# The Dawn of Precision Delivery:

## Integrating Analytics in Routine Patient Care

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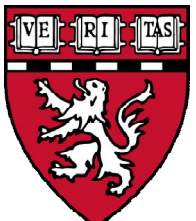


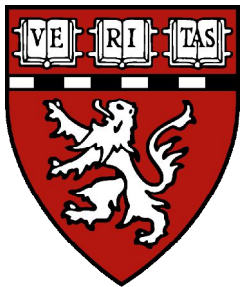

HARVARD MEDICAL SCHOOL


BRIGHAM AND WOMEN'S HOSPITAL

# Disclosures

I have no financial conflicts of interest to report

| | |
|---|---|
| Senior Clinical Advisor | Coalition to Transform Advanced Care (C-TAC) |




# More Disclosures

**What I am not:**

Statistician or Data Scientist

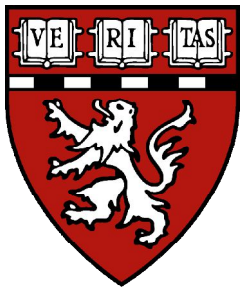
Entrepreneur

Innovation Officer

Finance Officer

## **What I am:**

A Clinician



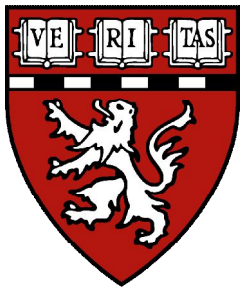

# Outline

What is precision delivery?

Current use cases

Barriers to adoption

What could integrated analytics look like?



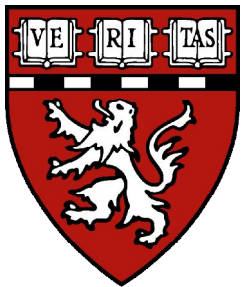


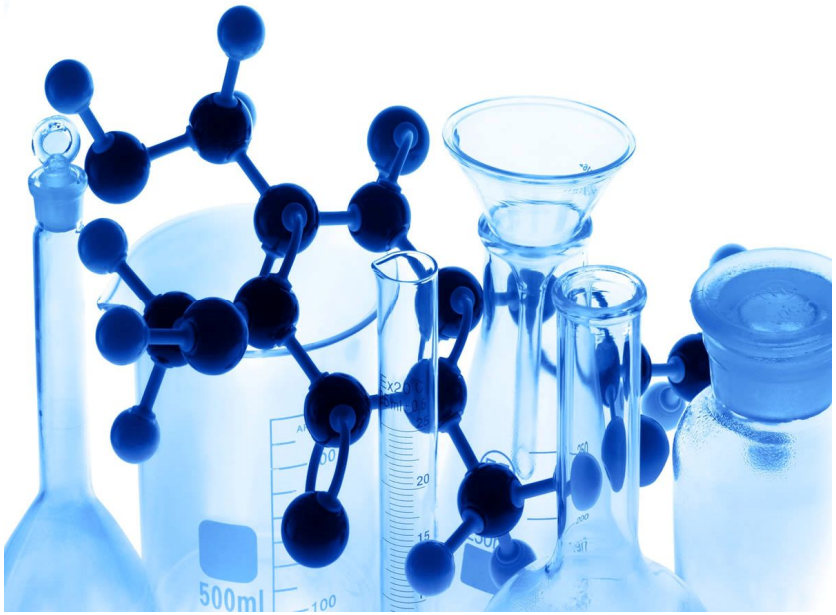
MEDICINE

*"Doctors have always recognized that every patient is unique, and doctors have always tried to tailor their treatments as best they can to individuals."*

*"...that's the promise of precision medicine, delivering the right treatments, at the right time, every time to the right person."*

- President Obama, January 30th, 2015

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Harvard Business Review

ANALYTICS

# Making Predictive Analytics a Routine Part of Patient Care

Ravi B. Parikh, Ziad Obermeyer, and David Westfall Bates

IL 21, 2016

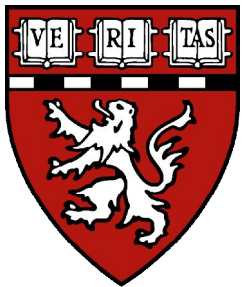
JAMA

INNOVATIONS IN HEALTH CARE DELIVERY

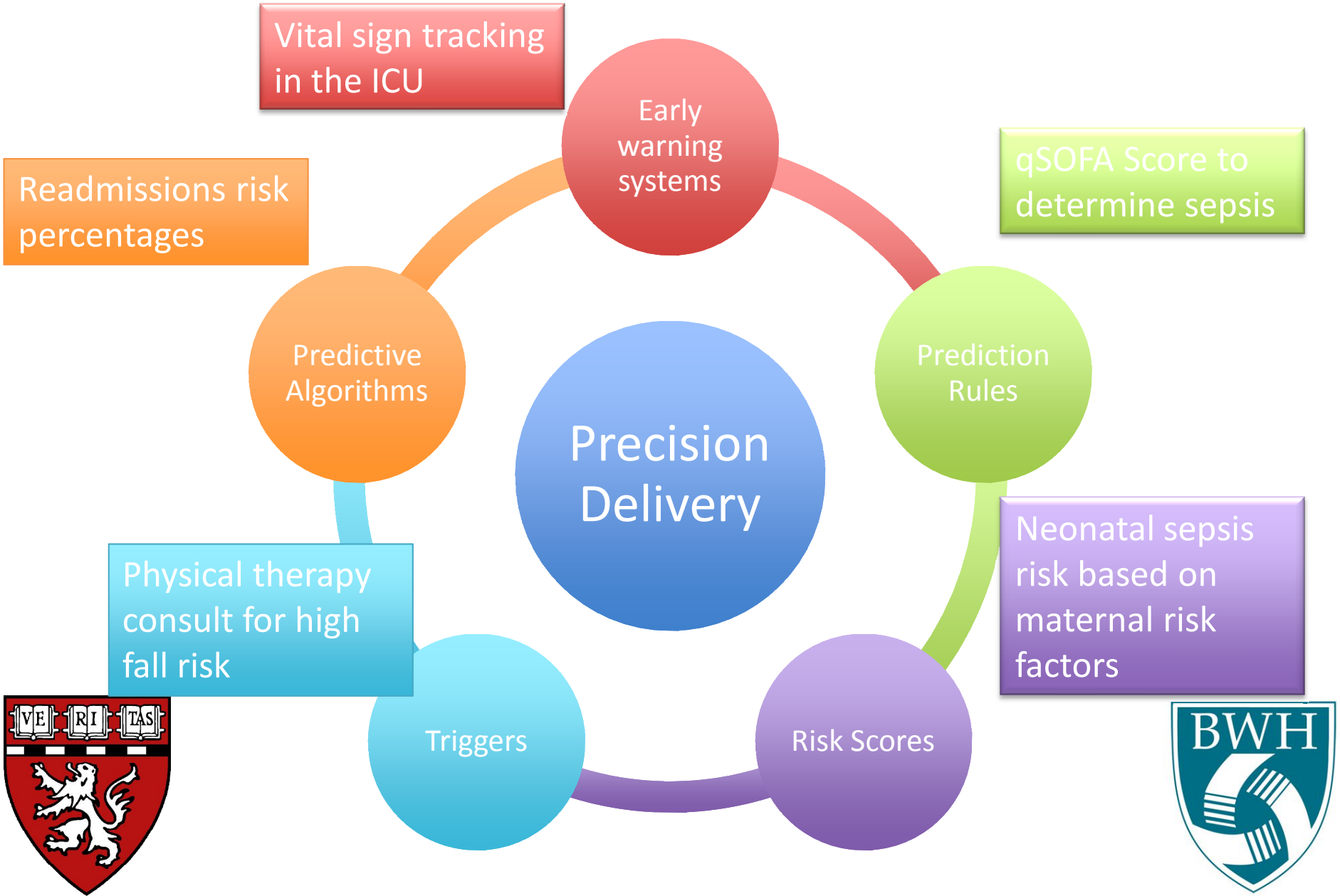
## Integrating Predictive Analytics Into High-Value Care

## The Dawn of Precision Delivery

*"...using an individual's electronic health data to predict risk and personalize care to substantially improve value"*

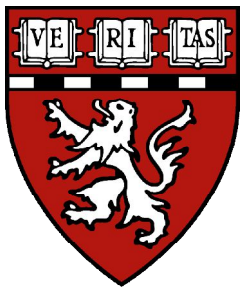



# Use Cases


Vital sign tracking in the ICU
Early warning systems
qSOFA Score to determine sepsis
Readmissions risk percentages
Predictive Algorithms
Prediction Rules
Precision Delivery
Physical therapy consult for high fall risk
Neonatal sepsis risk based on maternal risk factors
Triggers
Risk Scores
VE RI TAS
BWH

Problem

Output is just another number





You might want to lay off the analytics for a while.

Problem

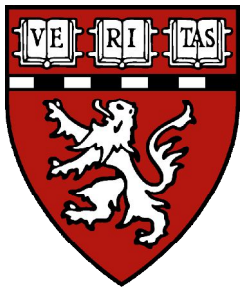
Output is just another number

Solutions

Focus on low-value decisions

Flexible, iterative outputs

Prediction → Prescription




# Antibiotic Assistant™

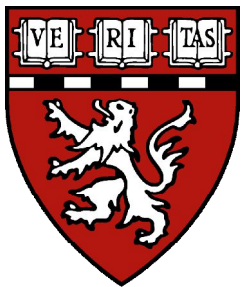
TheraDoc

| Variable | Effect of Antibiotic Assistant |
|---|---|
| Antibiotic costs per patient | $122.66 → $51.90 |
| Daily dose of antibiotic | ↓ 22% |
| Appropriate preop antibiotics | 40% → 99% |
| Antibiotic-associated ADEs | ↓ 30% |

Ann Intern Med 1996

Problem

Inadequate access to all necessary inputs




JAMA

# Risk Prediction Models for Hospital Readmission

## A Systematic Review

Devan Kansagara, MD, MCR
Honora Englander, MD
Amanda Salanitro, MD, MS, MSPH
David Kagen, MD
Cecelia Theobald, MD
Michele Freeman, MPH
Sunil Kripalani, MD, MSc

**Context** Predicting hospital readmission risk is of great interest to identify which patients would benefit most from care transition interventions, as well as to risk-adjust readmission rates for the purposes of hospital comparison.

**Objective** To summarize validated readmission risk prediction models, describe their performance, and assess suitability for clinical or administrative use.

**Data Sources and Study Selection** The databases of MEDLINE, CINAHL, and the Cochrane Library were searched from inception through March 2011, the EMBASE database was searched through August 2011, and hand searches were performed of the retrieved reference lists. Dual review was conducted to identify studies published in the English language of prediction models tested with medical patients in both deri-

- Systematic review of readmission risk prediction models in MEDLINE, CINAHL, and Cochrane Library Databases
- 30 studies of 26 unique models included
- In models tested in large US populations, c-statistic range:

0.55-0.65

JAMA 2011

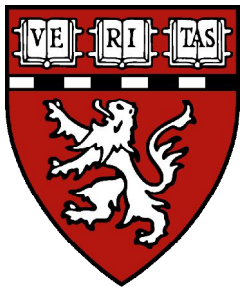
Problem

Inadequate access to all necessary inputs

Solutions

Integrated data warehouses

Unique data sources




# VHA Corporate Data Warehouse

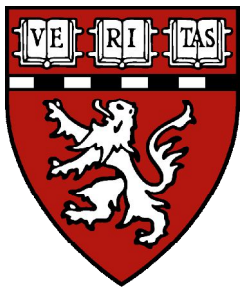
- Repository for patient-level data aggregated since 2006
- Accessed 3,000-4,000 times monthly by over 1,200 clinicians
- Used to calculate risk scores for hospitalization & death

| Type of Record | # of Records |
|---|---|
| Outpatient encounters | 1,967,728,159 |
| Inpatient admits | 10,510,613 |
| Clinical orders | 3,816,367,144 |
| Lab tests | 6,621,446,020 |
| Pharmacy fills | 1,918,648,827 |
| Radiology procedures | 181,331,522 |
| Vital signs | 2,739,094,630 |
| Text notes | 2,570,709,839 |

Health Affairs, 2014

# Problem

Analytics takes us away from the patient



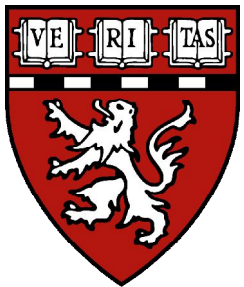

# PATIENT-CENTERED CARE

Problem

Analytics takes us away from the patient

Solution

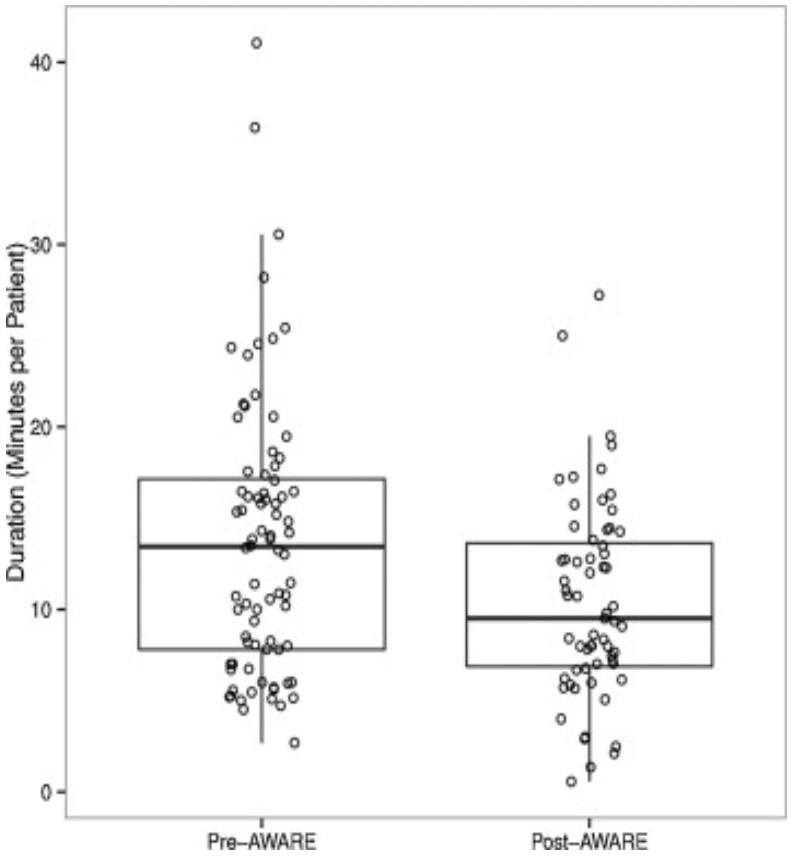
Integrating – not forcing – analytics into provider workflow



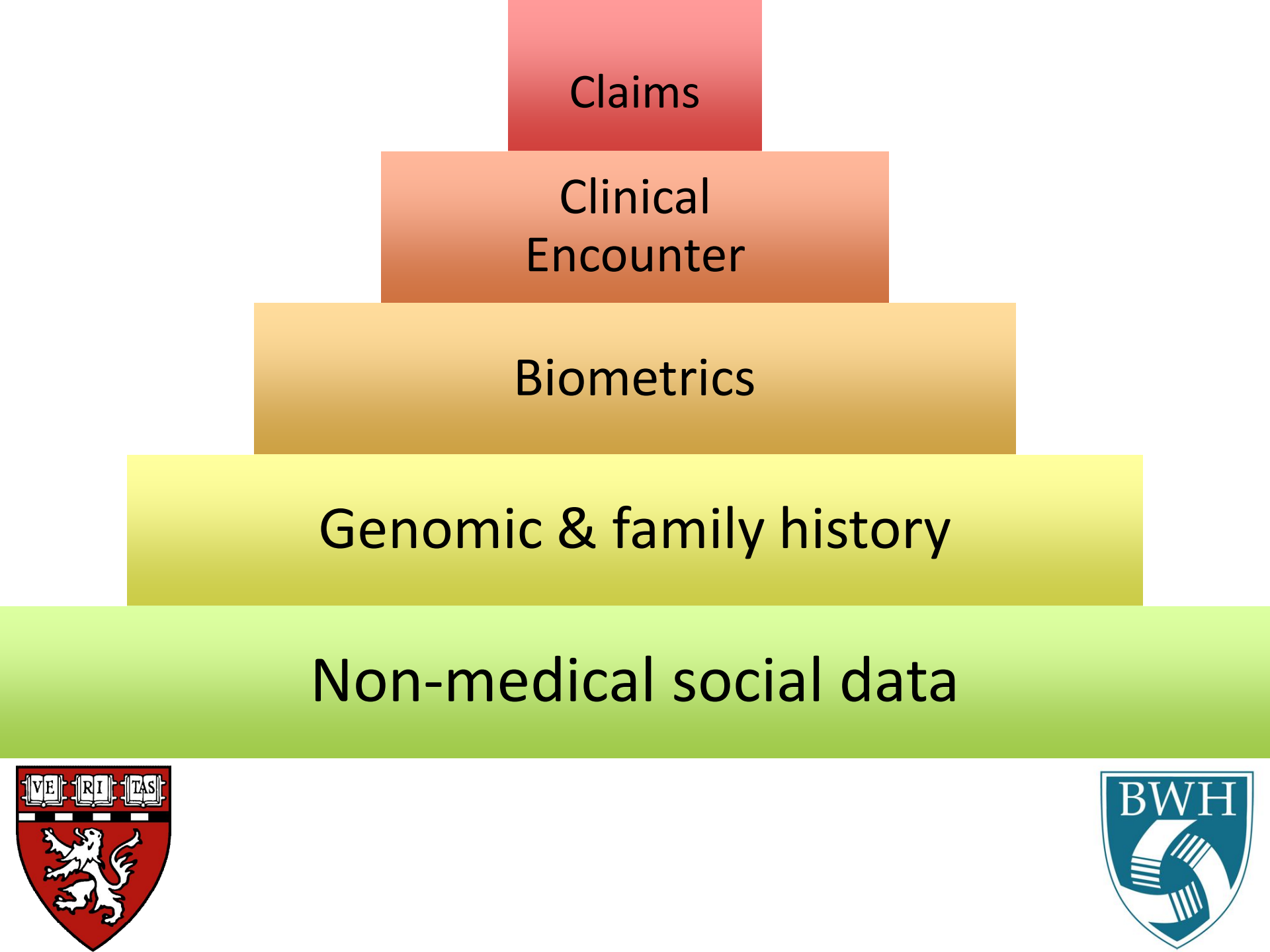

The implementation of clinician designed, human-centered electronic medical record viewer in the intensive care unit: A pilot step-wedge cluster randomized trial ☆

Brian W. Pickering[a, c], Yue Dong[c], Adil Ahmed[c], Jyothsna Giri[c], Oguz Kilickaya[c], Ashish Gupta[d], Ognjen Gajic[b, c], Vitaly Herasevich[a, c]

- Decreased pre-rounding time (9 vs 12 minutes, p=0.03)
- No impact on perceptions of ICU rounds
- Trend towards lower in-hospital mortality (6.5% vs 9.1%, p=0.07)

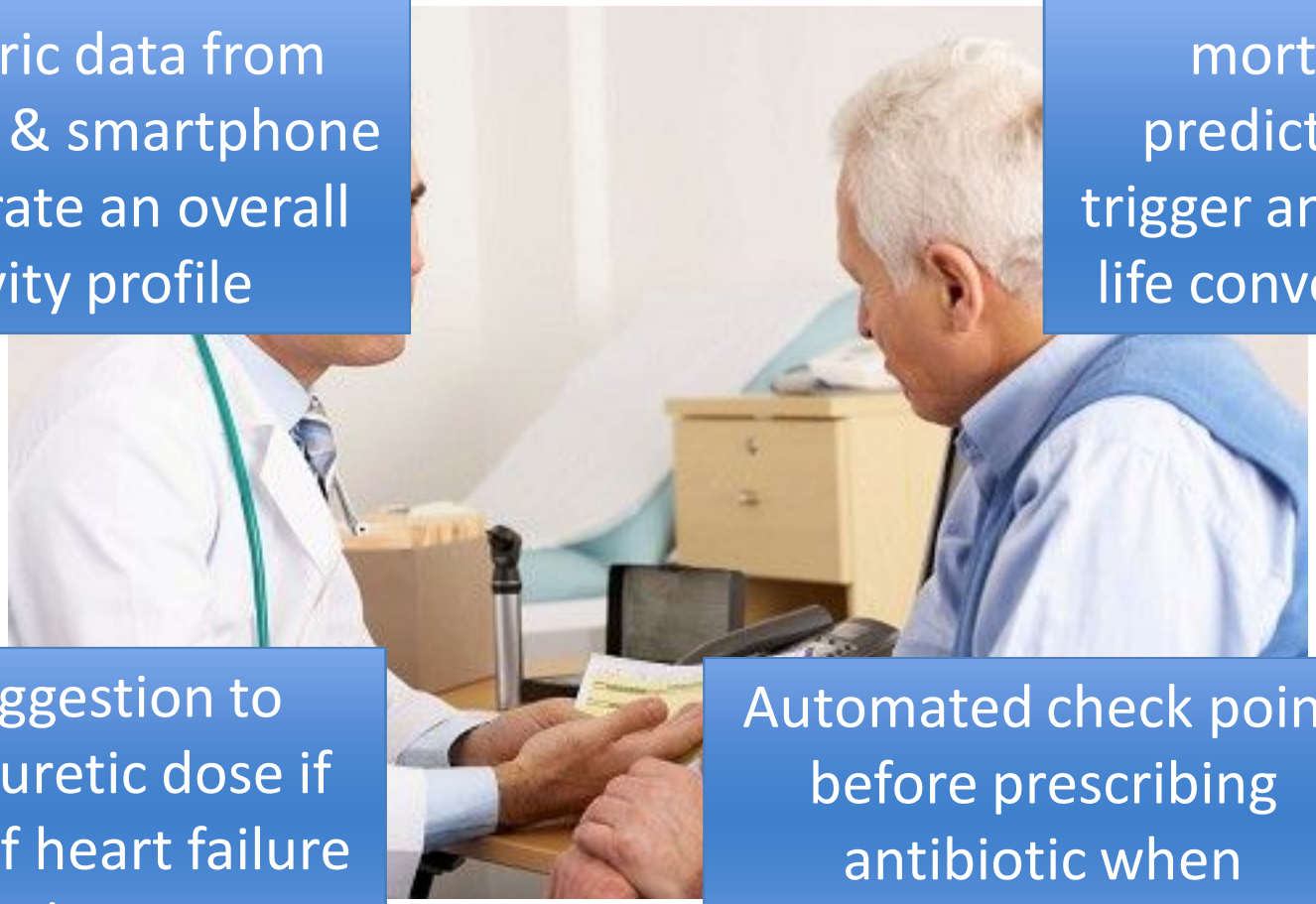



Int J Med Inform 2015


Claims
Clinical Encounter
Biometrics
Genomic & family history
Non-medical social data
VE RI TAS
BWH

Dashboard with biometric data from wearable & smartphone to generate an overall activity profile

Accurate real-time mortality prediction to trigger an end-of-life conversation



EMR suggestion to double diuretic dose if high risk of heart failure exacerbation

Automated check point before prescribing antibiotic when infection risk is low

# Take Away Points

- Current uses of analytics in clinical practice fit into **five** general categories
- Future integration depends on
  - Identifying low-value decision points
  - Prescriptive, not just predictive, analytics
  - Comprehensive and unique data sources
  - Fitting analytics into existing provider workflows
  - Real-time iterative outputs

# Special Thanks

David W. Bates, MD
Meetali Kakad, MD, MPH
Ziad Obermeyer, MD, MPhil
Amol S. Navathe, MD, PhD



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