Equalising health, personalizing experiences and removing bias in AI

Dr Ewelina Türk
Senior Vice President, Medical Product

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The challenges facing our industry

Access to care

- 18 million global staff shortfall by 2030[1]
- GPs have <15 minutes per patient[2]
- 40% of ED attendances are unnecessary[3]

Quality

- Satisfaction in healthcare lowest since 1997[4]
- 4-9 years to diagnose a rare disease[5]
- 50% of GP appts are for long-term conditions[6]

Outcomes

- 75% of consumers want more personalized experiences[7]
- 27% of all spending is on preventable illness[8]
- 4x higher costs for adults with low health literacy[9]

1. WHO/KPMG, 2019 2. The Health Foundation, 2016 3. NHS England, 2013 4. Kings Fund, 2022. 5. Isono, M. et al, 20224. 6. NHS England, 2014 7. Dynata, 2020 8. Galea, S. & Maani, N., 2020 9. Partnership for Clear Health Communication via Centre for Healthcare Strategies, 2013

Done right, AI can help tackle these challenges, and more

Save time collecting information needed for the next step

Guide people to the right next steps at the right time

Empower people to take care of their health

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Potential problems of bias in Artificial Intelligence (AI) in healthcare

Examples of bias:

- Bias in literature and data:
  - Data mostly focused on sub-populations (e.g. EHR, population studies)
  - Limited ethnicity, i.e. white men
  - western populations with high income and high literacy
- Account for differences:
  - in occurrence of conditions
  - in healthcare systems
  - in how people are treated
- Failure to adapt fast to changing circumstances, i.e. COVID, monkeypox

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Impact of bias:

- Models built on unrepresentative / low diversity data
- Unpersonalized and impersonal experiences
- Unsafe and inaccurate
- Not appropriate for many communities
- Prevents health equity and personalization
- Can discriminate against those most in need of health support (LMICs, underfunded, low access, literacy, high health inequality users)

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Comparing AI vs Machine Learning

Bias	Expert-written decision trees	Machine learning models	Ada's AI
Premature closure	**Yes** If a case is classified in the wrong branch, there is no way back	**No** All options are open at all stages	**No** All options are open at all stages
Population bias	**Yes** Concentrate on common presentations	**Yes** Strong bias towards the training sub-population	**No** Universal because it's based on medical knowledge, valid in all sub-populations
Confirmation bias of a human doctor using the system	**Moderate** The doctor visiting the patient and the expert who wrote the tree are likely to make similar mistakes that can reinforce each other	**Strong** The system tends to reproduce the same mistakes that doctors make most often, reinforcing them	**Low** Ada's mistakes are independent of doctor's mistakes and can correct each other

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Why Ada exists?

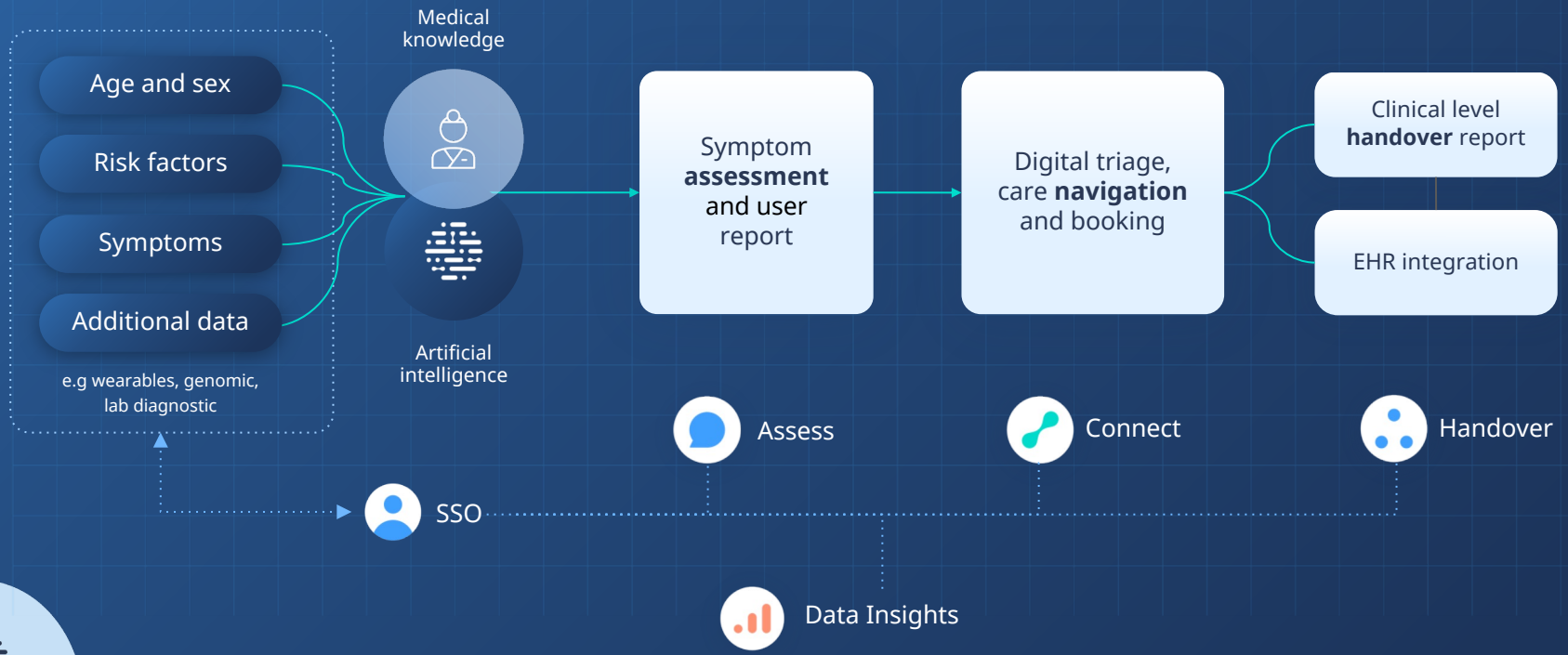
Guidance

- Give access to high quality medical information
- Guide people towards the right next steps at the right time, in the right place

Enable personalization:

- Take different factors into account
- Changes to region, sex, age, risk factors lead to a different assessment outcome

Provide a single point of entry to safely and efficiently guide them through your system



Our clinical focus is designed to avoid bias

Ada's models address bias by being tailored to needs to specific populations, locations and backgrounds

1 million+ hours
of clinician time invested into our medical knowledge

14,000+
unique sources used to model Ada's conditions

Every condition
is manually tested against 15-20 cases by at least 4 human doctors

1,000+
verification cases created by external doctors and published case reports

6,000
automated test cases used continuously review and optimize Ada's performance

2 weeks
New medical content and optimizations released every 14 days

Ensuring that our Ada can accurately interpret thousands of conditions.

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We built and maintain Ada to avoid bias, remain accurate and safe for all

- Unmatched medical knowledge, built by doctors
- Highly accurate, probabilistic reasoning AI
- The highest safety standards
- Proven user satisfaction
- Peer-reviewed and objective research
- A robust approach to governance

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Ada excels in peer-reviewed published research

Peer Reviewed

Quality

99%

condition coverage[1]

3x

more accurate than some competitors[1]

Safety

97%

Advice safety, on par with GPs[1]

Stanford University

Ada's advice is comparable to human triage nurses[6]

Efficiency

20%

reduction in primary care consultation time[2]

54%

reduced wait time to see triage nurse[3]

13%

would de-escalate care to less urgent or self care[2]

Outcomes

50-70%

reduction in diagnostic costs of rare disease if Ada had been used to support earlier[4]

54%

of rare disease cases Ada identified correctly sooner than the time of clinical diagnosis[5]

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[1]Gilbert, S., et al. BMJ Open, (2020), doi: 10.1101/2020.05.07.2009387. [2]Miller, S., et al. JMIR Hum Factors, (2020), doi: 10.2196/19713.
[3]Montazeri M., et al. JMIR Form Res (2021), doi: 10.2196/26402. [4]Willmen T., et al. BMC Health Serv Res. (2021), doi: 10.1186/s12913-021-06926-y.
[5]Ronicke S., et al. Orphanet J of Rare Diseases (2019), doi: 10.1186/s13023-019-1040-6

Compliance with regulatory, quality and data standards

CE Mark
MDR Class I medical device, Class IIa certification pending.

ISO 27001
Certified with the quality standard for information security.

ISO 14971
Medical device risk management.

ISO 13485
Certified quality management system.

EU-GDPR compliant
European Union General Data Protection Regulation.

HIPAA compliant
Certified PHI protection system.

Case study

Personalizing care while removing bias for 10 million pregnant women, new mums and babies in South Africa

Problem statement:

Maternal and child health challenges in SA differ from those in the West. Much research and clinical knowledge is based on western populations.

How does Ada cater for these differences?

Native clinical review
local physicians create and optimize condition models

Localization
Knowledge base adapted to account for regional differences in disease incidence and presentation

Accessibility
Readability of Ada's medical content reduced from grade 11 to grade 7

Approach to AI
Ada's interpretable and human-reviewable AI can be reviewed and tested for bias

Collaboration
with local partners, clinicians, and users to identify and further reduce bias

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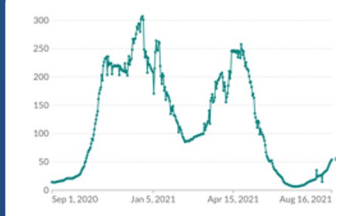
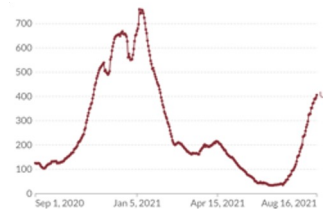
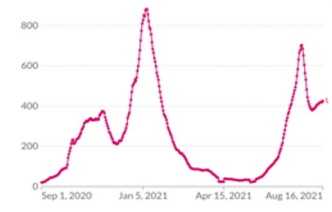
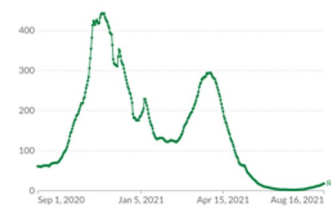
The ROCKEFELLER FOUNDATION

PRAEKELT

Data Insights: Ada's trends are highly accurate

During COVID-19 waves, Ada's top matching result matched that seen by John Hopkins University

	Germany (waves 2 and 3)	**USA** (waves 2, 3, and 4)	**UK** (waves 2 and 3)	**Romania** (waves 2 and 3)
Ada				
John Hopkins University				

01.09.2020 – 15.08.2022

In summary

- Global challenges require global solutions.
- Bias is common in AI models and often hard to avoid.
- Bias creates inequality - modern technology must take all possible steps to identify bias and remove or avoid.
- AI solutions should be designed and adapted for the needs of the local population for unbiased, personalized experiences.

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Thank you

Ewelina Türk

Ada Health GmbH
Karl-Liebknecht-Str. 1
10178 Berlin
Germany

ada.com