

Trust in Artificial Intelligence and Factors Affecting its Acceptance

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AI OUTPERFORMS MEDICAL EXPERTS!

**Six Radiologists in
Reading
Mammograms¹**

**DL-CNN Identified
95% Skin Cancer –&
Dermatologists Did
86.6%²**

**Diagnostic
Performance of DL
Model to be
equivalent to that
of Doctors³**

¹McKinney, S.M., Sieniek, M., Godbole, V. *et al.* International evaluation of an AI system for breast cancer screening. *Nature* **577**, 89–94 (2020).

²Pham, TC., Luong, CM., Hoang, VD. *et al.* AI outperformed every dermatologist in dermoscopic melanoma diagnosis, using an optimized deep-CNN architecture with custom mini-batch logic and loss function. *Sci Rep* **11**, 17485 (2021).

³Liu, X., Faes, L., Kale, A. U., Wagner, S. K., Fu, D. J., Bruynseels, A., ... & Denniston, A. K. (2019). A comparison of deep learning performance against health-care professionals in detecting diseases from medical imaging: a systematic review and meta-analysis. *The lancet digital health*, 1(6), e271-e297.

AI IN PRECISION ONCOLOGY

**Analyze Large
Datasets for
Pattern
Identification**

**Genetic and
Molecular
Profiling**

**Personalized Care
and Clinical Trial
Matching**

¹Ballester, P.J., Carmona, J. Artificial intelligence for the next generation of precision oncology. *npj Precis. Onc.* **5**, 79 (2021).

²Coudray, N., Ocampo, P. S., Sakellaropoulos, T., Narula, N., Snuderl, M., Fenyo, D., ... & Tsirigos, A. (2018). Classification and mutation prediction from non-small cell lung cancer histopathology images using deep learning. *Nature medicine*, 24(10), 1559-1567.

AI IN PRECISION ONCOLOGY

**Streamline the
workflow**

**Expedite
Diagnosis**

**Improve Care
Quality**

¹Hollon, T. C., Pandian, B., Adapa, A. R., Urias, E., Save, A. V., Khalsa, S. S. S., ... & Orringer, D. A. (2020). Near real-time intraoperative brain tumor diagnosis using stimulated Raman histology and deep neural networks. *Nature medicine*, 26(1), 52-58.

²Tschandl, P., Rinner, C., Apalla, Z., Argenziano, G., Codella, N., Halpern, A., ... & Kittler, H. (2020). Human-computer collaboration for skin cancer recognition. *Nature Medicine*, 26(8), 1229-1234.

**520 FDA-APPROVED
AI ALGORITHMS**



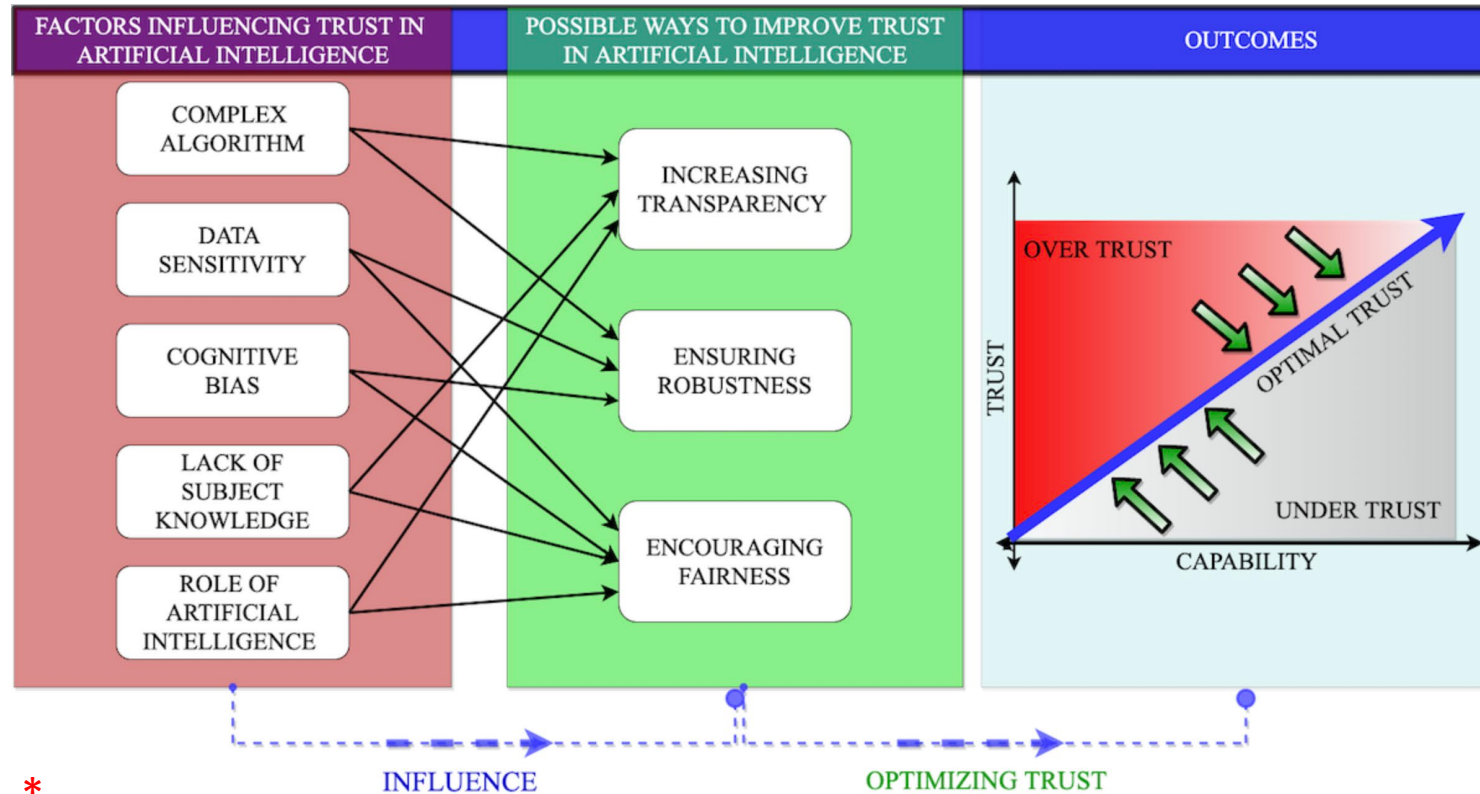
**396
RADIOLOGY**

Then why do doctors hesitate to use AI?

TRUST

Trust in AI measures a user's willingness to follow or make decisions based on AI recommendations.

OPTIMAL TRUST



* Asan, O., Bayrak, A. E., & Choudhury, A. (2020). Artificial intelligence and human trust in healthcare: focus on clinicians. *Journal of medical Internet research*, 22(6), e15154.

Merritt, S. M., Lee, D., Unnerstall, J. L., & Huber, K. (2015). Are well-calibrated users effective users? Associations between calibration of trust and performance on an automation-aided task. *Human Factors*, 57(1), 34-47.

Hoffman, R. R., Johnson, M., Bradshaw, J. M., & Underbrink, A. (2013). Trust in automation. *IEEE Intelligent Systems*, 28(1), 84-88.

CONFIRMATION BIAS OR TRUST?

Trust only when the AI confirms their beliefs?

OR

Change judgment based on AI recommendation?



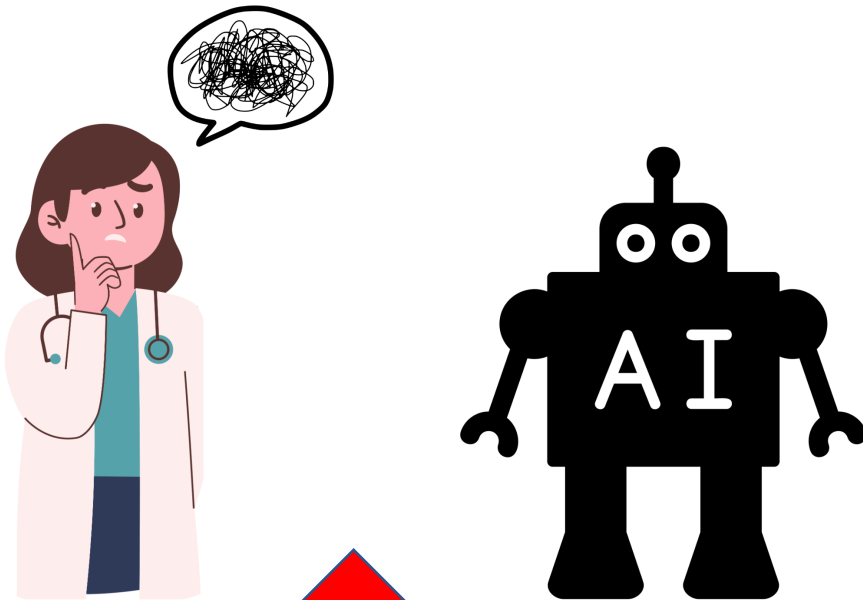
INITIAL TRUST



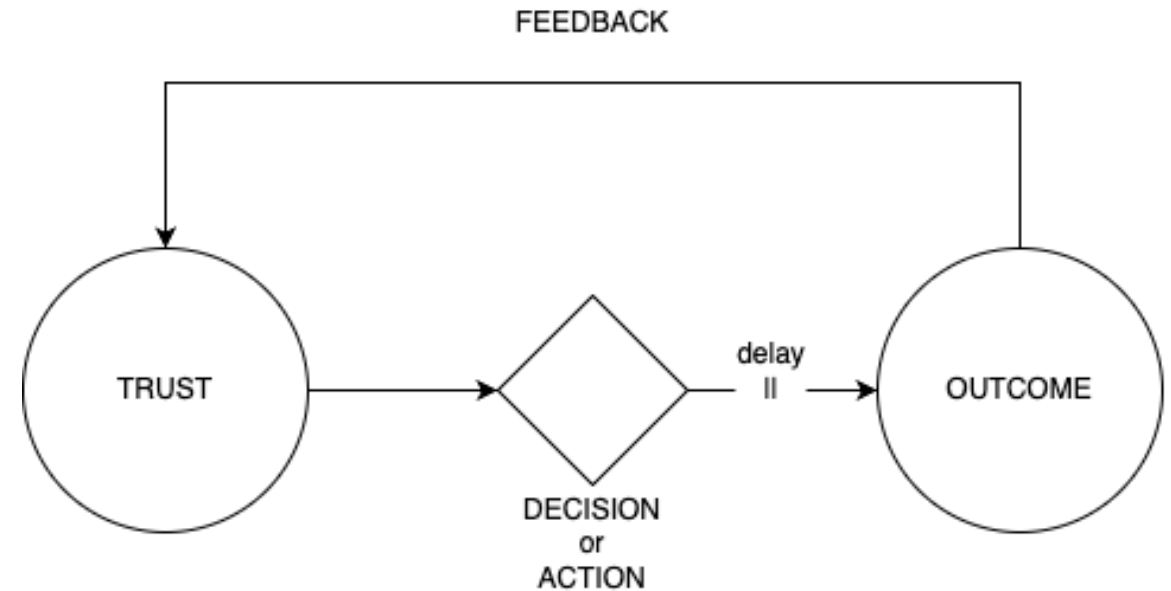
TRUST EVOLUTION

Experience and Consequence

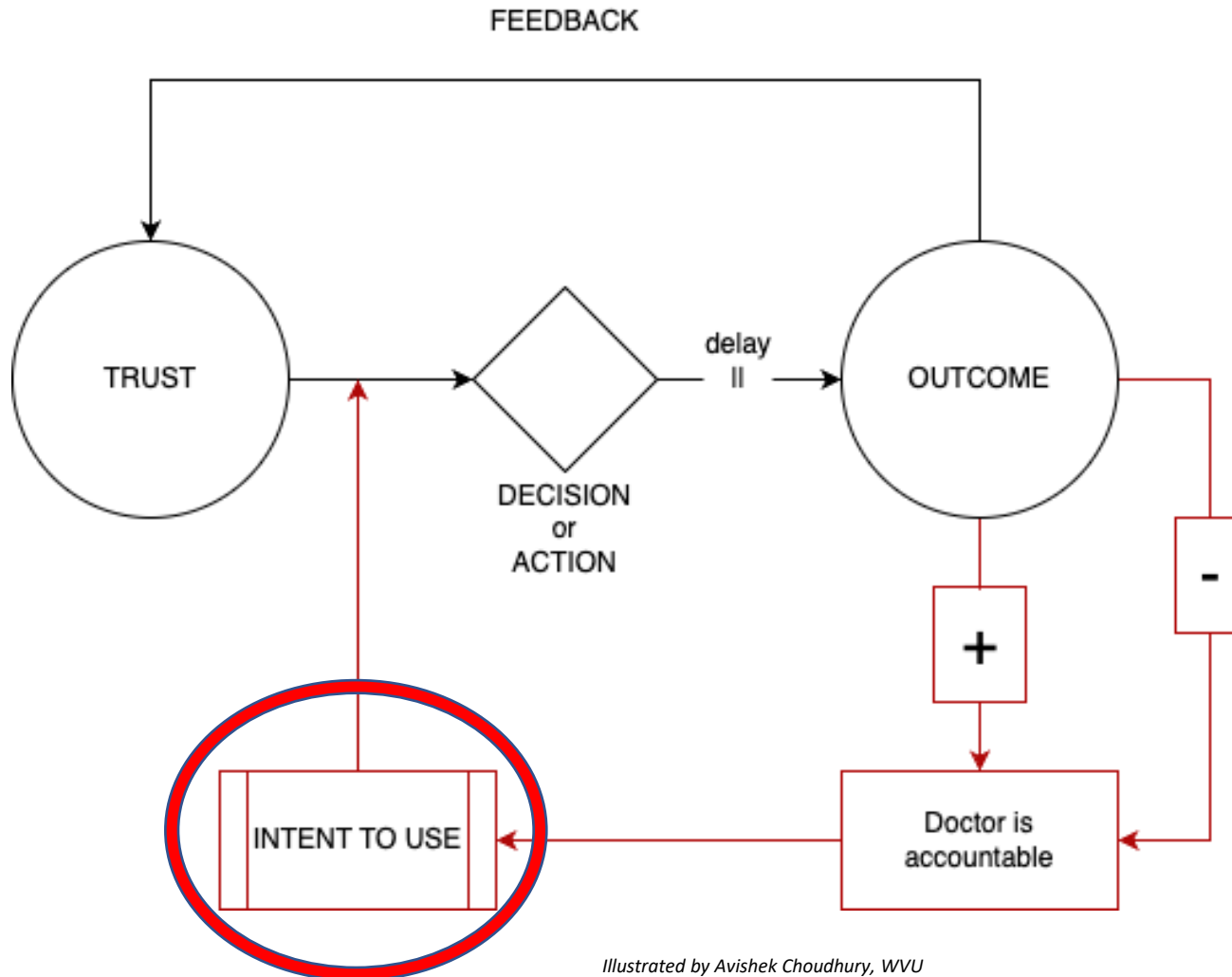
Assumptions and Perceptions



We have to start here
and start small



ACCOUNTABILITY



Illustrated by Avishek Choudhury, WVU

“Delegating a part of the decision-making process to artificial intelligence systems raises important questions about how far a clinician is accountable for patient harm”.¹

Habli, I., Lawton, T., & Porter, Z. (2020). Artificial intelligence in health care: accountability and safety. *Bulletin of the World Health Organization*, 98(4), 251.

Need further
clarifications and
protocols

ACCOUNTABILITY



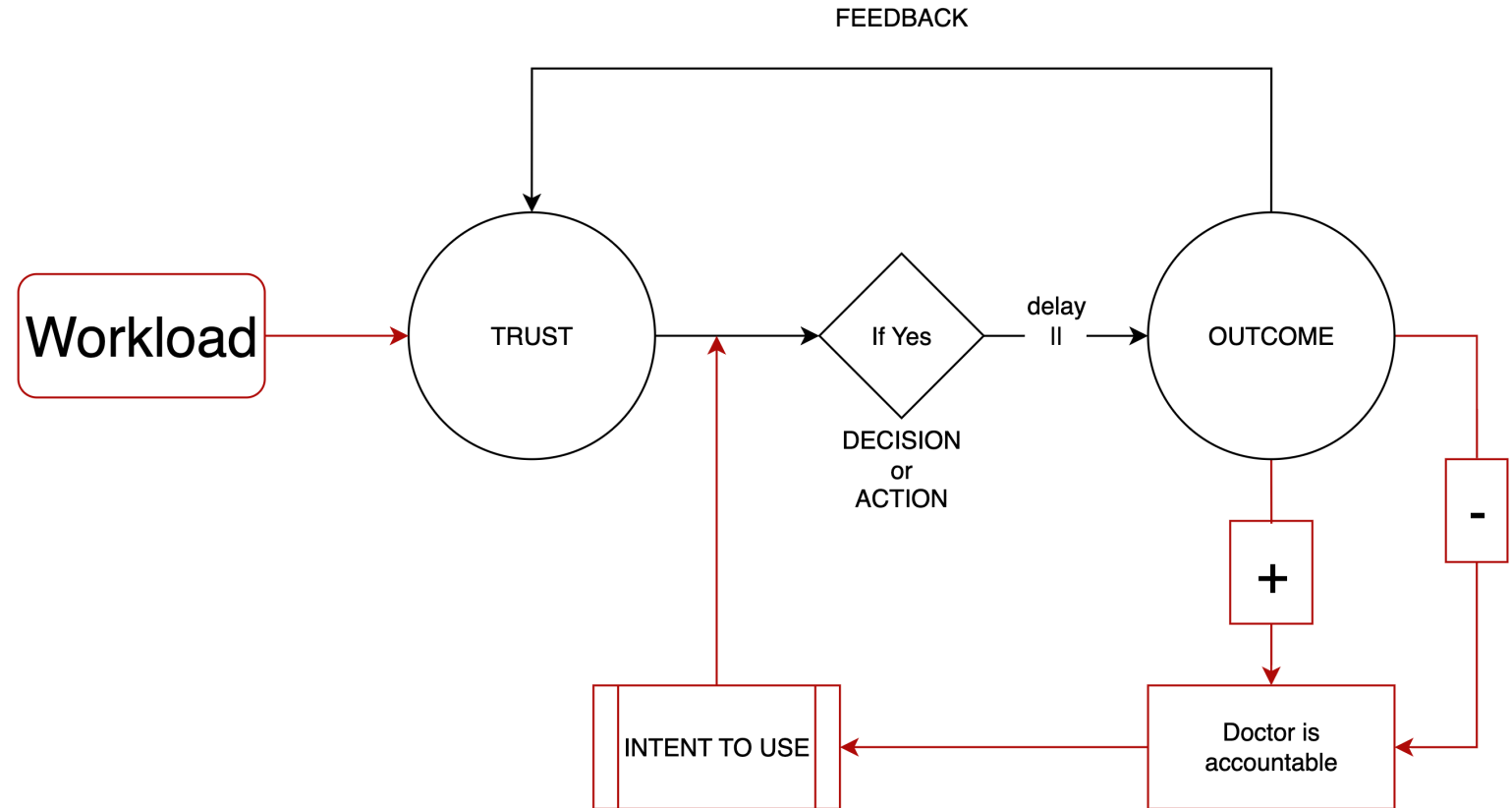
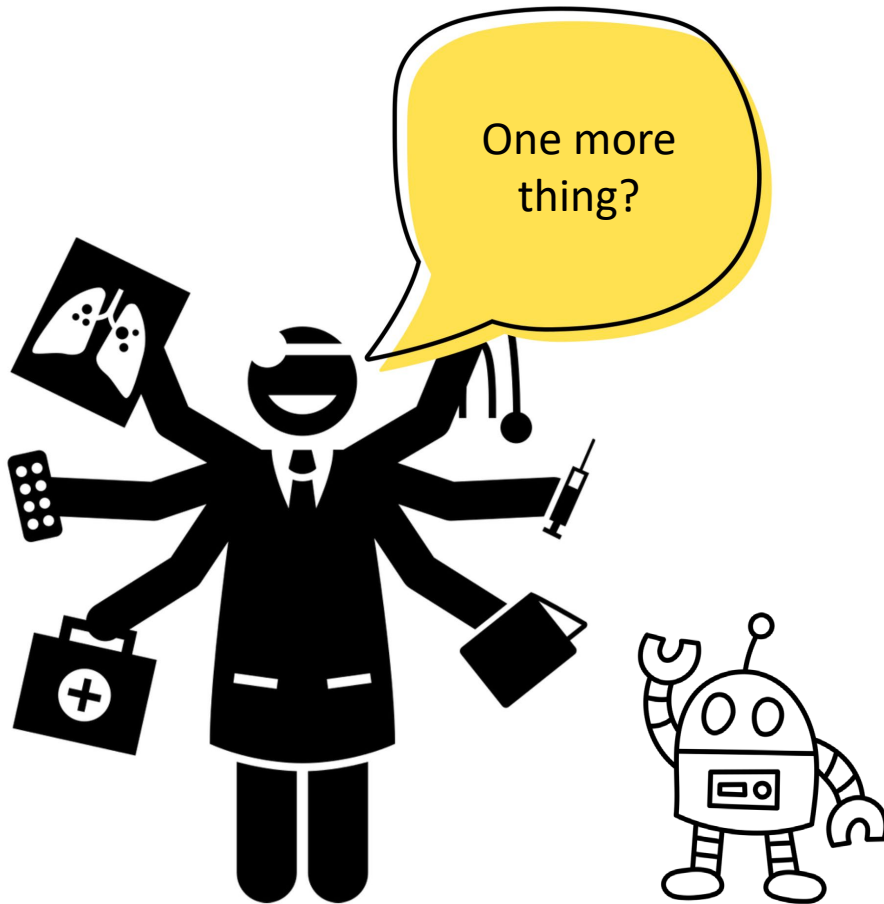
“It is a great risk to put full trust into an AI system which could ultimately affect me [...]
and my career.”

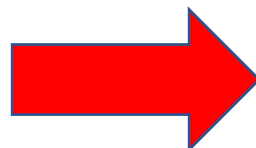
“It would make it harder to trust the system [...] if it could cost me my license.”

“I think it [AI] has a negative impact on how patients perceive their treatment. Many
older people do not trust technology, which may create more work for the doctor.”

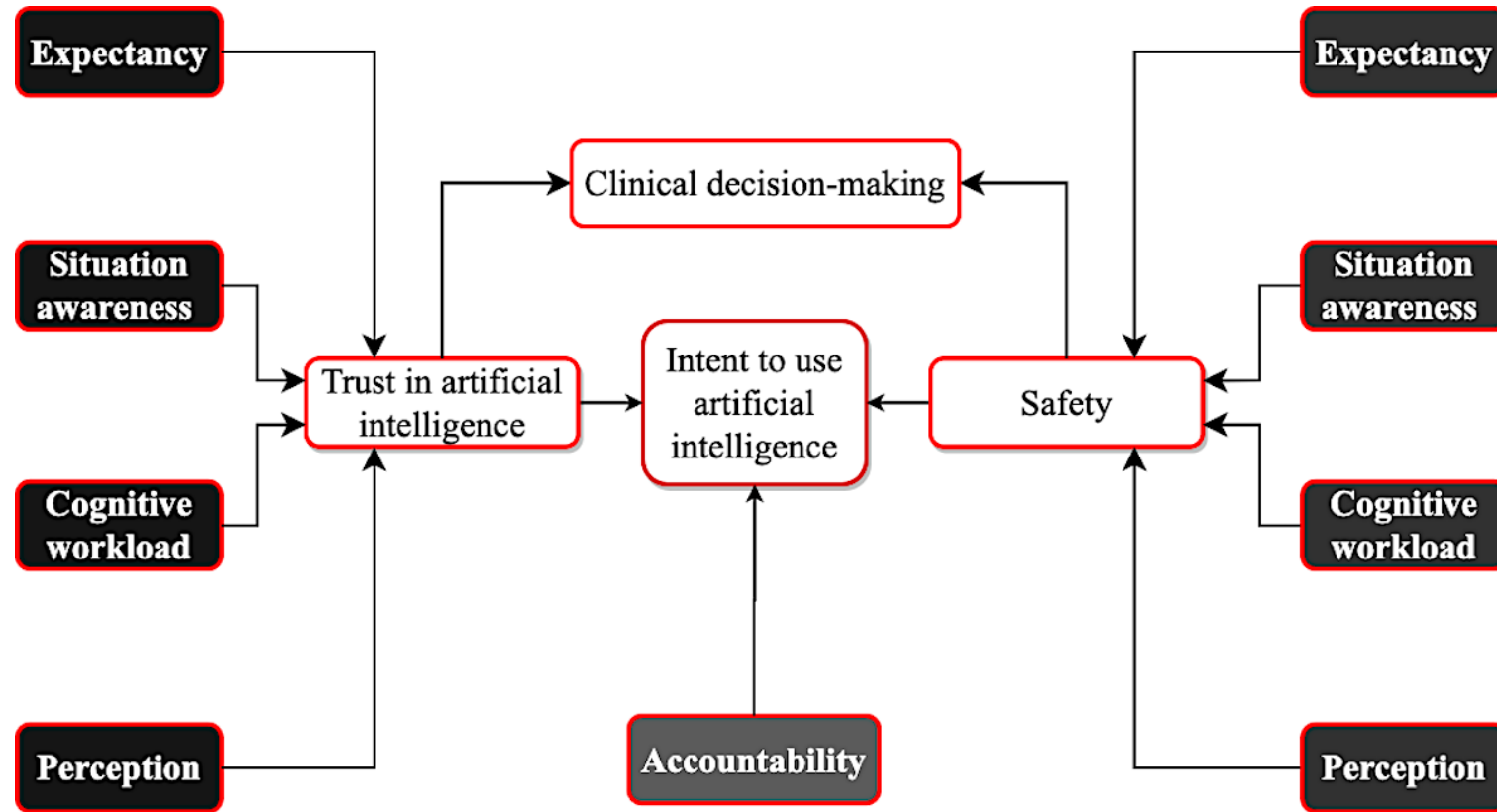
“I believe this [absence of AIs’ accountability] is a problem. I worry that certain people
will become complacent with AI making decisions or diagnoses. They also may believe
the AI over their own clinical decision-making. This is a problem.”

PERCEIVED WORKLOAD



 ONE MORE MODULE IN THE EHR? | ANOTHER TRAINING?

... many more



IMPOSITION TO INTEGRATION

Do I have
to use it?



“And I remember the first time I’ve seen it, [...] which one of these apply to me so that I can get the order to go through. And that can take a little bit of time [...].”

IMPOSITION TO INTEGRATION



An Example

An AI-based DSS achieved the target hemoglobin value in more than 96% of the prescribed transfusions. It was also noted to be more consistent than clinicians.

But only 49% of the time, clinicians accepted AI recommendations.

RECOMMENDATIONS

- 1st – Shared or distributed accountability
- 2nd – Human factors consideration
(explainability is important but not sufficient)
- 3rd – Need-based integration





Questions

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