# AMBOSS Cross Talk

# AI-ENABLED MEDICAL DEVICES

## Progress • Potential • Challenges

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# CONTENT

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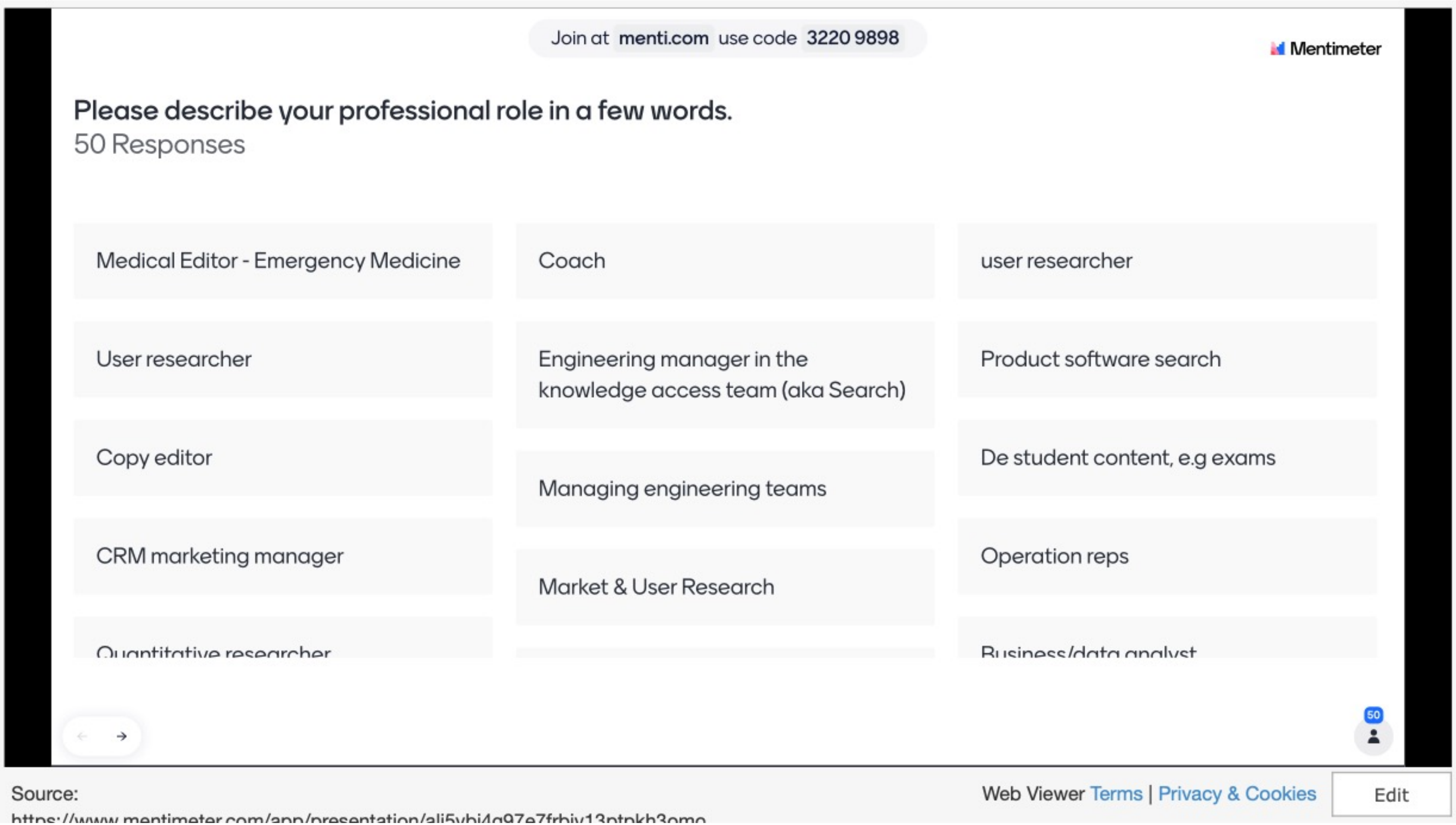
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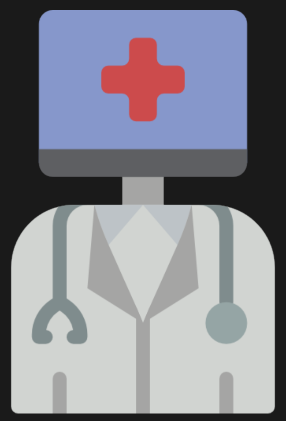
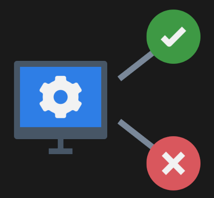
# Use cases for artificial intelligence in healthcare



# USE CASES FOR ARTIFICIAL INTELLIGENCE IN HEALTHCARE



## CLINICAL DECISION SUPPORT

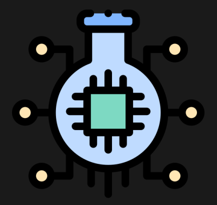
- Assisting clinicians in making decisions
- Using algorithms to analyze medical data
- Providing evidence-based treatment options, or alerts

## ADMINISTRATIVE TASKS

- Appointment scheduling
- Processing patient information
- Supply chain management

## TRAINING AND EDUCATION

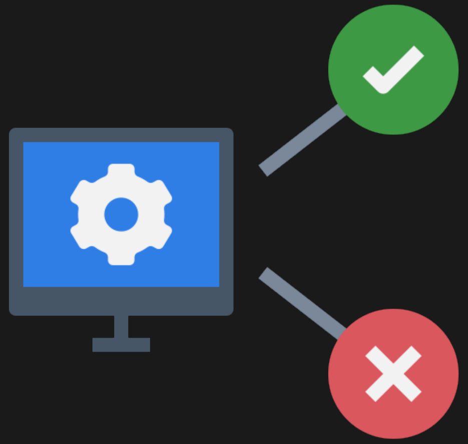
- Automated feedback systems
- Simulation of medical conditions



## RESEARCH

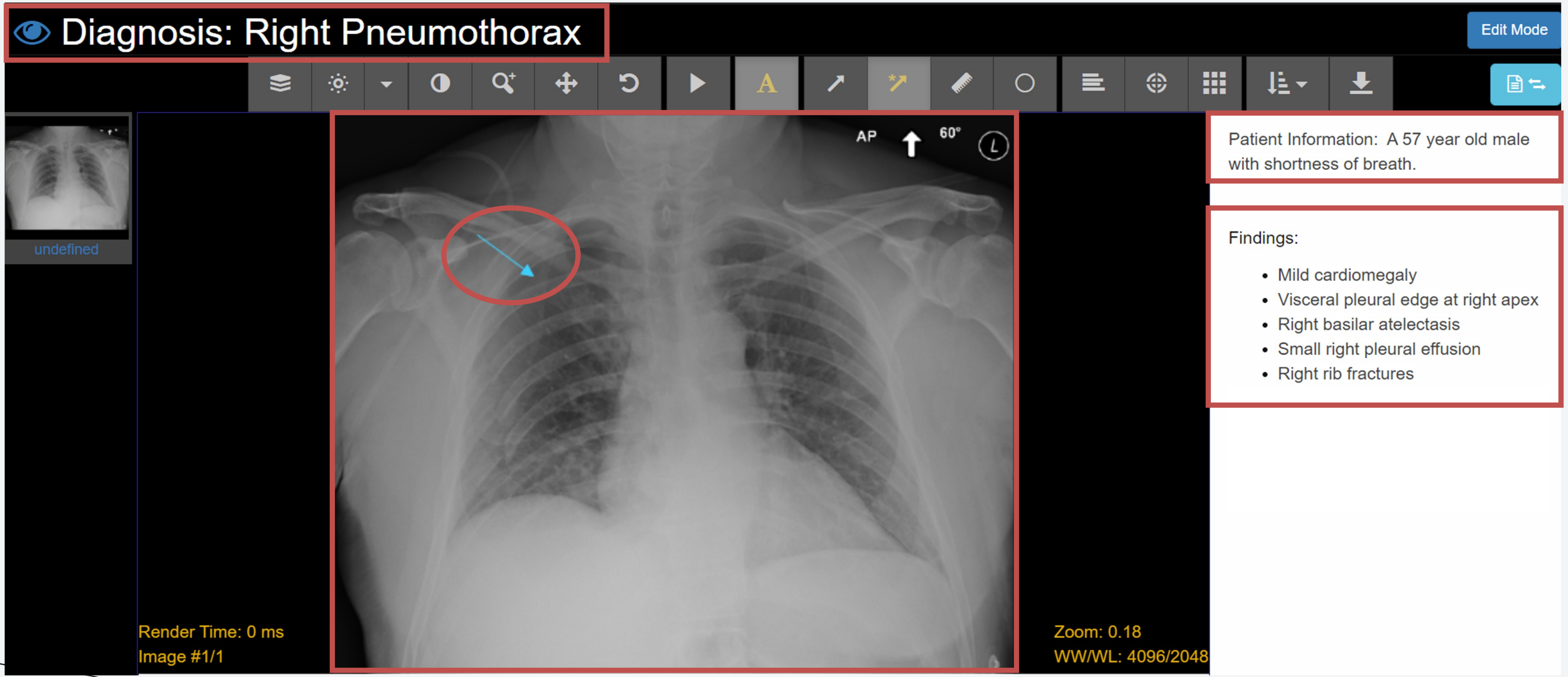
- New drug discovery
- New technologies and technological features
- Gentic profiles

# ARTIFICIAL INTELLIGENCE IN THE HEALTHCARE CONTEXT: PERCEIVED RISK



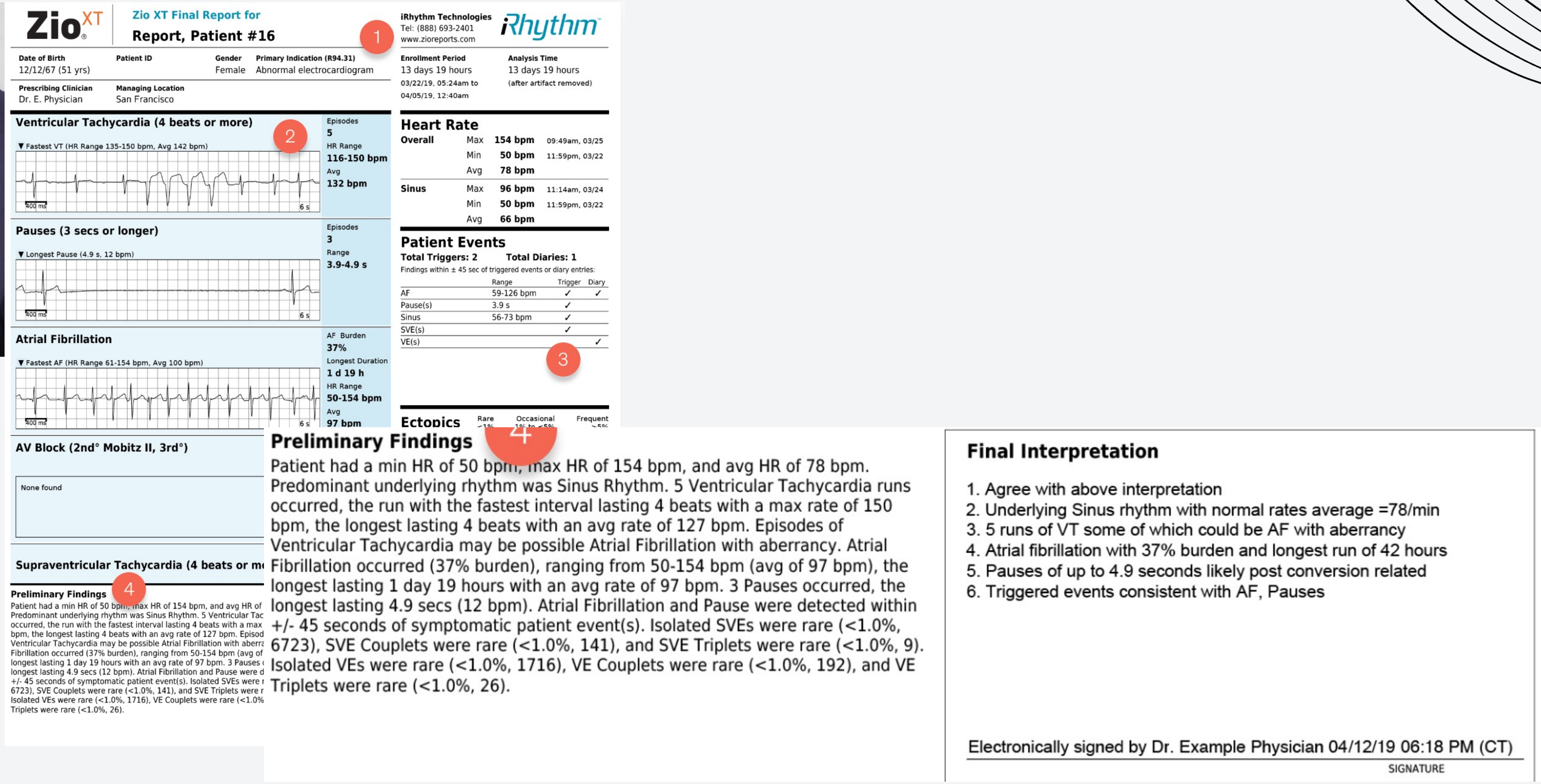
# AI-enabled clinical decision support in different medical fields

# AI in radiology




Source: OWN

# AI in cardiology



Zio XT Final Report for
Report, Patient #16

iRhythm Technologies
Tel: (888) 693-2401
www.zioreports.com

| Date of Birth | Patient ID | Gender | Primary Indication (R94.31) |
|---|---|---|---|
| 12/12/67 (51 yrs) | | Female | Abnormal electrocardiogram |

| Prescribing Clinician | Managing Location |
|---|---|
| Dr. E. Physician | San Francisco |

| Enrollment Period | Analysis Time |
|---|---|
| 13 days 19 hours 03/22/19, 05:24am to 04/05/19, 12:40am | 13 days 19 hours (after artifact removed) |

**Ventricular Tachycardia (4 beats or more)**
Fastest VT (HR Range 135-150 bpm, Avg 142 bpm)
Episodes 5
HR Range 116-150 bpm
Avg 132 bpm

**Pauses (3 secs or longer)**
Longest Pause (4.9 s, 12 bpm)
Episodes 3
Range 3.9-4.9 s

**Atrial Fibrillation**
Fastest AF (HR Range 61-154 bpm, Avg 100 bpm)
AF Burden 37%
Longest Duration 1 d 19 h
HR Range 50-154 bpm
Avg 97 bpm

**AV Block (2nd° Mobitz II, 3rd°)**
None found

**Supraventricular Tachycardia (4 beats or m**

**Heart Rate**

| | | | |
|---|---|---|---|
| Overall | Max | 154 bpm | 09:49am, 03/25 |
| | Min | 50 bpm | 11:59pm, 03/22 |
| | Avg | 78 bpm | |
| Sinus | Max | 96 bpm | 11:14am, 03/24 |
| | Min | 50 bpm | 11:59pm, 03/22 |
| | Avg | 66 bpm | |

**Patient Events**
Total Triggers: 2 Total Diaries: 1
Findings within ± 45 sec of triggered events or diary entries:

| | Range | Trigger | Diary |
|---|---|---|---|
| AF | 59-126 bpm | ✓ | ✓ |
| Pause(s) | 3.9 s | ✓ | |
| Sinus | 56-73 bpm | ✓ | |
| SVE(s) | | ✓ | |
| VE(s) | | | ✓ |

**Ectopics** Rare Occasional Frequent

**Preliminary Findings**

Patient had a min HR of 50 bpm, max HR of 154 bpm, and avg HR of 78 bpm. Predominant underlying rhythm was Sinus Rhythm. 5 Ventricular Tachycardia runs occurred, the run with the fastest interval lasting 4 beats with a max rate of 150 bpm, the longest lasting 4 beats with an avg rate of 127 bpm. Episodes of Ventricular Tachycardia may be possible Atrial Fibrillation with aberrancy. Atrial Fibrillation occurred (37% burden), ranging from 50-154 bpm (avg of 97 bpm), the longest lasting 1 day 19 hours with an avg rate of 97 bpm. 3 Pauses occurred, the longest lasting 4.9 secs (12 bpm). Atrial Fibrillation and Pause were detected within +/- 45 seconds of symptomatic patient event(s). Isolated SVEs were rare (<1.0%, 6723), SVE Couplets were rare (<1.0%, 141), and SVE Triplets were rare (<1.0%, 9). Isolated VEs were rare (<1.0%, 1716), VE Couplets were rare (<1.0%, 192), and VE Triplets were rare (<1.0%, 26).

**Final Interpretation**

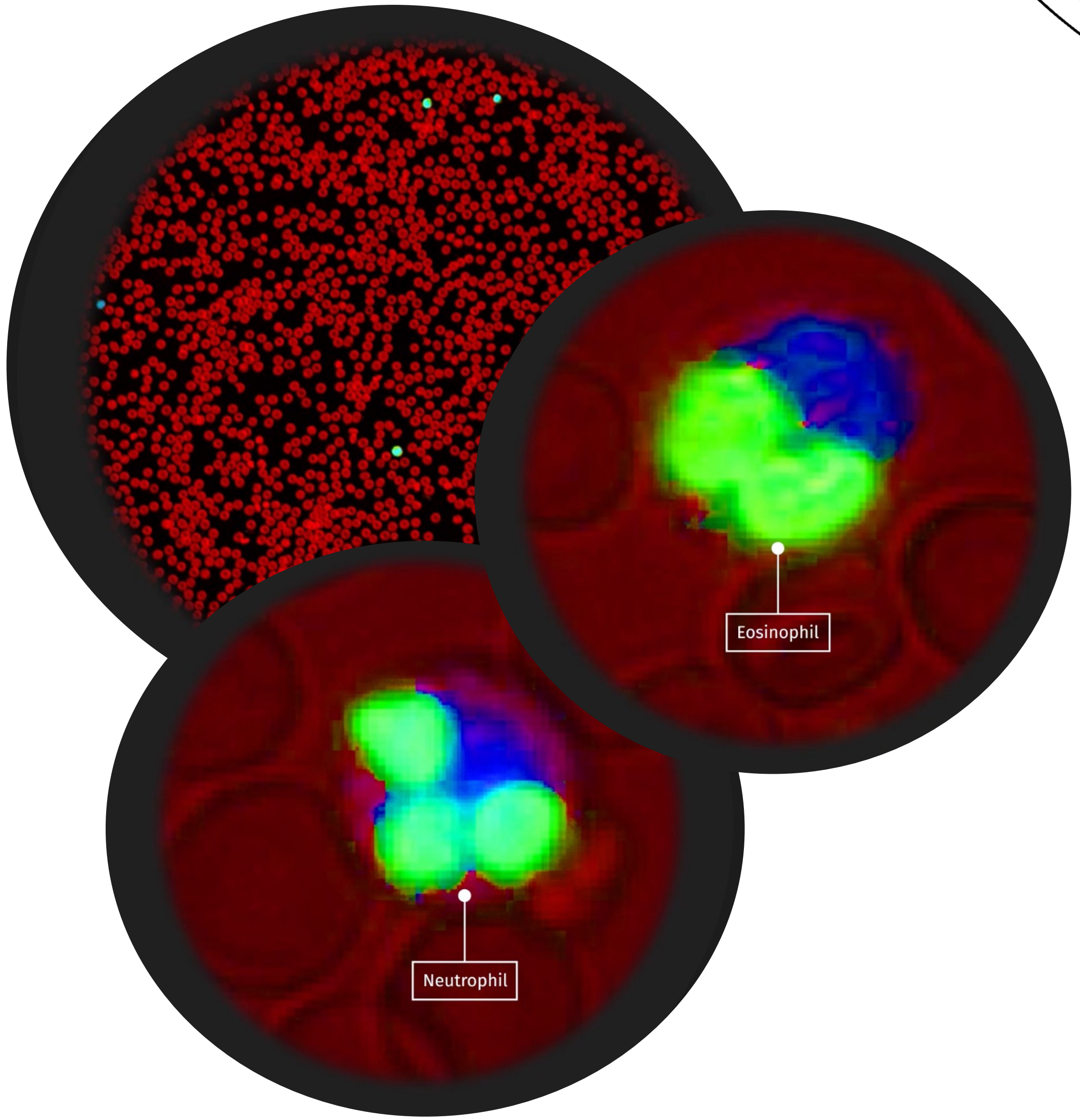
1. Agree with above interpretation
2. Underlying Sinus rhythm with normal rates average =78/min
3. 5 runs of VT some of which could be AF with aberrancy
4. Atrial fibrillation with 37% burden and longest run of 42 hours
5. Pauses of up to 4.9 seconds likely post conversion related
6. Triggered events consistent with AF, Pauses

Electronically signed by Dr. Example Physician 04/12/19 06:18 PM (CT)
SIGNATURE

Source: Zio by iRhythm, https://www.irhythmtech.com/providers/zio-service/reporting

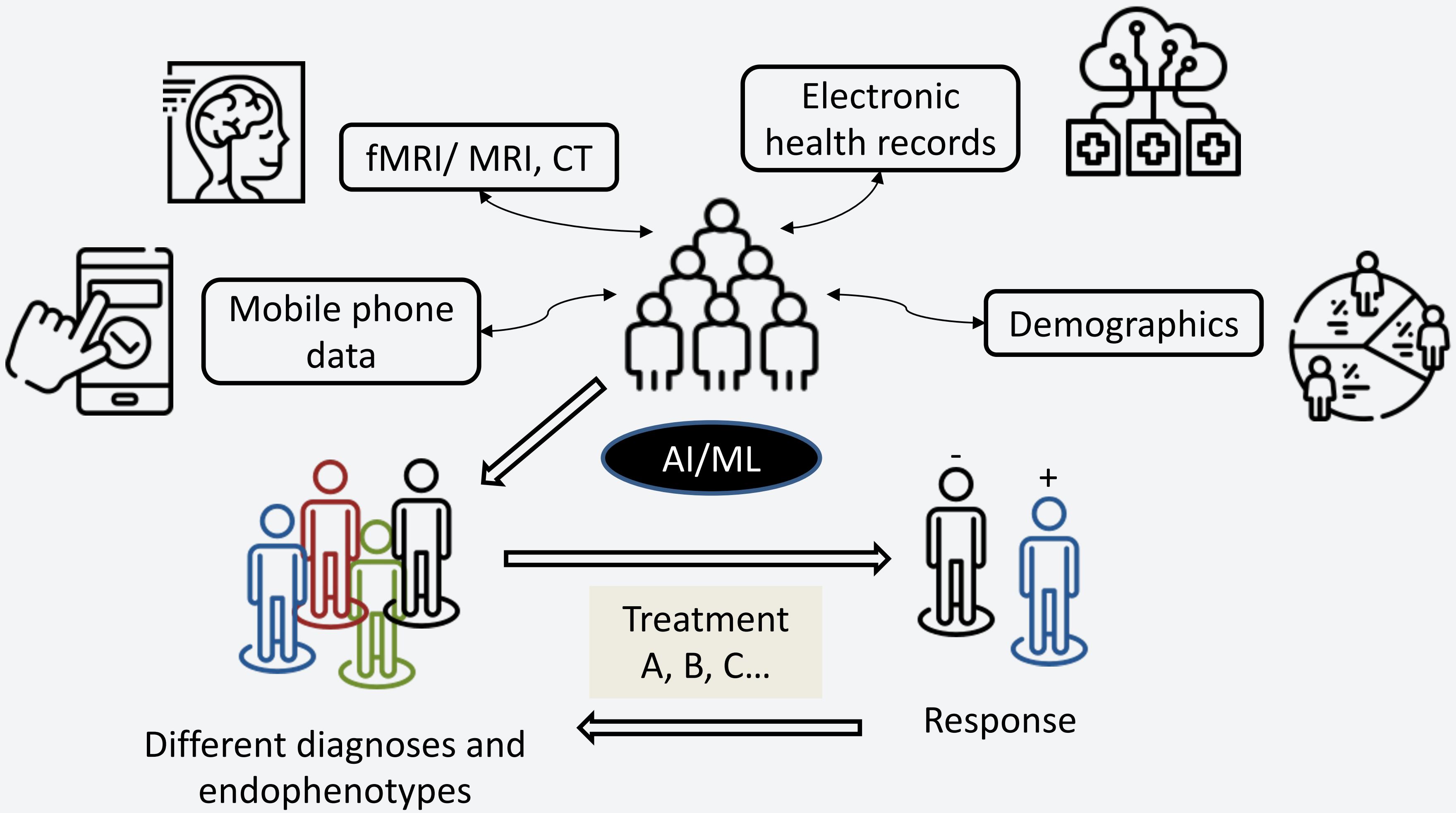
# AI in hematology





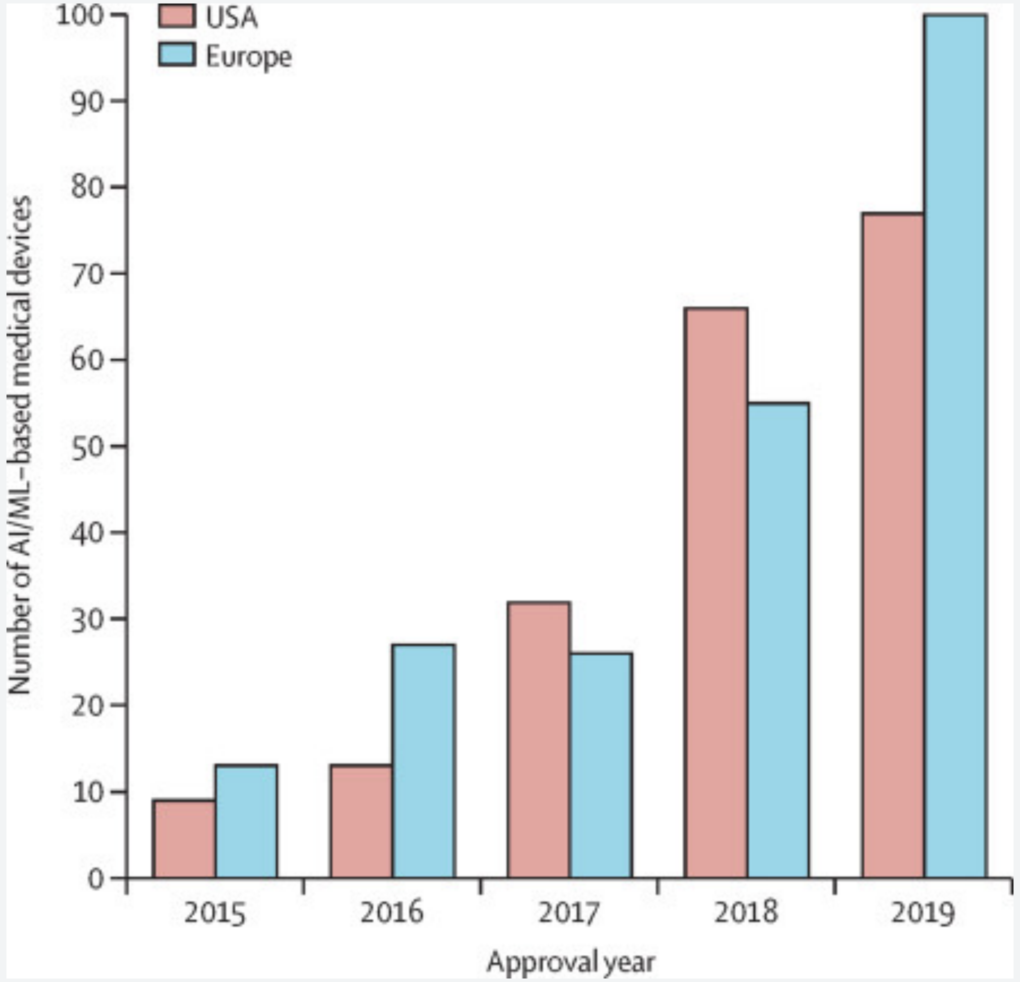

Source: Sight OLO, https://sightdx.com/en/product

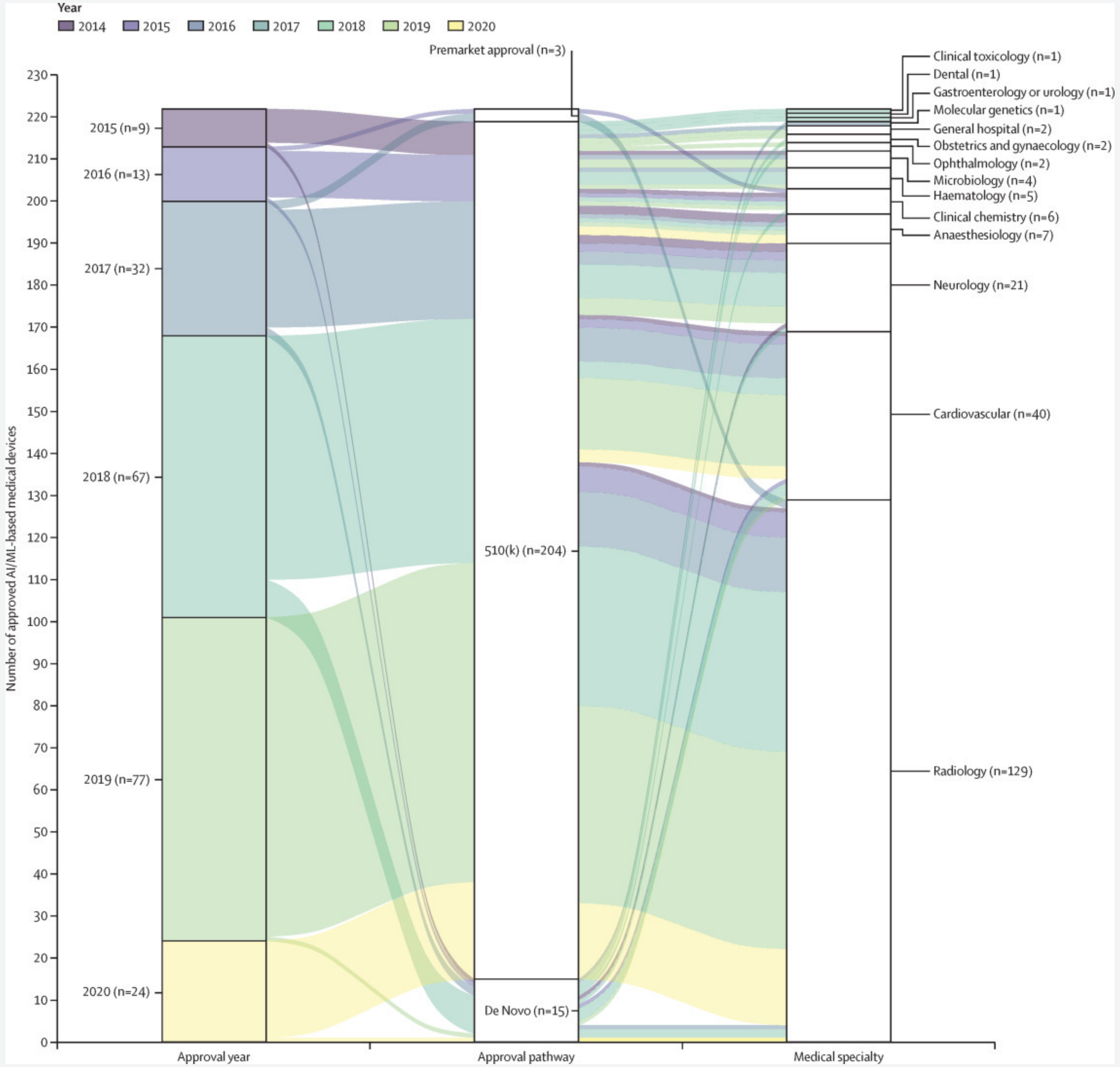
# AI in mental health: Dreams of the future




Fernandes et al., 2017

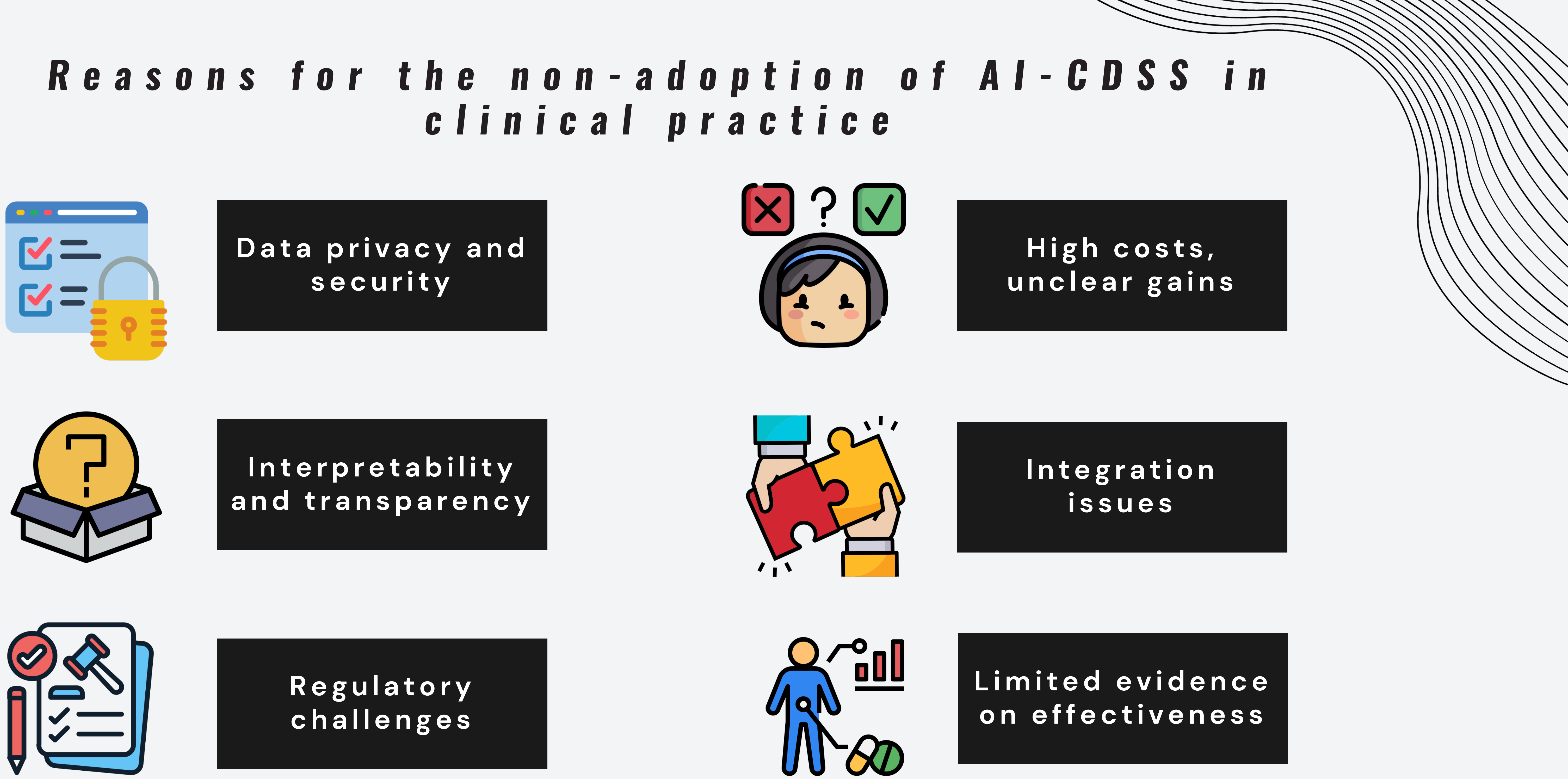
# Regulated AI-CDSS in different medical fields




Source: Muehlematter et al. (2021). Approval of artificial intelligence and machine learning-based medical devices in the USA and Europe (2015–20): a comparative analysis.

# Reasons for the lack of implementation of AI-CDSS into clinical practice


Reasons for the non-adoption of AI-CDSS in clinical practice
Data privacy and security
High costs, unclear gains
Interpretability and transparency
Integration issues
Regulatory challenges
Limited evidence on effectiveness

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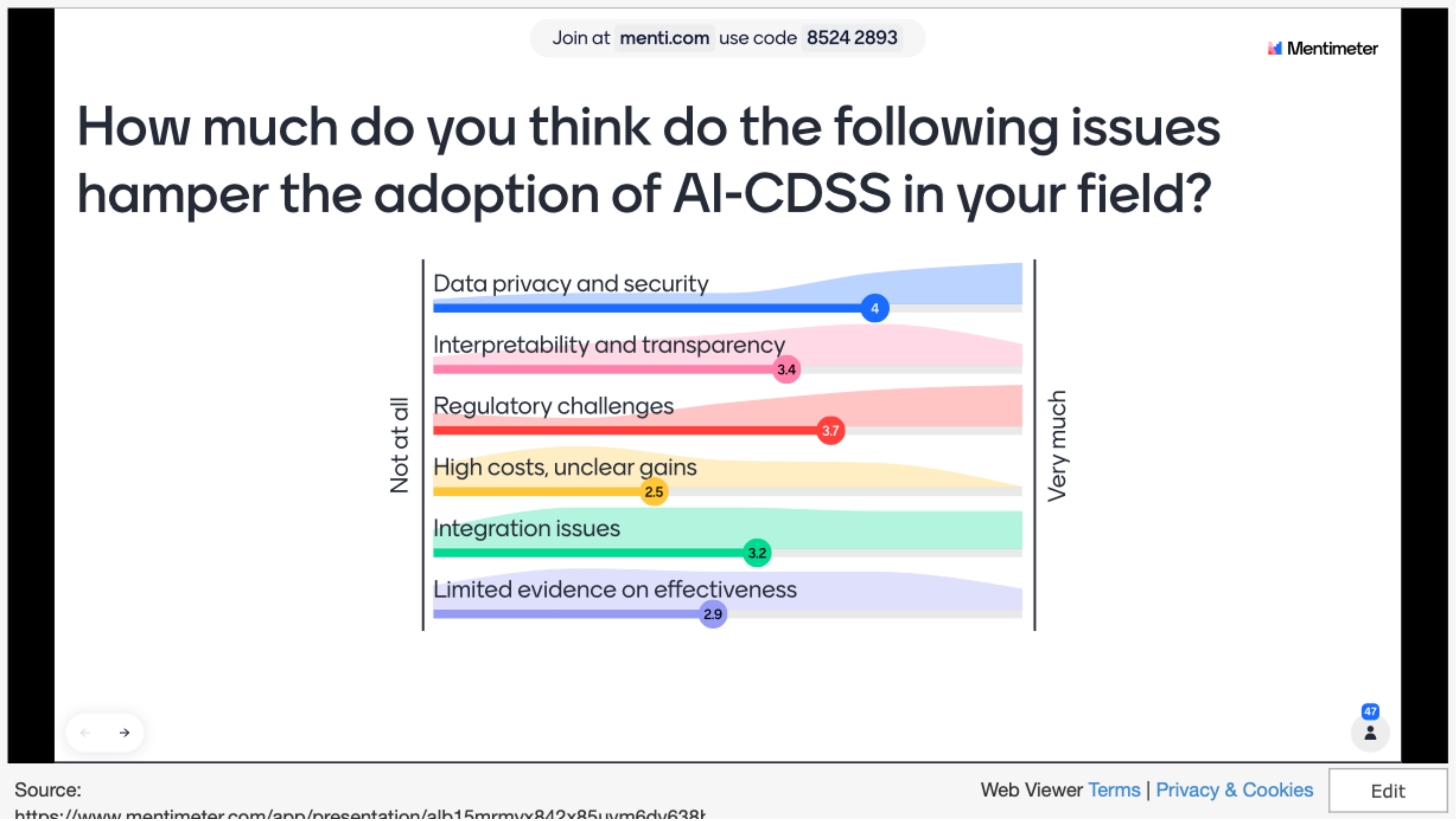
# How much do you think do the following issues hamper the adoption of AI-CDSS in your field?



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Mentimeter
How much do you think do the following issues hamper the adoption of AI-CDSS in your field?
Not at all
Very much
Data privacy and security
4
Interpretability and transparency
3.4
Regulatory challenges
3.7
High costs, unclear gains
2.5
Integration issues
3.2
Limited evidence on effectiveness
2.9
47
Source:
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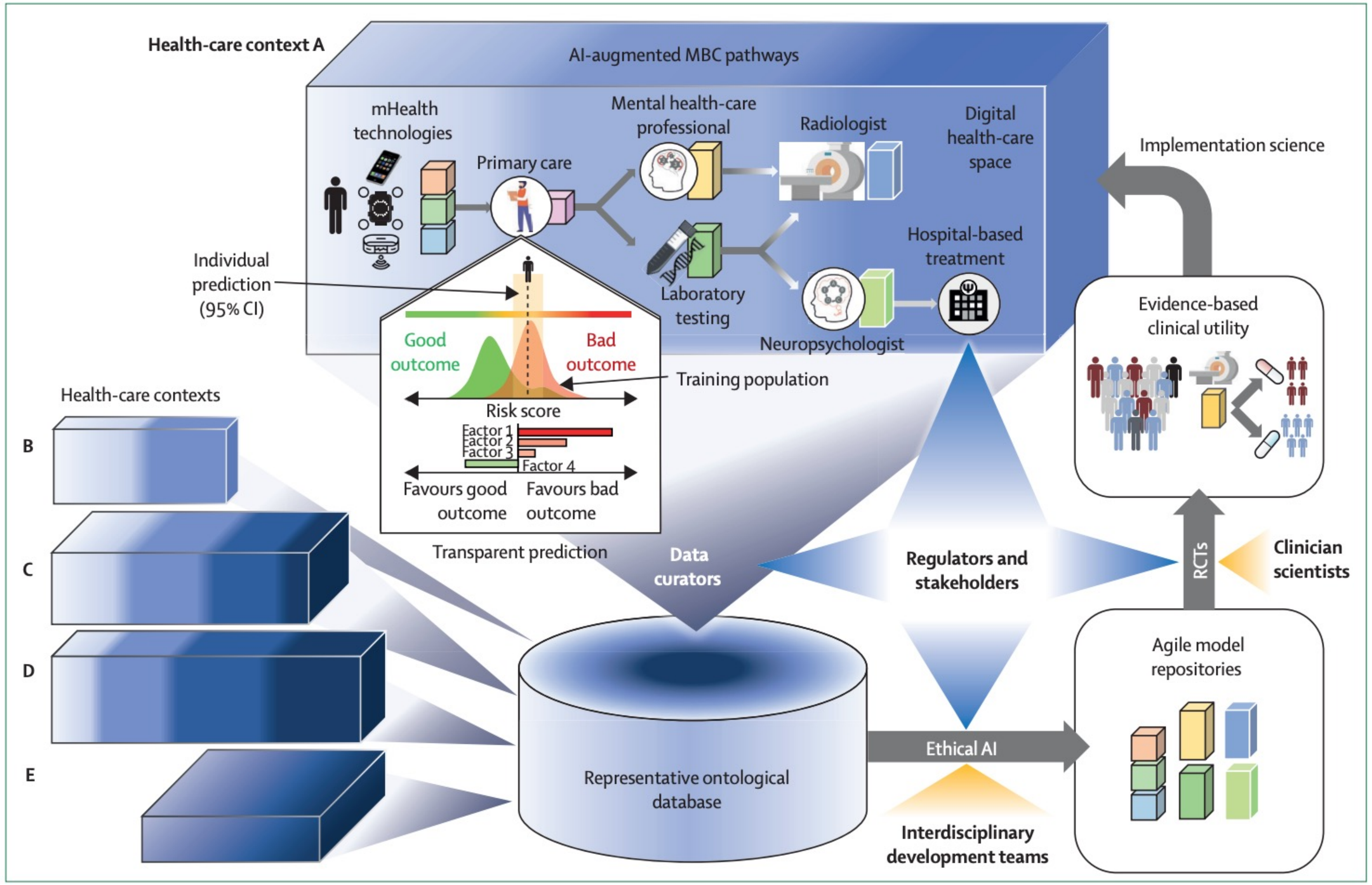
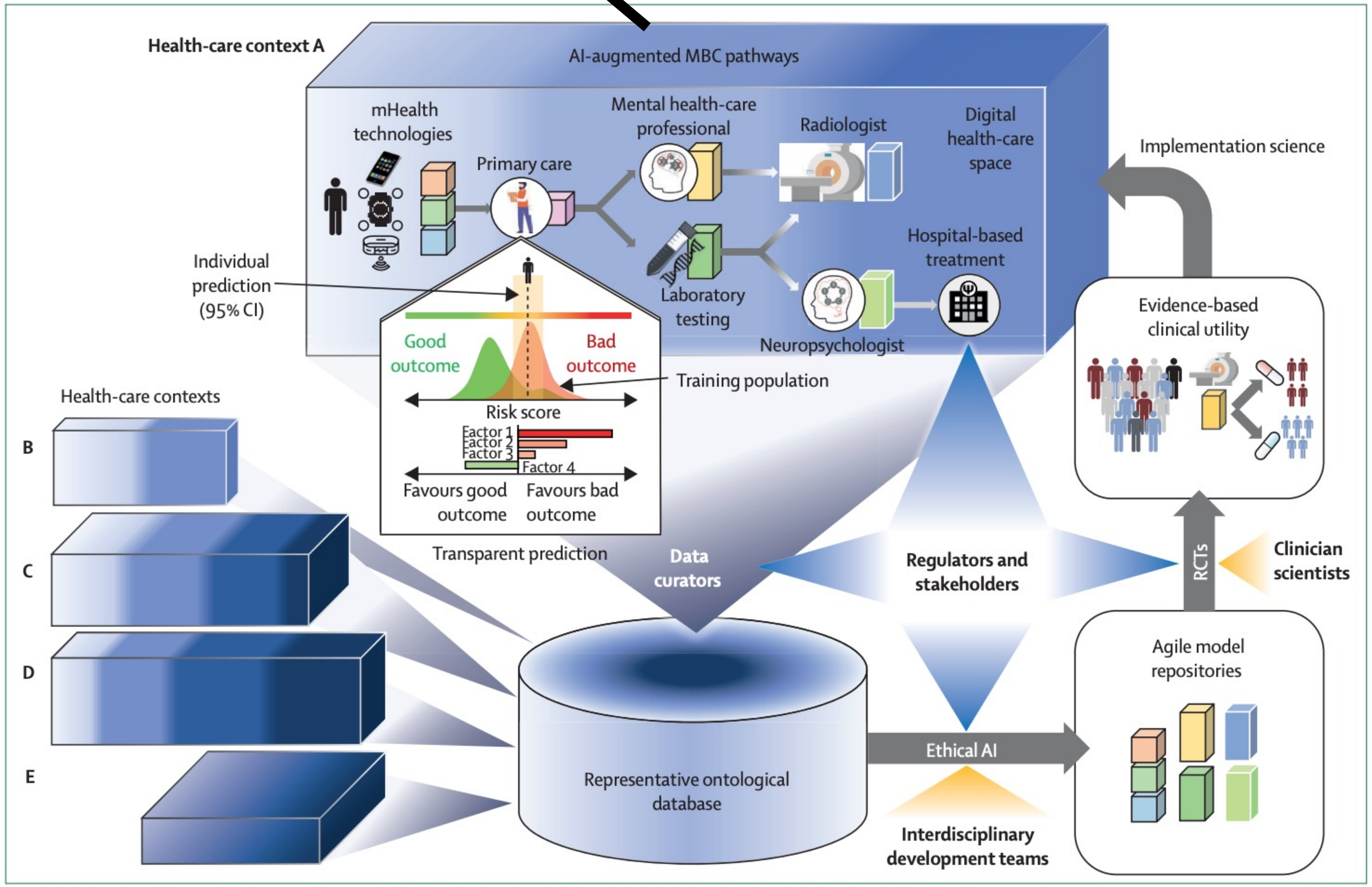
# AI-informed healthcare: A system view

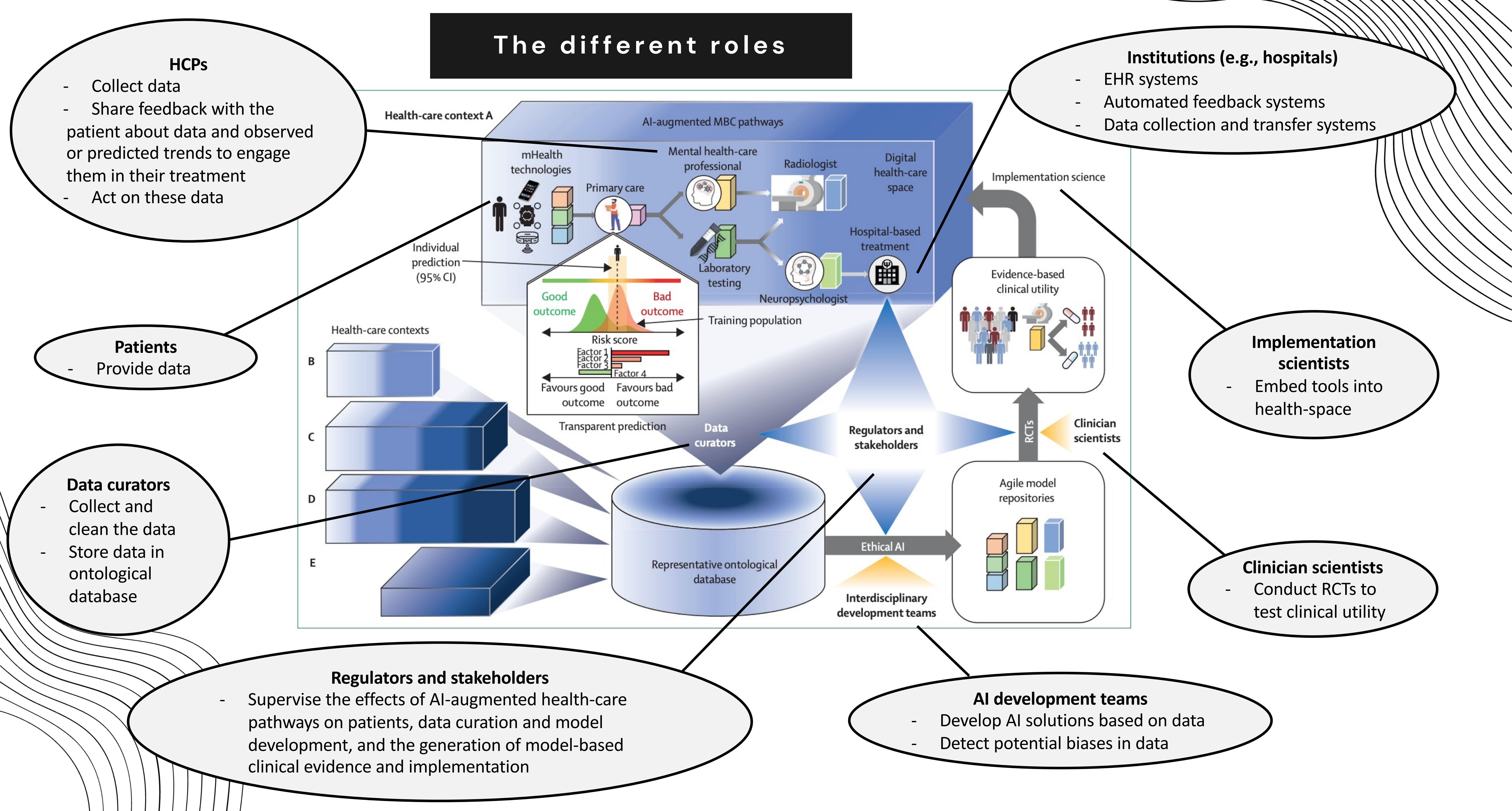
Koutsouleris et al. (2022). From promise to practice: Towards the realisation of AI-informed mental health care



Measurement-based care (MBC)

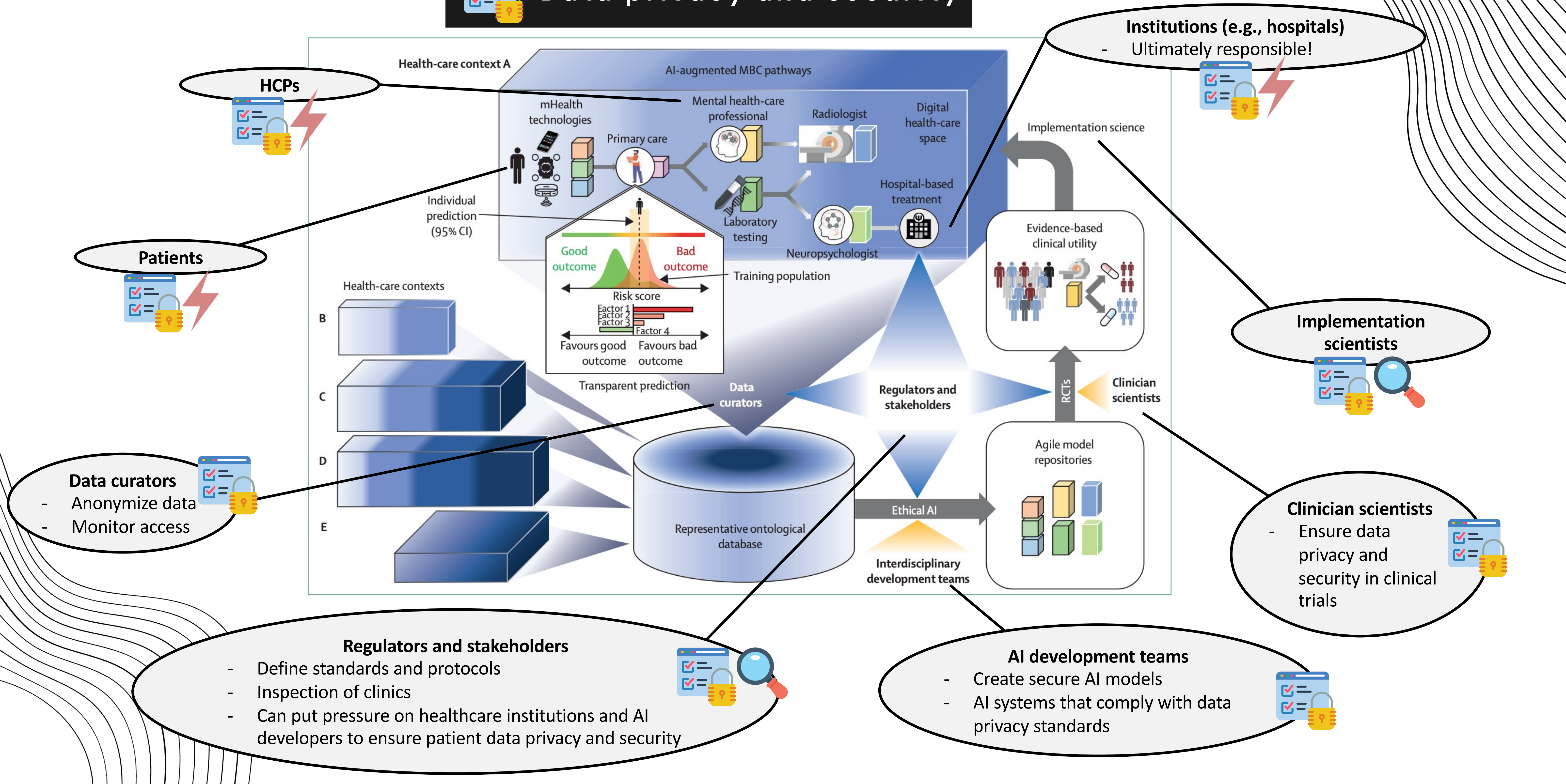
- Evidence-based practice where care providers systematically assess patient symptoms and use that information to inform treatment decisions





The different roles
HCPs
- Collect data
- Share feedback with the patient about data and observed or predicted trends to engage them in their treatment
- Act on these data
Institutions (e.g., hospitals)
- EHR systems
- Automated feedback systems
- Data collection and transfer systems
Patients
- Provide data
Implementation scientists
- Embed tools into health-space
Data curators
- Collect and clean the data
- Store data in ontological database
Clinician scientists
- Conduct RCTs to test clinical utility
Regulators and stakeholders
- Supervise the effects of AI-augmented health-care pathways on patients, data curation and model development, and the generation of model-based clinical evidence and implementation
AI development teams
- Develop AI solutions based on data
- Detect potential biases in data
Health-care context A
AI-augmented MBC pathways
mHealth technologies
Primary care
Mental health-care professional
Radiologist
Digital health-care space
Hospital-based treatment
Laboratory testing
Neuropsychologist
Individual prediction (95% CI)
Good outcome
Bad outcome
Risk score
Factor 1
Factor 2
Factor 3
Factor 4
Favours good outcome
Favours bad outcome
Transparent prediction
Training population
Implementation science
Evidence-based clinical utility
Health-care contexts
B
C
D
E
Data curators
Regulators and stakeholders
RCTs
Clinician scientists
Agile model repositories
Representative ontological database
Ethical AI
Interdisciplinary development teams

# Data privacy and security



# THANK YOU!

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https://www.annekathrinkleine.com

## RESOURCES


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