

DIGITAL LEARNING COLLABORATIVE of the NAM Leadership Consortium for a Value & Science-Driven Health System

*Artificial Intelligence and the future of continuous health
learning and improvement*



JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM

Disclosures 1

- **Machine Learning for Healthcare – Board Member - www.mlforhc.org**
 - **August 17-18th at Stanford**
 - **Papers due 20 April 2018**
 - **Published in JMLR (about 30% acceptance rate)**

Disclosures 2

- **Rubicon Health – Founder**
 - **Startup to offer Team Performance Optimization with Augmented Intelligence**
 - Under a licensing agreement between Rubicon Health and the Johns Hopkins University, Dr. Fackler is entitled to royalty distributions on technology described in this presentation. Dr. Fackler is also the founder of and holds equity in Rubicon Health.
 - This arrangement has been reviewed and approved by the Johns Hopkins University in accordance with its conflict of interest policies.

Artificial Intelligence and the future of continuous health learning and improvement

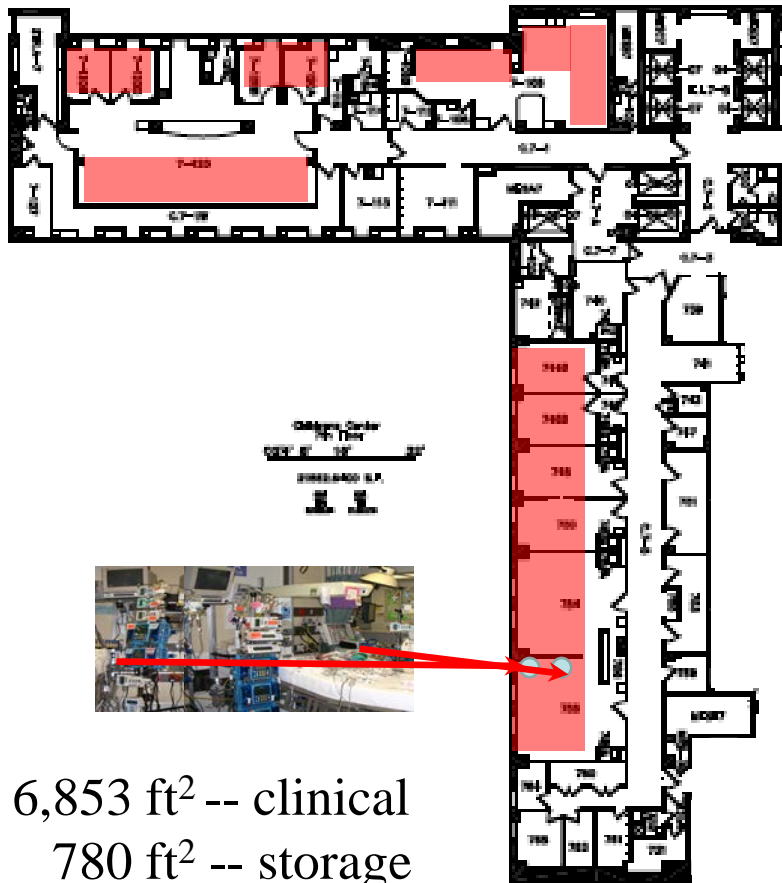
This session will focus on the role of data integration and sharing in enhancing the capabilities of machine learning algorithms to improve health and health care.

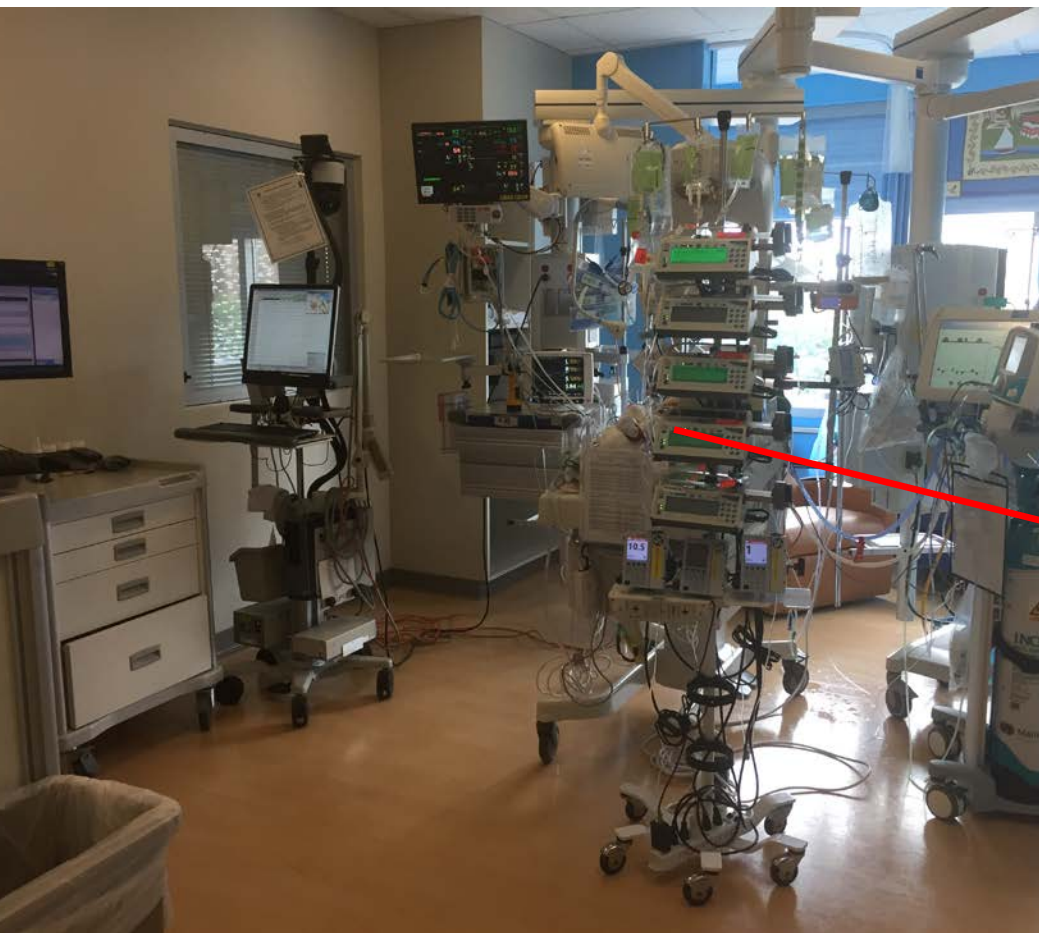


JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM







10.5

Artificial Intelligence and the future of continuous health learning and improvement

This session will focus on the role of data integration and sharing ...

Point 1 – there are 350 data streams per patient

Point 2 – 100's of care team members need AI



JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM

The role of data integration



Chapter 29 Beyond Current HIMS: Future Visions and a Roadmap

James Fackler

© Springer International Publishing Switzerland 2016
C.A. Weaver et al. (eds.), Healthcare Information Management
Systems: Cases, Strategies, and Solutions, Health Informatics.

29 Beyond Current HIMS: Future Visions and a Roadmap

501

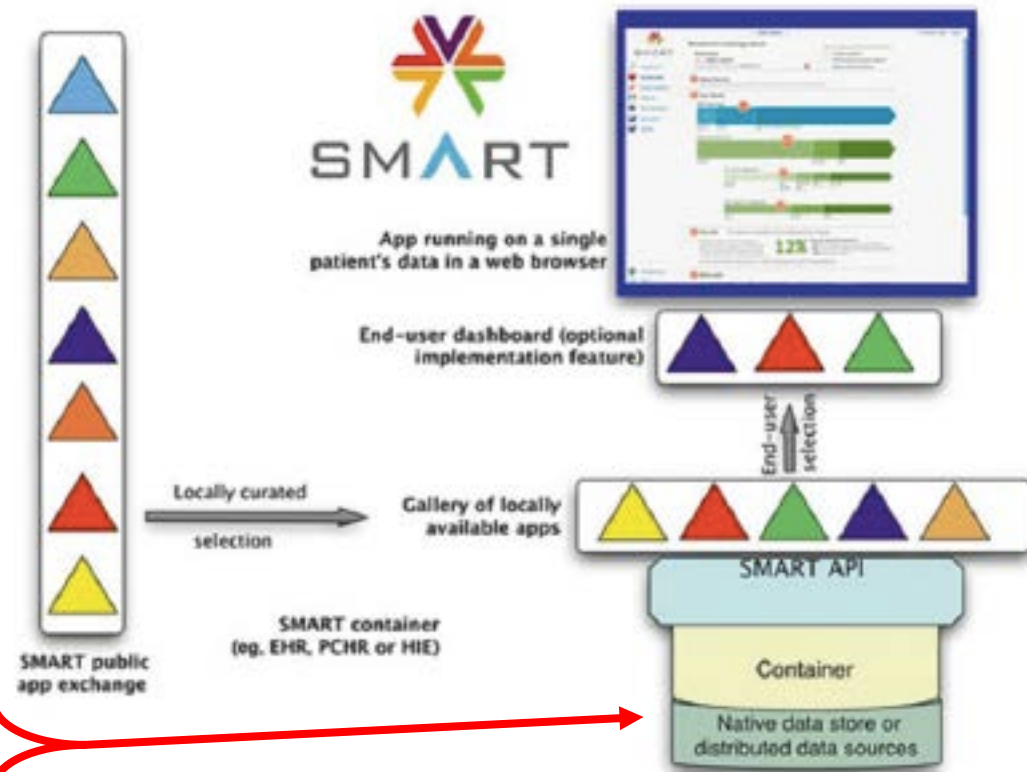


Fig. 29.1 The SMART Platform. Central to the success of the SMART platform is the SMART API that delivers to developers a consistent way to acquire data (from the Container) upon which CDS apps can be built. See text for further details (Reproduced from Mandl et al. [48], with permission of Oxford University Press and the authors)

The role of data integration



Clinician blood pressure documentation of stable intensive care patients: An intelligent archiving agent has a higher association with future hypotension

Caleb W. Hug, PhD; Gari D. Clifford, PhD; Andrew T. Reisner, MD

Patients: Mixed medical/surgical patients.

Interventions: None.

Measurements and Main Results: Using intervals of hemodynamic stability from 2,320 patient records, we retrospectively compared paired sources of invasive blood pressure data: 1) measurements documented by the nursing staff and 2) measurements generated by an automated archiving method that intelligently excludes unreliable (e.g., noisy or excessively damped) blood pressure values. The primary outcome was the occurrence of subsequent “consensus” hypotension, i.e., hypotension documented jointly by the nursing staff and the automated archive. The automated method could be adjusted to alter its operating characteristics (sensitivity and specificity). At a matched level of specificity (96%), blood pressures from the automated archiving

Conclusions: During periods of hemodynamic stability in an intensive care unit patient population, clinician-documented blood pressure values were inferior to values from an intelligent automated archiving method as early indicators of hemodynamic instability. **Human oversight may not be necessary for creating a valid archive of vital sign data within an electronic medical record.** Furthermore, if clinicians do have a tendency to disregard early indications of instability, then an automated archive may be a preferable source of data for so-called early warning systems that identify patients at risk of decompensation. (Crit Care Med 2011; 39:1006–1014)

KEY WORDS: hypotension; intensive care; physiologic monitoring; electronic medical record; digital signal processing; automatic data processing

Artificial Intelligence and the future of continuous health learning and improvement

This session will focus on the role of data integration and sharing ...

Point 1 – there are 350 data streams per patient

Point 2 – 100's of care team members need AI

Point 3 – SMART with FHIR / federated data stores



JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM

Sepsis – Roles for AI

from Health

to Health

Biological
background

Outcomes

**T₀=Bacterial
Invasion**

T_{AI-D}

Health

Pre-existing conditions

Genome
Environment
Exogenous
Endogenous
Chronic disease

Patient data

portal
wearable
implanted

Location

Remote
EMS
ED
Hospital
ICU

Proximate

Issues

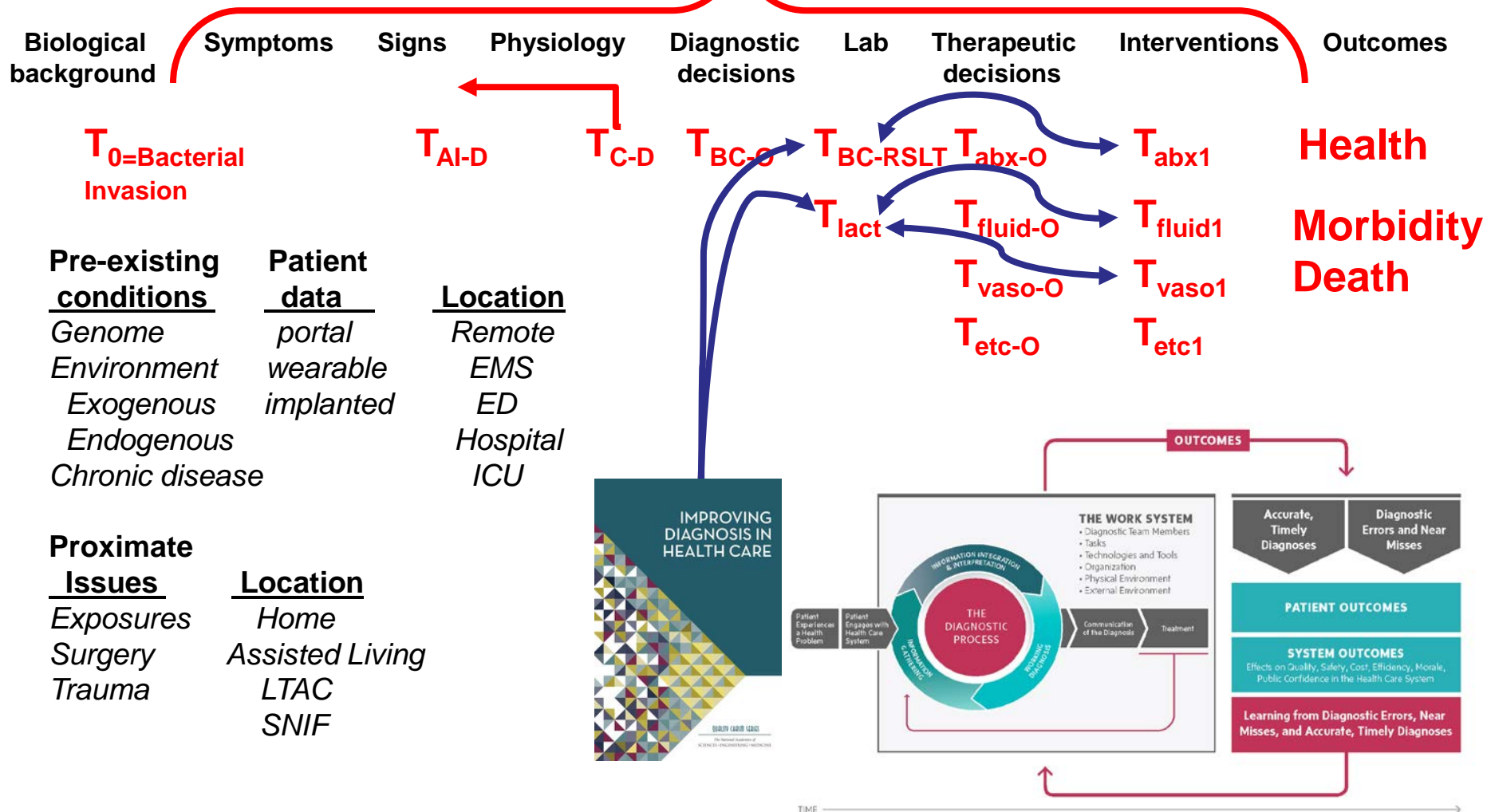
Exposures
Surgery
Trauma

Location

Home
Assisted Living
LTAC
SNIF

Sepsis – Roles for AI

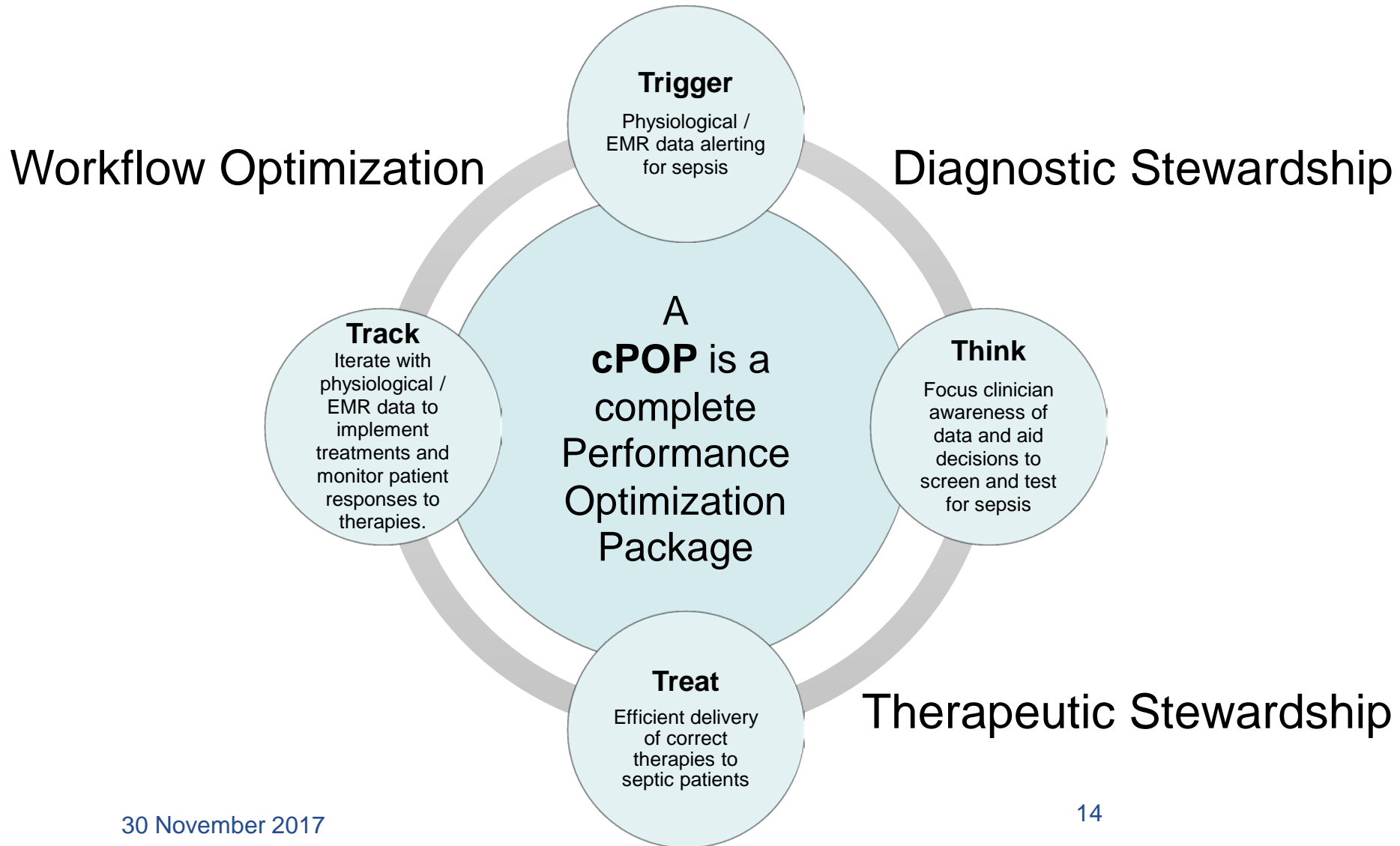
from Health through Sepsis to Health



30 November 2017

FIGURE 3-1 Outcomes from the diagnostic process. NAM 2015

The value of data integration



Artificial Intelligence and the future of continuous health learning and improvement

This session will focus on the role of data integration and sharing ...

Point 1 – there are 350 data streams per patient

Point 2 – 100's of care team members need AI

Point 3 – SMART with FHIR / federated data stores

Point 4 – AI will be useful when we continuously harvest the “data exhaust” to optimize performance and track outcomes.



JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM

Artificial Intelligence and the future of continuous health learning and improvement

This session focused on the role of data integration and sharing ...

Thank you

jim@jhmi.edu

@jimbckler

443-858-6370



JOHNS HOPKINS
M E D I C I N E

JOHNS HOPKINS
HEALTH SYSTEM