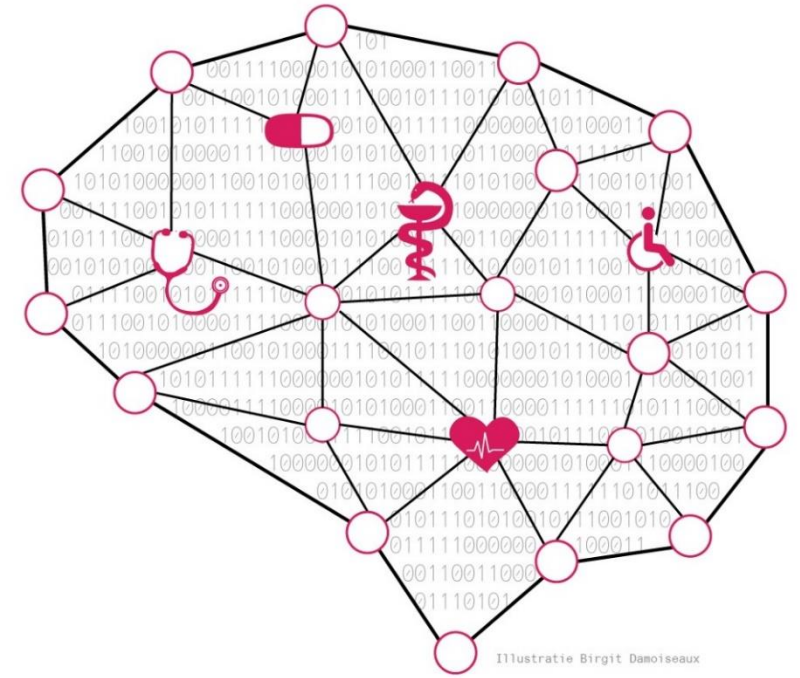
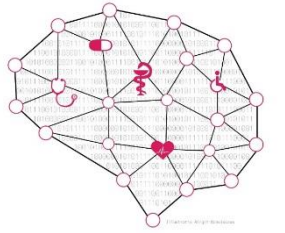




AI will see you now

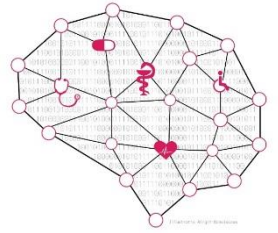
Recommendations for responsible development and use of AI in healthcare

Dr. Joanna E. Klopotoska, assistant professor, Dept. of Medical Informatics, Amsterdam UMC, location AMC



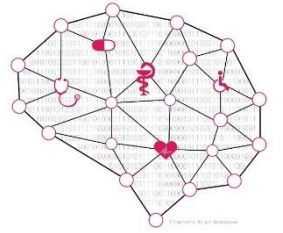
Conflict of interest to disclose

- Principle investigator of ZonMW and NWO funded research (unrestricted grants to my institution).
- Topics: use of machine learning to improve detection of adverse drug events



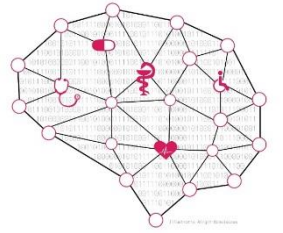
Use case

- ICU treats patients (at risk of developing) acute, life-threatening organ dysfunction.
 - ICU admission is high in costs: economically & emotionally.
 - ICU beds are scarce.
-
- Intensive life sustaining treatments (LST) in all circumstances?
 - Patient's preferences towards LST based on survival prognosis.



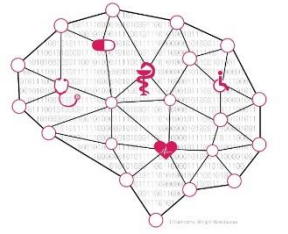
Problem

- Currently ICU survival prognoses largely based on intuitive insights of the ICU team.
- Several studies have shown that ICU physicians' estimations of such prognoses are modest.



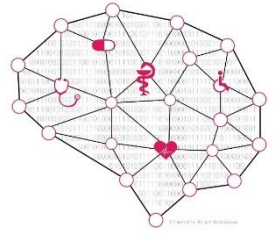
Potential solution

- Prognostic models for predicted probabilities of ICU survival.
- Machine learning based prognostic models increasingly used.
- Current understanding of patients and physicians needs and views regarding ICU survival prognosis limited.

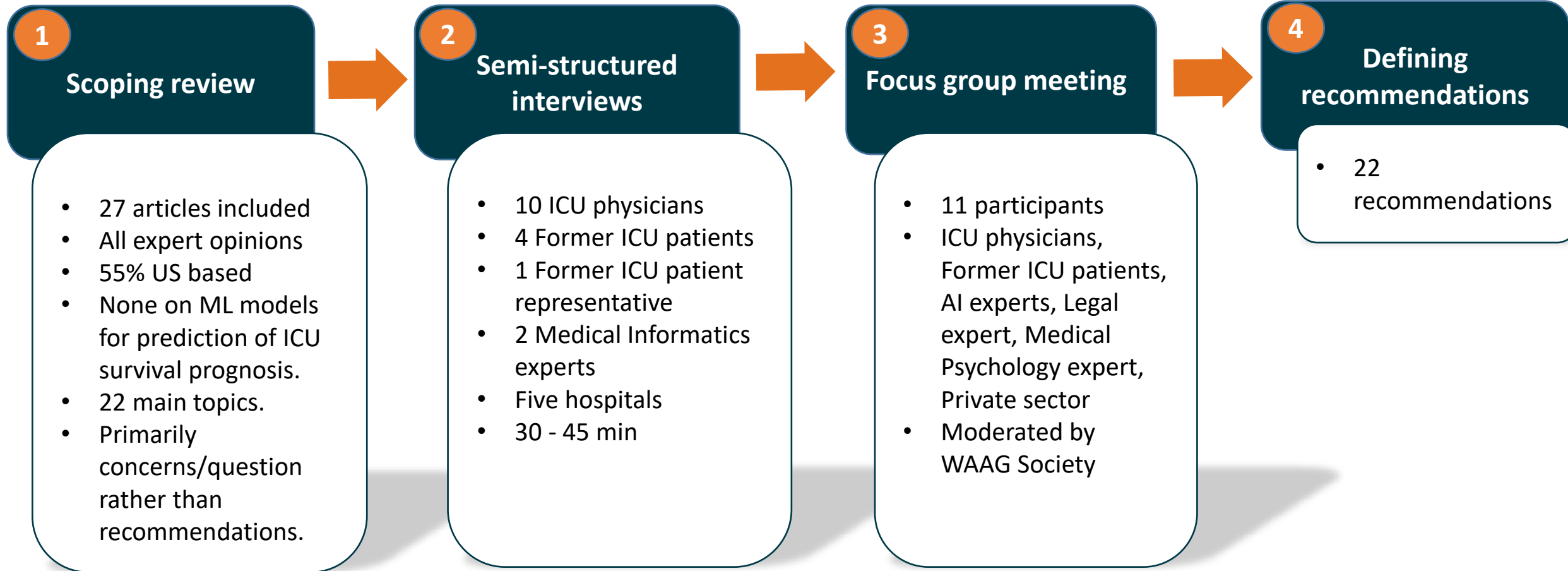


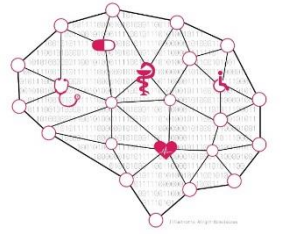
Objective

- Identify views of ICU physicians and former ICU patients regarding ML based models for the prediction of ICU survival prognosis.
- Define generic recommendations for responsible development and use of AI in healthcare based on the findings from the use case study.



Approach used





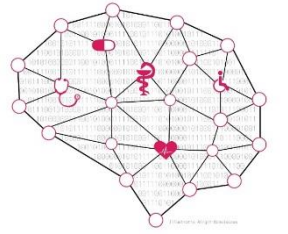
Results: interviews & focus group

Responsible development

Prediction of ICU survival prognosis by ML, may be less appropriate.

"The ICU physicians don't know the person that is lying in the ICU bed. My family does and therefore should be consulted."

"It seems decisions are made based on doctors' experience. I would like to have more substantiation and more time to talk about the options."



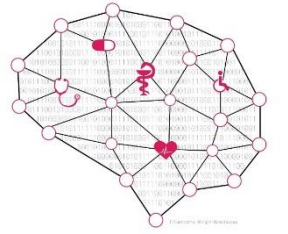
Results: interviews & focus group

Responsible development

Less trust in private companies as model developers.

"Google could easily develop such a model, but I think this is not a suitable party for healthcare. They simply have different obligations and quality standards."

"I hope these models will be developed by academic scientists working together with doctors and patients."



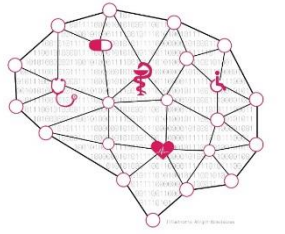
Results: interviews & focus group

Responsible use

Knowledge of end-users about ML
insufficient

"I wonder if the doctors have sufficient expertise to understand these models and explain it to me."

"I view such a model as an extra on top of doctors' expertise. AI cannot beat doctors' expertise."



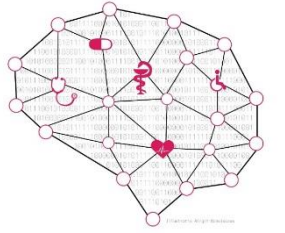
Results: interviews & focus group

Responsible use

Tension between machine learning and evidence-based medicine

"If AI leads to in-transparency, then we have replaced 'doctor knows best' with 'machine knows best'. That seems awful to me."

"I would like to know on which ICUs in the Netherlands such model is used. I would prefer to go there because it gives me extra reassurance."



Generic recommendations

Responsible development

Prediction of ICU survival prognosis by ML, may be less appropriate.

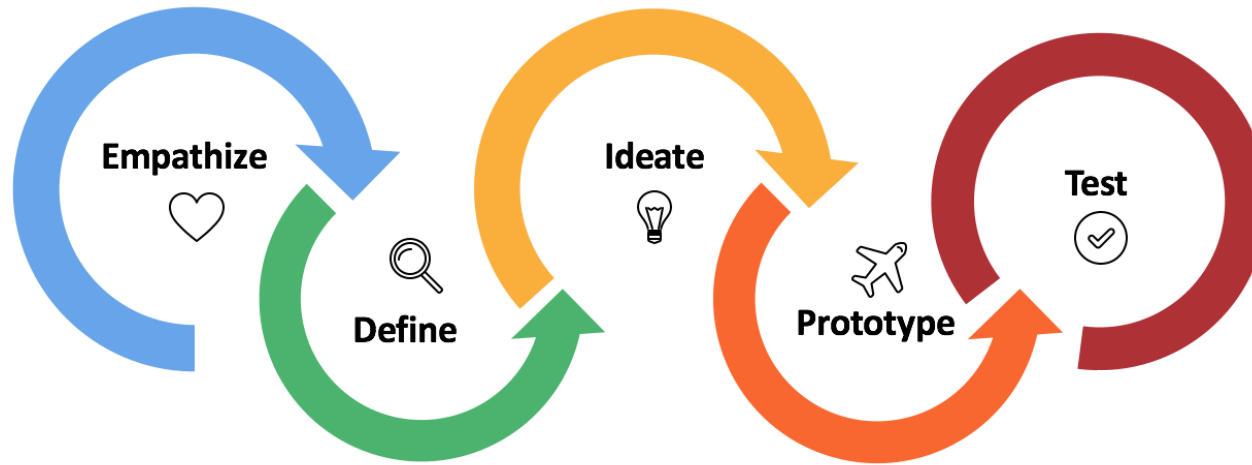
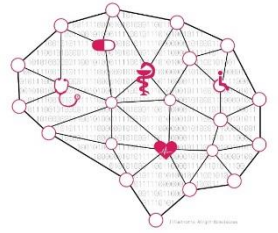
Less trust in private companies as model developers.

Avoid techno-fix.

Responsible use

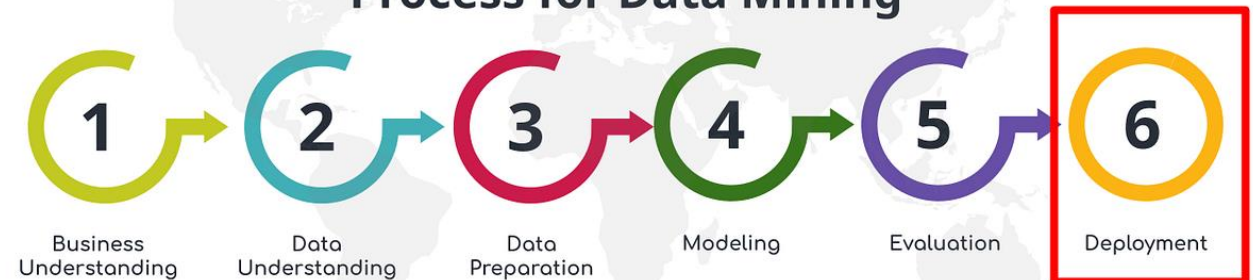
Knowledge of end-users about ML insufficient.

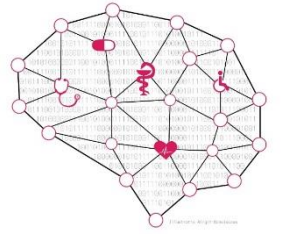
Tension between machine learning and evidence-based medicine.



Design thinking steps

CRISP-DM: The Cross-Industry Standard Process for Data Mining





Generic recommendations

Responsible development

Prediction of ICU survival prognosis by ML, may be less appropriate.

Less trust in private companies as model developers.

Avoid techno-fix.

Complementary codes of conduct and legal frameworks in the context of healthcare are needed for private companies.

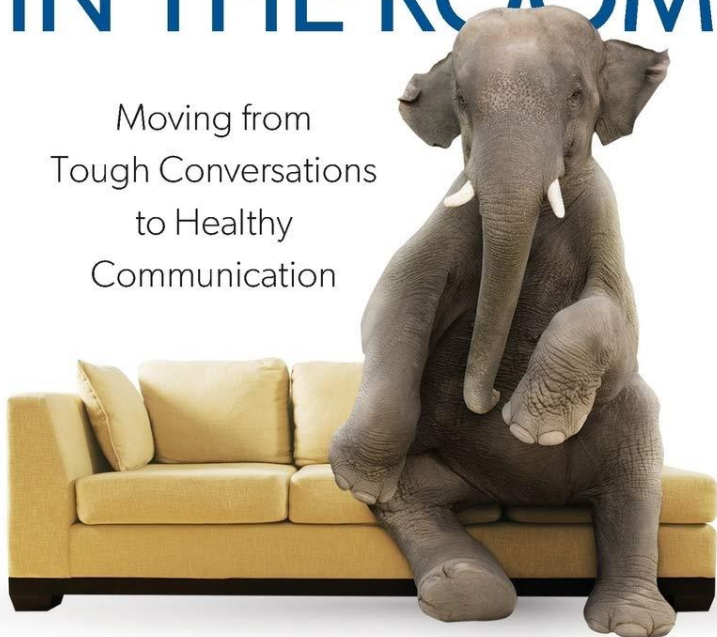
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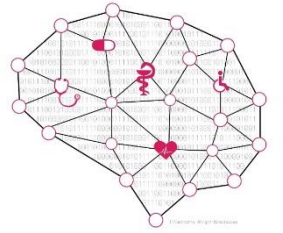
DEALING WITH THE ELEPHANT IN THE ROOM

Moving from
Tough Conversations
to Healthy
Communication



Dr. Mike Bechtle

Author of *People Can't Drive You Crazy If You Don't Give Them the Keys*

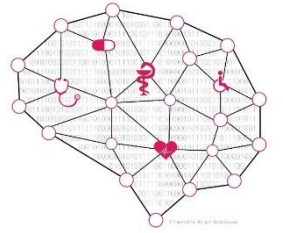


**Bad apples, bad cases, and bad barrels:
Meta-analytic evidence about sources of
unethical decisions at work.**

Kish-Gephart, J. J., Harrison, D. A., & Treviño, L. K.
Journal of Applied Psychology 2010, 95(1): 1–31

<https://doi.org/10.1037/a0017103>

*Signing own AI codes of conduct without
clearly defined and enforceable obligations is
good for the reputation of a company to the
outside world, but insufficient to guarantee
that such a party actually adheres to it.*



Generic recommendations

Responsible development

Prediction of ICU survival prognosis by ML, may be less appropriate.

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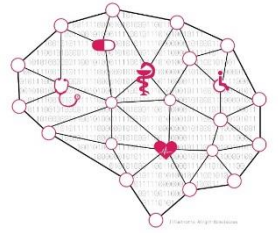
Complementary codes of conduct and legal frameworks in the context of healthcare are needed for private companies.

Development and validation according to EQUATOR standards

Responsible use

Knowledge of end-users about ML insufficient.

Tension between machine learning and evidence-based medicine.



ELSEVIER



Journal of Clinical Epidemiology 154 (2023) 8–22

**Journal of
Clinical
Epidemiology**

REVIEW

Systematic review identifies the design and methodological conduct of studies on machine learning-based prediction models

Constanza L. Andaur Navarro, Doctoral Student^{a,b,*},

Johanna A.A. Damen, Assistant Professor^{a,b}, Maarten van Smeden, Associate Professor^a,

Toshihiko Takada, Assistant Professor^a, Steven W.J. Nijman, Doctoral Student^a,

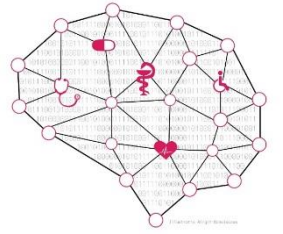
Paula Dhiman, Research Fellow^{c,d}, Jie Ma, Medical Statistician^c, Gary S. Collins, Professor^{c,d},

Ram Bajpai, Research Fellow^c, Richard D. Riley, Professor^c, Karel G.M. Moons, Professor^{a,b},

Lotty Hooft, Professor^{a,b}

Only 8% of studies reported using TRIPOD

Deficiencies in reporting and methodological conduct were extensively found in the sample of studies on machine learning models.



Generic recommendations

Responsible development

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Avoid techno-fix.

Complementary codes of conduct and legal frameworks in the context of healthcare are needed for private companies.

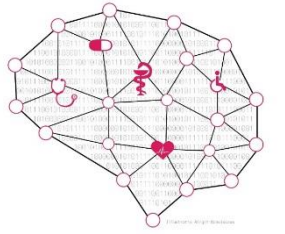
Development and validation according to EQUATOR standards

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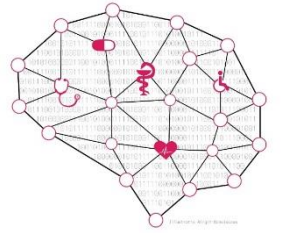
Tension between machine learning and evidence-based medicine.

Improve ML knowledge and quantitative reasoning of end-users.



Improving AI knowledge

- Since 2020 health informatics theme included in the master of medicine at UvA/Amsterdam UMC incl. education about ML
- Health Data Science module in Health Informatics master:
<https://www.amc.nl/web/leren/master-health-informatics-1/health-informatics/health-data-sciencebig-data-start-maart.htm>
- [De Nationale AI-cursus \(tech-cursus.nl\)](https://tech-cursus.nl)



Generic recommendations

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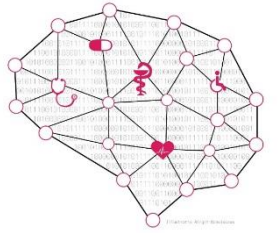
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Tension between machine learning and evidence-based medicine.

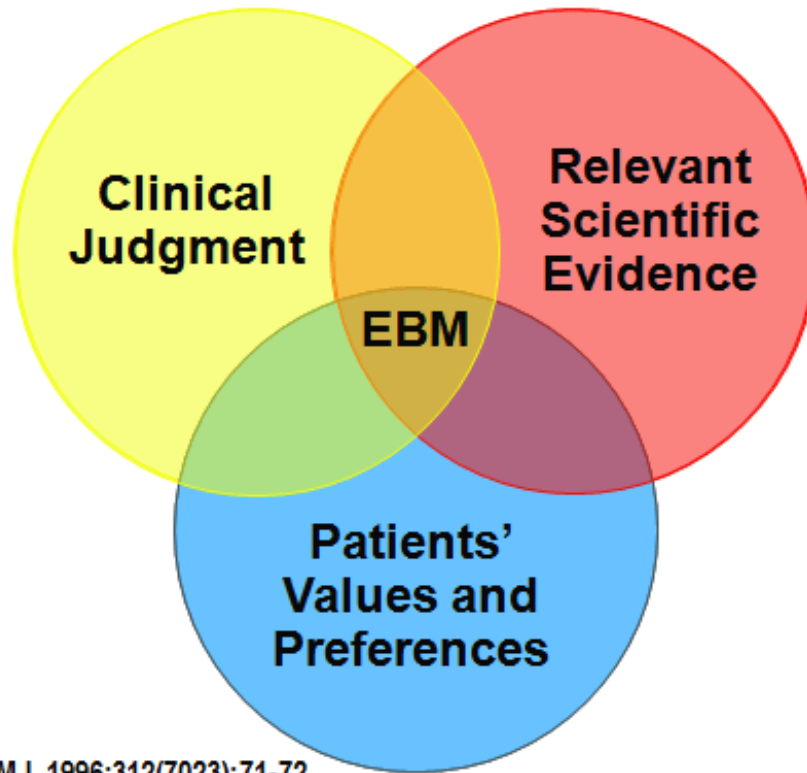
Improve ML knowledge and quantitative reasoning of end-users.

Don't undermine evidence-based medicine.

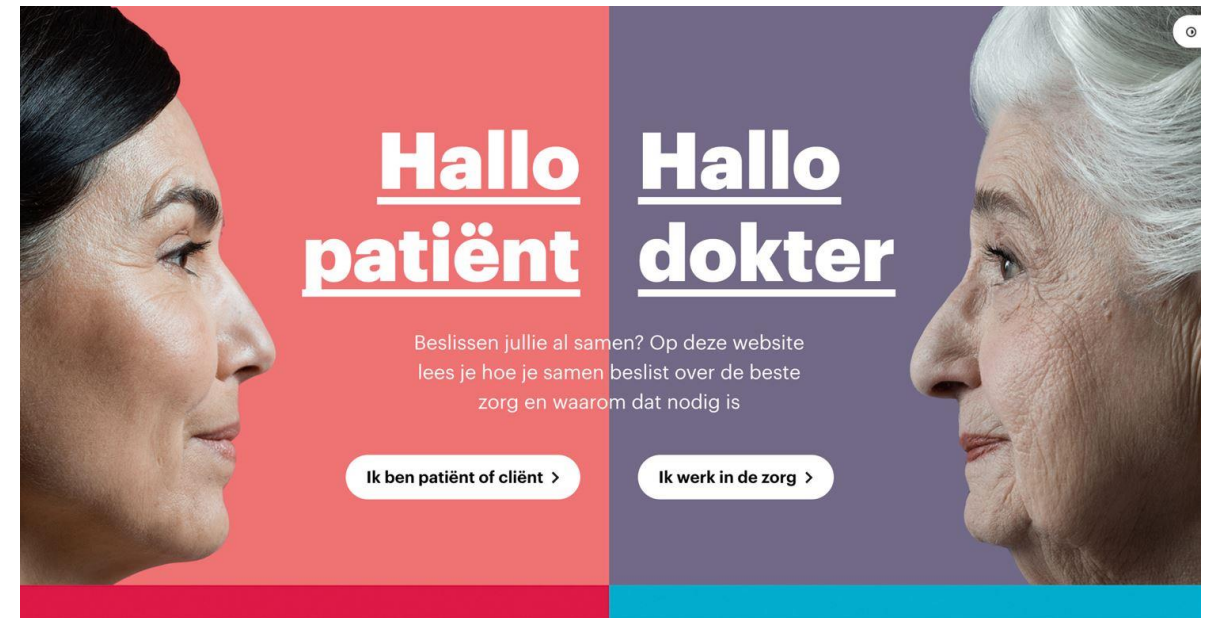
Include model use in shared-decision making.



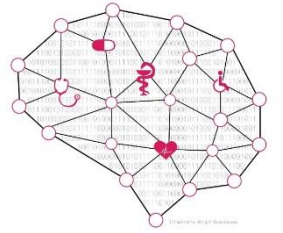
Generic recommendations



Sackett DL, et al. BMJ. 1996;312(7023):71-72.



<https://beginneengoesprek.nl/>



Generic recommendations

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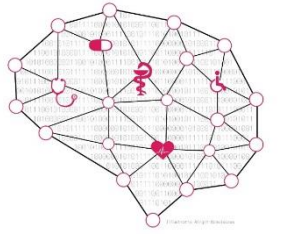
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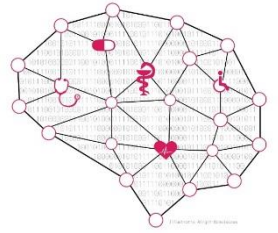
Don't undermine evidence-based medicine.

Include model use in shared-decision making.



Limitations & future research

- Qualitative study with a limited sample size.
- Interviews about hypothetical scenario.
- Learning from the two examples from Amsterdam UMC



Project team

Joanna Klopotowska – assistant professor medical informatics (**projectlead**)

Irene Stellingwerf – research assistant

Ellen Smets – professor medical psychology

Danielle Sent – assistant professor medical informatics

Ameen Abu-Hanna – professor medical informatics

Nicolette de Keizer - professor medical informatics

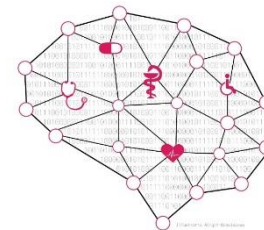
Dave Dongelmans – intensive care specialist

Dick Willems – professor medical ethics

SIDNfonds



Family and Patient Centered Intensive Care
Samen de impact van een IC - opname beperken



UMC Utrecht



Amsterdam UMC
Universitair Medische Centra



UMC Utrecht
Julius Centrum



ZIEKENHUIS
ST ANTONIUS

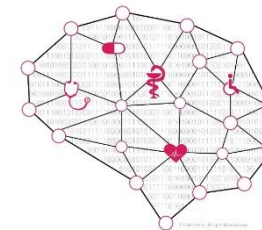


umcg



waag society

institute for art, science and technology



Full Rapport “AI will see you now”

www.datavoorgezondheid.nl/documenten/publicaties/2020/04/03/rapport-ai-will-see-you-now

“Guideline for high-quality diagnostic and prognostic applications of AI in healthcare”

<https://www.leidraad-ai.nl/>



j.e.klopotowska@amstermdamumc.nl

www.pharmacoinformaticslab.nl