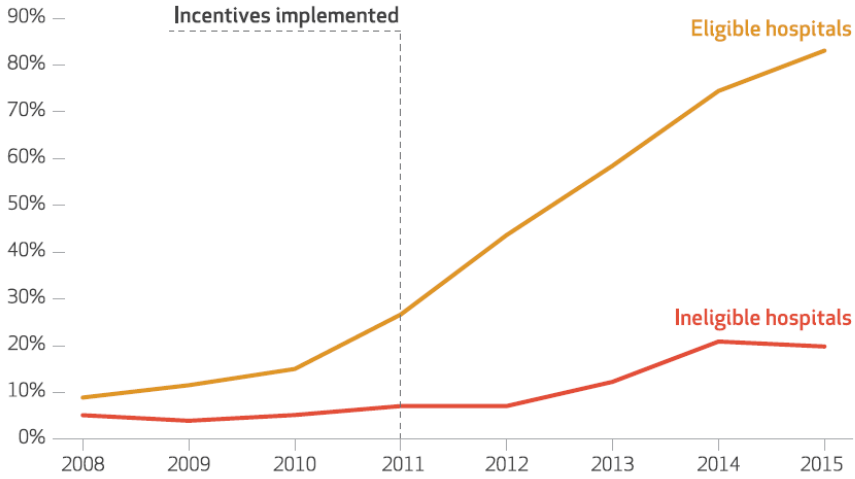
By Julia Adler-Milstein and Ashish K. Jha

HITECH Act Drove Large Gains In Hospital Electronic Health Record Adoption

- Health Affairs
- HITECH drove annual gains in EHR adoption of 8 percentage points over the first 5 years
- *HITECH can serve as a model for other countries seeking to increase EHR adoption and for other policy efforts seeking to promote technology adoption*

EXHIBIT 2

Percentages of hospitals that adopted at least a basic electronic health record system in 2008–15, by eligibility for meaningful-use incentives



SOURCE Authors' analysis of data for 2008–15 from the American Hospital Association's Annual Health Information Technology Supplemental Survey.

Physician Beliefs about the Meaningful Use of the Electronic Health Record: A Follow-Up Study

Srinivas Emani[1] David Y. Ting[2] Michael Healey[1,3] Stuart R. Lipsitz[1] Andrew S. Karson[4]
David W. Bates[1,5]

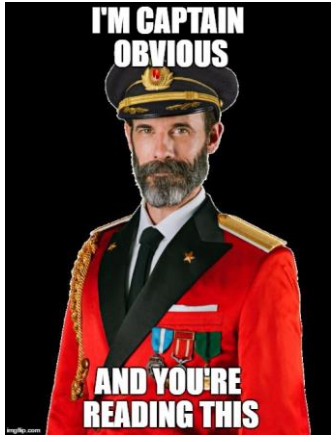
- Surveyed providers in 2 Boston AMCs – 2000 total
- Only 1/5th believed it would improve quality of care, patient centeredness of care, or the care they personally provide
- Became increasingly negative between Stages 1 and 2

Yup…..

Table 7 Change in beliefs from stage 1 to stage 2 meaningful use (percent respondents)

	All respondents ($n = 518$)		Primary care physicians ($n = 129$)	
	Stage 1	Stage 2	Stage 1	Stage 2
	(Agree or strongly agree)			
Beliefs				
Decrease medical errors	35.9	28.1[a]	42.0	33.3[b]
Not increase efficiency of care	44.3	67.5[a]	46.2	63.0[a]
Improve patient-centered care	27.4	20.0[a]	37.8	25.2[a]
Not improve patient outcomes	28.1	44.1[a]	18.1	35.3[a]
Improve quality of care	24.7	18.4[a]	33.6	22.0[a]
Improve care personally delivers	20.8	17.8[a]	27.7	18.6[b]
Improve care the AMC delivers	36.7	21.5[a]	41.2	22.6[a]
Self-efficacy (moderately confident to extremely confident)	58.1	57.3	60.0	66.1

Abbreviation: AMC, academic medical center.
[a] $p < 0.001$.
[b] $p < 0.01$.



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Incorrectly Performed Meaningful Use Audits Hurt Small Practices

Christoph U. Lehmann[1] Steven E. Waldren[2] Thomson Kuhn[3]

- ACI article
- Based on a sample of 100 Eps; over $730M inappropriate payments were given out due to insufficient attestation support
- But… Audits were heavy handed and inconsistent
- And of course – MU is (was) an all or nothing program, failure of one was failure of the entirety

Examples of the pain:

- Request for screenshots after the fact (why not require these with attestation?)
- Auditors were unfamiliar with the context of the program
- Short timelines to respond
- Cascading audits to the rest of an EPs group


REGION

Homicide victims rarely talk to police

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PERSPECTIVE

The HITECH Era in Retrospect

John D. Halamka, M.D., and Micky Tripathi, Ph.D.

- NEJM
- “In a sense, we gave clinicians suboptimal cars, didn’t build roads, and then blamed them for not driving.”
- Closes with a call for market forces to shape interoperability as well as usability (in the form of FHIR / API / etc.)

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- “If the post-HITECH era can return control of the agenda to customers, developers, and multistakeholder collaborations, we should be able to recapture the hearts and minds of our clinicians.”

Transition Comedy Slide - Is this your next API connection?

Uber Offers In-Hospital Patient Transport with UberGURNEY

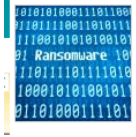
SAN FRANCISCO, CA – Uber's success knows no bounds. After infiltrating cities across the ...

Allscripts Ransomware; then gets sued

“Allscripts failed to implement appropriate processes that could have prevented or minimized the effects of the SamSam ransomware attack.”

Allscripts Ransomware Update: Outages Expected through Monday

January 22, 2018 by Rajiv Leventhal | Reprints



Updating a report from Friday, Jan. 19, the Chicago-based Allscripts, one of the most prevalent EHR (electronic health record) vendors in the world, is still working to restore some of its IT systems following a ransomware attack last week.

As conveyed on Friday, Allscripts acknowledged that it has been

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Hackers hit Nuance again in 2017, while NotPetya cost $98 million in lost revenue

A recent SEC filing by the voice and language tool vendor outlined a December cyberattack, which impacted the records of 45,000 individuals.

By Jessica Davis | March 01, 2018 | 12:55 PM

· 62.5% of respondents affected by transcription loss due to malware

· 80%+ use native EHR tools or voice recognition. About 30% of sites had back up transcription evenly split between internal and external team

· 90% did have a documentation backlog, all types but mainly Op Notes

· About a 50/50 split of sites holding off on suspensions for delinquencies

· Some curiosity as to whom kept onsite voice files, and was a backup contracted for on call (we did not thinking 99.99% uptime was pretty reliable…lesson learned)

· One site had aggressive voice recognition install to mitigate transcription loss risk

In the news – developments

Students and the Medical Record

AMA: Medical students, residents receive insufficient EHR training

By
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More in
EHR training
HIT

Print Reprint

Medical students and residents are not effectively using electronic health records because they continue to receive insufficient training on the systems as part of their formal professional education.

CMS Manual System	**Department of Health & Human Services (DHHS)**
Pub 100-04 Medicare Claims Processing	**Centers for Medicare & Medicaid Services (CMS)**
Transmittal 3971	**Date: February 2, 2018**
	Change Request 10412

SUBJECT: E/M Service Documentation Provided by Students (Manual Update)

I. SUMMARY OF CHANGES: This revision to Pub. 100-04, Medicare Claims Processing Manual, Chapter 12, Section 100.1.1, B. E/M Documentation Provided by Students, allows the teaching physician to verify in the medical record any student documentation of components of E/M services, rather than re-documenting the work. (Manual Update Only)

EFFECTIVE DATE: January 1, 2018
**Unless otherwise specified, the effective date is the date of service.*
IMPLEMENTATION DATE: March 5, 2018

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In the News

Seema Remarks at HIMSS 2018

Tells a story of transferring records for husband's specialty care using paper and a CD-ROM

- MyHealthEData
- BlueButton 2.0
- Interoperability via APIs
- Overhaul of the MU Program
- ***Changes to the E/M Payment Structure***

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VA Secretary Announces VA Open Application Programming Interface Pledge

Allscripts · Beth Israel Deaconess Medical Center · Cleveland Clinic · Fairview · Geisinger · Johns Hopkins Medicine · Intermountain Healthcare · Jefferson · Mayo Clinic · Partners Healthcare · Rush · UPMC · VCU Health System

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In The NEWS

https://www.oit.va.gov/news/article/?read=va-secretary-announces-va-open-application-programming-interface-pledge

CMS overhauls meaningful use EHR program, removes redundancies

Administrator Seema Verma said changes to the program eliminate 25 measures and ultimately save hospitals over 2 million hours of work.

Amazon's Latest Ambition: To Be a Major Hospital Supplier; The online retailer is pushing hard to expand its foothold in medical supplies, creating a marketplace where hospitals could shop to stock emergency rooms, operating suites and outpatient facilities

Evans, Melanie; Stevens, Laura . Wall Street Journal (Online) ; New York, N.Y. [New York, N.Y]13 Feb 2018: n/a.

ProQuest document link

VCU Health

Actual footage of Bill’s last day

Other articles of interest

MEDICATION INDICATIONS SPECIAL FEATURE

Incorporating medication indications into the prescribing process

Kevin Kron, B.S., Partners Healthcare, Somerville, MA.

Sara Myers, B.A., Division of General Internal Medicine, Brigham and Women's Hospital, Boston, MA.

Purpose. The incorporation of medication indications into the prescribing process to improve patient safety is discussed.

Summary. Currently, most prescriptions lack a key piece of information

Brief Communication

Adherence to recommended electronic health record safety practices across eight health care organizations

Dean F Sittig,[1] Mandana Salimi,[2] Ranjit Aiyagari,[3] Colin Banas,[4] Brian Clay,[5] Kathryn A Gibson,[6] Ashutosh Goel,[7] Robert Hines,[8] Christopher A Longhurst,[5] Vimal Mishra,[4] Anwar M Sirajuddin,[9] Tyler Satterly,[10,11] and Hardeep Singh[10,11]

VIEWPOINT

Why 'Universal Precautions' are needed for medication lists

Rita Shane

Research and Applications

Information technology to support patient engagement: where do we stand and where can we go?

Daniel M Walker,[1] Cynthia J Sieck,[1] Terri Menser,[1] Timothy R Huerta,[1,2] and Ann Scheck McAlearney[1]

[1]Department of Family Medicine, College of Medicine, Ohio State University, Columbus, OH, USA and [2]Department of Bioinformatics, College of Medicine, Ohio State University

Technologic Distractions (Part 1): Summary of Approaches to Manage Alert Quantity With Intent to Reduce Alert Fatigue and Suggestions for Alert Fatigue Metrics

Sandra L. Kane-Gill, PharmD, MSc, FCCM, FCCP[1,2]; Michael F. O'Connor, MD, FCCM[3,4]; Jeffrey M. Rothschild, MD, MPH, FCCM[5]; Nicholas M. Selby, BMedSci, BMBS, DM, MRCP[6]; Barbara McLean, MN, RN, CCNS-BC, NP-BC, CCRN, FCCM[7]; Christopher P. Bonafide, MD, MSCE[8,9]; Maria M. Cvach, DNP, RN, FAAN[10]; Xiao Hu, PhD[11]; Avinash Konkani, PhD, AHFP[12]; Michele M. Pelter, RN, PhD[11]; Bradford D. Winters, MD, PhD, FCCM[13]

Improving Refill Adherence in Medicare Patients With Tailored and Interactive Mobile Text Messaging: Pilot Study

Rena Brar Prayaga[1], MA, JD; Erwin W Jeong[2], PharmD; Erin Feger[1], BA; Harmony K Noble[3], BA; Magdalen Kmiec[1], BA; Ram S Prayaga[1], MS

Prescriber response to computerized drug alerts for electronic prescriptions among hospitalized patients

Yael Zenziper Straichman[a,f,*], Daniel Kurnik[a,d], Ilan Matok[f], Hillel Halkin[a,e], Noa Markovits[a], Amitai Ziv[b,e], Ari Shamiss[c,e], Ronen Loebstein[a,e]

ESMO GOOD SCIENCE BETTER MEDICINE BEST PRACTICE

Annals of Oncology 0: 1–6, 2018
doi:10.1093/annonc/mdx781

ORIGINAL ARTICLE

Watson for Oncology and breast cancer treatment recommendations: agreement with an expert multidisciplinary tumor board

S. P. Somashekhar[1*], M.-J. Sepúlveda[2], S. Puglielli[3], A. D. Norden[3], E. H. Shortliffe[4], C. Rohit Kumar[1], A. Rauthan[1], N. Arun Kumar[1], P. Patil[1], K. Rhee[3] & Y. Ramya[1]

LETTERS | 20 FEBRUARY 2018

Patients Contributing to Their Doctors' Notes: Insights From Expert Interviews

John N. Mafi, MD, MPH; Macda Gerard, BA; Hannah Chimowitz, BA; Melissa Anselmo, MPH; Tom Delbanco, MD; Jan Walker, RN, MBA

Article, Author, and Disclosure Information

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