

Participatory design of transparent and understandable AI/ML-enabled medical devices

Melanie C. Wright, PhD

Associate Professor
College of Pharmacy

October 14, 2021

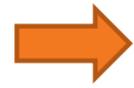


AI/ML transparency is a hard problem

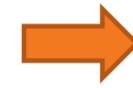
Data generated



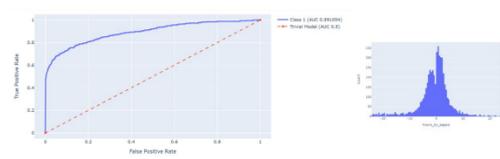
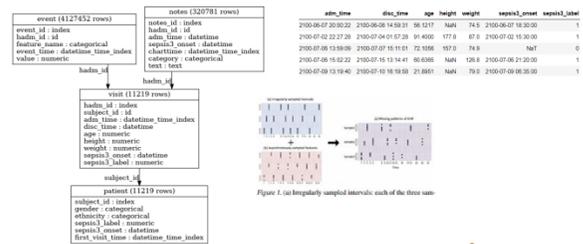
Data curated, cleaned, questions posed, analysis designed



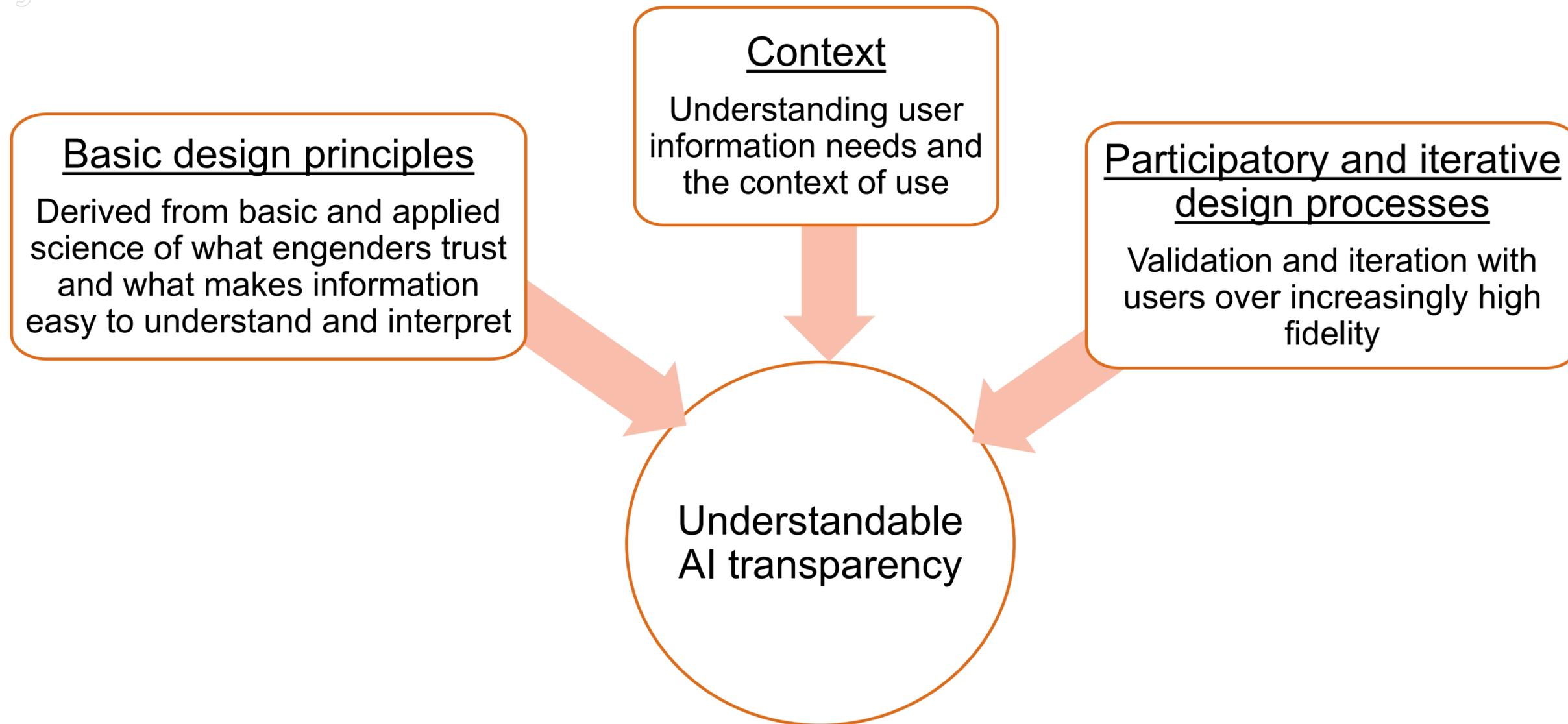
Analysis interpreted (redesigned, reanalyzed)



Application (redesigned, reanalyzed)



Understandable AI transparency is a design problem



AI trust and explanations

- Trustworthy and useful AI
 - Accurate
 - Transparent
 - Understandable
 - Fair
 - Secure
 - Private
 - Empowers patients
- Explanation goodness
 - Appropriate detail
 - Veridical (truthful)
 - Useful
 - Clear
 - Complete
 - Observable
 - Reveals boundaries
- **A sufficient explanation**
 - Balances detail and comprehensibility
 - Explains how and also: Why? Why not? What if?

Questions to answer

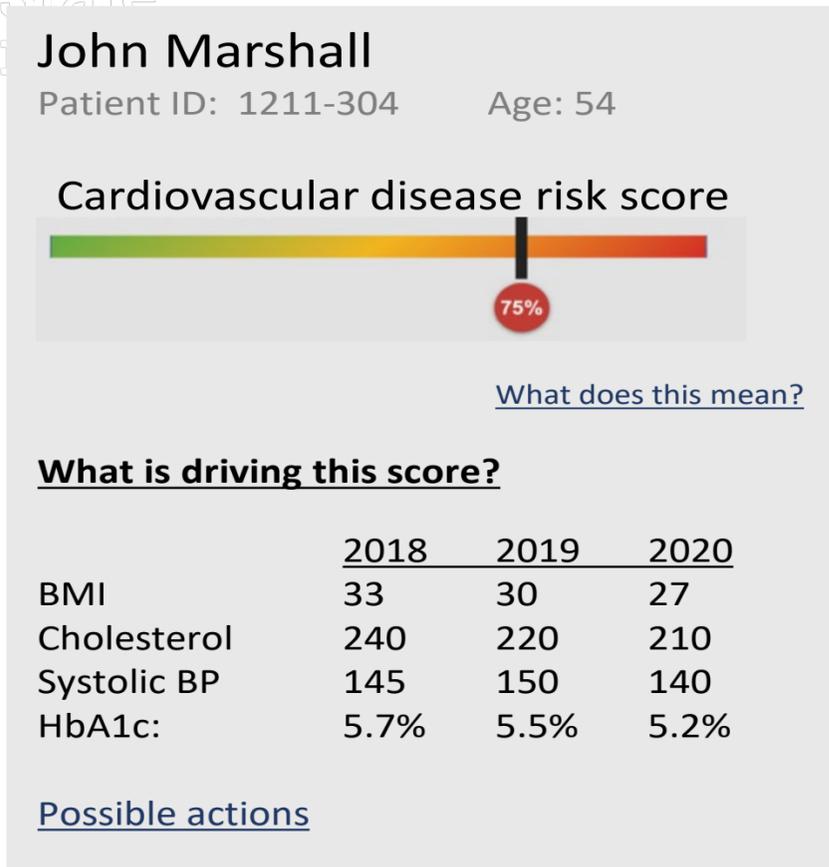
- What content should be included in labeling AI/ML-enabled medical devices:
 - Accuracy of models?
 - Population from which models are derived?
 - Frequency of model revision?
 - Testing methods?
 - Oversight responsibility?
- How do we present this content in a way that is both sufficiently transparent and easily understood?

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
	% Daily Value*
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
	7%
	13%
	14%
	20%
	10%
	20%
	45%
	6%
	10%
	20%
	45%
	6%

Drug Facts	
Active ingredient (in each tablet)	Purpose
Chlorpheniramine maleate 2 mg.....	Antihistamine
Uses temporarily relieves these symptoms due to hay fever or other upper respiratory allergies: ■ sneezing ■ runny nose ■ itchy, watery eyes ■ itchy throat	
Warnings Ask a doctor before use if you have ■ glaucoma ■ a breathing problem such as emphysema or chronic bronchitis ■ trouble urinating due to an enlarged prostate gland Ask a doctor or pharmacist before use if you are taking tranquilizers or sedatives	
When using this product ■ drowsiness may occur ■ avoid alcoholic drinks ■ alcohol, sedatives, and tranquilizers may increase drowsiness ■ be careful when driving a motor vehicle or operating machinery ■ excitability may occur, especially in children	
If pregnant or breast-feeding, ask a health professional before use. Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away.	
Directions	
adults and children 12 years and over	take 2 tablets every 4 to 6 hours; not more than 12 tablets in 24 hours
children 6 years to under 12 years	take 1 tablet every 4 to 6 hours; not more than 6 tablets in 24 hours
children under 6 years	ask a doctor

“Labeling is defined as all labels and other written, printed, or graphic matters (1) upon any article or any of its containers or wrappers, or (2) accompanying such an article. Depending on the circumstances, labeling may include packaging, product inserts, Web sites, and other promotional materials.”
https://www.accessdata.fda.gov/scripts/cder/training/otc/topic4/topic4/da_01_04_0070.htm

Contextual interviews and focus groups



- Do you trust the information?
- Would you want to know about its accuracy?
- What data was used in development?
- How your data is used?
- Testing and oversight?
- ...



Participatory iterative design of AI transparency

Concepts

- High level ideas
- Low fidelity sketches
- Qualitative assessment
- Representative participants (small numbers)

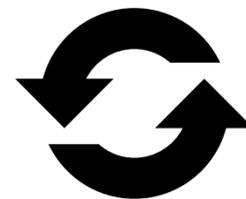
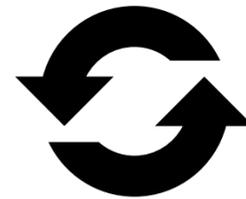
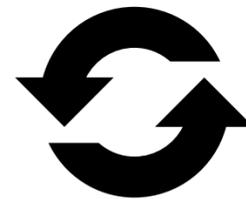
Mockups

- Many choices
- Narrow choices and improve on best options (more iterations)
- Qualitative and quantitative assessment
- Representative participants (small numbers)

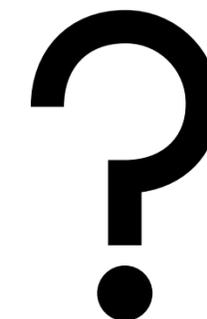
High fidelity prototypes

- Few choices
- Quantitative and qualitative assessment
- Representative participants (medium numbers)
- Improve again (fewer iterations)

Post deployment assessment and design iteration



AI Facts



Health Innovation through Human-Centered Design

Optimizing user experiences and health outcomes with health technology and artificial intelligence



Inter-professional education, empathy, equity in university education and health professions



<https://www.isu.edu/ichr/>

<https://www.linkedin.com/in/melaniecwright/>