USE OF ELECTRONIC HEALTH RECORD DATA IN THE FIELD: CONDUCTING RANDOMIZED STUDIES ACROSS DIVERSE PRACTICE SETTINGS

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National Institute on Aging – 1RC4AG039115
Funding and Partnerships

• **NIA – 1RC4AG039115**  
  *Application of Behavioral Economics to Improve ARI Treatment (BEARI)*  
  • Jason N. Doctor, Principal Investigator  
  • Key collaborators: Daniella Meeker (USC), Laura Pearlman (USC), Jeffrey Linder (Partners Health System), Craig Fox (UCLA), Stephen Persell (NWU), Mark Friedberg (RAND)

• **AHRQ – R01 HS19913**  
  *Scalable National Network for Effectiveness Research (SCANNER)*  
  • Lucila Ohno-Machado (UCSD), Principal Investigator  
  • Key collaborators: Daniella Meeker (USC), Carl Kesselman (USC), Laura Pearlman (USC), Mike D’Arcy (USC), Xiaoqian Jiang (UCSD), Kathy Kim (USF/UCD), Michael Matheny (Vanderbilt/VA)
Overview

• Brief description of our work

• The structure and characteristics of EHR data across diverse systems

• Necessary considerations before undertaking a project
‘Nudging’ quality of care

Part I Overview Information

Nudgering Guideline-Concordant Antibiotic Prescribing

Original Investigation

Nudgering Physicians: Results of a Vignette-Based Survey

Nudgering Physicians: Results of a Vignette-Based Survey

JAMA Internal Medicine

Time of Day and the Decision to Prescribe Antibiotics

Original Investigation

Economics for Nudging

Participating Organizations

National Institutes of Health (NIH) (http://www.nih.gov)

Agency for Healthcare Research and Quality (AHRQ): (http://www.ahrq.gov)

Components of Participating Organizations

National Cancer Institute (NCI) (http://www.cancer.gov)

National Institute on Aging (NIA) (http://www.nia.nih.gov)

National Institute of Mental Health (NIMH) (http://www.nimh.nih.gov)
Application of Behavioral Economics to Improve ARI Treatment (BEARI)

- **Problem** Inappropriate antibiotic prescribing persists for 50% acute respiratory infections despite well-known guidelines
- **Hypothesis** “Nudge” principles of behavioral economics can be used to improve the quality of care
- **Three randomized trials conducted:**
  - **Study I** (RCT; 5 clinics, 954 visits)
    Clinicians’ public commitment to guideline concordance
  - **Study II** (Observational; 47 clinics, 21,867 visits)
    The effect of decision fatigue on antibiotic prescribing
  - **Study III** (RCT; 47 clinics, 69,965 visits)
    Three nudges leveraging electronic health records (EHRs)
Each study had a different combination of EHR use for measurement and interventions

- Interventions were in physician environment, email, communications, and EHR interface changes
  - Evaluated 5 EHRs for feasibility (eClinicalWorks, SAGE-Intergy, NextGen, Epic, LMR) – only 3 could be feasibly changed to deliver interventions
  - A 5th partnering organization meeting technical feasibility criteria did not have organizational capacity after EHR implementation
- Measurements were from EHRs merged with survey data sources
Partners, Vendors and Management Tools

Research Network Partner Systems

EHR Vendors
- AltaMed
- Partners Healthcare
- Northwestern University
- Jtcc
- Q

Survey Data Collection
- NextGen
- LMR
- Epic
- Sage

Analytic Data System & Portals

Specification Management

Operations Management
Study I – Public commitment

JAMA Internal Medicine
Original Investigation
Nudging Guideline-Concordant Antibiotic Prescribing: A Randomized Clinical Trial
Daniella Meeker, PhD; Tara K. Knight, PhD; Mark W. Friedberg, MD, MPP; Jeffrey A. Linder, MD, MPH; Noah J. Goldstein, PhD; Craig R. Fox, PhD; Alan Rothfeld, MD; Guillermo Diaz, MD; Jason N. Doctor, PhD

- EHR for measurement
- Intervention in physical environment
Study II – Decision Fatigue

- Antibiotics sometimes indicated (n = 7544)
- Overall (n = 21,867)
- Antibiotics never indicated (n = 14,323)

Hour of the Day:
- 8 AM
- 9 AM
- 10 AM
- 11 AM
- Lunch
- 1 PM
- 2 PM
- 3 PM
- 4 PM

Antibiotic Prescribing, %

- O.R. 1.26

- EHR for measurement
- Observation of natural behavior
Study III – BEARI Trial

- EHR for measurement
- Interventions delivered through EHR
- Interventions delivered through email
Conducting these trials: What is needed?

- **Project Management**
  - IRB
  - Data use agreements
  - Protocol management
  - Study staff
  - Task management

- **Data Management System**
  - Data source modeling
  - Data harmonization
  - Network implementation

- **Auditing Systems**
  - Data quality monitoring
  - Measure calculation validity
  - PHI monitoring

- **Point-of-Care enrollment**
  - Baseline EHR workflow analysis
  - Enrollment design and modeling
  - Specification localization

- **Analysis & Modeling**
  - Quality measure calculations
  - Outcomes analysis
  - DSMB reports

- **Sample Management & Communication**
  - Recruiting & enrollment
  - Entry & exit surveys
  - Feedback emails
What we learned?

• **EHRs & Data Pull Capability**
  - UI centered (Inaccessible)
  - Business logic (Less Accessible)
  - Clinical data warehouse (Accessible)
  - Research data warehouse (Accessible)

• **EHRs & POC Intervention**
  - UI centered (Hard)
  - Business logic (Hard)
  - Clinical data warehouse (not possible)
  - Research data warehouse (not possible)

• **EHRs & Data Processing**
  - UI centered (high)
  - Business logic (high)
  - Clinical data warehouse (medium)
  - Research data warehouse (low)

• **Contracts Affect Completeness**
  - Managed care/Billing data
  - Lab data
  - Pharmacy benefits

• **Auditing Systems**
  - Need fast and frugal tools to view data
  - Need to monitor for PHI
  - Build in time for DSMB analysis

• **Measuring Outcomes**
  - May require refinement
    - Adding exclusions
  - Benefits from tools (HQMF Engine)
  - Data quality checks
Take Home Message: In a mixture of academic medical centers and community clinics Health IT challenges vary

• Programming interfaces to EHR presentation layers are poor

• Some EHRs require customized programming for even basic data capture (breaks natural workflow)

• Not all sites have a operational (“business”) data warehouse, much less a research data warehouse

• Data quality protection requires constant care and feeding, even for small number of measures

• There are many other software tools needed to conduct an EHR Trial
Team and Acknowledgments

[Image of team members]
Team and Acknowledgements

National Institutes of Health (RC4AG039115)

**University of Southern California**
- Jason Doctor, PhD (PI)
- Daniella Meeker, PhD
- Dana Goldman, PhD
- Joel Hay, PhD
- Richard Chesler
- Tara Knight
- Laura Pearlman
- Mike D’Arcy

**University of California, Los Angeles**
- Craig R. Fox, PhD
- Noah Goldstein, PhD

**RAND**
- Mark Friedberg, MD, MPP
- Chad Pino

**Partners HealthCare, BWH, MGH**
- Jeffrey Linder, MD, MPH
- Yelena Kleyner
- Harry Reyes Nieva
- Chelsea Bonfiglio
- Dwan Pineros

**Northwestern University**
- Stephen Persell, MD, MPH
- Elisha Friesema

**Cope Health Solutions**
- Alan Rothfeld, MD
- Rebekah Dell
- Charlene Chen
- Gloria Rodriguez
- Auroop Roy
- Hannah Valino
Thank You

Questions?

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