



## **RESEARCH COMMUNITY ON LOW-VALUE CARE**

WEBINAR SERIES

## Using EHR Data for Low-Value Care Research

Friday, September 7, 2018 from 3:30-4:30pm ET

AcademyHealth and ABIM Foundation Webinar Sponsored by the ABIM Foundation

Moderator: Lisa Simpson, MB, BCh, MPH, FAAP

**Presenters:** Philip Payne, PhD Daniella Meeker, PhD



## Webinar/Call Information

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We look forward to your engagement!



## Practical Considerations When Leveraging EHR Data for Research

#### Philip R.O. Payne, PhD, FACMI

Robert J. Terry Professor and Founding Director, Institute for Informatics Washington University School of Medicine Professor of Computer Science and Engineering Washington University School of Engineering and Applied Science

## **Evolution:** the changing landscape of data generation in the healthcare environment



#### But, EHRs are not (currently) designed for research...



- ✓ Hierarchical (visit-oriented) vs. longitudinal (patient-oriented) data models
- Computational costs of queries and other analytics activities when applied to operation data "stores"
- ✓ Privacy, security, and confidentiality concerns
- ✓ Revenue-cycle and medical-legal documentation requirements
- ✓ Support for extensions and integration of external tools/methods

### Given this landscape, how do I leverage data generated in the healthcare delivery environment for research?

3 Critical Questions You Can and Should Answer

**Question 1:** do I know where the data I need is located and how can I access it?



## **Question 2:** once I gain access to my data, how do I integrate and harmonize it?



Hersh W, Cimino J, Payne PRO, Embi P, Logan J, Weiner M, et al. Recommendations for the Use of Operational Electronic Health Record Data in Comparative Effectiveness Research. eGEMs (Generating Evidence & Methods to improve patient outcomes). 2013;1(1):14. DOI: http://doi.org/10.13063/2327-9214.1018

## **Question 3:** is my newly integrated data "fit for use" given my driving research questions?



- Quality is "in the eye of the use case"
  - **Corollary:** there is not such thing as general "data quality"
- Verification and validation of data are two distinct questions:
  - Verification: is the data present in a format and with content of a type that I expect?
  - Validation: is that data capable of enabling me to answer my question(s)?

Hersh W, Cimino J, Payne PRO, Embi P, Logan J, Weiner M, et al.. Recommendations for the Use of Operational Electronic Health Record Data in Comparative Effectiveness Research. eGEMs (Generating Evidence & Methods to improve patient outcomes). 2013;1(1):14. DOI: http://doi.org/10.13063/2327-9214.1018

### A Few Final Thoughts...

Systems thinking as a central facet of enabling pragmatic research

#### Unique Issues to Consider When Examining the Causes and Impact of Low-Value Care



#### A systems-thinking approach to leveraging EHRs for research

OPEN ACCESS

Review

Methods and dimensions of electronic health record data quality assessment: enabling reuse for clinical research

Nicole Gray Weiskopf, Chunhua Weng



**Figure 1** Mapping between dimensions of data quality and data quality assessment methods. Dimensions are listed on the left and methods of assessment on the right, both in decreasing order of frequency from top to bottom. The weight of the edge connecting a dimension and method indicates the relative frequency of that combination.

 Systematic review of measures and methods that can be used to define "fitness for use" of data in EHRs when conducting clinical research

Critical dimensions of this domain enumerated:

- Completeness: Is a truth about a patient present in the EHR?
- **Correctness**: Is an element that is present in the EHR true?
- Concordance: Is there agreement between elements in the EHR, or between the EHR and another data source?
- Plausibility: Does an element in the EHR makes sense in light of other knowledge about what that element is measuring?
- Currency: Is an element in the EHR a relevant representation of the patient state at a given point in time?

Weiskopf and Weng, JAMIA, 2012



# Data Science, Decision Science, and Value Based Care

Daniella Meeker, PhD Using EHR Data for Low-Value Care Research September 7, 2018





## **RESEARCH COMMUNITY ON LOW-VALUE CARE**

## Overview

- Using EHR data for measurement and profiling operational workflow
- Measuring and Optimizing Individual Performance for VBC

## Data to Information

EHR data for feedback, process measurement, and decision support

## Theory vs. Reality of using EHRs for VBC

- All vendors that are certified support computation of eCQMs, including value/efficiency metrics
- *Even if they worked*, built-in metrics endorsed by CMS as eCQMs for EHR use are not necessarily functional, harmonized, important, or relevant to operational goals and incentive programs.
- To learn and improve practices, attribution of patients & outcomes to programs & providers is critical.

# How can medicine catch up with the rest of consumer information technology?

- How do we turn small data into big data for optimization?
  - Despite the same vendors, every departmental implementation is like its own app, with distinct data generation, workflows, and diffuse outcomes.
- Develop a patient centered **model process** to combine information about business process and data to connect process variations with outcomes.
- Map data to the model and maintain as processes and outcomes of interest change



## Optimizing Individual Performance

Value-Based Care for Improving Quality and Equity

Using EHRs to Apply Decision Science to VBC

## **SYSTEM 1**

### Intuition & instinct

## **SYSTEM 2**

### Rational thinking



Source: Daniel Kahneman

Takes effort Slow Logical Lazy Indecisive

5%

### Decision Fatigue: Judicial Decisions Revert to Path of Least Resistance





### **Decision Fatigue Reveals Habits and Intuitions**

#### **SYSTEM 2** 0.8 deliberative 0.7 Proportion favorable decisions 0.6 0.5 0.4 SYSTEM 1 0.3 defensive 0.2 0.1 0 Ordinal position

### **Decision Fatigue Reveals Habits and Intuitions**



## SYSTEM HYPOTHESIS STEM 2 The Fee For Service environment has cultivated low-value habits and instincts that we can detect and address with EHRs

Fast Associative Automatic pilot Differential Diagnosis

Cost-Benefit Analysis

Source: Daniel Kahneman





## Emergency Medicine

A decision fatigue factory

#### A LABORATORY FOR ERROR

The ED is a unique environment. It is difficult to imagine any other workplace in which there exists such range of problems, acuity, time pressure and decision density. There are few environments outside medicine that rival its complexity, unpredictability, and potential for causing harm. This high level of complexity is a threat to patient safety, and it is not surprising that the ED has been described as a natural laboratory for human error.<sup>1</sup>

A modified delphian study identified 25 ED processes that serve as potential sources of error and

come with the territory; they present the strongest drain on ED cognition. Systemic EPCs are largely due to the way in which the ED is designed and operated. They place considerable burden on ED cognition but may be alleviated to a large extent by good design and management.

Complex interrelated ED processes, combined with intrinsic and systemic EPCs, create an environment that is uniquely challenging and distinctly different from any other in medicine. The remainder of this article focuses on three features that pose particular threats to ED cognition and patient safety: decision making, ED overcrowding, and fatigue and shiftwork.

From the Critical Thinking Program and Division of Medical Education, Dalhousie University, Halifax, NS.

Correspondence to: Dr. Pat Croskerry, Critical Thinking Program, Division of Medical Education, Dalhousie University, Clinical Research Centre, 5849 University Avenue, PO Box 15000, Halifax, NS B3H 4R2; croskerry@eastlink.ca.

#### A LABORATORY FOR ERROR

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human error.1

### The Data

- 2 years of Electronic Medical Records
- 26 Emergency Departments
- 1024 Emergency Physicians
- Time-stamped EHR events mapped to operational model
- Metrics re-coded so that performance success is "1" and failure is "0".
- Patient Race imputed by zip code\*
- Decision Fatigue operationalized as time in shift

#### \*CAVEAT

Each ED will have independent data and process idiosyncrasies. Interpretation and analysis of EHR data must account for systematic missingness and other errors.

## The Metrics (mostly from federal programs)

Efficiency (best NOT TO order something)

- CT scan (all patients)
- Opioid Prescribing (all patients)
- CT for headache patients
- CT for low back pain patients

#### **Process (best TO order something)**

- (No) pregnancy test for females with stomach pain
- (No) lactic acid measurement for septic patients
- (No) antibiotic order for septic patients
- (No) EKG for non-traumatic chest pain patients

## Decision Fatigue: Error Rate\* Over All Efficiency Metrics Over Time in Shift



Decision Fatigue: Error Rate\* Over All Efficiency Metrics Over Time in Shift



Minutes from Start of Shift

## Decision Fatigue Impairs Electrocardiogram Compliance



no ekg for nontraumatic chestpain patients age 40+

- Very high compliance overall (95%)
- In this case we observed the deterioration over the course of the shift, even in a "DO SOMETHING" measure.
- (i.e. our hypothesis that physicians would increase test use with fatigue was not necessarily supported)

## Decision Fatigue Impairs Electrocardiogram Compliance

no ekg for nontraumatic chestpain patients age 40+

## Decision fatigue also exposed errors in appropriate use metrics course of the



shift, even in a "DO SOMETHING" measure.

 (i.e. our hypothesis that physicians would increase test use with fatigue was not necessarily supported) Decision-Fatigue:A Truth Serum for Disparities?

Cognitive habits interact with lowvalue practices. BASIC AND APPLIED SOCIAL PSYCHOLOGY, 35:515–524, 2013 Copyright © Taylor & Francis Group, LLC ISSN: 0197-3533 print/1532-4834 online DOI: 10.1080/01973533.2013.840630

#### When Fatigue Turns Deadly: The Association Between Fatigue and Racial Bias in the Decision to Shoot

Debbie S. Ma



explore the role that fatigue may have on the decision to shoot. In Study 1 we experimentally manipulated cognitive depletion and compared performance between control and cognitively depleted participants. Both groups showed significant racial bias in response latencies, but bias was even more pronounced among cognitively depleted participants. Study 2 investigated the association between sleep and decisions in the FPST among police recruits. We found that recruits showed significant racial bias in terms of reaction time, errors, criterion, and

In controlled experiments, officers and students overreact **defensively** & with disproportionate **racial bias** when they are sleep-deprived or cognitively depleted.

## Historic Disparities in Opioid Prescribing

FREE

#### **Original Contribution**

January 2, 2008

#### Trends in Opioid Prescribing by Race/Ethnicity for Patients Seeking Care in US Emergency Departments

Mark J. Pletcher, MD, MPH; Stefan G. Kertesz, MD, MSc; Michael A. Kohn, MD, MPP; et al

Article Information

JAMA. 2008;299(1):70-78. doi:10.1001/jama.2007.64



## **Decision Fatigue & Opioid Prescribing**



opioid orders

- Minorities continue to be "protected" from opioid exposure
- Whites more at risk of exposure to opioids as shift progresses
- Minorities increasingly "protected" as System 1 habits are exposed by fatigue

## **Decision Fatigue and Inappropriate CT Scans**

has ct scan for headache patients œ Predicted Mean, Fixed Portion Only 4 5 6 7 g ß e, 0 2 8 hours since start of shift white non-white

- Slight increase in inappropriate scans for white patients
- Sharp *decrease* in inappropriate scans for non-white patients

### Implicit Bias among Physicians and its Prediction of Thrombolysis Decisions for Black and White Patients

Alexander R. Green, MD, MPH<sup>1</sup>, Dana R. Carney, PhD<sup>2</sup>, Daniel J. Pallin, MD, MPH<sup>3</sup>, Long H. Ngo, PhD<sup>4</sup>, Kristal L. Raymond, MPH<sup>5</sup>, Lisa I. lezzoni, MD, MSc<sup>6</sup>, and Mahzarin R. Banaji, PhD<sup>2</sup>



## Decision Fatigue Impairs Quality More Acutely for Non-White Patients



# Decision Fatigue Impairs Quality More Acutely for Non-White Patients



## Conclusions

- Investment in EHR data enables measurement and introspection.
- The "Two System" psychological model is replicated in clinician performance.
- Optimizing individual performance for VBC requires changing FFS habits that resurface with decision fatigue.
- Unclear if efficiency metrics are impacted differently from active process
  metrics
- Racial bias may be actively suppressed by clinicians
  - If a provider is at her cognitive best, minority patients may receive better care than white patients.
  - Non-white patients are "protected" from inappropriate imaging and opioid prescribing.
  - Minority patients get proportionately fewer services, (both appropriate and inappropriate) as shift progresses.

### Collaborators

## Funding

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Kabar Yadav, MD	Stephen Persell, MD	
David Vinson, MD	Mark Friedberg, MD, MPP	

Laura Pearlman, MS



## **Discussion**





## **Thank You!**

Contact:

AcademyHealth and ABIM Foundation Research Community on Low-Value Care <u>RC-LVC@academyhealth.org</u>

