

From Burnout to Benefit: Reimagining the Role of the Electronic Health Record to Support Clinical Care

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E-sundhedsobservatoriets årskonference

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Overview of Remarks

Part 1:

Understanding the relationship between burnout and EHR work

Part 2:

(Practically) Reimagining the EHR

The transition to Electronic Health Records has not been smooth



Simultaneous evidence of growing clinician burnout and high clerical burden of EHRs

JAMA | **Original Investigation**

Prevalence of Burnout Among Physicians A Systematic Review

Lisa S. Rotenstein, MD, MBA; Matthew Torre, MD; Marco A. Ramos, MD, PhD; Rachael C. Rosales, MD; Constance Guille, MD, MSCR; Srijan Sen, MD, PhD; Douglas A. Mata, MD, MPH

PHYSICIAN PRACTICE

By Ming Tai-Seale, Cliff W. Olson, Jinnan Li, Albert S. Chan, Criss Morikawa, Meg Durbin, Wei Wang, and Harold S. Luft

THE PRACTICE OF MEDICINE

Electronic Health Record Logs Indicate That Physicians Split Time Evenly Between Seeing Patients And Desktop Medicine

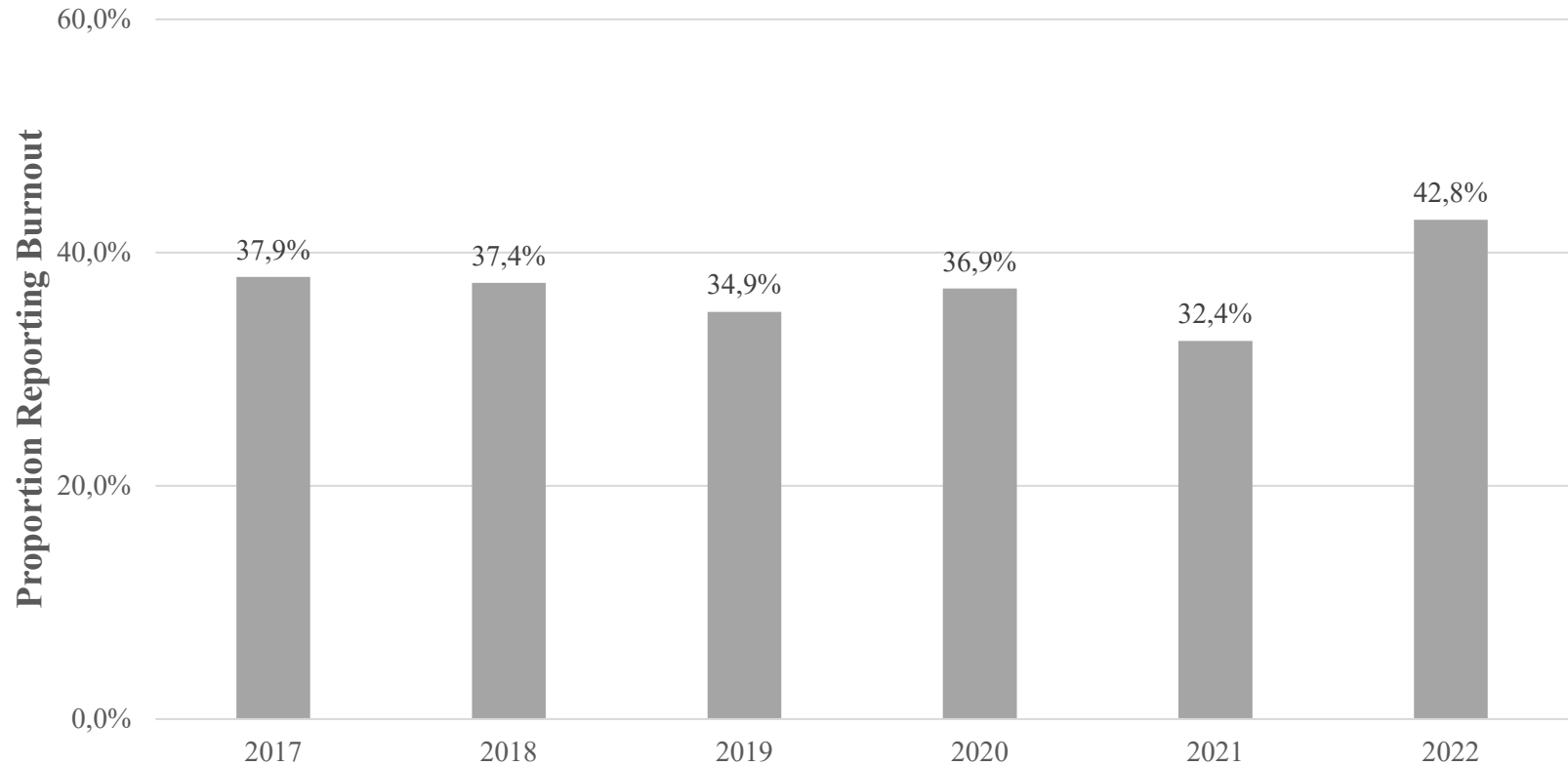
The New York Times

The Coronavirus Pandemic > | [Map and Cases](#) [Updated Boosters: What to Know](#) [Findings on Covid Recovery](#) [Covid F.A.Q.](#)

Physician Burnout Has Reached Distressing Levels, New Research Finds

Nearly two-thirds of doctors are experiencing at least one symptom of burnout, a huge increase from before the pandemic. But the situation is not irreparable, researchers say.

Evidence from US Primary Care Physicians suggests a post-pandemic increase in burnout



Results forthcoming

But is EHR work causing burnout?

ANNALS OF MEDICINE NOVEMBER 12, 2018 ISSUE

WHY DOCTORS HATE THEIR COMPUTERS

Digitization promises to make medical care easier and more efficient. But are screens coming between doctors and patients?

IDEAS AND OPINIONS

Annals of Internal Medicine

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

Research and Applications


Electronic health records and burnout: Time spent on the electronic health record after hours and message volume associated with exhaustion but not with cynicism among primary care clinicians

Julia Adler-Milstein¹, Wendi Zhao¹, Rachel Willard-Grace², Margae Knox², and Kevin Grumbach²

A (brief!) summary of the evidence

Review

Exploring the relationship between electronic health records and provider burnout: A systematic review

Qi Yan ^{1,2}, Zheng Jiang³, Zachary Harbin⁴, Preston H. Tolbert⁴, and Mark G. Davies^{1,2}

Multiple studies have established associations between EHR time and burnout (Adler-Milstein, et al 2020; Gardner, et al 2019; Hilliard, et al 2020; Tai-Seale, et al 2023, Peccoralo, et al. 2021)


- In particular, time on the EHR **after hours** and the **volume of inbox messages** have the strongest associations with burnout



A (brief!) summary of the evidence

Review

Exploring the relationship between electronic health records and provider burnout: A systematic review

Qi Yan ^{1,2}, Zheng Jiang³, Zachary Harbin⁴, Preston H. Tolbert⁴, and Mark G. Davies^{1,2}

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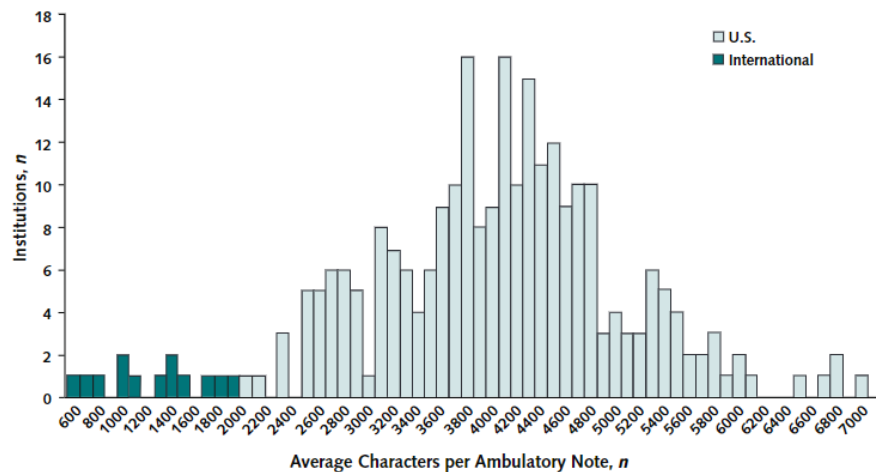
Physicians rank “reduce time on documentation” as the most important intervention for improving wellbeing (Aiken 2023)

Reducing physician documentation burden has become a policy priority (at least in US) and a focus for delivery organizations (Apathy, et al 2022; AMIA 25x5)

Is this just the crazy US payment system?

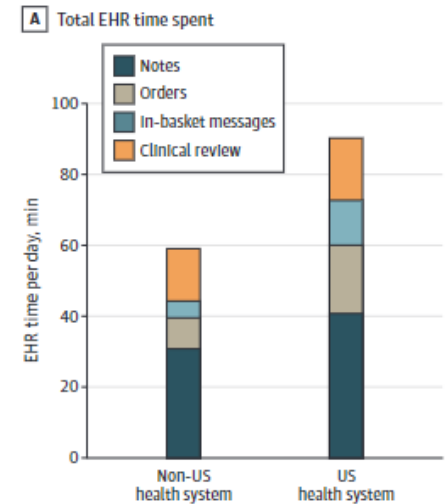
Suggestive evidence of a (somewhat) uniquely US problem...

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



Column height represents number of organizations. Dark columns represent 13 organizations outside the United States (140 000 notes from Canada, the United Kingdom, Australia, the Netherlands, Denmark, the United Arab Emirates, and Singapore). Light columns represent 254 organizations in the United States (10 million notes).

Source: Downing, et al 2018



Source: Holmgren, et al 2020

... but the EHR time in non-US health systems is still substantial.

What does the evidence say about actionable factors to improve EHRs and reduce burnout?

Agreeing that **practice unloads clerical burden** was associated with a lower likelihood of burnout and lower burnout scores (Peccoralo et al. 2021)

Prescription authorization message volumes were associated with higher odds of burnout (Tai-Seale et al. 2023)

What does the evidence say about actionable factors to improve EHRs and reduce burnout?

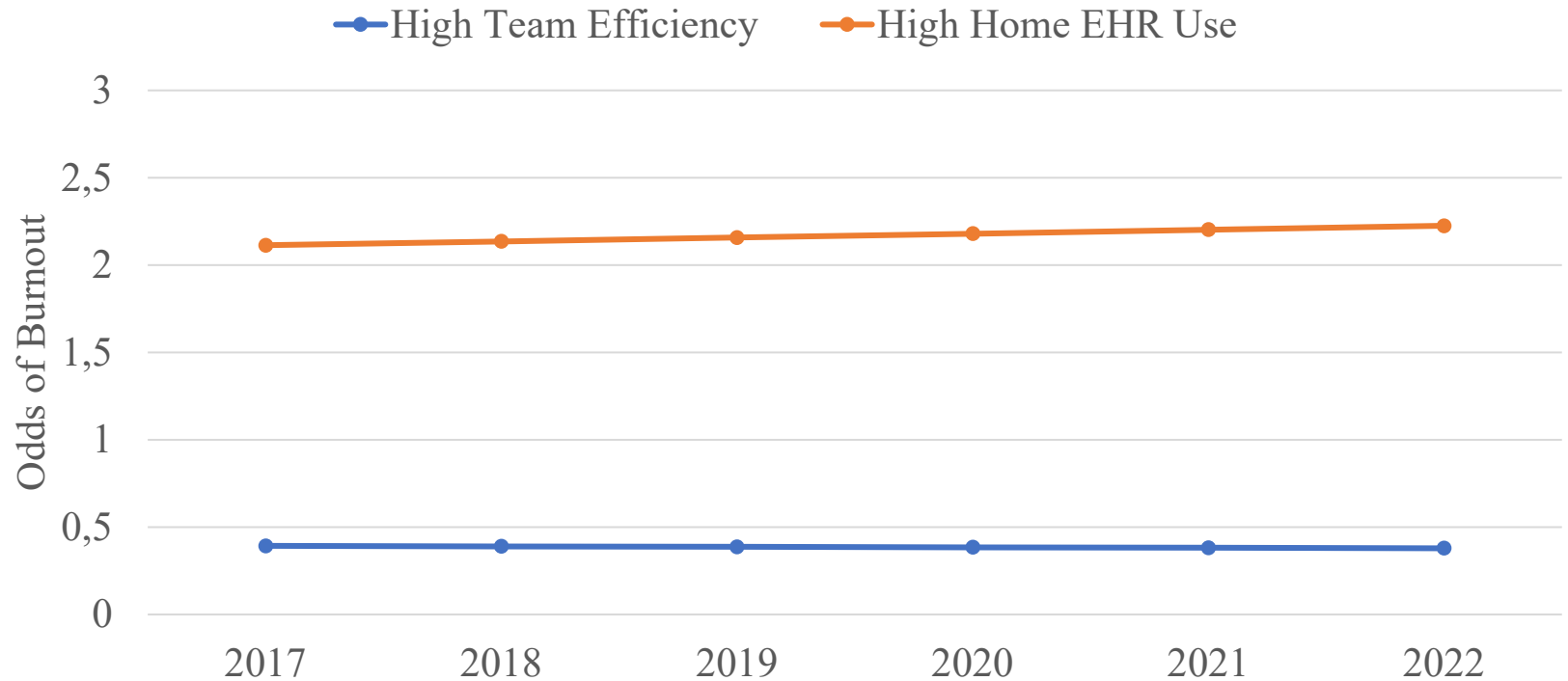
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And what underlies these factors?

TEAMWORK!

Digging deeper into teamwork and EHR work



Also interesting: we did not find relationships between EHR proficiency and burnout

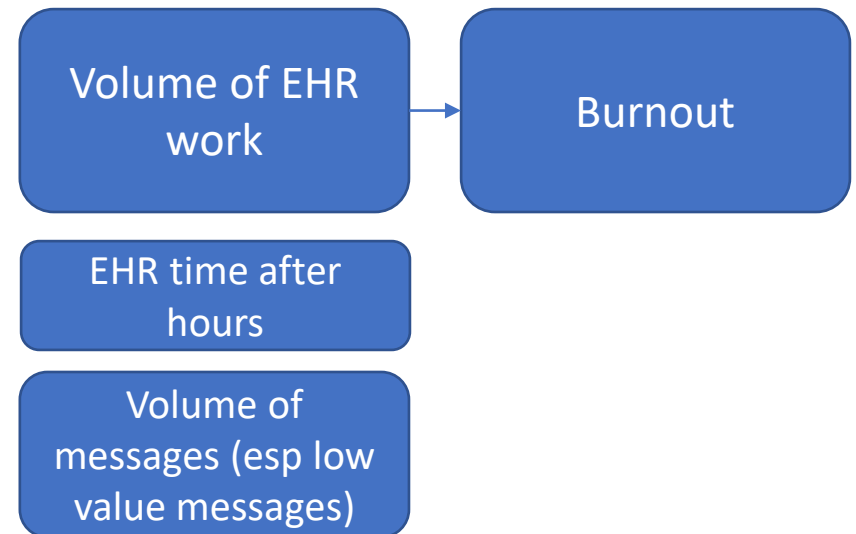
Results forthcoming

Digging even deeper into teamwork and EHR work

High teamwork was most likely to be found in settings with **more stable workforce** (independent practices, rural locations)

Low EHR work was most likely to be found in settings that gave physicians **sufficient time for documentation** and had **higher EHR proficiency**

So where does this leave us?



So where does this leave us?

Strategies that reduce burnout

High team efficiency

Reduce clerical burden

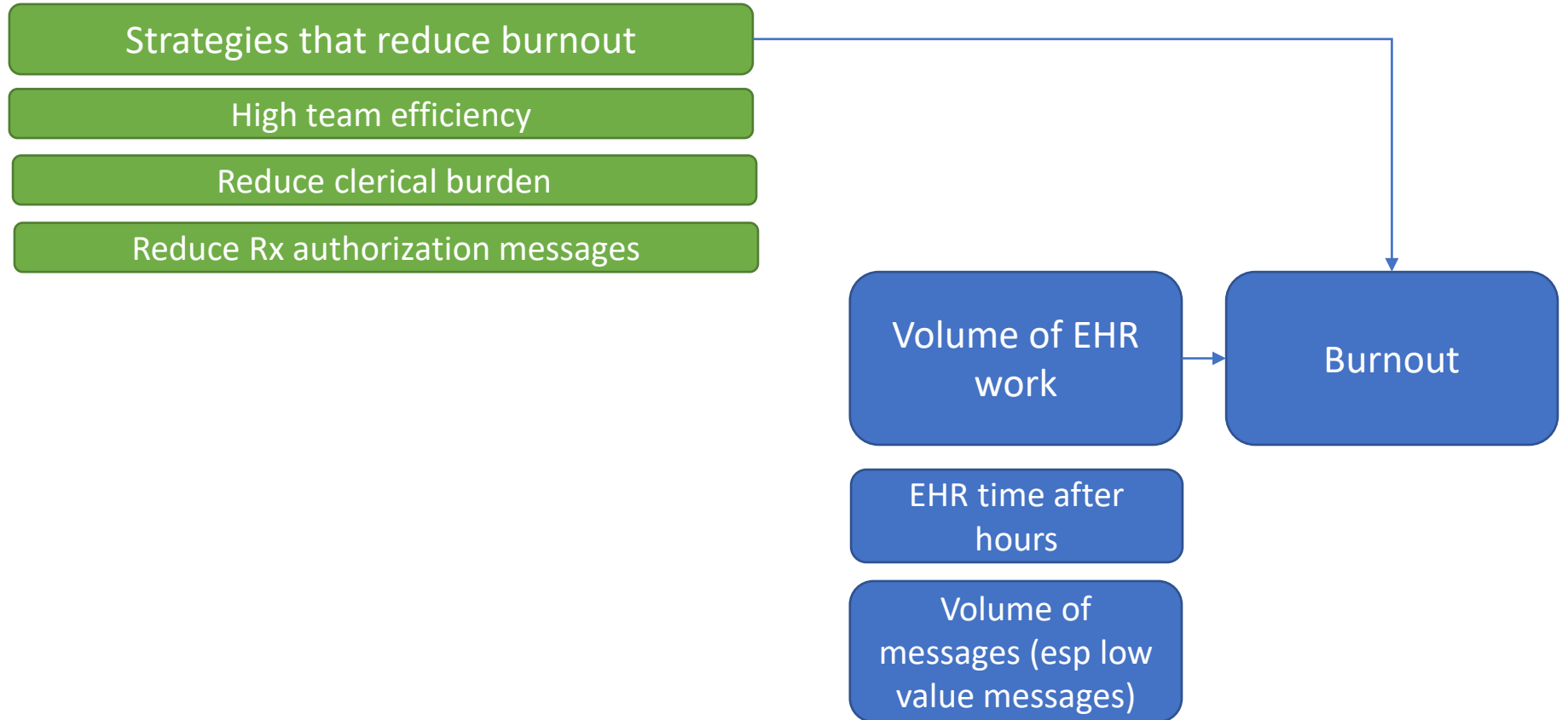
Reduce Rx authorization messages

Volume of EHR work

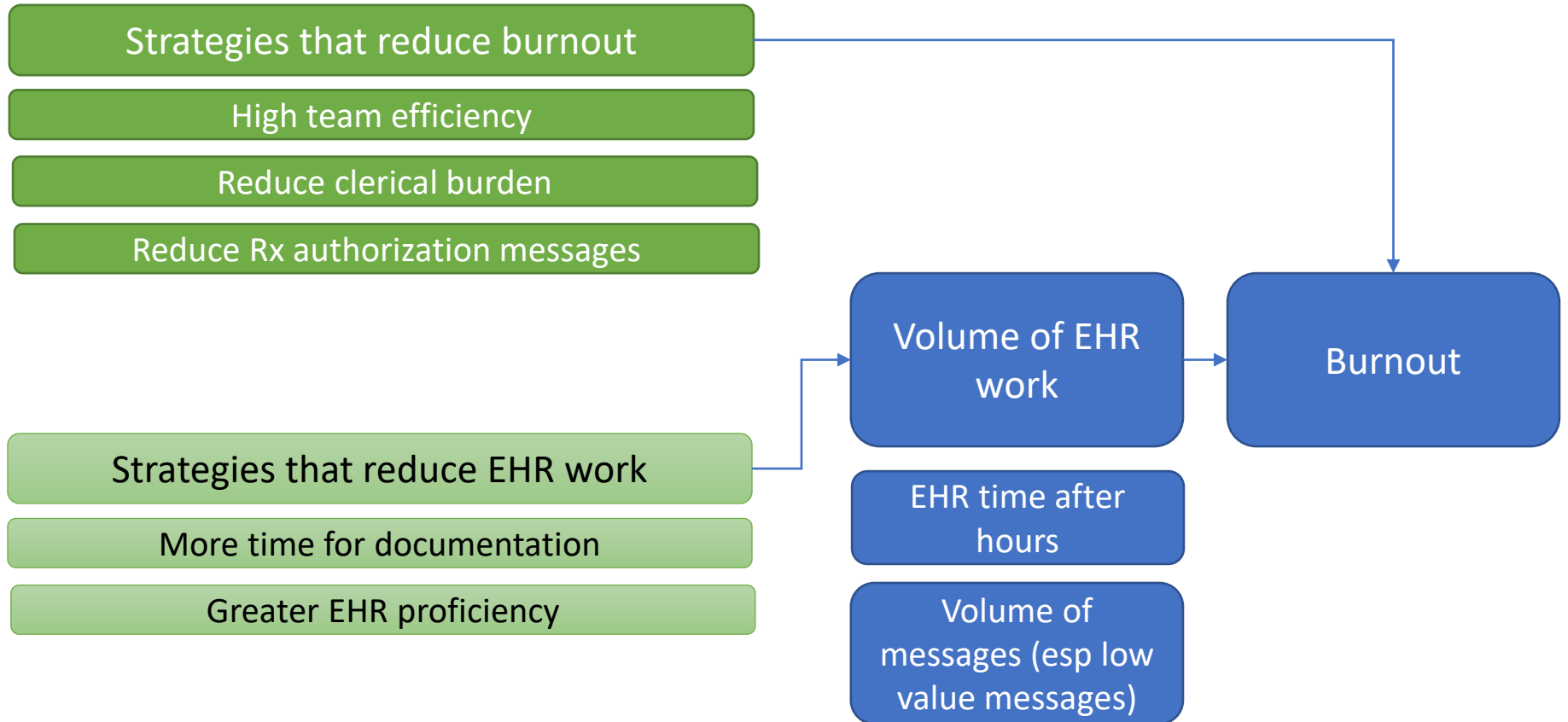
EHR time after hours

Volume of messages (esp low value messages)

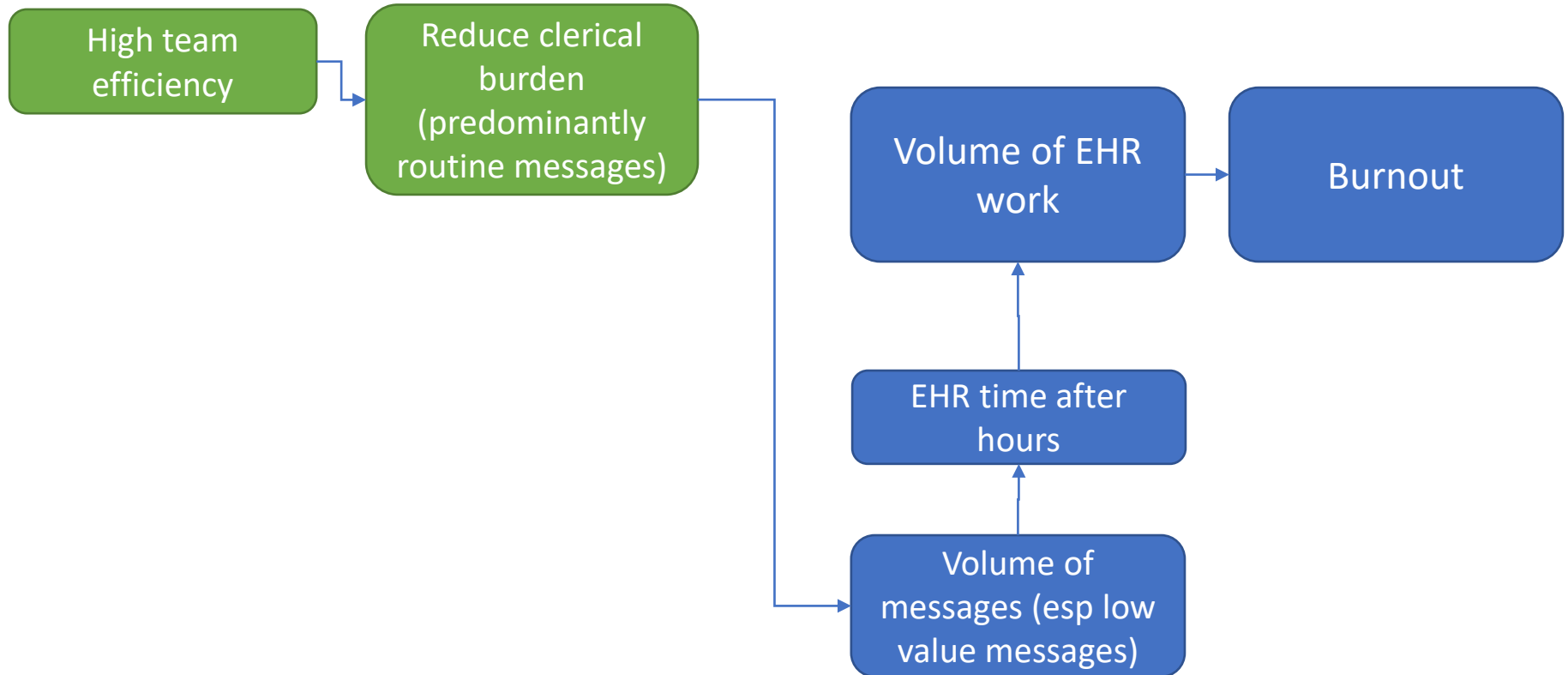
Burnout



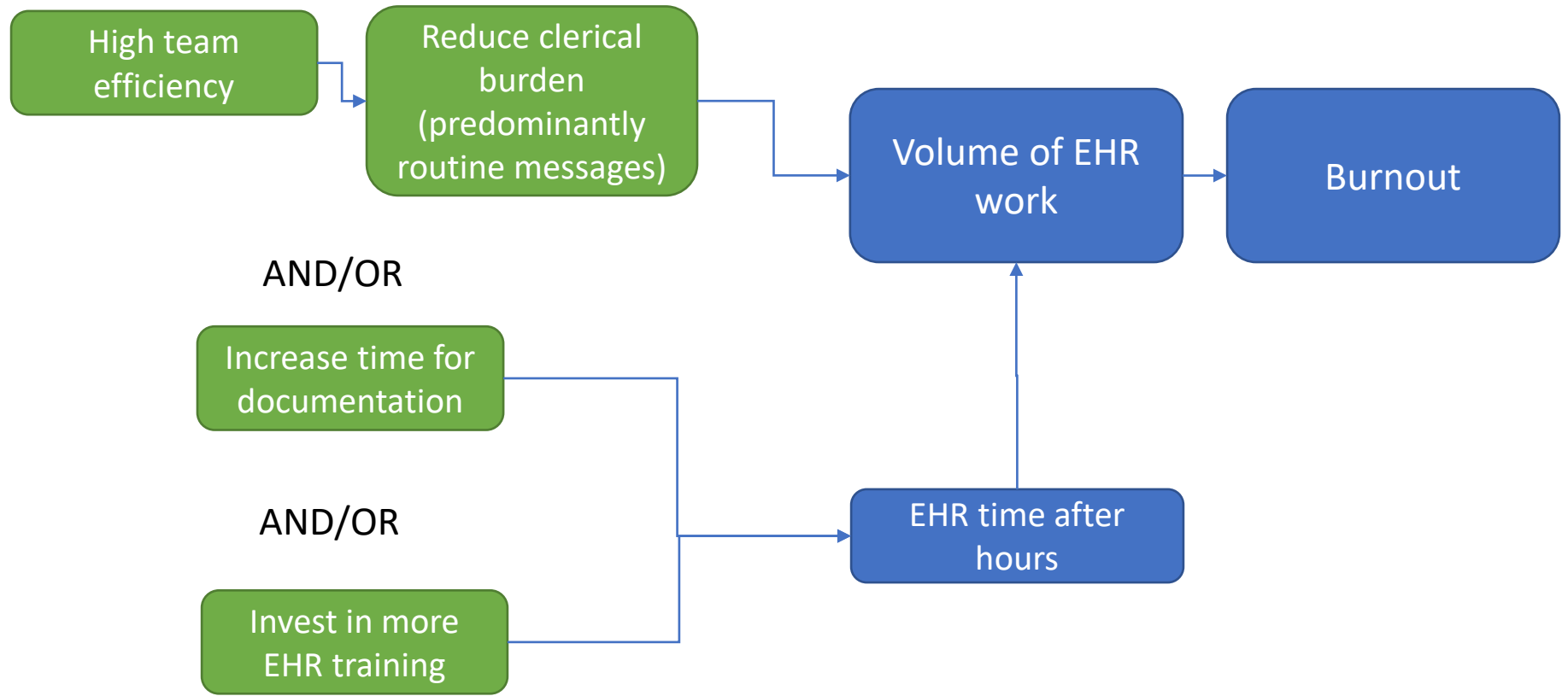
So where does this leave us?



So where does this leave us? My summary



So where does this leave us? My summary



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Part 2:

(Practically) Reimagining the EHR

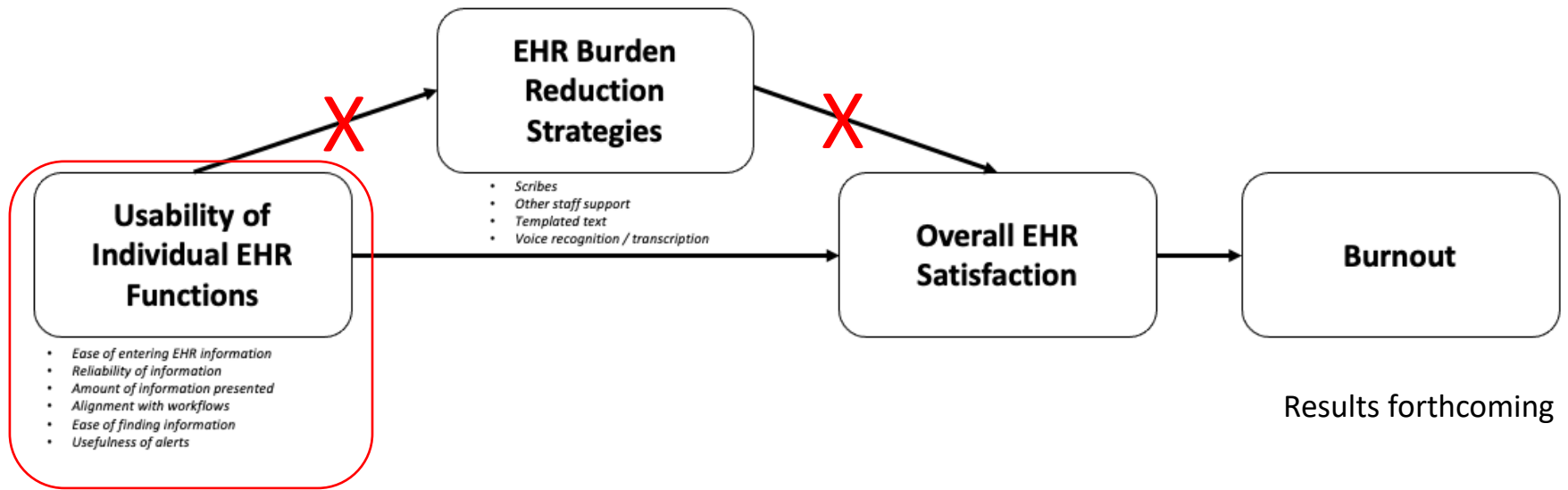
Is the optimal solution hiding in plain sight?



amazon



Improving EHR usability should be a top-priority solution



Two dimensions of usability (from Raj Ratwani):

- (1) User Interface Design (Context Independent) – e.g., font size, icons, colors & contrast, layout
- (2) Cognitive Task Support (Context Dependent) – e.g., workflow design, visualization, memory aids, error anticipation

Three Examples:

1) Improving chart review...

...by co-locating related information

2) Improving order sets...

...by dynamic updating of content

3) Improving diagnostic reasoning...

... by offering “best next steps”

Starting with the simple

Does an EHR user interface design change – one that integrated outside records (comingled local/outside encounters) vs. keeping them separated within the EHR - result in greater use of outside records?

Specifically, with data integration, are outside records reviewed

➤ *More often?*

➤ *If so, by whom?*

➤ *If so, in what settings?*

Outside Data Integration in Epic: Before

Epic ED Manager ED Track Board ED Map In Basket ED Chart

Galvan, Kelly

Galvan, Kelly
Male, 55 y.o., 08/04/1964
Care Everywhere: Dysuria

TT: 00:33
Rm: CC 02
Code: Not on file

Att: EDDISON, C
RN: None
Acuity: 4

T: 36.8 °C
HR: 68
BP: 110/72
W: 79.5 kg

Allergies/Reactions
Penicillins
Sulfa Drugs
New Ord/Rslt:
IP Bed: None

Ins: Epic Ins
MRN: 35791
MyChart: Active
PCP: Marty Seeger

Care Everywhere JESSIE TRAUMEL Search

Care Everywhere Outside Records

Request Updates Query New Organization

Home Summary Documents Lab Results Other Results

| | New Info Received | Last Request | Available Information |
|---------------------------|-------------------|--------------|---|
| Glacier Edge Clinic | 12/2/2019 | 12/2/2019 | Documents |
| River Hills Health System | 12/2/2019 | 12/2/2019 | Summary Documents Lab Results Other Results |

Chart Review
Care Everywh...
Triage
ED Narrator
Disposition
Orders
Communicatio...
Customize
More

Outside Data Integration in Epic: After

Epic | ED Manager | ED Track Board | ED Map | In Basket | ED Chart | JESSIE TRAUMEL | Search

Galvan, Kelly
 Male, 55 y.o., 08/04/1964
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 Att: EDDISON, C | RN: None | Acuity: 4
 T: 36.8 °C | HR: 68 | BP: 110/72 | W: 79.5 kg
 Allergies/Reactions: Penicillins, Sulfa Drugs
 Ins: Epic Ins | MRN: 35791 | MyChart: Active | PCP: Marty Seeger

Chart Review

Encounters | ED Visits | Labs | Imaging | Procedures | ECG | Other Orders | Medications | Episodes | Letters | Notes | Misc Reports | Media

Preview | Refresh (9:43 AM) | Select All | Deselect All | Review Selected | Side-by-Side | Synopsis | Lifetime | Flowsheet | Route | Load Remaining | Encounter | Add to Bookmarks

Filters: Default filter | Me | Emergency Medicine | Emergency Dept, EMC | Admissions

| When | Type | With | Description |
|--------------|--------------------|----------------------------|---|
| Today | | | |
| Today | ED | EM - Eddison, C | |
| 6 Months Ago | | | |
| 03/20/2019 | Office Visit | Family Medicine - Benn... | Urinary tract infection, site not sp... |
| 1 Year Ago | | | |
| 09/01/2018 | Office Visit | Family Medicine - Benn... | UTI (urinary tract infection) (Prim... |
| 08/24/2018 | Office Visit | Family Medicine - Seeg... | Diabetes mellitus, type 2 (Primary... |
| 08/24/2018 | Brief Office visit | Family Medicine - Seeg... | |
| 3 Years Ago | | | |
| 01/23/2016 | Office Visit | Family Medicine - Walke... | Diabetes mellitus type II (Primary... |
| 11/09/2015 | Colonoscopy | GI - Davis, P | |
| 02/22/2015 | Office Visit | Ophthalmolog - Kadil, T | Screening for eye condition (Prim... |
| 01/02/2015 | Office Visit | Ophthalmolog - Kadil, T | Screening for eye condition (Prim... |
| 12/29/2014 | Office Visit | Fam Med - Walker, D | Type II or unspecified type diabet... |
| 5 Years Ago | | | |
| 06/01/2014 | Office Visit | Fam Med - Walker, D | Diabetes mellitus (Primary Dx); H... |
| 05/30/2014 | Brief Office visit | Family Medicine - Gardn... | Essential Hypertension (Primary... |
| 05/21/2014 | PCP/Clinic Change | | |
| 05/20/2014 | Office Visit | Fam Med - Stadler, J | Pure hypercholesterolemia; Esse... |
| 01/04/2014 | Office Visit | Family Medicine - Gardn... | Osteoarthritis of knee (Primary D... |

Office Visit

3/20/2019
Verona Medicine Clinic

River Hills Health System
Location

Mr. Kelly Galvan - 54 y.o. Male; born Aug. 04, 1964
Encounter Summary, generated on Jun. 24, 2019

Reason for Visit

| Reason | Comments |
|------------------------|----------|
| Genito-urinary Problem | |

Encounter Details

| Date | Type | Department | Care Team | Description |
|------------|--------------|---|---|--|
| 03/20/2019 | Office Visit | Verona Medicine Clinic 25 Northern Lights Ln VERONA, WI 53593 608-303-2340 | Bennett, Dana, M.D. 1979 Milky Way VERONA, WI 53593 608-271-9000 608-255-6192 (Fax) | Urinary tract infection, site not specified (Primary Dx) |

Social History - documented as of this encounter

| Tobacco Use | Types | Packs/Day | Years Used | Date |
|---------------|------------|-----------|------------|------------------|
| Former Smoker | Cigarettes | 1 | 20 | Quit: 05/14/3466 |

Comments: Quit smoking following episode of hemoptysis, negative bronchoscopy

| Alcohol Use | Drinks/Week | oz/Week | Comments |
|-------------|-------------|---------|-------------------------|
| Yes | | 1.0 | Beer or wine on weekend |

Sex Assigned at Birth | Date Recorded

After

Epic ED Manager Track Board ED Map In Basket ED Chart

Langer, Eric

Langer, Eric
Male, 55 y.o., 10/25/1960
My Sticky Note: ↑
Dysuria

TT: 13:30
Rm: None
Code: Not on file

Att: EDDISON, C
RN: None
Acuity: 4

T: 36.8 °C
HR: 68
BP: 110/72
W: 79.5 kg

Allergies/Reactions
No Known Drug Allergies or A...

Ins: Epic Ins
MRN: 34585
MyChart: Active
PCP: SEEGER, MARTY

Chart Review

Snapshot Encounters ED Visits Labs Imaging Procedures ECG Other Orders Medications Episodes Letters Notes Misc Reports Media

Preview Refresh (7:43 AM) Select All Deselect All Review Selected Side-by-Side Master Report Flowsheet Route Load Remaining Egcounter

Filters Default filter Me Emergency Medicine Emergency Dept, EMC Admissions

| When | Type | With | Description |
|------------------------|--------------|----------------------------|---|
| Upcoming Visits | | | |
| 02/19/2017 | Office Visit | Family Medicine - Seeg... | |
| Recent Visits | | | |
| Yesterday | ED | EM - Eddison, C | |
| 09/09/2016 | Office Visit | Family Medicine - Graw,... | Second degree burn of left thigh, initial encounter (Pri... |
| 04/14/2016 | Office Visit | Family Medicine - Benn... | UTI (urinary tract infection) (Primary Dx);Diabetes me... |
| 6 Months Ago | | | |
| 09/25/2015 | Office Visit | Family Medicine | Urinary tract infection, site not specified (Primary Dx) |
| 1 Year Ago | | | |
| 09/12/2015 | Office Visit | Family Medicine - Seeg... | Diabetes mellitus, type 2 (Primary Dx);Hypercholeste... |
| 3 Years Ago | | | |
| 08/08/2012 | Colonoscopy | GI - Davis, P | |
| 10/01/2011 | Office Visit | Ophthalmolog - Kadil, T | Screening for eye condition (Primary Dx) |
| 09/28/2011 | Office Visit | Fam Med - Walker, D | Type II or unspecified type diabetes mellitus without... |
| 5 Years Ago | | | |
| 07/18/2011 | Office Visit | Family Medicine - Gardn... | Osteoarthritis of knee (Primary Dx);Hypothyroidism |
| 06/18/2011 | OP Visit | Gastroenterology | Screening Colonoscopy |
| 06/04/2011 | Office Visit | Family Medicine - Gardn... | Knee Pain (Primary Dx); Hypercholesterolemia; Hypo... |
| 02/28/2011 | Office Visit | Fam Med - Walker, D | Diabetes Mellitus (Primary Dx); Hypothyroidism; Esse... |
| 02/16/2011 | Office Visit | Fam Med - Stadler, J | Pure Hypercholesterolemia; Essential Hypertension,... |
| 05/21/2010 | Office Visit | Family Medicine - Gardn... | Viral URI (Primary Dx); Hypothyroidism; Essential Hy... |
| 05/19/2009 | Office Visit | Family Medicine - Gardn... | Essential Hypertension (Primary Dx); Hypothyroidism... |
| 01/11/2009 | Office Visit | Fam Med - Stadler, J | Essential Hypertension (Primary Dx); Hypothyroidism... |

Office Visit 4/14/2016

River Hills Health System
Verona Medicine Clinic

Eric Langer - 55 y.o. Male, born May 03, 1961

Reason for Visit

Dysuria

Encounter Details

| Date | Type | Department | Care Team | Description |
|------------|--------------|---|---|---|
| 04/14/2016 | Office Visit | Verona Medicine Clinic 25 Northern Lights Ln VERONA, WI 53593 608-303-2340 | Bennett, Dana, M.D. 1979 Milky Way VERONA, WI 53593 608-271-9000 608-255-6192 (Fax) | UTI (urinary tract infection) (Primary Dx);Diabetes mellitus, type 2;Essential Hypertension |

Social History - as of this encounter

| Tobacco Use | Types | Packs/Day | Years Used | Date |
|---------------|------------|-----------|------------|------------------|
| Former Smoker | Cigarettes | 1 | 20 | Quit: 01/25/2001 |

Comments: Quit smoking following episode of hemoptysis, negative bronchoscopy

| Alcohol Use | Drinks/Week | oz/Week | Comments |
|-------------|-------------|---------|-------------------------|
| Yes | | 1.0 | Beer or wine on weekend |

Birth Sex: Unknown
Date Recorded:

JESSIE TRAUMEL 7:45 AM

After

Langer, Eric
Male, 55 y.o., 10/25/1960
My Sticky Note: **Dysuria**

TT: 13:30 Rm: None Code: **Not on file** Att: EDDISON, C RN: **None** Acuity: 4 T: 36.8 °C HR: 68 BP: 110/72 W: 79.5 kg Allergies/Reactions: **No Known Drug Allergies or A...** New Ord/Rsit: IP Bed: None Bid Draw: None Ins: Epic Ins MRN: 34585 MyChart: Active PCP: BEEGER, MARTY

Chart Review

SnapShot **Encounters** ED Visits Labs Imaging Procedures ECG Other Orders Medications Episodes Letters Notes Misc Reports Media

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Filters Default filter Me Emergency Medicine Emergency Dept, EMC Admissions

| When | Type | With | Description |
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| 06/18/2011 | OP Visit | Gastroenterology | Screening Colonoscopy |
| 06/04/2011 | Office Visit | Family Medicine - Gardn... | Knee Pain (Primary Dx); Hypercholesterolemia; Hypo... |
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| 05/19/2009 | Office Visit | Family Medicine - Gardn... | Essential Hypertension (Primary Dx); Hypothyroidism... |
| 01/11/2009 | Office Visit | Fam Med - Stadler, J | Essential Hypertension (Primary Dx); Hypothyroidism... |

Office Visit 4/14/2016

River Hills Health System
Verona Medicine Clinic [Jump to Section](#)

Eric Langer - 55 y.o. Male, born May 03, 1961 Encounter Summary, generated on Sep. 18, 2016

Reason for Visit

| Reason | Comments |
|---------|----------|
| Dysuria | |

Encounter Details

| Date | Type | Department | Care Team | Description |
|------------|--------------|---|--|---|
| 04/14/2016 | Office Visit | Verona Medicine Clinic 25 Northern Lights Ln VERONA, WI 53593 608-303-2340 | Bennett, Dana, M.D. 1979 Milky Way VERONA, WI 53593 608-271-9000 608-255-6192 (Fax) | UTI (urinary tract infection) (Primary Dx);Diabetes mellitus, type 2;Essential Hypertension |

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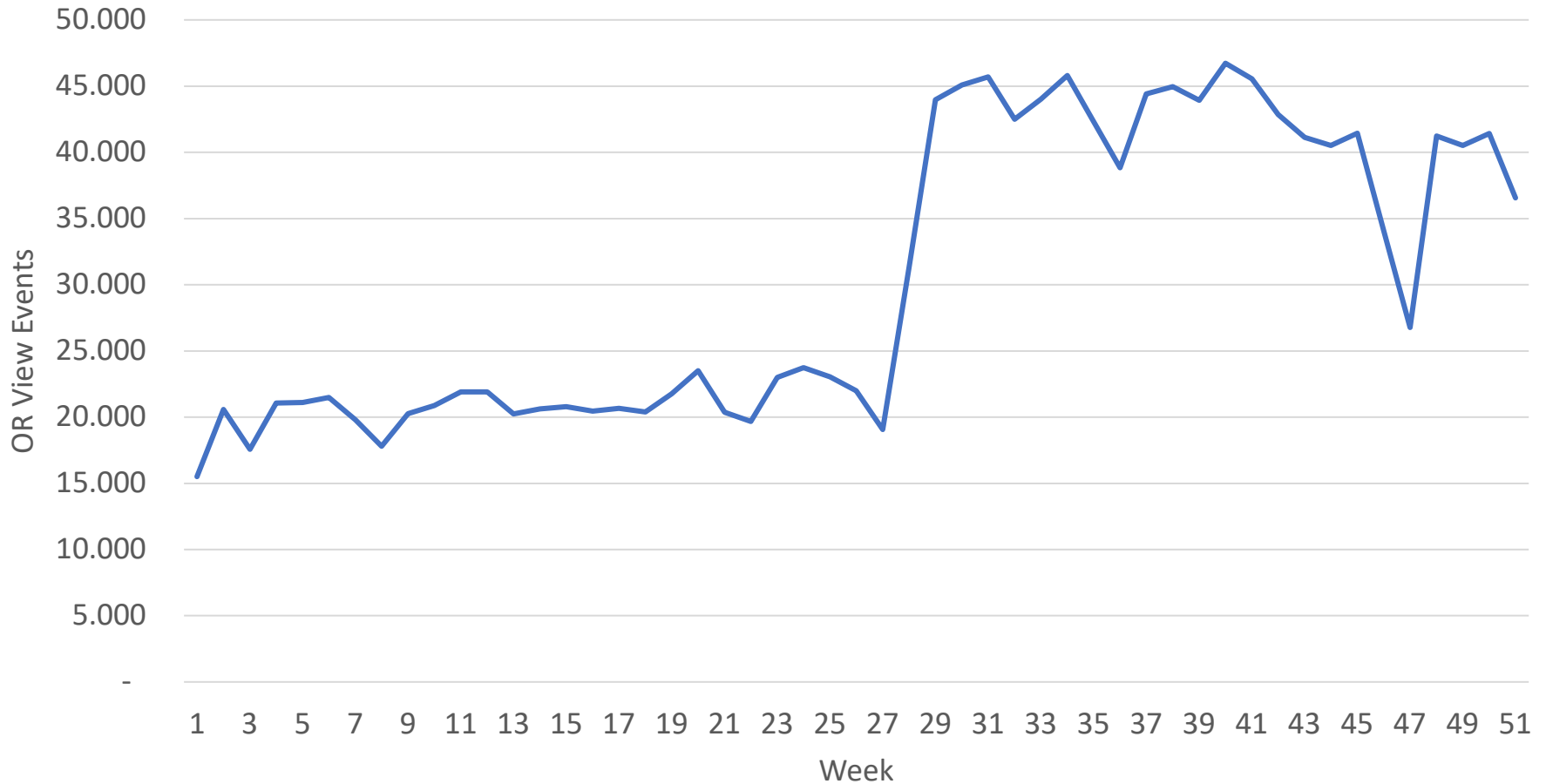
Comments: Quit smoking following episode of hemoptysis, negative bronchoscopy

| Alcohol Use | Drinks/Week | oz/Week | Comments |
|-------------|-------------|---------|-------------------------|
| Yes | | 1.0 | Beer or wine on weekend |

| Birth Sex | Date Recorded |
|-----------|---------------|
| Unknown | |

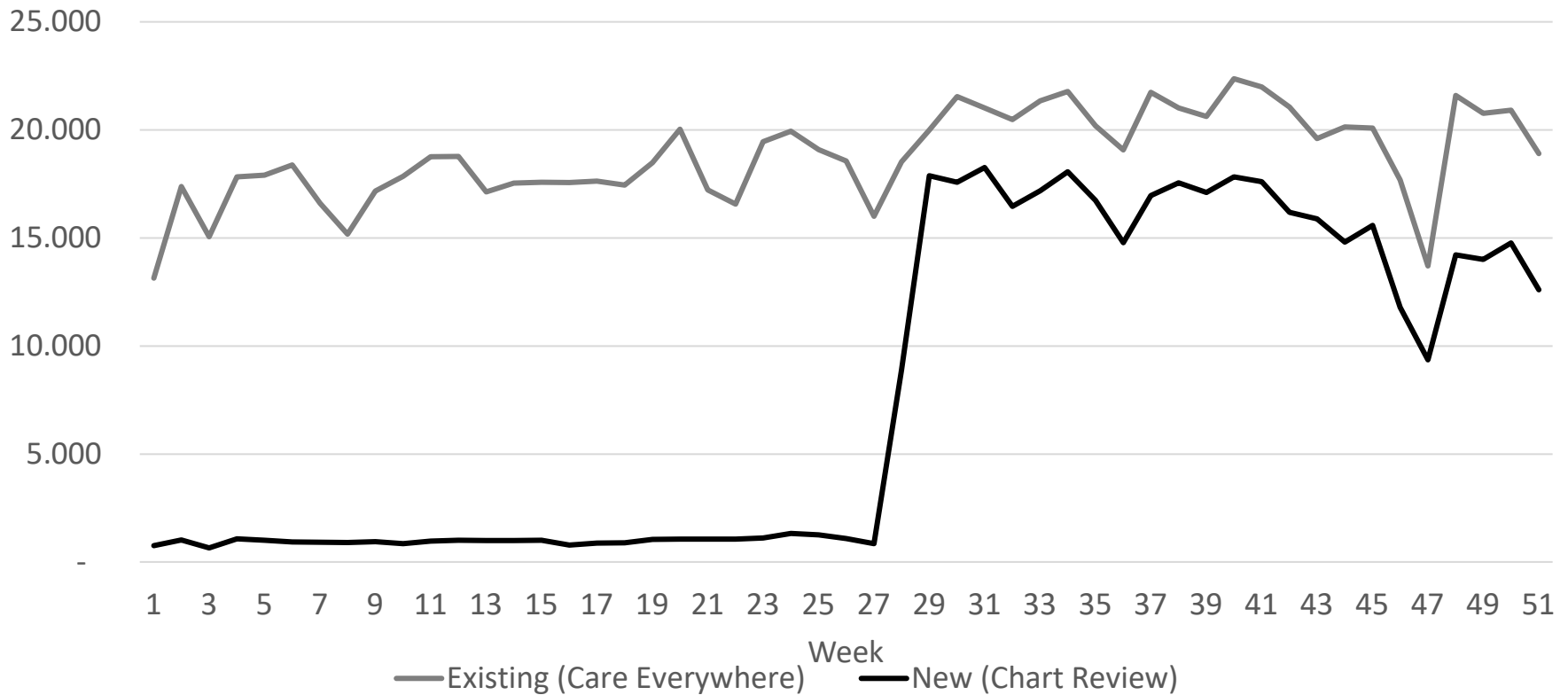
JESSIE TRAUMEL 7:45 AM

Impact of Inline Encounters on Viewing of Outside Records



Significant increase in level: 29,921 outside record views per week ($p < 0.001$)

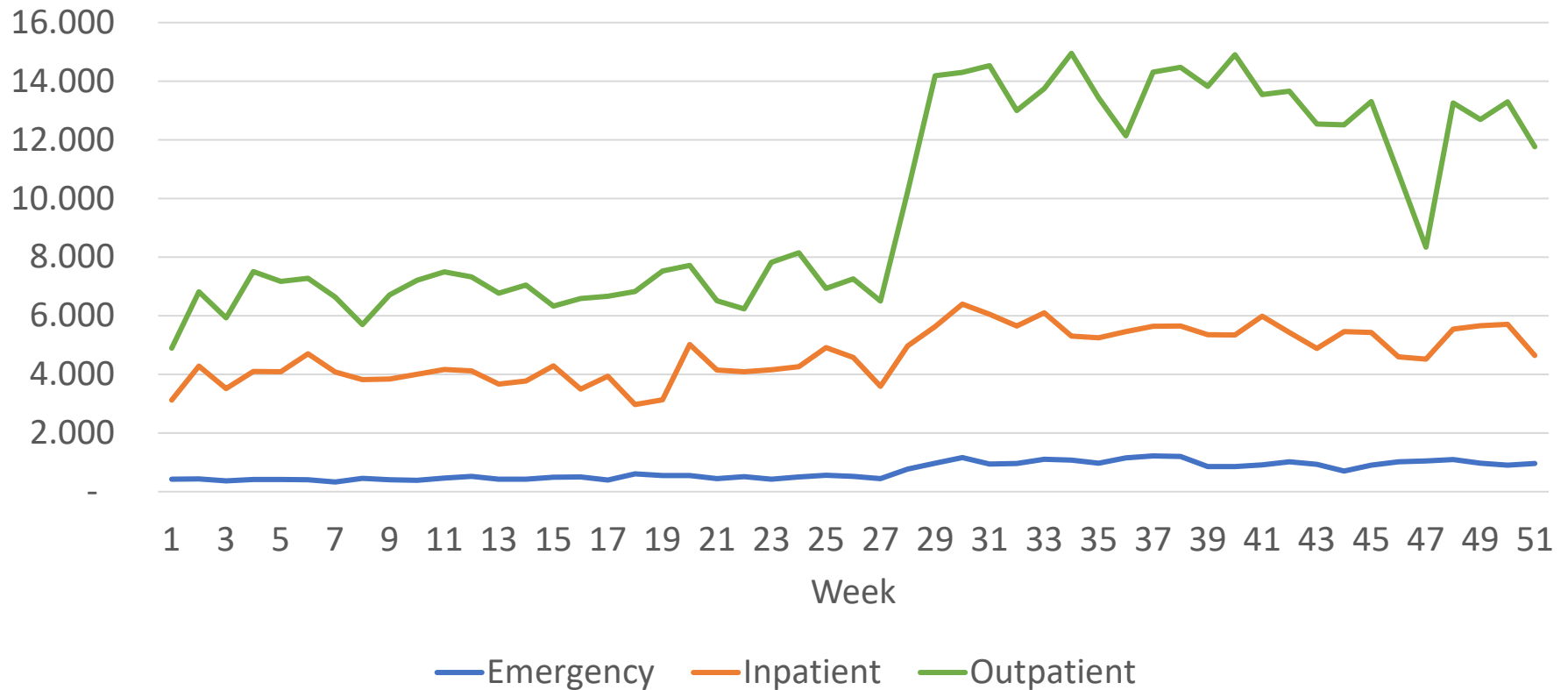
Impact of Inline Encounters on Viewing of Outside Records: via Chart Review versus Care Everywhere



Almost all of which came via the “new” channel (16,600 per week; $p < 0.001$)

No substitution of CR pathway for CE pathway; net gain

Impact of Inline Encounters on Viewing of Outside Records: By Encounter Type



Emergency: 487 per week (0.38 per encounter)

Inpatient: 1,676 per week (2.15 per encounter)

Outpatient: 7,228 per week (0.22 per encounter)

WHAT WE LEARNED...

Simple user interface design changes can have a huge impact on provider behavior!

Frontline providers are in the *information business*.
Improving their performance will heavily depend on how well we structure their IT environment to facilitate accessing, synthesizing, and documenting information.

Three Examples:

1) Improving chart review...

...by co-locating related information

2) Improving order sets...

...by dynamic updating of content

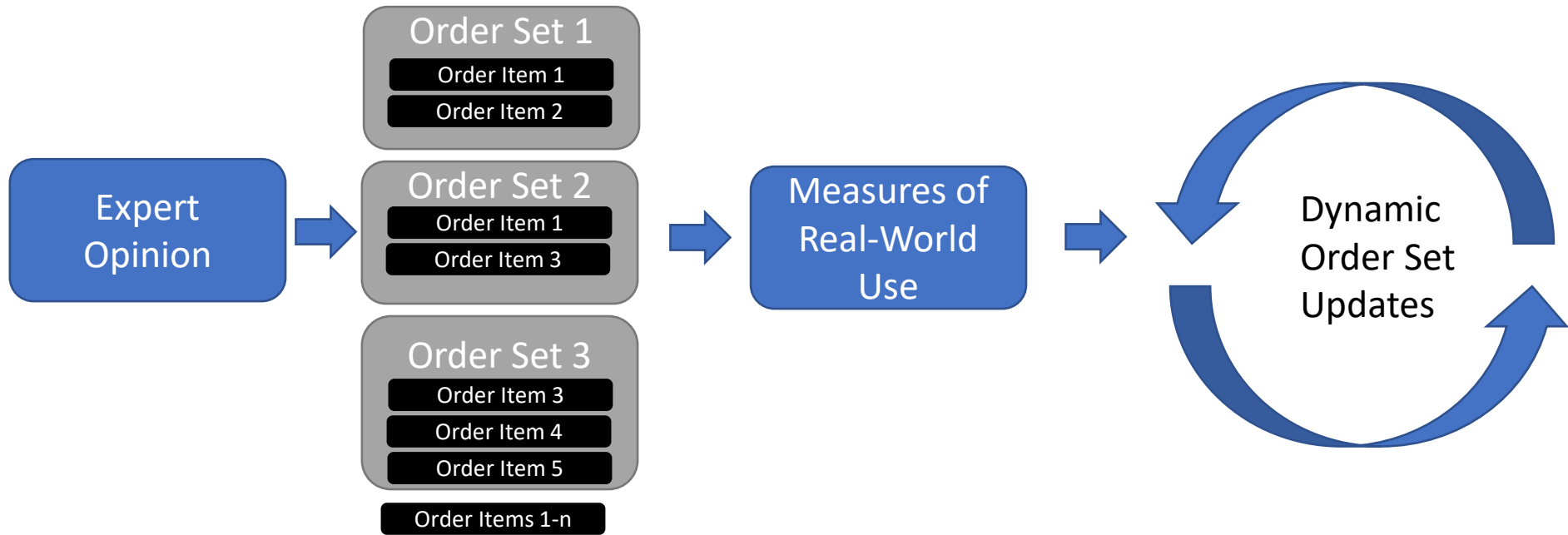
3) Improving diagnostic reasoning...

... by offering “best next steps”

Hospital Order Sets

Current State

Future State



Hospital Order Sets

Measures of
Real-World
Use

What to consider for removal from existing order sets:

Measure 1: Infrequently ordered items within each order set

- # of orders for a given item / the respective number of order set uses

Measure 2: Rapid retraction

- rate of order items discontinued within 30 min

What to consider for addition to existing order sets:

Measure 3: A la carte orders not part of order set co-occurring within 10 min of a given order set use

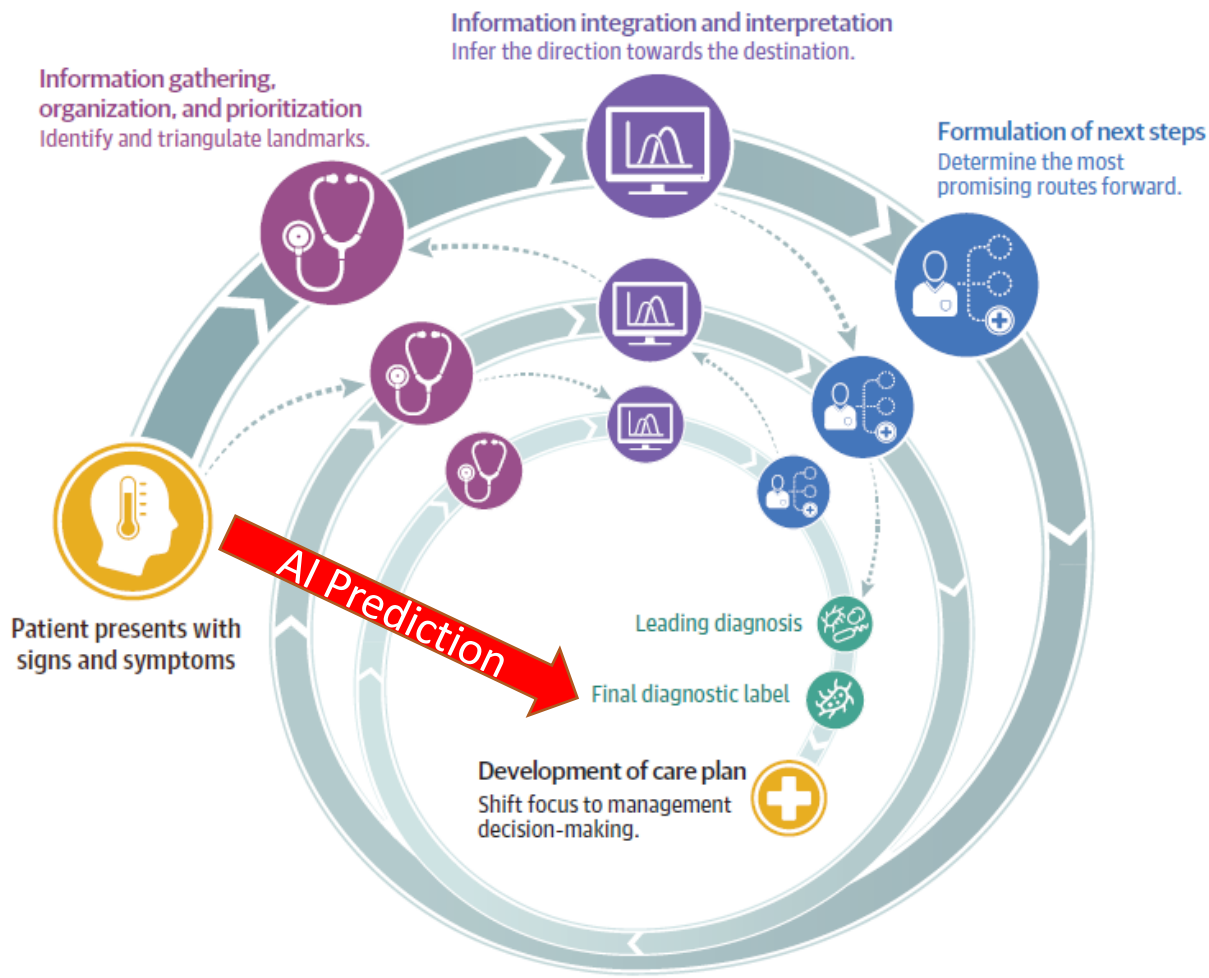
What to investigate:

Measure 4: A la carte orders part of order set co-occurring within 10 min of a given order set use

Three Examples:

- 1) Improving chart review...
...by co-locating related information
- 2) Improving order sets...
...by dynamic updating of content
- 3) **Improving diagnostic reasoning...**
... by offering “best next steps”

Figure. The Dynamic Diagnostic Refinement Process



The solid arrows illustrate the diagnostic process, and the dashed arrows illustrate how new information can alter the process. New information may increase uncertainty, causing a return to an earlier point and consideration of a broader set of possible next steps, or it may also enable jumping ahead in the process, avoiding an additional cycle. The diagnostic label is final in that it meets the administrative requirement for entering a code for billing purposes, but ongoing revision of the diagnosis, which drives treatment, is possible.

Overview of Remarks

Part 1:

Understanding the relationship between burnout and EHR work

Part 2:

(Practically) Reimagining the EHR – 3 examples

If you are interested, join our national network...

National Research Network for EHR Audit Log Data

150+

MEMBERS FROM OVER 50 ORGANIZATIONS

The National Research Network for EHR Audit Log Data is focused on use of EHR Audit-log and Meta-data to support health services research. Kicking off on March 16, 2018, a group of researchers convened to share their experiences and ideas, learn from each other, and pursue collaborative projects.

The monthly NRN webinars are focused on these three topics:

- Research Topics and Funding (types of research questions well suited to audit log data, funding sources for audit log research)
- Research Methodologies and Skillsets (methodological/modeling approaches well suited to audit log data, skillsets of research team)
- Data Quality and Creating Meaningful Measures (accuracy, usefulness of data documentation, various levels of granularity, strategies for reducing noise/errors)

NRN Workgroups

Questions about the NRN for EHR Audit Log Data?

Contact Sarah Rosenthal | sarah.rosenthal@ucsf.edu

[Local Projects](#)

[National Policy](#)

[National Research Network](#)