Welcome & Announcements

PCPCC
EXECUTIVE MEMBER

Welcome – Julie Schilz, Executive Member Board Liaison

Upcoming PCPCC Webinars

Interested in PCPCC Executive Membership?

Email: Jennifer Renton or visit our website!

PCPCC Annual Conference

Save the Date: November 4-5, 2019

Webinar Speakers

Moderator: Julie Schilz, Mathematica Policy Research

Anil Jain, MD, VP & Chief Health Information Officer, Watson Health at IBM

Steven Waldren, MD, Vice President & Chief Medical Informatics Officer at American Academy of Family Physicians

Lisa Bari, MPH, MBA, Health IT and Interoperability Lead, CMS Innovation Center

AI in Primary Care

Opportunities, Challenges and Lessons Learned

May 15, 2019

Anil Jain, MD, FACP
VP & Chief Health Information Officer
IBM Watson Health
JAnil@us.ibm.com

Our Healthcare Data and Delivery Challenge

EVERY

73 Days

The rate medical data is expected to double by 2020.

80%

OF HEALTHCARE DATA

Healthcare data that comes from unstructured data sources.

90

THOUSAND

Expected shortage of physicians by 2020.

$$$

A third of care is unnecessary and only half get evidence-based care
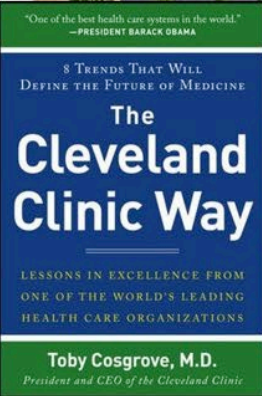
Despite high costs, high quality care remains elusive.

My journey from primary care to big data to trusted AI
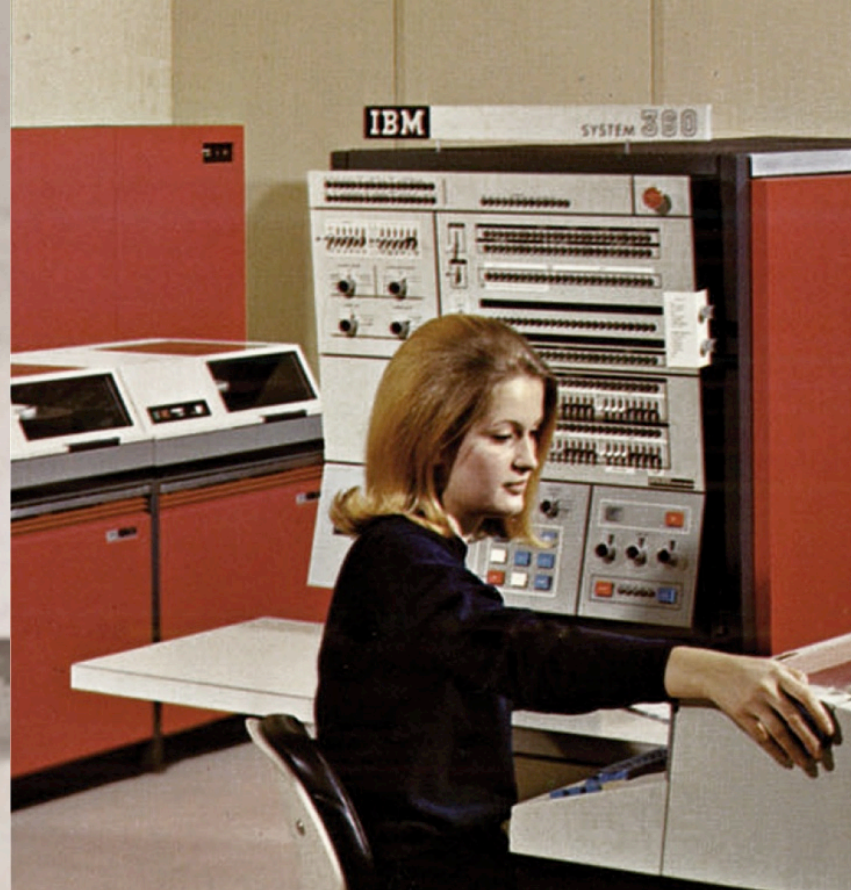

2009 Explorys (spun out of Cleveland Clinic)

too BIG to IGNORE
THE BUSINESS CASE FOR BIG DATA
PHIL SIMON
Award-Winning Author of THE AGE OF THE PLATFORM
WILEY

IBM

Key Strategies for Healthcare in the Cognitive Era
PROVIDER-LED POPULATION HEALTH MANAGEMENT
Second Edition

Richard Hodach, MD, MPH, PhD • Paul Grundy, MD, MPH
Anil Jain, MD, FACP • Michael Weiner, DO, MSM, MSIST
Edited by Karen Ezekiel Hanohaker, MPF

"One of the best health care systems in the world."
—PRESIDENT BARACK OBAMA

8 Trends That Will Define the Future of Medicine
The Cleveland Clinic Way
LESSONS IN EXCELLENCE FROM ONE OF THE WORLD'S LEADING HEALTH CARE ORGANIZATIONS
Toby Cosgrove, M.D.
President and CEO of the Cleveland Clinic

Innovation the Cleveland Clinic Way
Powering Transformation by Putting Ideas to Work
Thomas J. Graham, MD
Chief Innovation Officer of Cleveland Clinic

April 2015
IBM Acquires Explorys to Accelerate Cognitive Insights for Health and Wellness

IBM Watson Health

Anil Jain, MD, FACP - @anilkjainmd - Copyright IBM, 2019

Tabulating
Systems Era
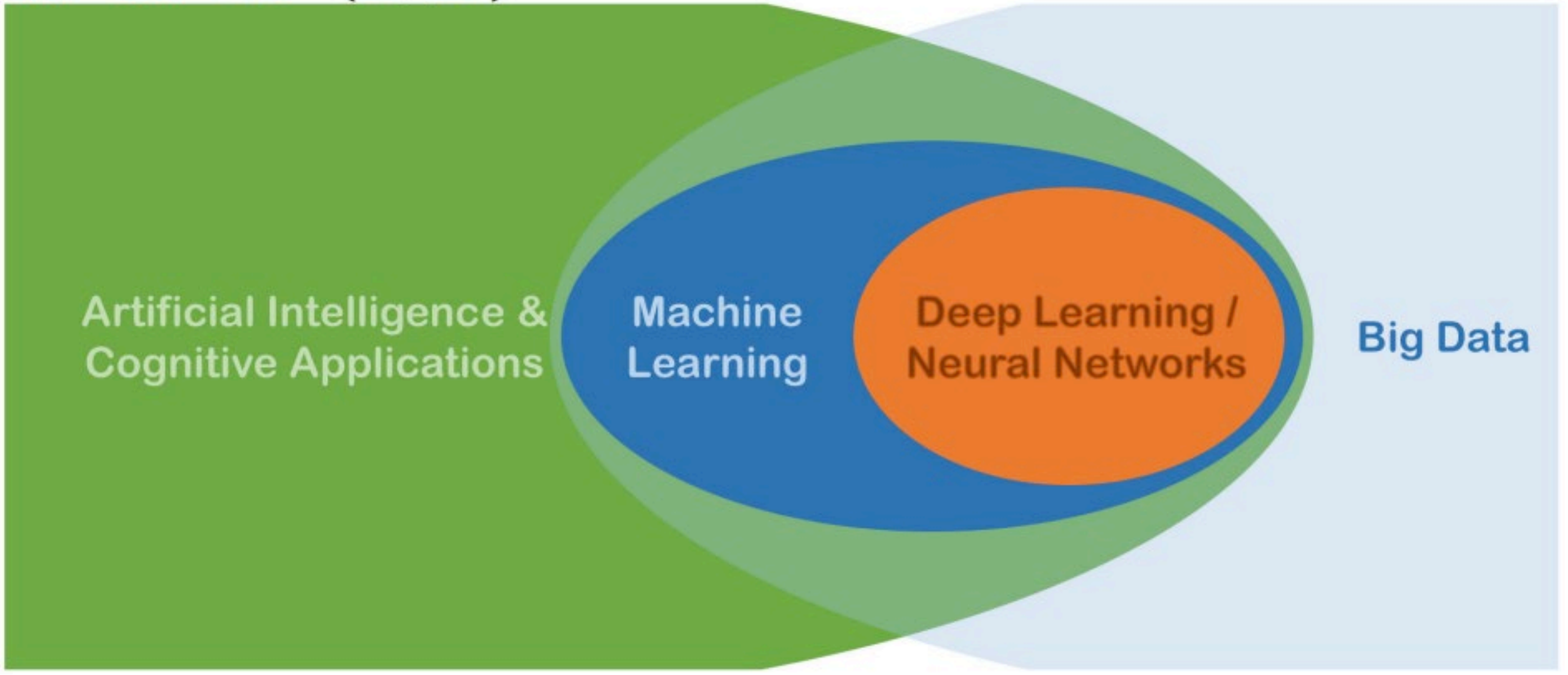
1900 – 1940s

Programmable
Systems Era

1950s – Present

Cognitive
Computing Era

2011 –

AI vs. Machine Learning vs Deep Learning

$$NN \in DL \in ML \in (AI \cap BD)$$

Artificial Intelligence & Cognitive Applications

Machine Learning

Deep Learning / Neural Networks

Big Data

AI = Augmented Intelligence

People excel at:

| Common sense | Dilemmas | Morals | Compassion | Imagination | Dreaming | Abstraction | Generalization |

Cognitive systems excel at:

| Natural Language | Pattern Identification | Locating Knowledge | Machine Learning | Eliminate Bias | Endless Capacity |

AI in Primary Care

Opportunities

- Efficient integration of disparate health information (text, images and knowledge)

- Increased efficiency of establishing diagnoses and suggesting treatment

- Predict and possibly prevent complications and reduce unnecessary services/cost

- Save time on administrative tasks

- Allow each member of care team to perform at the highest level of their license

Challenges

- Lack of reliable access to curated data

- Access to data for training expose privacy & security concerns

- Lack of interoperability between data sets and systems

- Skepticism/reluctance to adopt AI solutions by clinicians into workflows

- Potential for "Black box" AI solutions

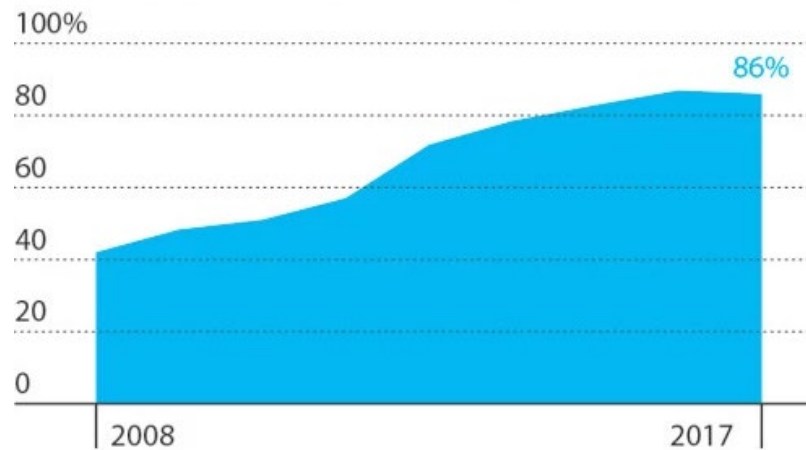- Regulatory oversight, bias and ethical concerns

BOTCHED OPERATION

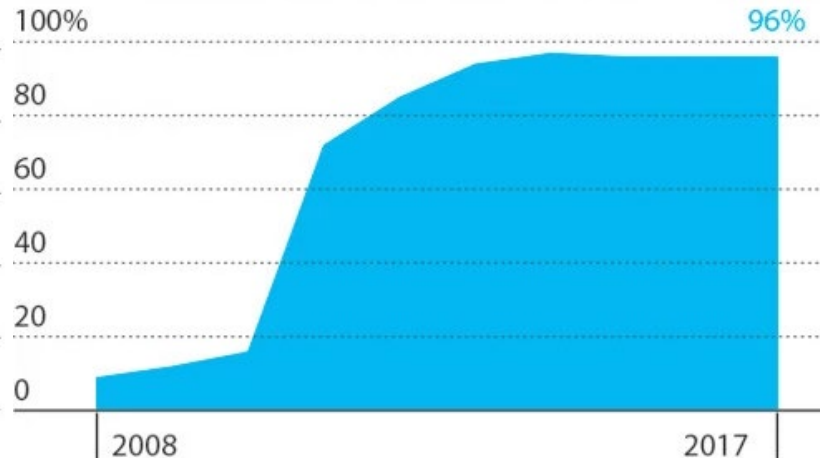# Death By 1,000 Clicks: Where Electronic Health Records Went Wrong

The U.S. government claimed that turning American medical charts into electronic records would make health care better, safer and cheaper. Ten years and $36 billion later, the system is an unholy mess. Inside a digital revolution that took a bad turn.

By **Fred Schulte** and **Erika Fry**, **Fortune** • MARCH 18, 2019
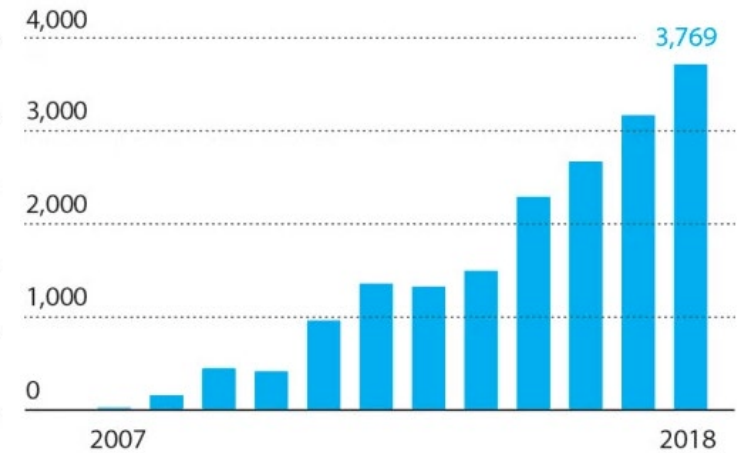
(The Voorhes for Fortune)

EHR ADOPTION FOR OFFICE-BASED PHYSICIANS
86%
2008 — 2017

EHR ADOPTION FOR NONFEDERAL ACUTE CARE HOSPITALS
96%
2008 — 2017

SAFETY-RELATED INCIDENTS LINKED TO EHR OR OTHER IT
3,769
2007 — 2018

Fred Schulte and Erika Fry, Fortune, Fortune, https://khn.org/news/death-by-a-thousand-clicks/view/republish/, 3/18/2019

Ambulatory Progress Notes

Regulatory mandates?

Defensive Medicine?

Copy-Paste?

Teaching?

Downing NL, Bates DW, Longhurst CA. Physician Burnout in the Electronic Health Record Era: Are We Ignoring the Real Cause?. Ann Intern Med. [Epub ahead of print 8 May 2018] doi: 10.7326/M18-0139

How good is good enough to augment Radiologists...

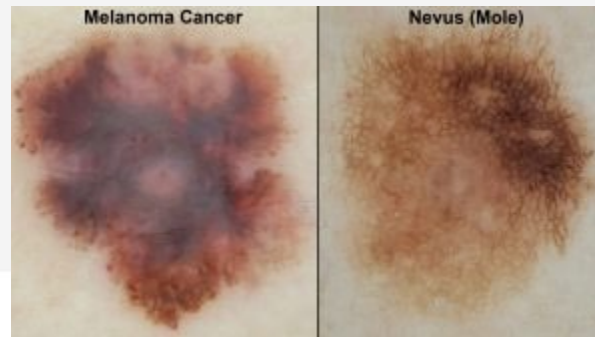# Extending expertise virtually: Identifying potential Melanoma

Globule and network

Watson inspects the skin mole for the presence of any globular or network pattern, two patterns that are indicative of a potential melanoma, and calculates a percentage. The higher the percentage, the higher the risk.

Similar images
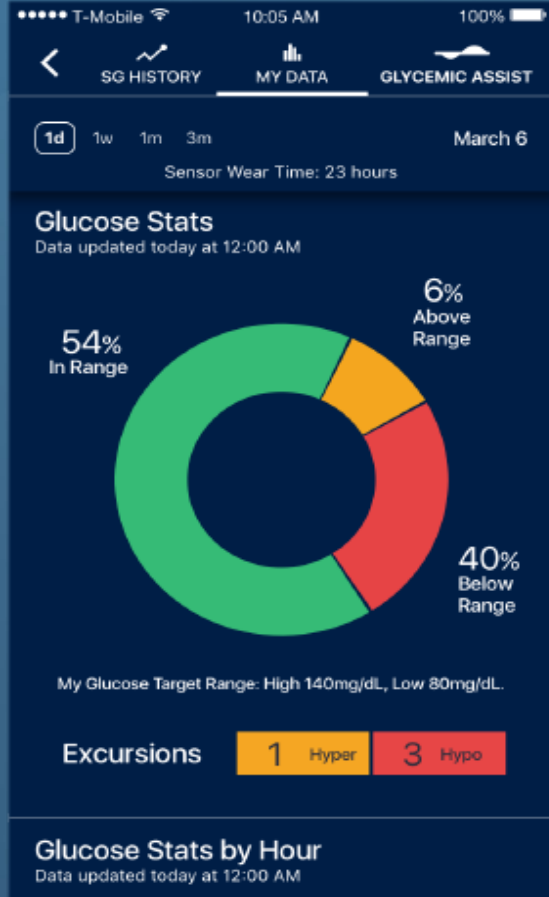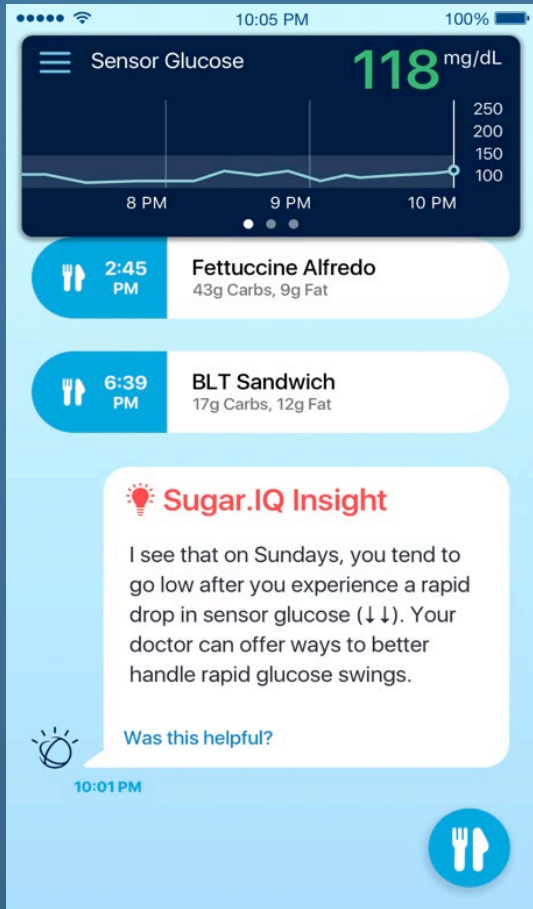
Watson searches the database for an image similar to the skin mole being analysed, and considers the prior diagnosis of this image.

Melanoma score

Watson scours through thousands of historical images in the database in a matter of seconds and uses an algorithm to assign a melanoma score to the skin mole being analysed. The higher the score, the higher the likelihood of melanoma.

14

Engaging Patients in their Daily Diabetes Management using Sugar.IQ with Watson App

American Diabetes Association Scientific Sessions
June 2018

36 minutes more per day in healthy glucose range

30 minutes less time in hyperglycemia

6 minutes less time in hypoglycemia

(N=11,356 calendar days in 256 users)

"This represents more than 9 additional days in a year that a person with diabetes is spending in a healthy glucose range."
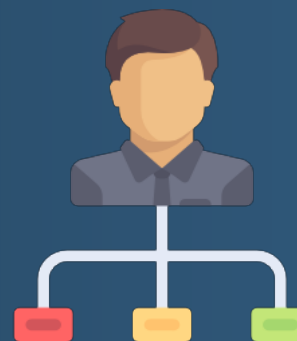
Enhancing primary care decisions at the Point of Need

Summary of relevant clinical data

Answer the next question without foraging

Precision cohort for possible treatments

Shared decision making

Retrospective Insights

Prospective Insights

Anil Jain, MD, FACP - @anilkjainmd - Copyright IBM, 2019

AMA Policy
June 22, 2018

James Madara, MD, CEO,
American Medical Association

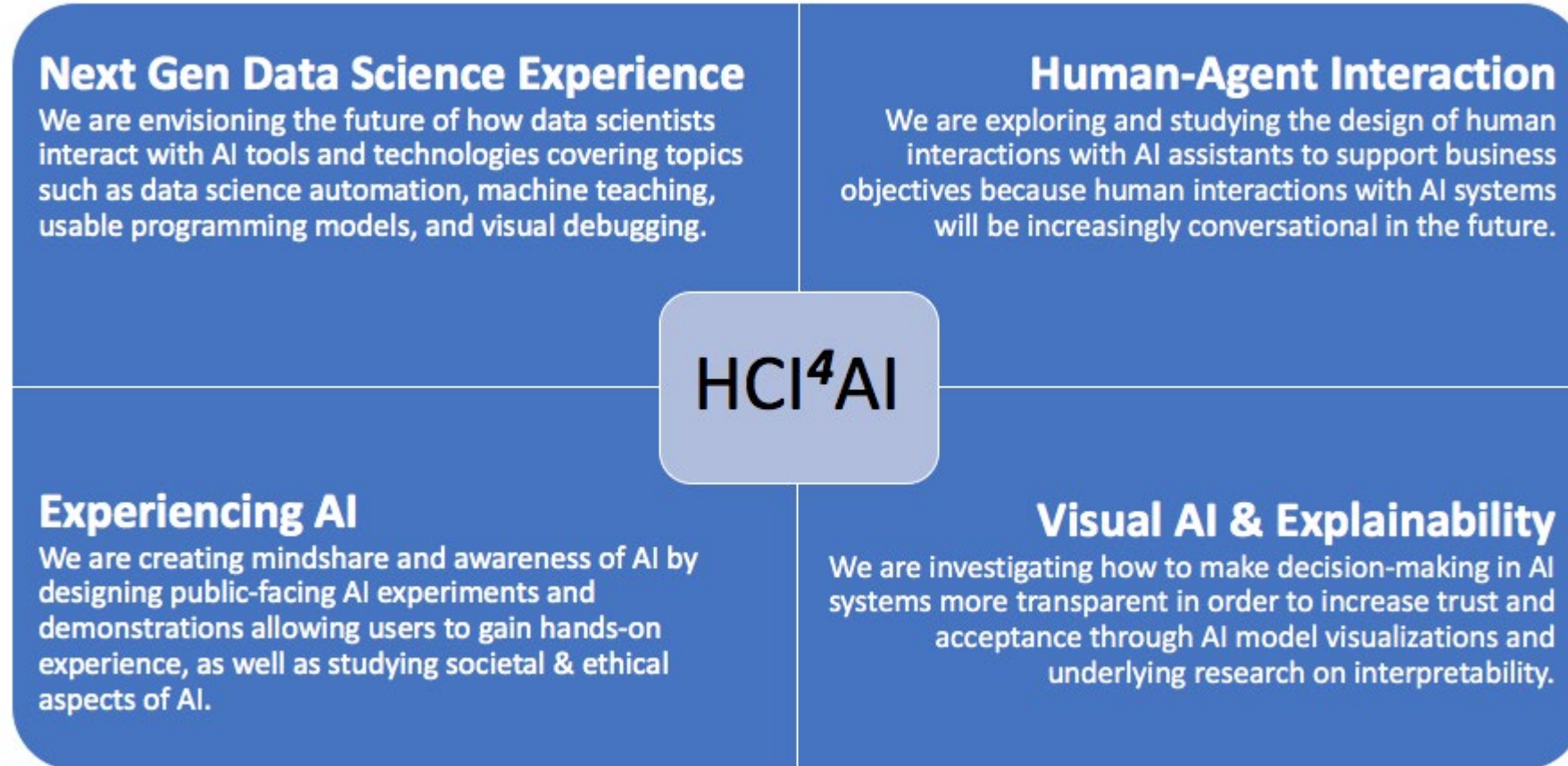# Augmented intelligence in health care*

Interest in augmented intelligence (AI) and its potential to dramatically impact medicine is growing rapidly among Congress, federal agencies, and other health care stakeholders. As a leader in American medicine, our American Medical Association (AMA) is uniquely positioned to ensure that the evolution of AI in medicine benefits patients, physicians, and the health care community. This report contains baseline policy to guide AMA's engagement with a broad cross-section of stakeholders and policymakers to ensure that the perspective of physicians in various practice settings informs and influences the dialogue as this technology develops.

Ensuring the appropriate implementation of AI in health care will require that stakeholders forthrightly address challenges in the design, evaluation, implementation, and oversight of AI systems. Through its strategic partnerships and collaborations, the AMA has the capacity to help set priorities for health care AI; integrate the perspective of practicing physicians into the design, validation, and implementation of high-quality, clinically valuable health care AI; and promote greater understanding of the promise and limitations of AI across the health care community. A strong tradition of advocacy well positions our AMA to explore the

- Leverage its ongoing engagement in digital health and other priority areas for improving patient outcomes and physicians' professional satisfaction to help set priorities for health care AI.

- Identify opportunities to integrate the perspective of practicing physicians into the development, design, validation, and implementation of health care AI.

- Promote development of thoughtfully designed, high-quality, clinically validated health care AI that:

  — is designed and evaluated in keeping with best practices in user-centered design, particularly for physicians and other members of the health care team;
  — is transparent;
  — conforms to leading standards for reproducibility;
  — identifies and takes steps to address bias and avoids introducing or exacerbating health care disparities including when testing or deploying new AI tools on vulnerable populations; and
  — safeguards patients' and other individuals' privacy interests and preserves the security and integrity of personal information.

Human Computer Interaction and Data Visualization
Focus areas for IBM Research

Next Gen Data Science Experience
We are envisioning the future of how data scientists interact with AI tools and technologies covering topics such as data science automation, machine teaching, usable programming models, and visual debugging.

Human-Agent Interaction
We are exploring and studying the design of human interactions with AI assistants to support business objectives because human interactions with AI systems will be increasingly conversational in the future.

HCI⁴AI

Experiencing AI
We are creating mindshare and awareness of AI by designing public-facing AI experiments and demonstrations allowing users to gain hands-on experience, as well as studying societal & ethical aspects of AI.

Visual AI & Explainability
We are investigating how to make decision-making in AI systems more transparent in order to increase trust and acceptance through AI model visualizations and underlying research on interpretability.

Transparency
Fair
Accountable
Ethical
Socially Responsible
Provable
Trust

Academic Partners

https://researcher.watson.ibm.com/researcher/view_group.php?id=9529

Anil Jain, MD, FACP - @anilkjainmd - Copyright IBM, 2019

Addressing bias through Trusted AI

AI Fairness 360 (AIF360), a comprehensive open-source toolkit of metrics to check for unwanted bias in datasets and machine learning models, and state-of-the-art algorithms to mitigate such bias.

https://www.ibm.com/blogs/research/2018/09/ai-fairness-360/

Thank You!

Anil Jain, MD, FACP

VP & Chief Health Information Officer
IBM Watson Health

✉ janil@us.ibm.com

🐦 @anilkjainmd

in aniljainmd

20

AMERICAN ACADEMY OF FAMILY PHYSICIANS
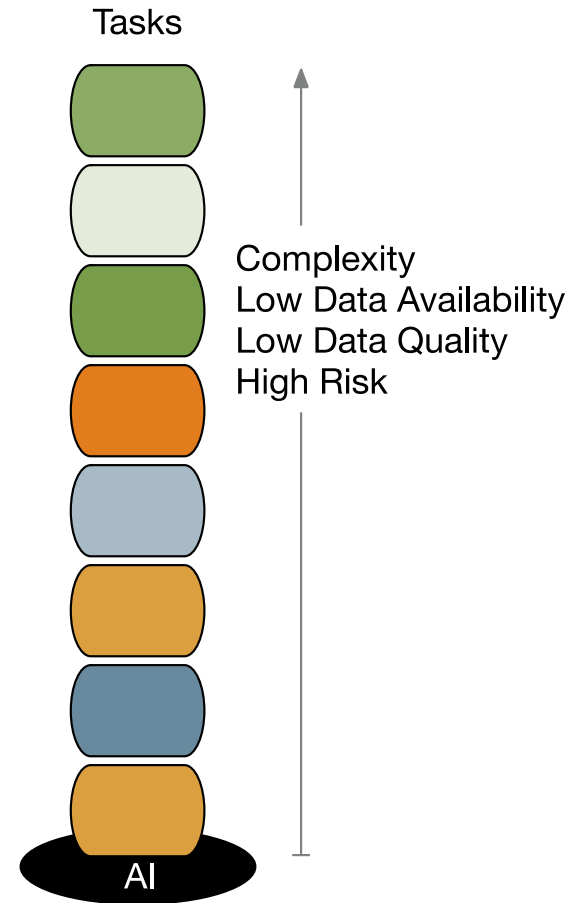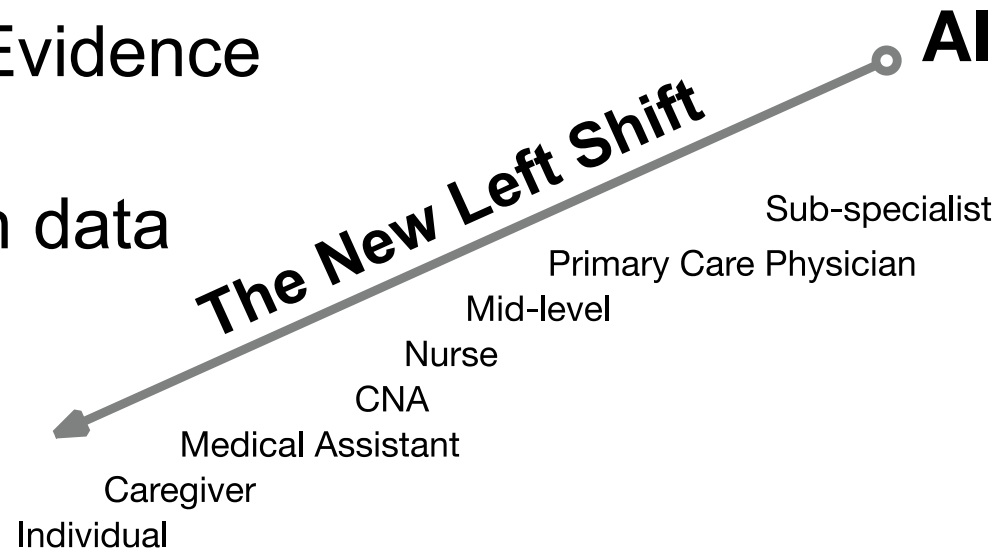
Key Challenge & Opportunity

"20 Percent Doctor Included" & Dr. Algorithm: Speculations and Musings of a Technology Optimist

SEPTEMBER 30, 2016 • BY VINOD KHOSLA • HEALTH

?

Human + AI Performance $$$
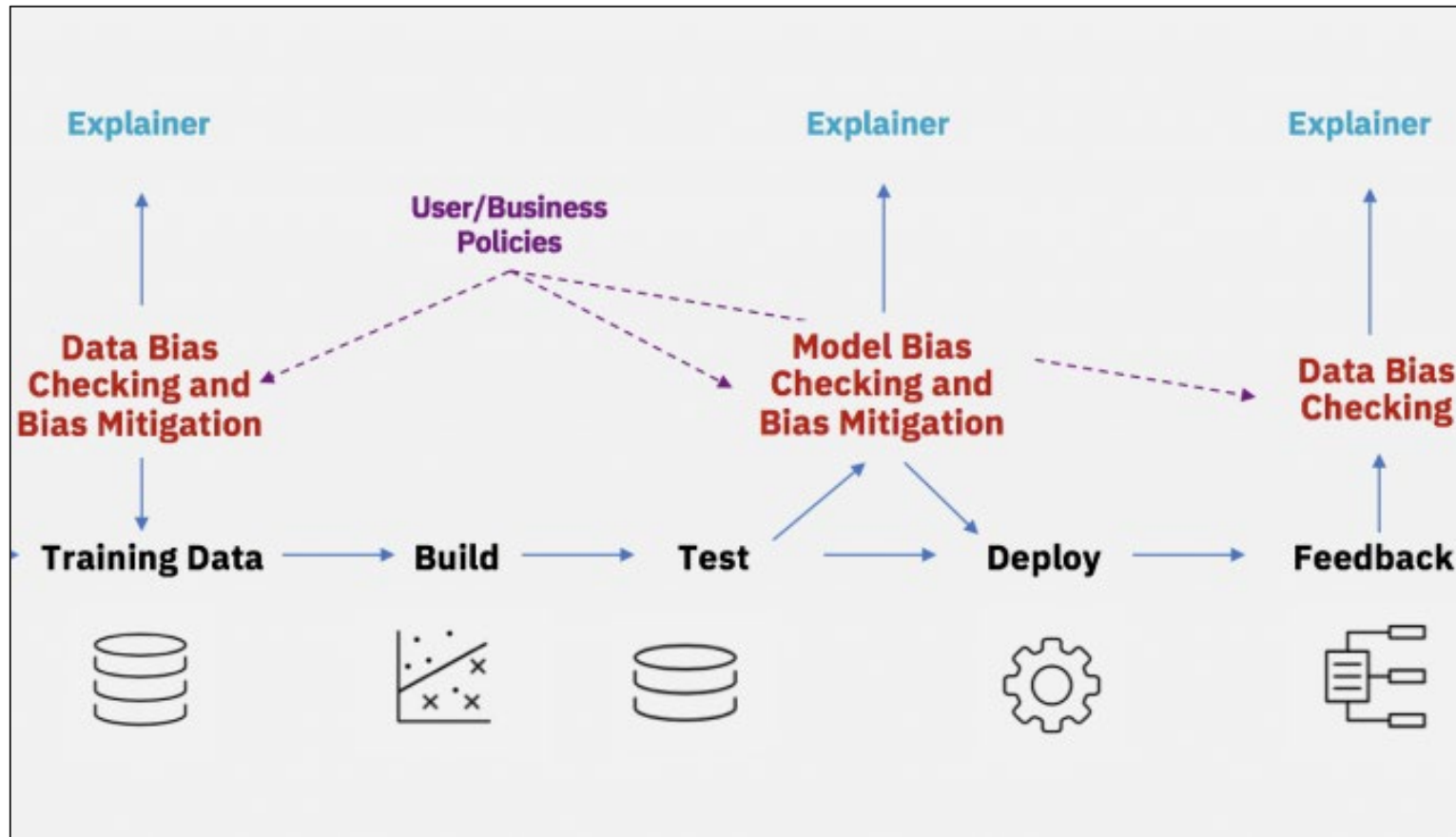
Human Performance $$$

AI / ML Performance ¢

Time
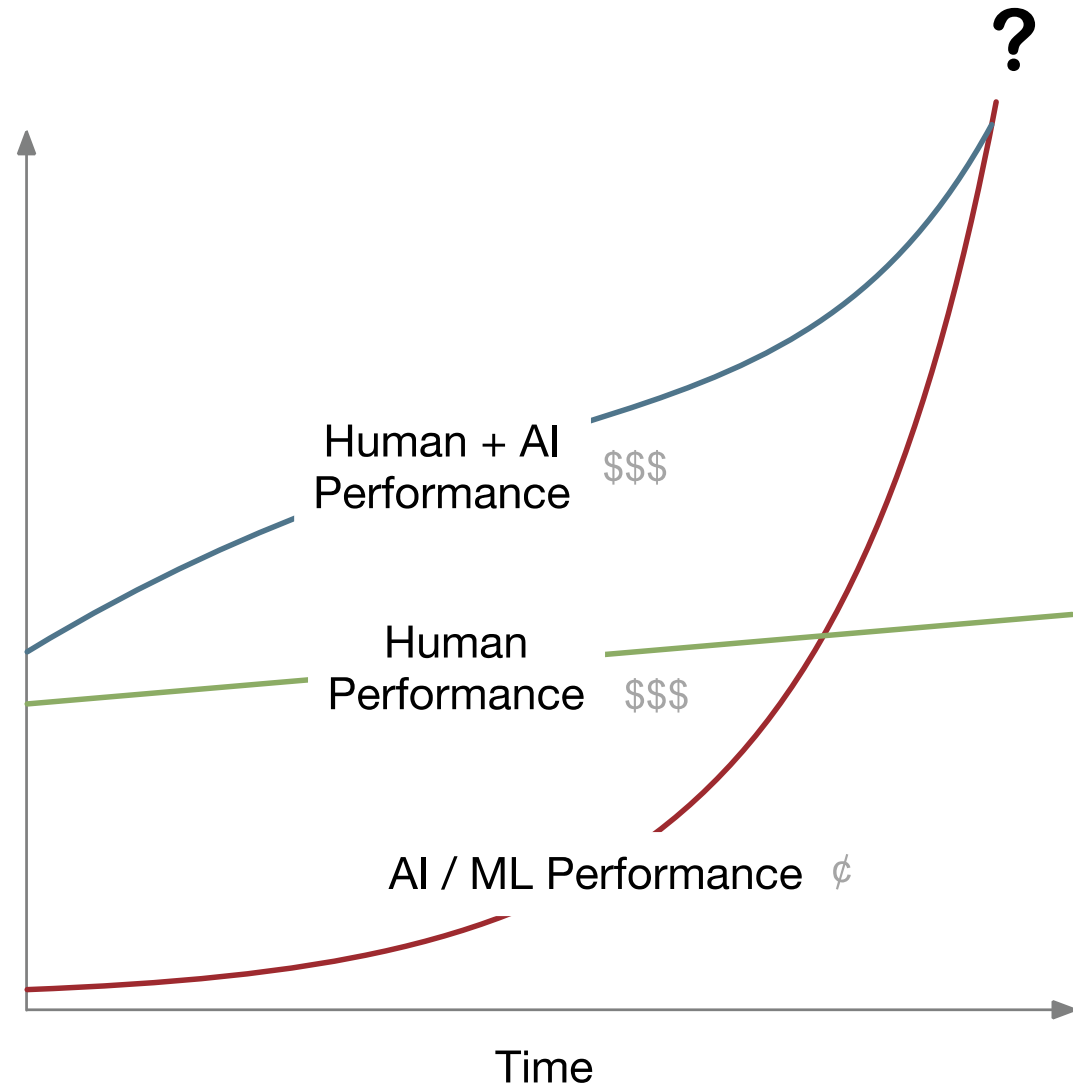
Market Pressures on Medicine

- Be more cost effective
- High burden/burnout
- Medical Errors
- Volume of new Evidence Based Medicine
- Volume of health data

AI

The New Left Shift

Sub-specialist
Primary Care Physician
Mid-level
Nurse
CNA
Medical Assistant
Caregiver
Individual

Tasks

Complexity
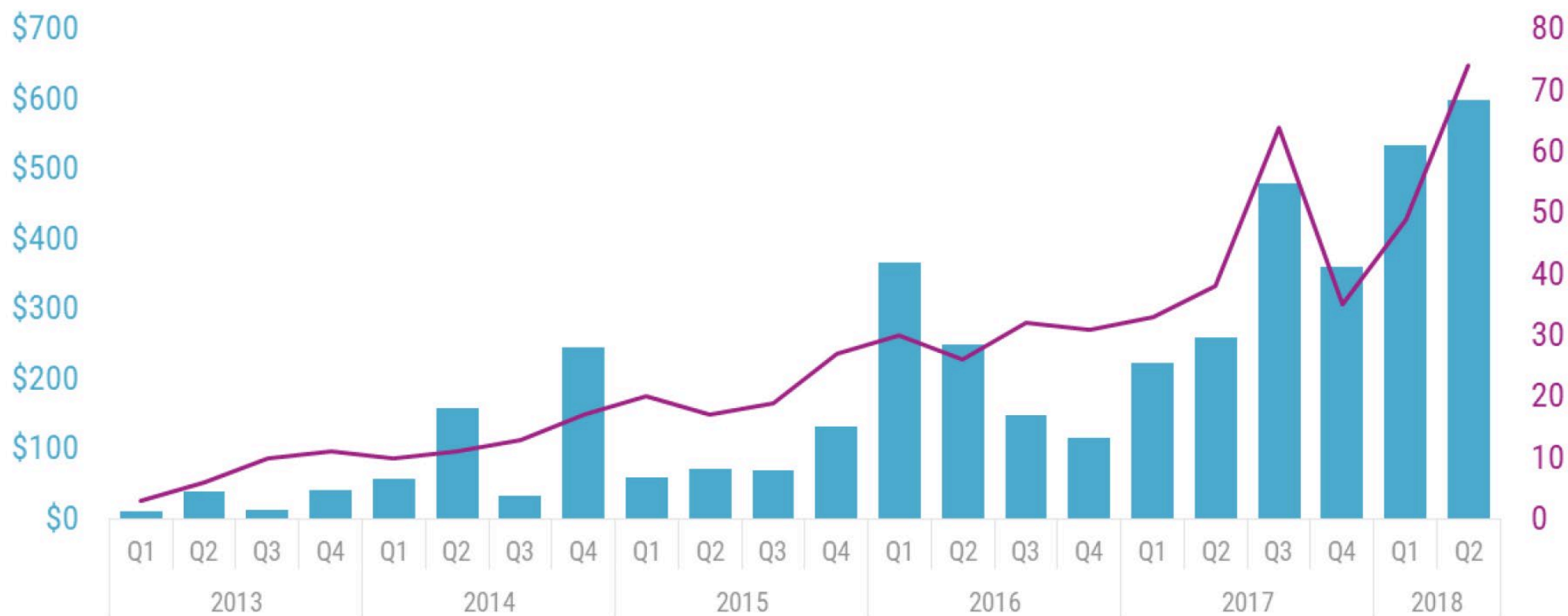Low Data Availability
Low Data Quality
High Risk

AI

AI in healthcare funding hit a historic high in Q2'18

Disclosed equity funding, Q1'13 – Q2'18

Equity funding ($M)

Equity deals

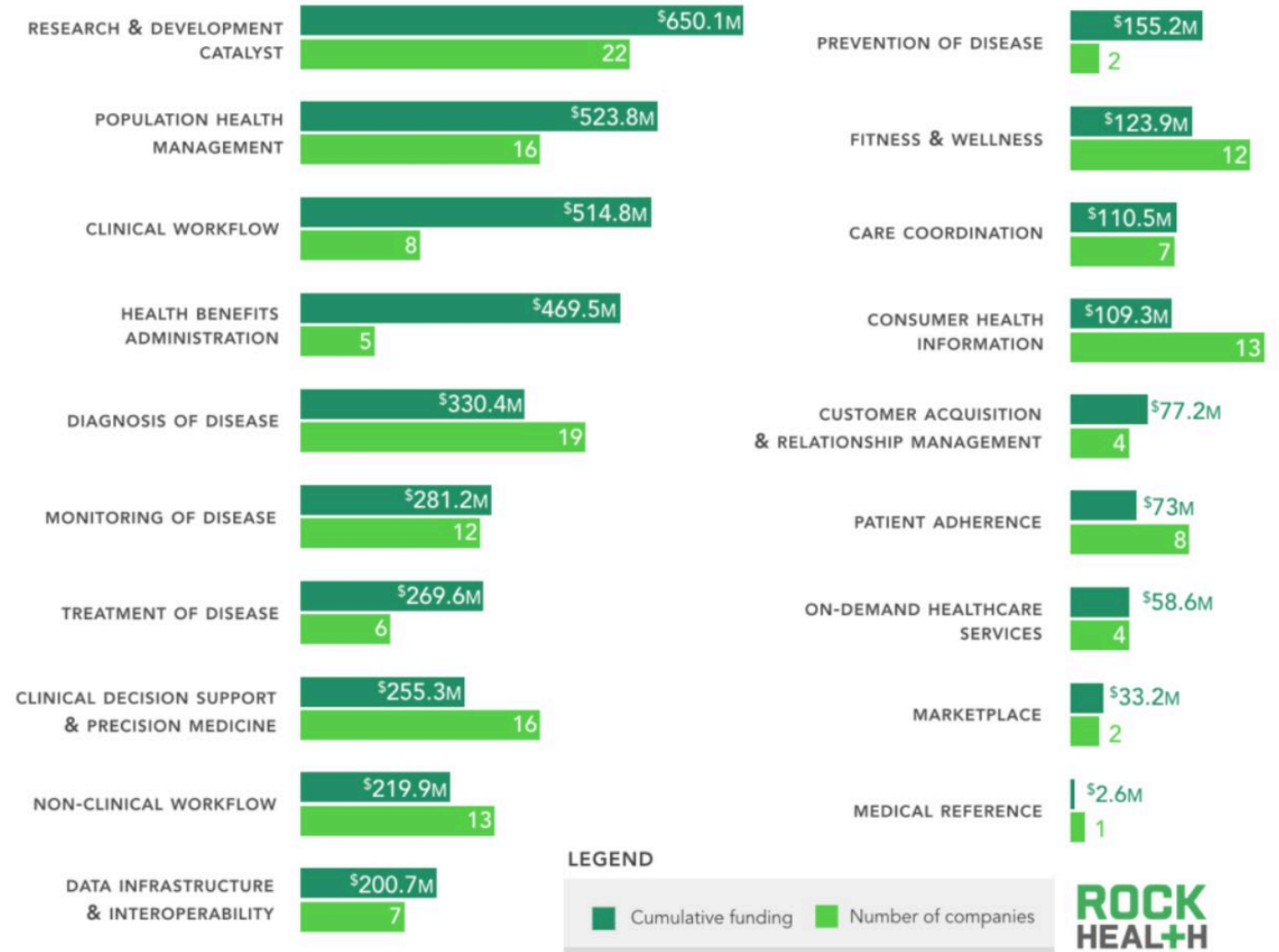Source: cbinsights.com

CB INSIGHTS

AMERICAN ACADEMY OF FAMILY PHYSICIANS

AI Funding Domains

VALUE PROPOSITIONS OF FUNDED AI/ML-POWERED DIGITAL HEALTH COMPANIES
2011–2017

Value Proposition	Cumulative funding	Number of companies
RESEARCH & DEVELOPMENT CATALYST	$650.1M	22
POPULATION HEALTH MANAGEMENT	$523.8M	16
CLINICAL WORKFLOW	$514.8M	8
HEALTH BENEFITS ADMINISTRATION	$469.5M	5
DIAGNOSIS OF DISEASE	$330.4M	19
MONITORING OF DISEASE	$281.2M	12
TREATMENT OF DISEASE	$269.6M	6
CLINICAL DECISION SUPPORT & PRECISION MEDICINE	$255.3M	16
NON-CLINICAL WORKFLOW	$219.9M	13
DATA INFRASTRUCTURE & INTEROPERABILITY	$200.7M	7
PREVENTION OF DISEASE	$155.2M	2
FITNESS & WELLNESS	$123.9M	12
CARE COORDINATION	$110.5M	7
CONSUMER HEALTH INFORMATION	$109.3M	13
CUSTOMER ACQUISITION & RELATIONSHIP MANAGEMENT	$77.2M	4
PATIENT ADHERENCE	$73M	8
ON-DEMAND HEALTHCARE SERVICES	$58.6M	4
MARKETPLACE	$33.2M	2
MEDICAL REFERENCE	$2.6M	1

LEGEND
■ Cumulative funding ■ Number of companies

ROCK HEAL+H

Source: Rock Health Funding Database
Note: Only includes U.S. deals >$2M; data through December 31, 2017

AMERICAN ACADEMY OF FAMILY PHYSICIANS

Problem #1

- EHRs suck

- Clerical Burden > 50% of MD time

- Physician burnout at epic levels

- It is epidemic in Family Medicine

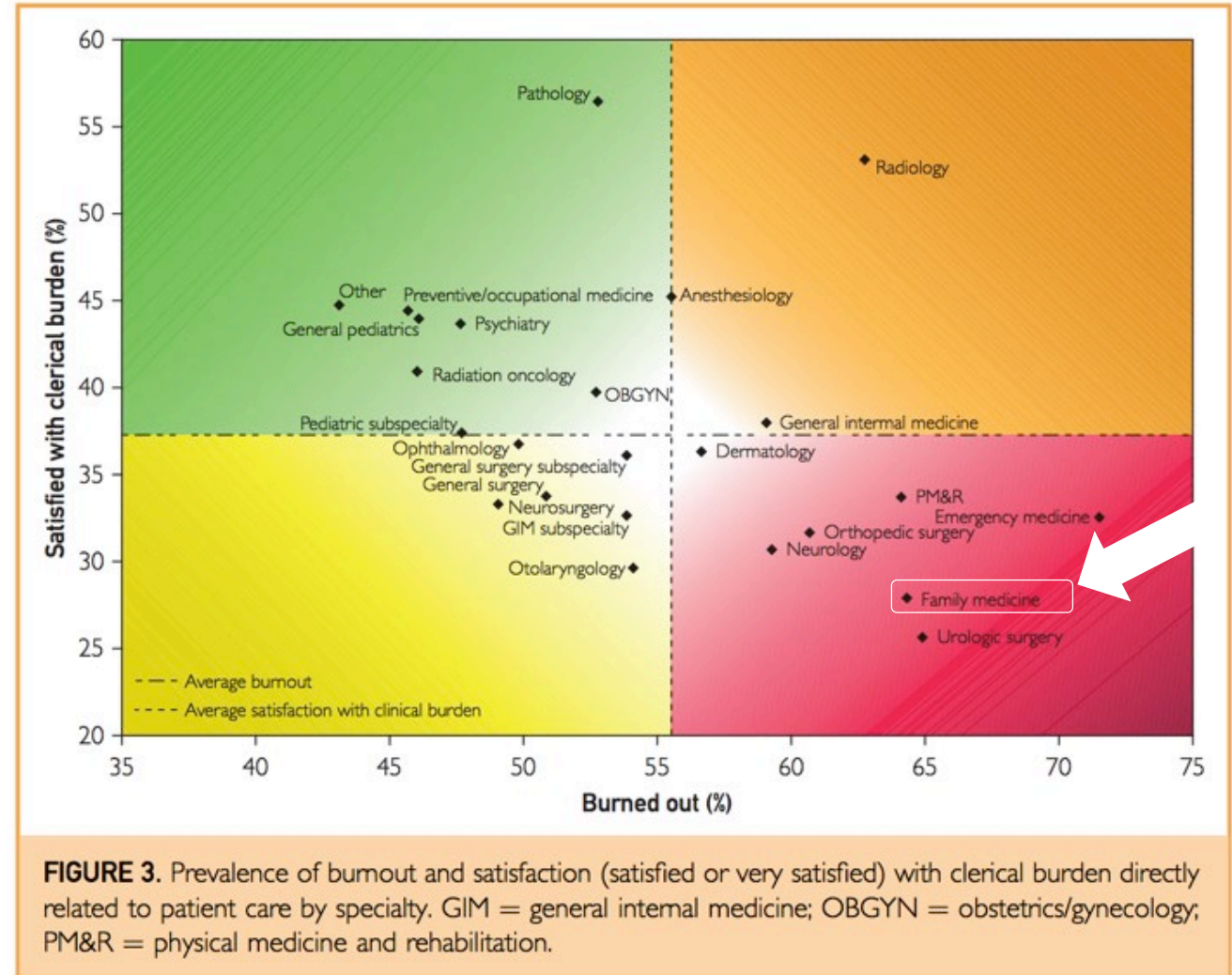# Burnout & Clerical Burden by Specialty

FIGURE 3. Prevalence of burnout and satisfaction (satisfied or very satisfied) with clerical burden directly related to patient care by specialty. GIM = general internal medicine; OBGYN = obstetrics/gynecology; PM&R = physical medicine and rehabilitation.

Shanafelt, TD et. al. Relationship Between Clerical Burden and Characteristics of the Electronic Environment with Physician Burnout and Professional Satisfaction. Mao Clin Proc. July 2016;91(7):836-848.

AMERICAN ACADEMY OF FAMILY PHYSICIANS

Why is Family Medicine Primary Care so effected?

- Patient relationship is "Primary" to FM

- EHR's burn daylight, nights and distract

- Primary care is essential to Triple AIM

  - Population Health

  - Experience of Care

  - Per capita cost

- Eroding professional satisfaction

Family physicians' EHR use by time of day.
Date nights and the EHR
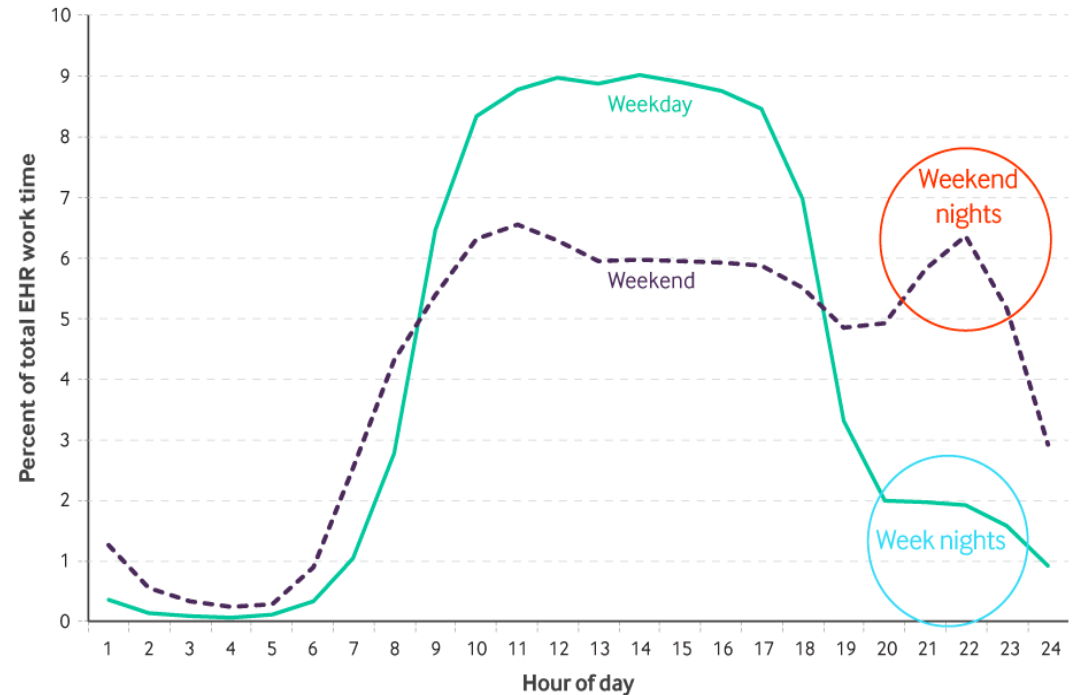
Modified from B. Arndt, et al., *Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and Time Motion Observations*, Annals of Family Medicine.
NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

AMERICAN ACADEMY OF FAMILY PHYSICIANS

Primary Care's Burning Problems

Clerical Burden 🔥   **Burning Out Primary Care Physicians**

Value-based Payment 🔥   **Potential to Burn Down Practices**

AI / ML 🔥   **Potential to Burn Primary Care**

🧯 **Drive Innovation Focused on the Needs of Primary Care**

Where Could AI Help Primary Care?

| Administrative Burden | Cognitive Burden | Expanding Capacity | Expanding Capabilities | Predicting Disease And Outcomes |

What If?

We were able to fundamentally change the paradigm

Status Quo is Not Acceptable

- AAFP has for years been advocating for change within both the public and private sectors. The AAFP sees HIT as inherent to the Family Medicine Experience. We have seen little progress, clearly not enough and not rapid enough.

- The Board of Directors has funded a multi-year project to drive innovation with proven technologies into family medicine.

- Role is to prove & promote innovations as essential best practices to membership

- Efforts include promoting development through challenge programs and establish an Innovation Lab to prove new solutions are effective and adoptable and contribute to a robust AI/ML community focused around primary care

Innovation Lab to
Optimize Family Medicine Experience

- The Family Medicine Experience is based on a deep physician-patient interaction that requires support from technology.

- Today's EHRs have greatly eroded the experience rather than enhancing it.

- The purpose of our Innovation Laboratory is to partner with industry to drive innovation with the latest proven technologies: cloud, AI/ML, voice and mobile technologies, to optimize the Family Medicine Experience.
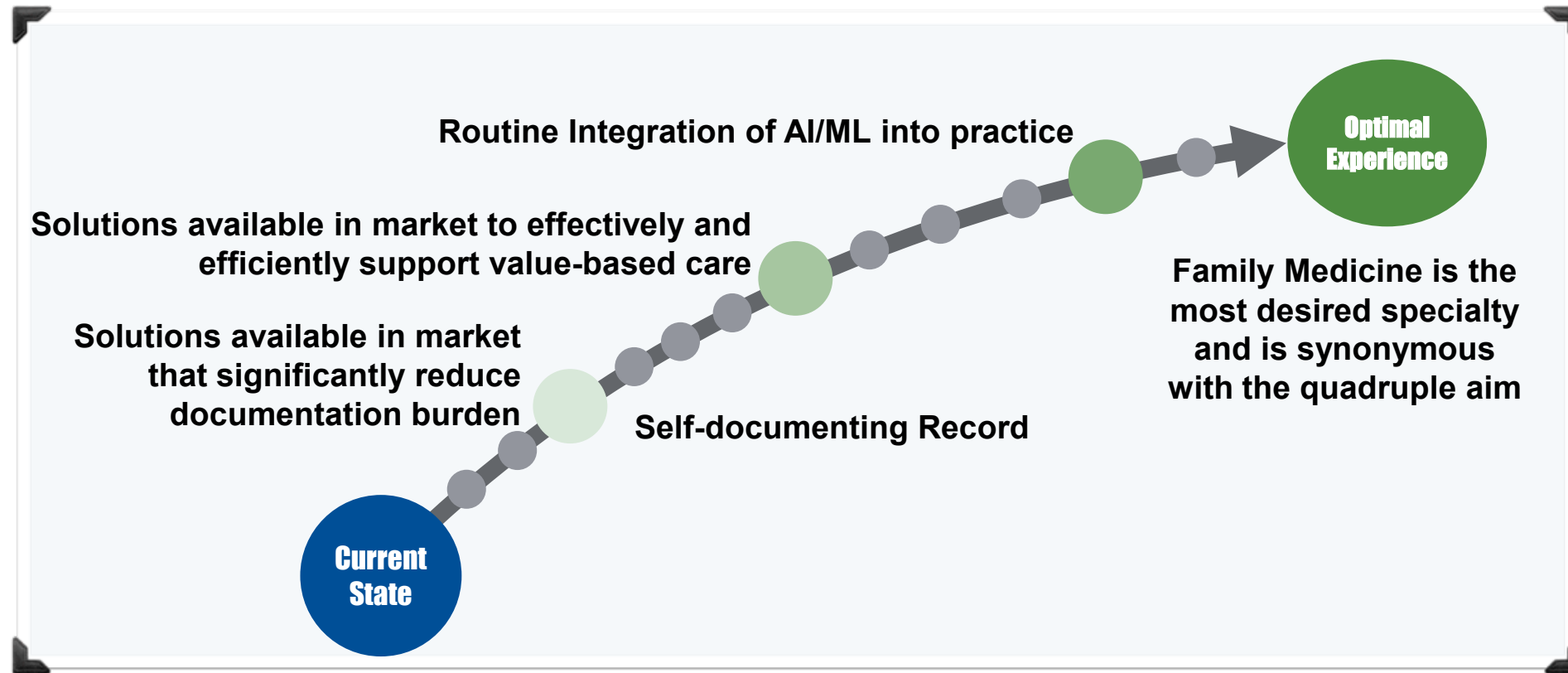
The Big Picture

Milestones on the Way to the Optimal Family Medicine Experience

The Centers for Medicare & Medicaid Services

Artificial Intelligence Health Outcomes Challenge

Disclaimer:

This presentation is only intended to give a high level overview of the CMS Artificial Intelligence Health Outcomes Challenge. This presentation is not intended to interpret or modify the actual Challenge announcement in any way; if there is a conflict between this presentation and the announcement, the announcement controls. The Public Notice may be found at https://go.cms.gov/AI.

Agenda

1. Overview of the CMS Innovation Center
2. Understanding the Problem
3. The Challenge Goals
4. Competition Structure
5. Submission Requirements
6. Eligibility
7. Intellectual Property Terms
8. Evaluation Criteria
9. Medicare Competition Data
10. How to Enter
11. Challenge Updates
12. Q&A

Overview of the Center for Medicare and Medicaid Innovation

The Center for Medicare and Medicaid Innovation (the Innovation Center) within CMS tests of **innovative health care payment and service delivery models.**

All models are designed to reduce program expenditures and preserve or enhance the quality of care for Medicare, Medicaid, and Children's Health Insurance Program beneficiaries.

The CMS Artificial Intelligence (AI) Health Outcomes Challenge is a $1.65 million prize competition designed to encourage the development of AI models to predict health outcomes and propose new outcome-based quality measures that can be used to test and evaluate innovative payment and service delivery models under the authority of section 1115A of the Social Security Act.

Understanding the Problem

High rates of unplanned admissions and adverse events are not only costly to the health care system, but may also indicate low-quality care during a prior hospital stay or contribute to poor care coordination in post-acute care.

Unplanned Admission: When an individual arrives at a hospital or skilled nursing facility (SNF) due to an urgent and/or unexpected condition.

Unnecessary institutionalization can also expose patients to medical risk, and can result in adverse events, including hospital-acquired infections and death.

Adverse Event: A negative consequence of care resulting in unintended injury or illness.

The Challenge Goals – What Participants Will Solve

1

Use AI/deep learning methodologies to **predict** unplanned hospital and SNF admissions, and adverse events within 30 days for Medicare beneficiaries.

2

Develop innovative strategies and methodologies to: **explain** the AI-derived predictions to front-line clinicians and patients.

AI HEALTH OUTCOMES CHALLENGE

We need solutions that are:

Accurate & Actionable

- Actionable data that offers more accurate predictive capabilities

- Empowers clinicians to provide appropriate resources to the highest risk patients, at the right time.

Explainable & Trustworthy

- Builds transparency and trust with clinicians and patients

- Output information is explainable and comprehensible.

AI HEALTH OUTCOMES CHALLENGE

Challenge Stages Overview

Launch **Stage**	**Stage 1:** Design	**Stage 2:** Refine	Stage 2 Winners Announced!
Public Entry All participants submit online application	**Up to 20 Launch Stage Winners** Participants develop proof of concept AI solution and white paper ___ Participants receive data file #1	**Up to 5 Stage 1 Winners** Participants refine AI solution with larger data file ___ $80k + Participants receive prize award & data file #2	**$1M** **Grand Prize** **$250k** **Runner-Up**

Launch Stage: Submission Requirements

Online Application

Application Form:

1. Participant Information

2. Background & Prior Experience

3. Proposal & Methodology

Briefing Deck

Participants describe:

1. The team

2. The solution

3. How the solution will function

4. Methods to build explainable AI

5. How the AI model will be trained

6. How the team will use a cross disciplinary-design process

7. The development timeline

Submit by June 18, 2019 at 5 PM ET
Use the online platform: ai.cms.gov

AI HEALTH OUTCOMES CHALLENGE

Eligibility Requirements

To be eligible to win a prize under the AI Health Outcomes Challenge, an individual or entity:

- Shall have timely submitted an entry to participate in the relevant Challenge stage.

- Shall have complied with all described requirements in the Public Notice.

- Shall be incorporated in and maintain a primary place of business in the United States, and in the case of an individual, whether participating singly or in a group, shall be a citizen or permanent resident of the United States.

- May not be a Federal entity or Federal employee acting within the scope of his or her employment.

AI HEALTH OUTCOMES CHALLENGE

Additional Eligibility Requirements

To be eligible to win a prize under
the AI Health Outcomes Challenge,
an individual or entity:

- Shall not be an HHS employee.

- Federal grantees may not use Federal funds to develop entries unless
consistent with the purpose of their grant award.

- Federal contractors may not use Federal funds from a contract to develop AI Health Outcomes Challenge applications or to fund efforts in support of an AI Health Outcomes Challenge entry.

- **Full terms and requirements to participate are described in the Public Notice, accessible at https://go.cms.gov/AI.**
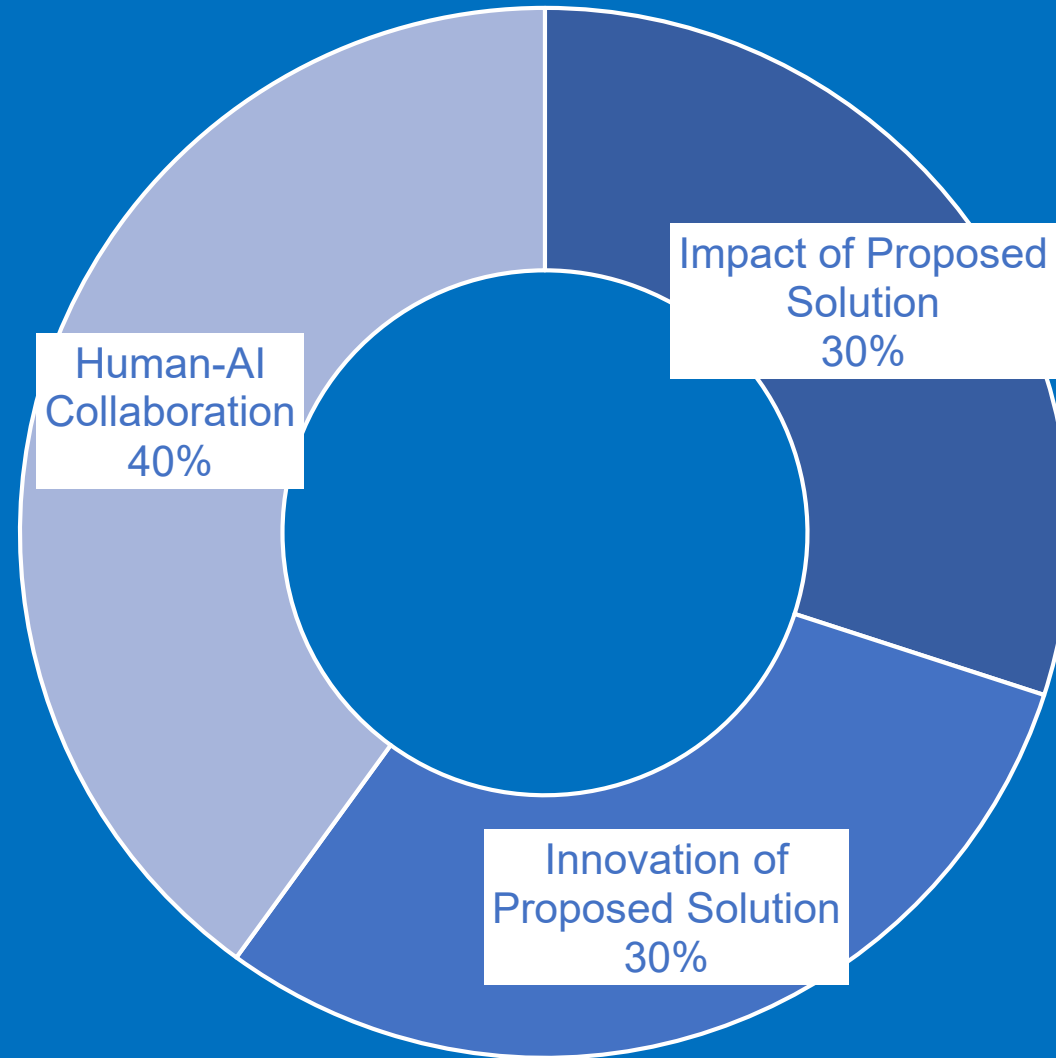
Intellectual Property Terms

- Participants are free to discuss their entry with other parties, are encouraged to share ideas/technologies publicly, collaborate or combine with other participants to strengthen their solutions, and are free to contract with any third parties.

- By participating, each participant warrants that he or she is the sole owner of, or has the right to use, any copyrightable works that the submission comprises.

- Each participant grants to CMS an irrevocable, paid-up, royalty-free nonexclusive worldwide license to reproduce, publish, post, link to, share, and display publicly the submission, and abstracts.

- Each participant must clearly delineate any Intellectual Property and/or confidential commercial information the participant wishes to protect as proprietary data.

- All materials submitted to CMS as part of an entry become CMS agency records.

- If the entry includes any third-party works, the participant must be able to provide documentation of all appropriate licenses and releases.

- See Public Notice for additional intellectual property terms at https://go.cms.gov/AI.

Launch Stage
Evaluation Criteria

*Subject to Change

Participant qualifications and history will also be assessed but not included in the weighted score.

Impact of Proposed Solution
30%

Human-AI Collaboration
40%

Innovation of Proposed Solution
30%

AI HEALTH OUTCOMES CHALLENGE

Impact of Proposed Solution (30%)

To what extent is the proposed approach operationally feasible for CMS?

How likely is it to succeed in predicting unplanned hospital and SNF admissions and adverse events?

Did the participant identify potential roadblocks to implementation and suggest ideas to facilitate resolution of such roadblocks?

Impact of Proposed Solution 30%

Innovation of Proposed Solution 30%
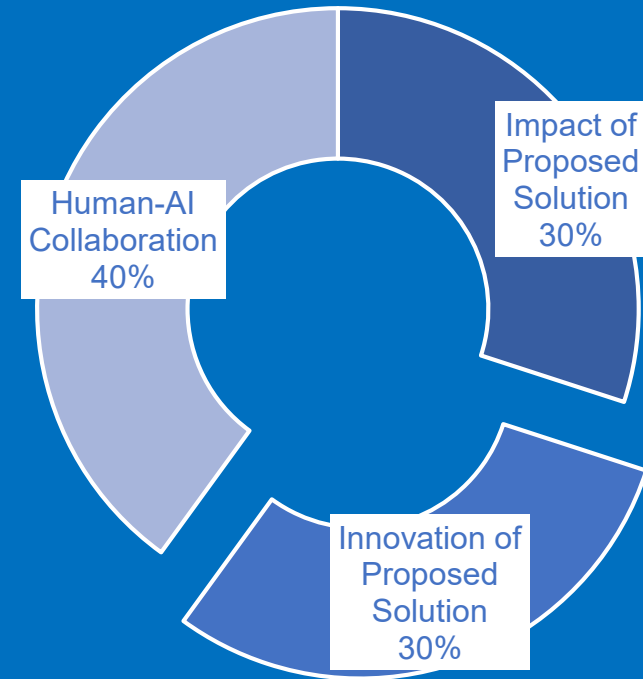
Human-AI Collaboration 40%
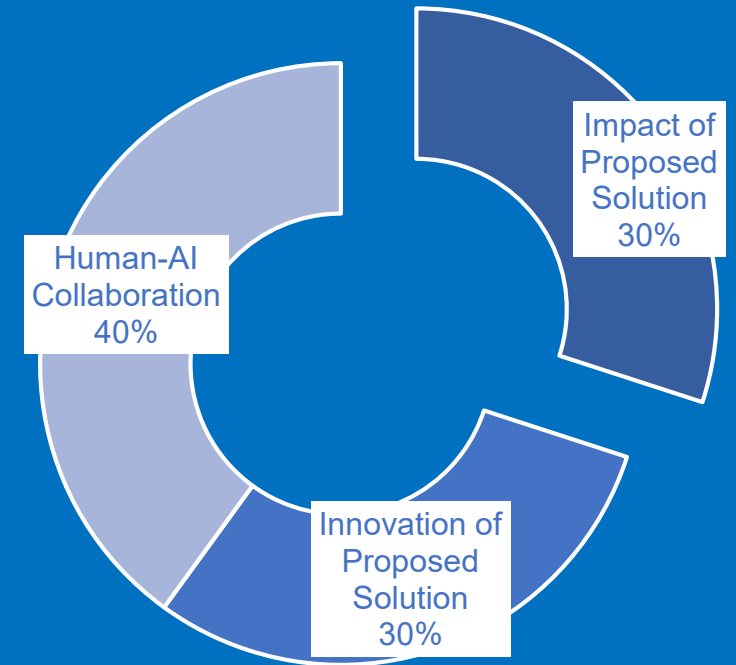
Innovation of Proposed Solution (30%)

To what degree is the proposed design innovative, creative, and original?

To what extent did the participant demonstrate how the proposed solution can outperform existing approaches?

To what extent has the participant identified other data sets and/or types of information that would be useful to further refine their solutions following the competition?

Impact of Proposed Solution 30%

Human-AI Collaboration 40%

Innovation of Proposed Solution 30%

HEALTH OUTCOMES CHALLENGE

Human-AI Collaboration (40%)

To what extent has the participant explained how the proposed AI tool will work with humans (clinicians and patients) to achieve the desired results?

To what extent has the participant demonstrated a link between the proposed solution and benefit to the Medicare population and potential impact on current health care practice and delivery methods?

To what extent has the participant identified strategies and tools to explain AI predictions to clinicians and patients to build trust and drive transparency?

Human-AI
Collaboration
40%

Impact of
Proposed
Solution
30%

Innovation of
Proposed
Solution
30%
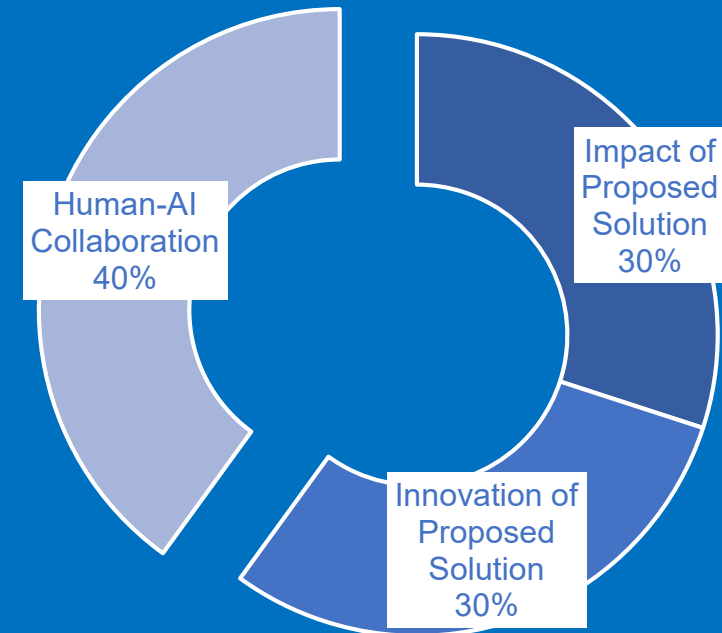
Medicare Fee-for-Service Competition Data

Stage 1 participants may request 5 years of data and Stage 2 finalists may request an additional, continuous 5 years of data for the same set of ~2.5-3 million beneficiaries.

Participants will follow the CMS process to sign Data Use Agreement (DUA) to access the Limited Data Set (LDS), free of charge. There are specific terms under the DUA that participants must follow, including but not limited to providing a valid research purpose for the data, and publishing research findings. More information about the LDS and DUA can be found in the Public Notice at https://go.cms.gov/AI.

LDS files contain beneficiary-level health information, but exclude specified direct identifiers.

Limited Data Set Snapshot

2.5-3 Million
De-identified Beneficiaries

290 MM
5 Year Claims Total

220 GB
File Size

2013-2017
5 Year Time Frame

1.47 Billion
5 Year Record Total

Outcomes are known.

File Characteristics
- 5% Sample of Medicare Parts A/B
- Random
- Structured
- Continuous

7 Analytical Files
Non-institutional & Institutional

Non-Institutional
1. Carrier
2. Durable Medical Equipment

Institutional
1. Home Health
2. Hospice
3. Inpatient
4. Outpatient
5. Skilled Nursing Facility (SNF)

AI HEALTH OUTCOMES CHALLENGE

How to Enter

1

Get Smart

on the problem, competition data, submission requirements, and judging criteria

2

Register

for the challenge at ai.cms.gov

3

Attend

informational webinars

4

Submit

your application by **June 18, 2019 at 5 p.m. ET.**

AI HEALTH OUTCOMES CHALLENGE
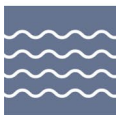
Challenge Updates

+600

Teams Registered

Additional information regarding the Challenge, information on the competition data, and details of the later stages will be provided throughout 2019.

Additional information will be published on the challenge platform: ai.cms.gov

Discussion