



MADIS TIIK MD, PHD

*Future Wellbeing services in the Digital Age  
- from Estonian and Finnish perspectives*



# EDUCATION

- \* Tartu University, *Medical Doctor*, 1996
- \* Tartu University, *Family Doctor*, 2000
- \* Nordic School of Public Health (Sweden) - *Diploma in Public Health*, 2003
- \* Estonian Business School, *ICT Management*, 2001-2003
- \* Tallinn University of Technology, *PhD* (Healthcare Engineering) 2012
- \* Scripps Translational Science Institute (San Diego, USA), *Digital Medicine intern*, 2014-2015





# CAREER

- \* Family doctor 1998-
- \* Estonian Society of Family Doctors, *Chairman* 2001-2008.
- \* Estonian eHealth Foundation (EEHF), *Board member*, 2005-2007
- \* Terviseagentuur Ltd. *CEO, Owner*, 2006-...
- \* Estonian eHealth Foundation, *CEO*, 2007-2011
- \* *Scientific adviser of the President of the Estonia*. Preparing report for EU Commission, how to improve ehealth after 2020. 2011-2012
- \* Tallinn University of Technology (TUT), *eHealth Lab, lecturer* 2014-
- \* Sitra (Finnish innovation fund), *Senior Adviser*, 2012-



# System Intelligence in Healthcare ?

[https://www.youtube.com/watch?  
v=5J67xJKpB6c](https://www.youtube.com/watch?v=5J67xJKpB6c)



HEALTH 1.0

AI 1.0

# DIGITALIZATION

PACS

LIS

RIS

PIS

DEVICE  
1

PHR 1.0



HEALTH 2.0

AI 2.0

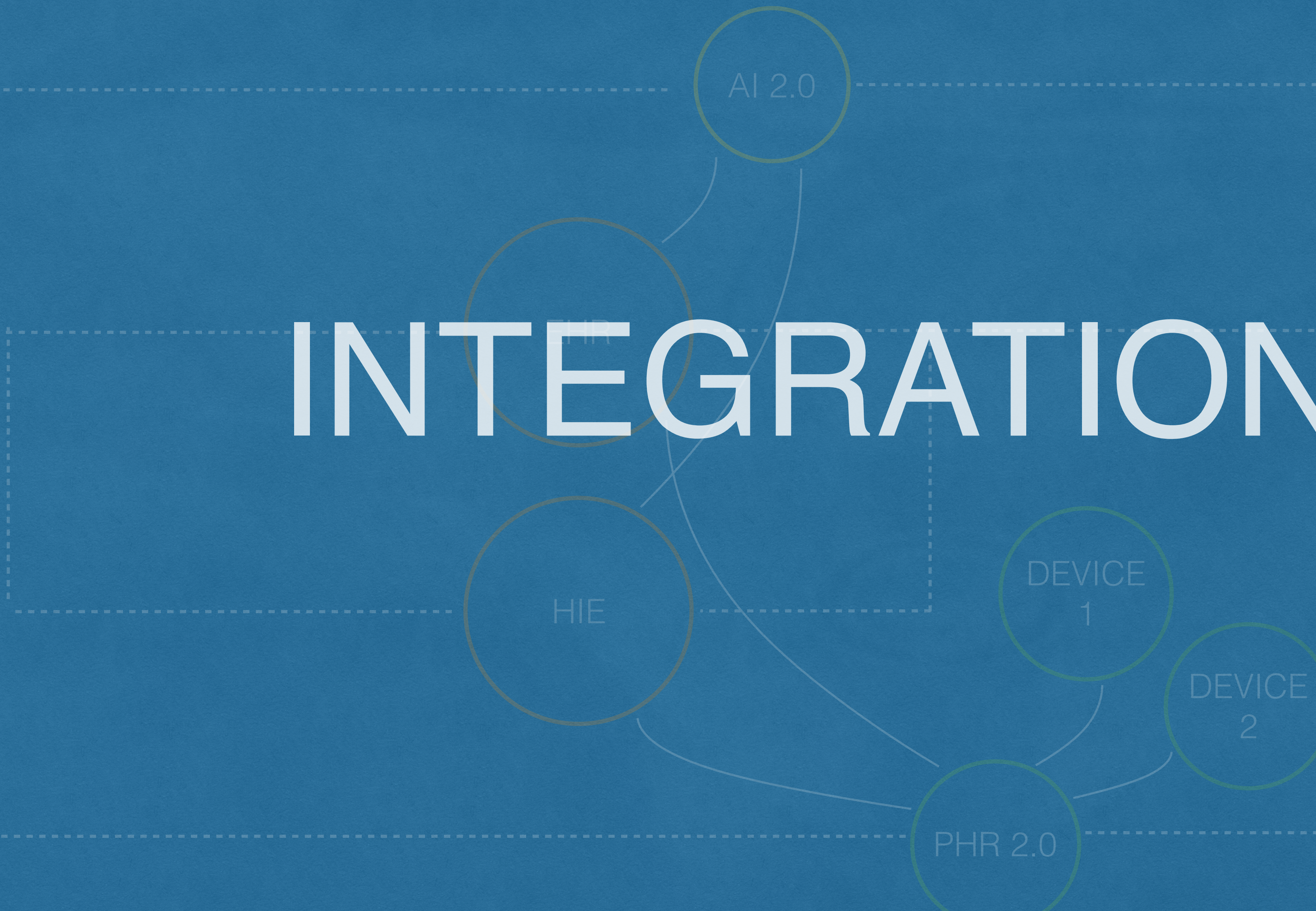
# INTEGRATION

HIE

DEVICE  
1

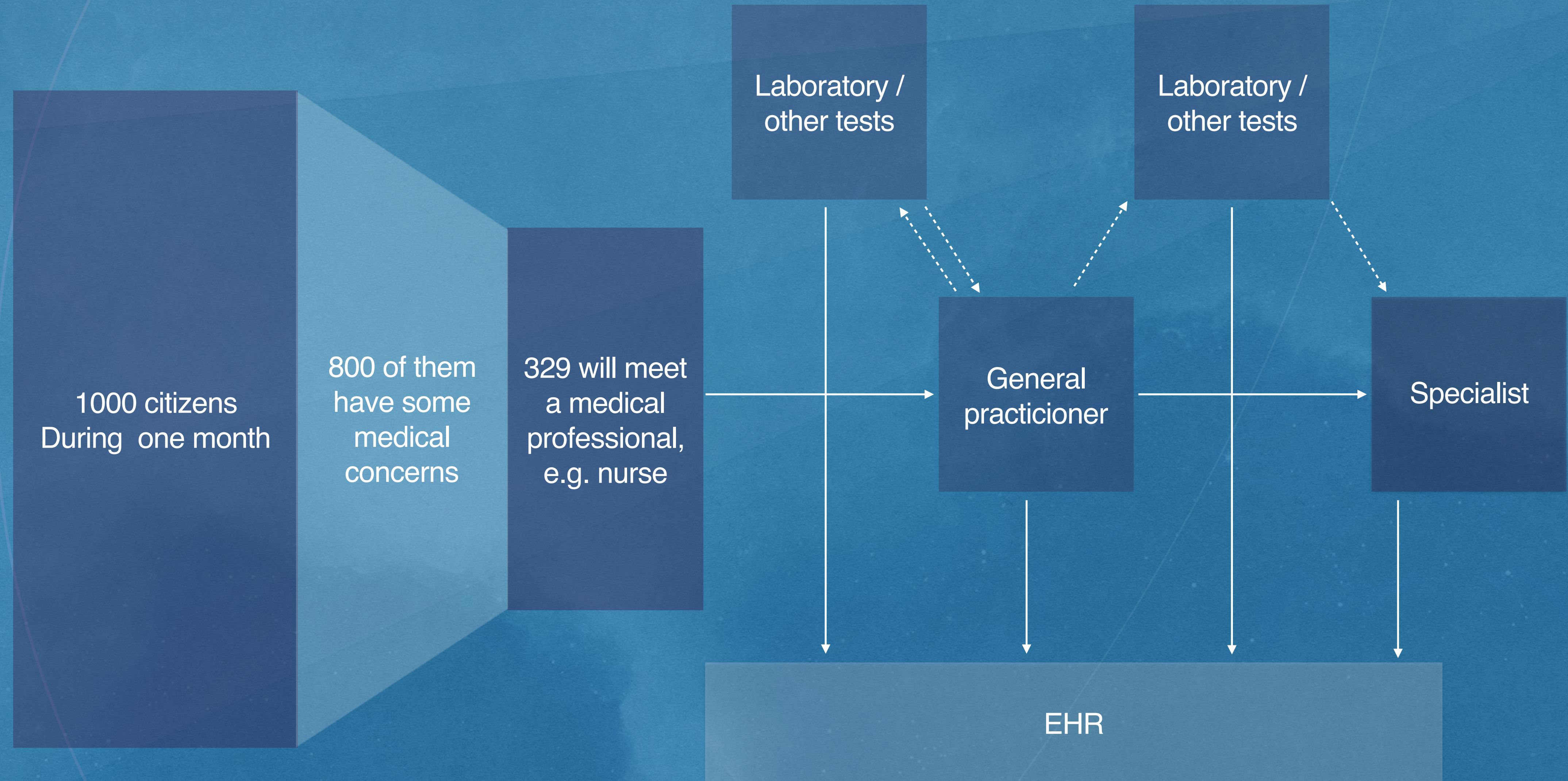
DEVICE  
2

PHR 2.0





# HEALTHCARE SYSTEM TODAY



Green, LA. Fryer, GE Jr. Yawn, BP. Lanier, D. Dovey, SM (2001). 'The ecology of medical care revisited.'  
New England Journal of Medicine, 344(26): 2021–2025



# NEW BUSINESS MODELS TO DELIVER CARE

## Working as a Team to Assess and Address Medical & Social Needs



A JOINT CENTER FOR HEALTH SYSTEMS INNOVATION

- Building a care team
  - Iora Health (US)
  - TurnTable Health (US)

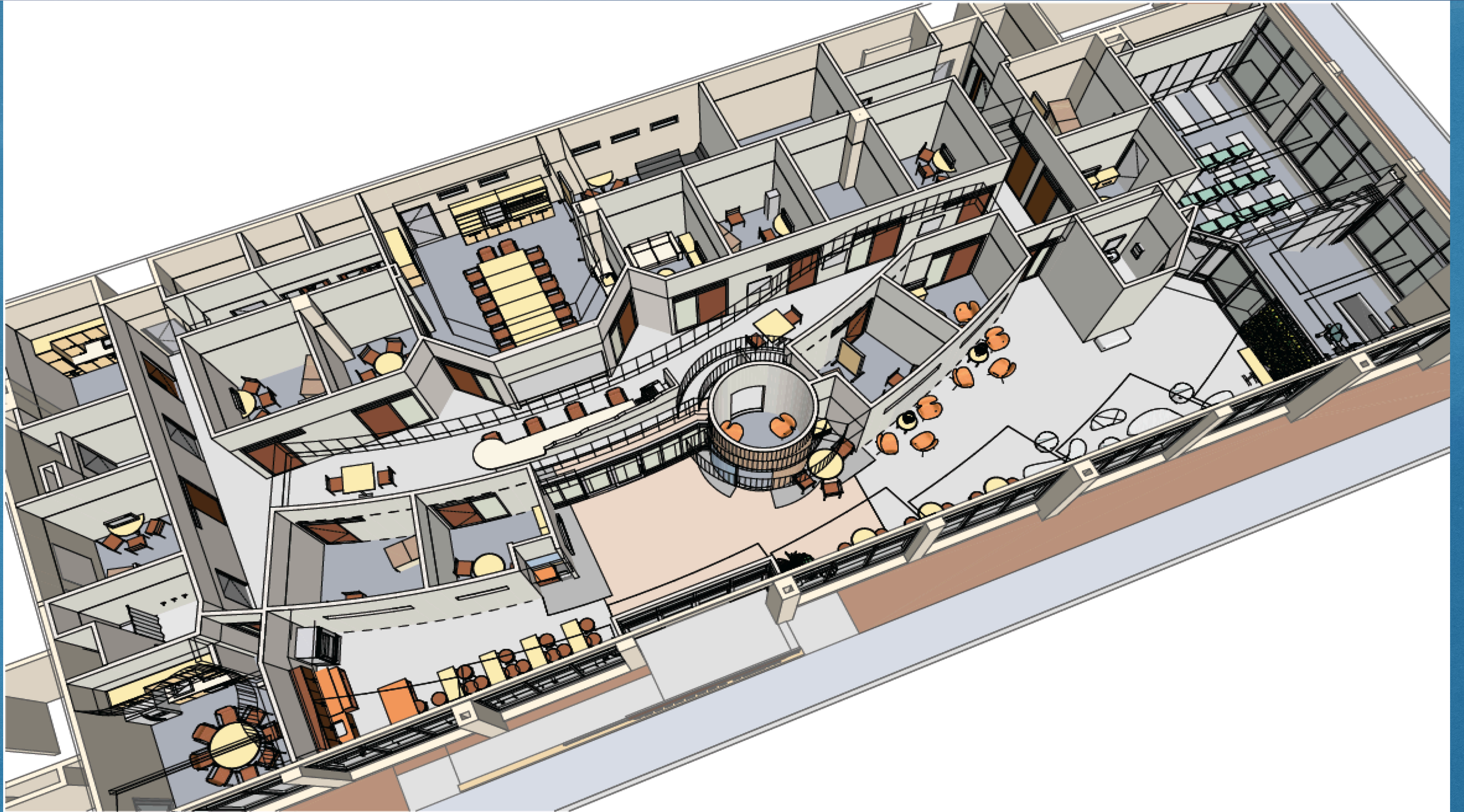


- Nuka (Alaska Natives)





# TURNTABLE CLINIC (LAS VEGAS, US)

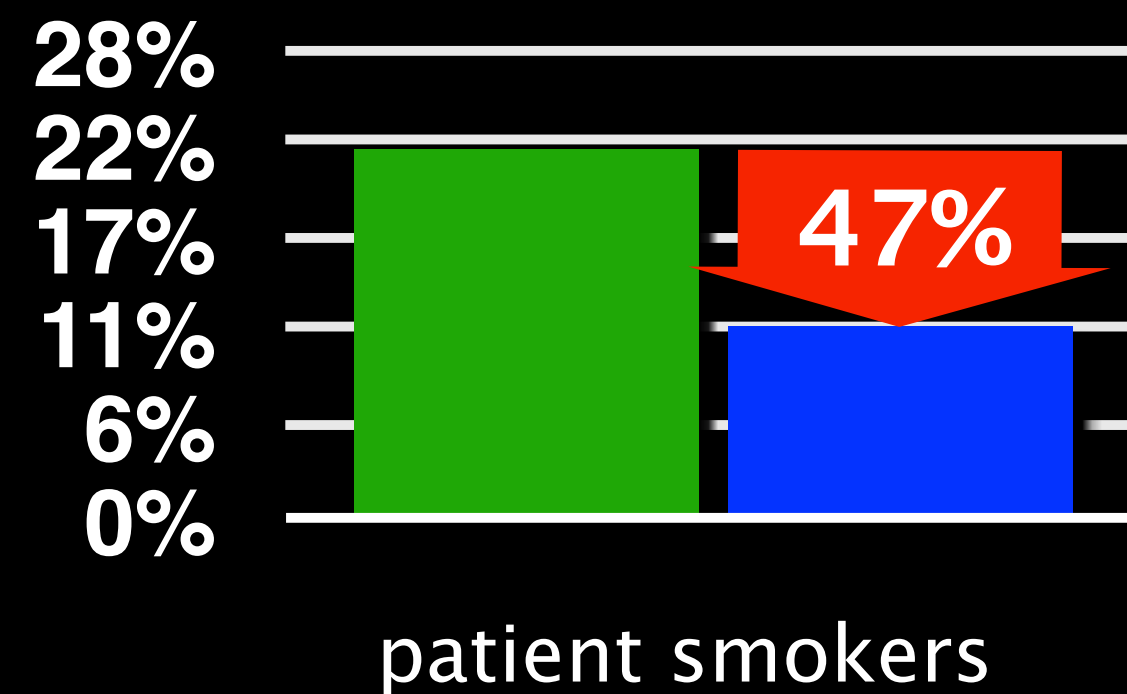




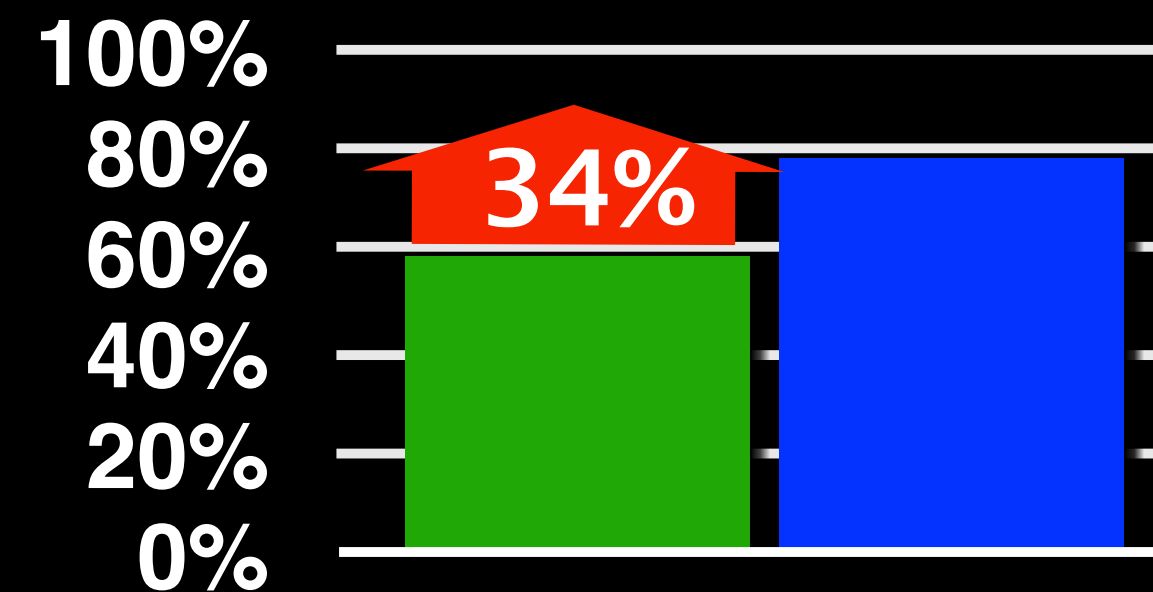
# TURNTABLE CLINIC - OUTCOMES

## Patient Health Improves

### Smoking Rate Decreases

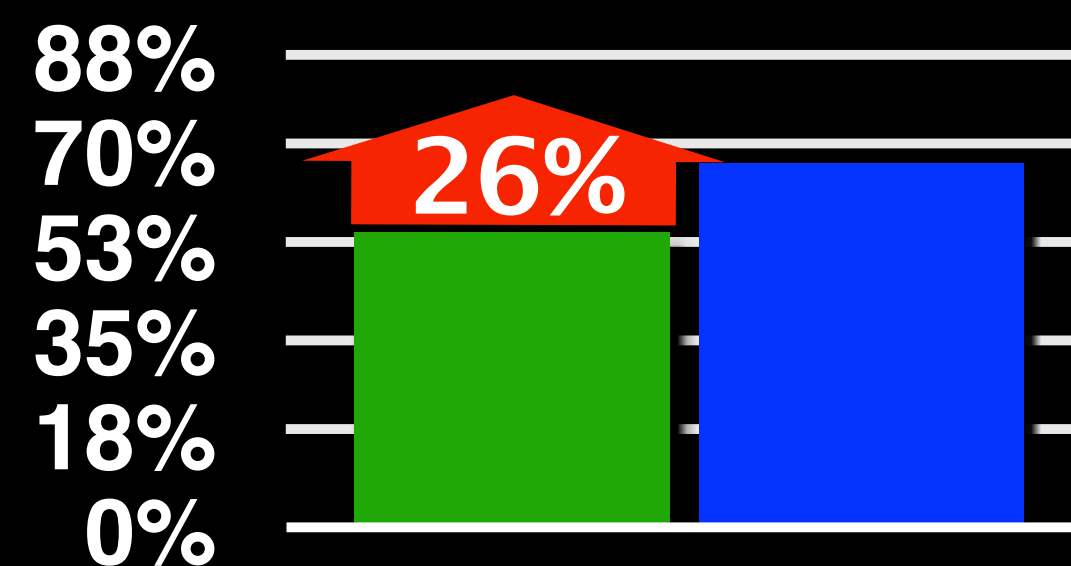


### Hypertension Control Improves

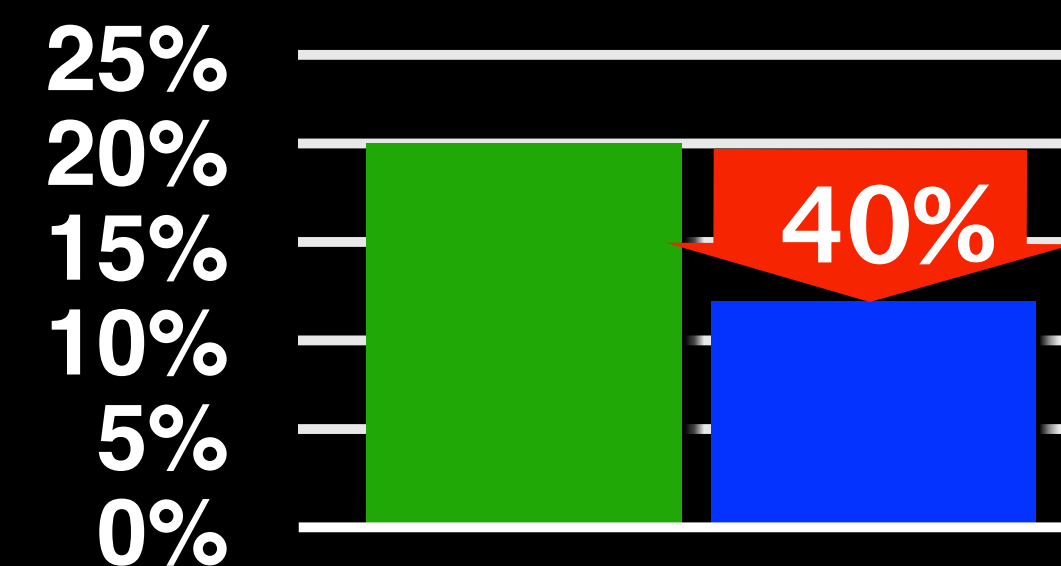


■ Pre-Period  
■ Post-Period

### Mental Health Improves



### Diabetic Control Improves



patients with A1c > 9%



<https://www.youtube.com/watch?feature=youtu.be&v=5J67xJKpB6c&app=desktop>

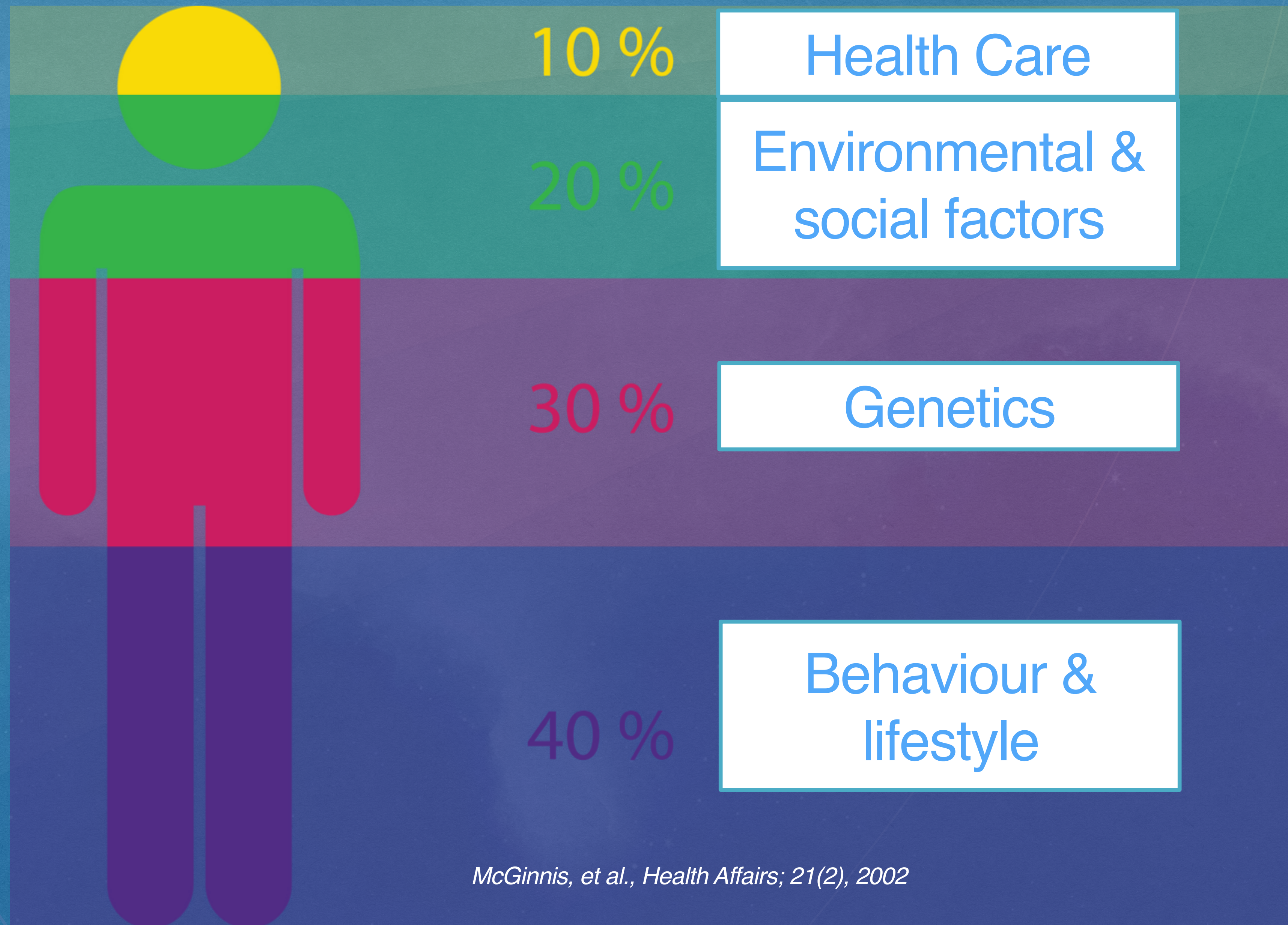


# REMOTE CONSULTATION - IS IT A MAGIC TOOL ?

- MD live (US)
- Doctor on demand (US)
- HealthSpot (US)
- American Well (US)
- BabylonHealth (UK)
- Meedoc (FIN)
- Netiarst (EST)
- Virtuwel (US)



# IMPACT OF DIFFERENT FACTORS TO WELLBEING

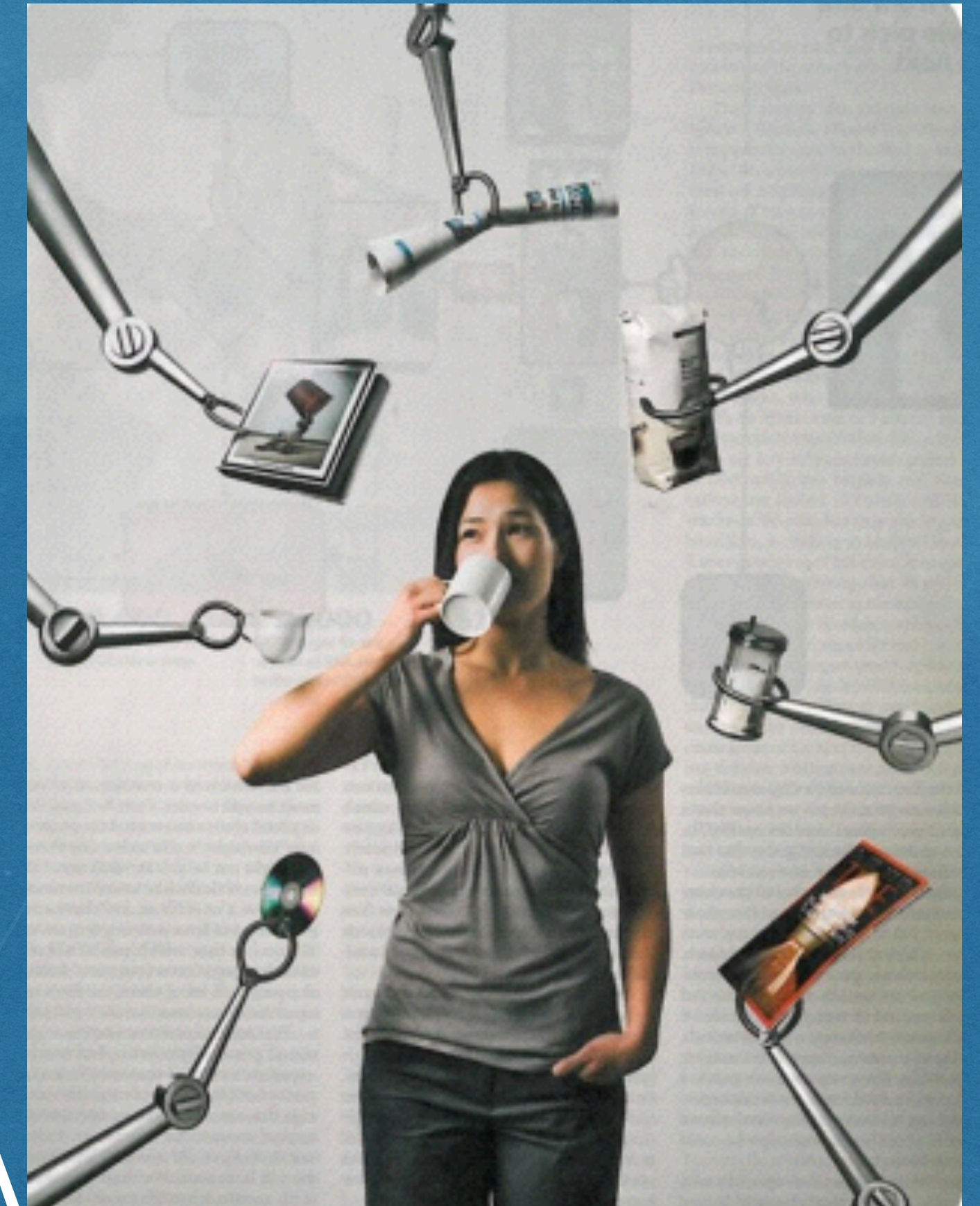


*McGinnis, et al., Health Affairs; 21(2), 2002*



# IMPACT OF PREVENTION

- Cardiovascular disease: 73-83% (Nurses Health Study, NEJM 2000;343:16-22, NEJM 2001;345:790-97)
- Diabetes type II: 58-91% (Tuomilehto, 2001 NEJM 344(18): 1343-50 Nurses Health Study, NEJM 2000;343:16-22, NEJM 2001;345:790-97)
- Cancer: 60-69% (De Lorgeril, Arch Int Med 1998;158:1181-87 HALE Project. Knoop JAMA 2004;292:1433- 1439)





# IMPACT OF THE BEHAVIOURAL CHANGE

Cardiovascular disease:

73-83% (Nurses Health Study, NEJM 2000;343:16-22, NEJM 2001;345:790-97)

Diabetes type II: 58-91% (Tuomilehto, 2001

NEJM 344(18): 1343-50 Nurses Health Study, NEJM 2000;343:16-22, NEJM 2001;345:790-97)

Cancer: 60-69% (De Lorgeril, Arch Int Med 1998;158:1181-87

HALE Project. Knoop JAMA 2004;292:1433- 1439)





# IPHONE AS A...

- Otoscope (CellScope)
- Portable EKG (AliveCor)
- Microscope
- GLUCOMETER : (IBGStar)
- DERMATOSCOPE (Handyscope)
- Ultrasound (Mobisante)
- BLOOD PRESSURE Monitor (Withings)
- SPIROMETER (SpiroSmart App)
- Alcohol Breathalyzer (iPega)
- Brain SCANNER
- Eye Clinic (PEEK VISION)
- Ophtalmoscope (Welch Allyn)



**Eye**  
Glucose-sensing lens  
Digital fundoscope  
Smartphone visual-acuity tracking  
Automated refractive error  
Noninvasive intraocular pressure

**Ear**  
Smart hearing aids  
Digital otoscope

**Lung**  
Home spirometry  
Pulse oximetry  
Inhaler use  
Breath-based diagnostics  
Breathing sounds  
Environmental exposure

**Blood**  
Continuous glucose  
Transdermal Hb  
Pathogens (genomics-based)  
PoC blood tests

**Skin**  
Temperature  
Gross lesions  
Pressure sensor (wound care)  
Sweat chemistry  
Cutaneous blood flow

**Other sensors and monitors**  
Pill-box and -bottle  
Posture  
Body position  
Activity  
Sleep

**Bladder and urine**  
Comprehensive urinalysis  
STDs (genomic detection)  
Diaper-based sensors

**Brain and emotion**  
Wireless mobile EEG  
Seizure  
Autonomic nervous activity  
Head-impact sensor  
Intracranial pressure (noninvasive)  
Stress recognition (voice, respiration)

**Heart and vascular**  
Continuous BP tracking  
Handheld ECG  
Heart rhythm  
Cardiac output  
Stroke volume  
Thoracic impedance (fluid)

**Gastrointestinal**  
Endoscopic imaging  
Esophageal pH  
Medication compliance  
Fecal blood or bilirubin  
Gut electrical activity  
Chewing

**Watching over one's health**  
Pulse  
BP  
Temperature  
Activity  
Hydration  
Sleep stages  
Seizure  
Respiration rate  
O<sub>2</sub> saturation  
Blood CO<sub>2</sub>  
Blood glucose  
ECG (single-lead)  
Cardiac output  
Stroke volume  
Stress:  
Heart-rate variability  
Electrodermal activity

# How Tiny Sensors Are Driving Innovation in Medicine



Sources:  
ScienceTranslationalMedicine.org 15  
April 2015 Vol 7 Issue 283 <http://www.stsiweb.org/wp-content/uploads/2015/04/Sci-Transl-Med-2015-Steinhubl.pdf> & <http://www.kqed.org/futureofyou/2015/09/02/how-tiny-sensors-are-driving-innovation-in-medicine/>;



# How Africa's mobile revolution is disrupting the continent

By **Nmachi Jidenma**, Special to CNN

January 24, 2014 — Updated 1347 GMT (2147 HKT)



eHealth is transforming healthcare and **potentially saving lives**, especially in low-income countries

A technician scanning the eye of a woman with a smartphone application in rural Kenya.

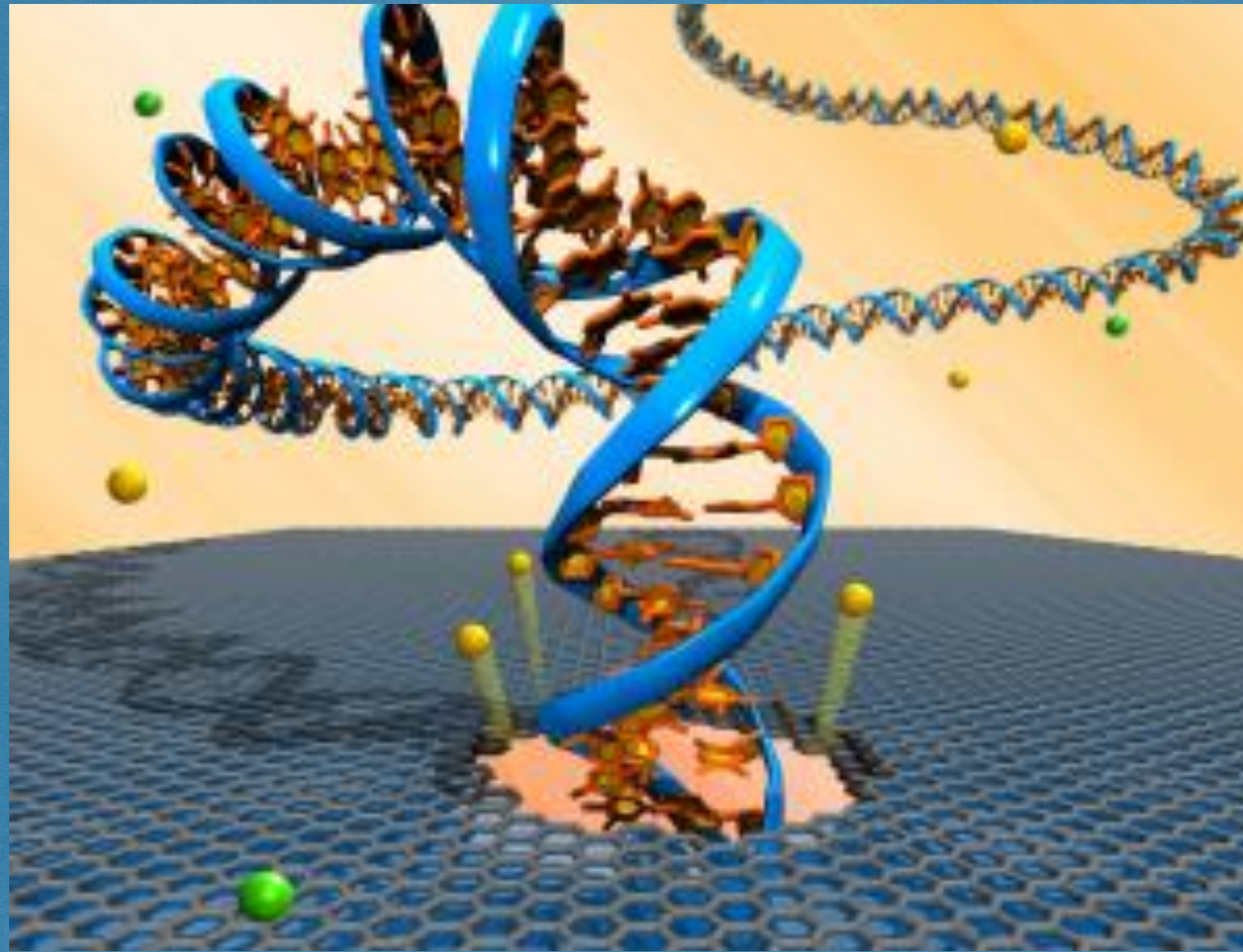


# CLINICLOUD'S SMART STETHOSCOPE AND THERMOMETER LET DOCTORS CHECK YOUR VITALS FROM THE CLOUD





# REAL TIME SEQUENCING OF INFECTIOUS DISEASES



Nanopore sequencing-detect all pathogens – viruses, bacteria, fungi and parasites – with a single test

$10^5$  copies of virus per milliliter needed

‘gold-standard’ PCR assays for viruses ( $10^2$ - $10^3$  copies per milliliter)

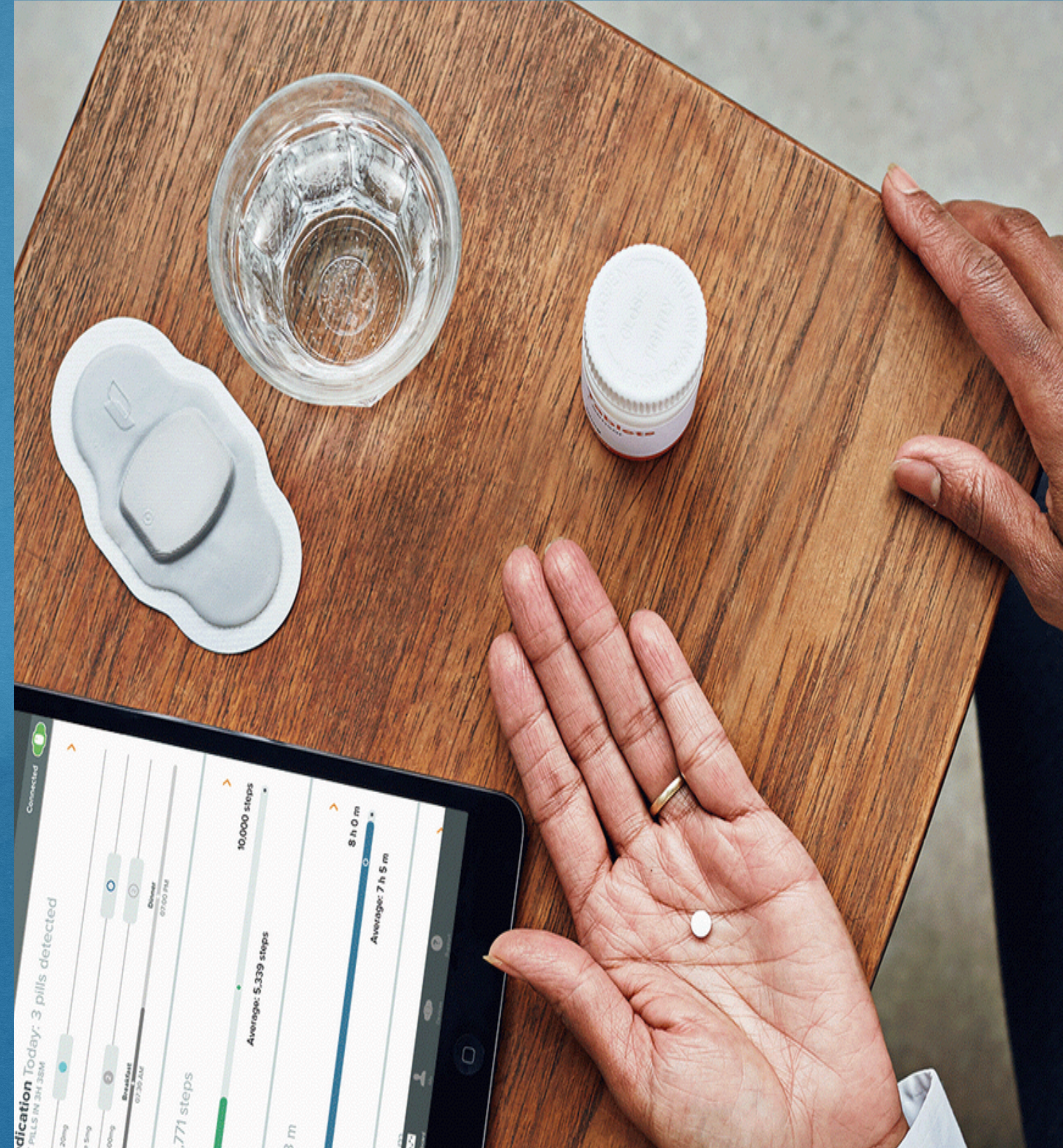
10 minutes

Ebola, HCV, chikungunya, malaria, typhoid fever, dengue etc

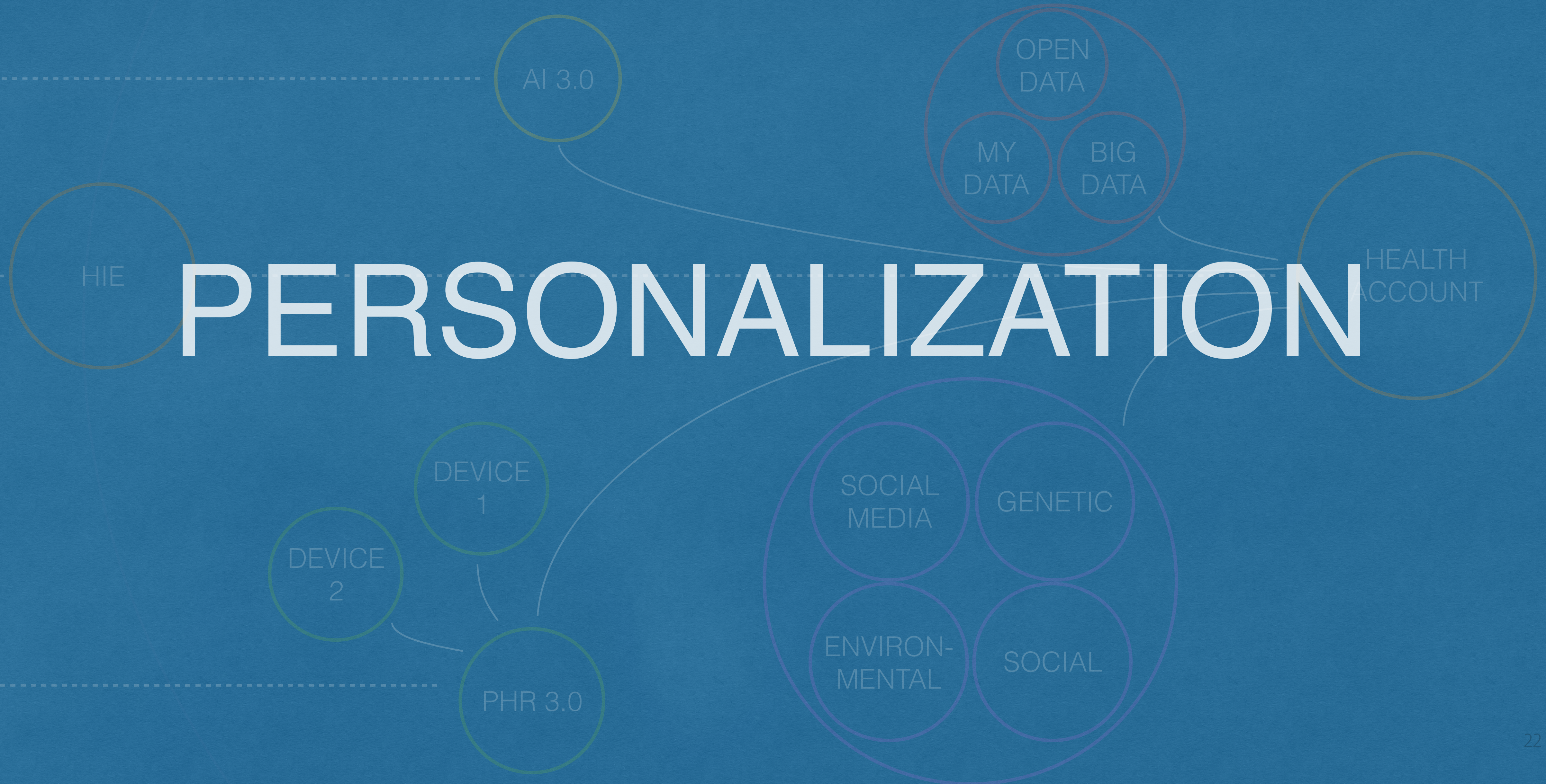




# PROTEUS DIGITAL HEALTH

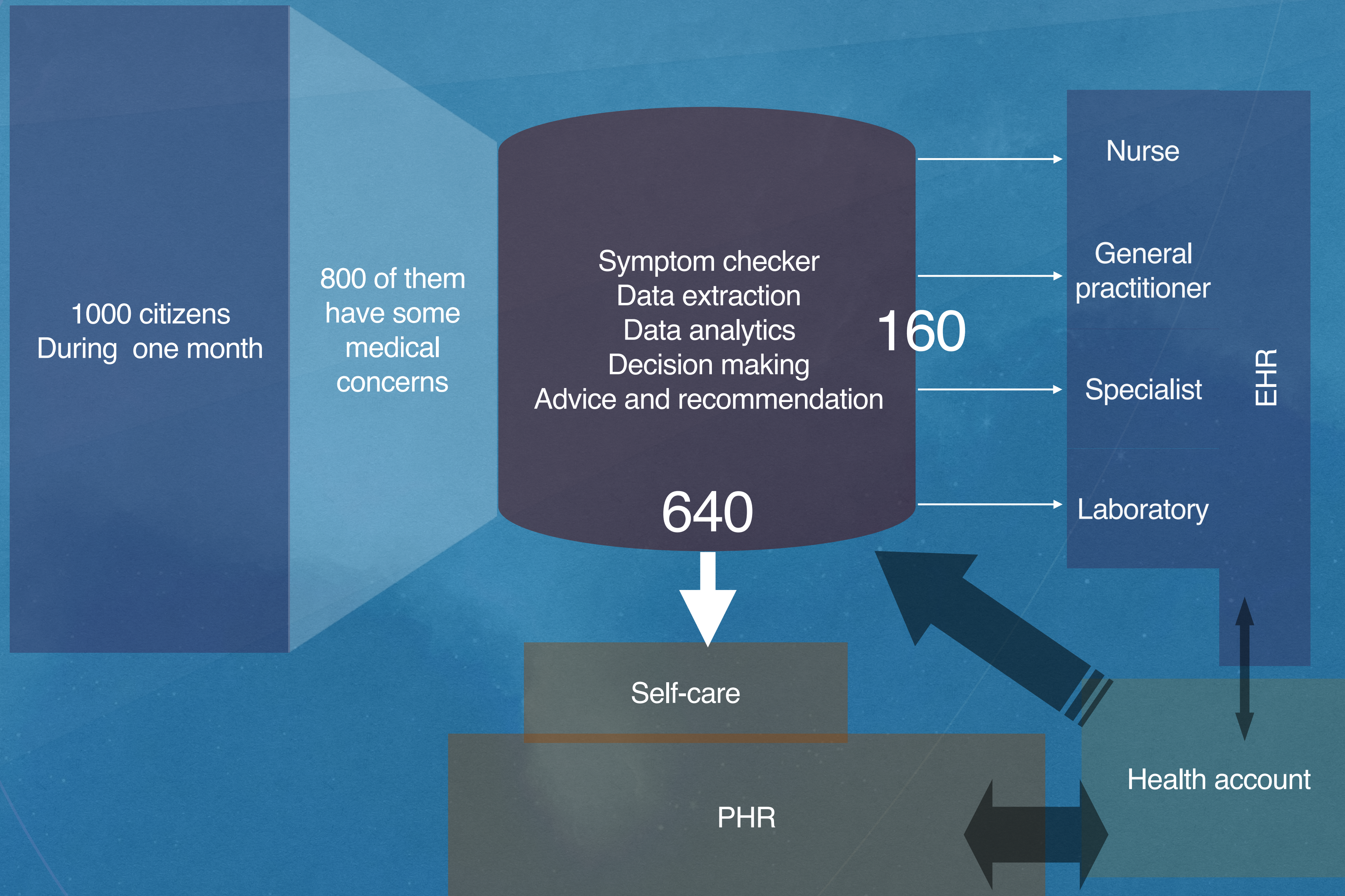








# WORKFLOW IN HEALTH 3.0





# HEALTH 1.0 TO HEALTH 3.0







The solutions feature Sophie, an empathetic avatar to collect data about the user and share it with healthcare providers and caregivers. Sophie utilizes Watson's cognitive resources to provide curated information about medical conditions and health & wellness.

InterConnect Demo: <https://vimeo.com/156499030>

Pilot program with Veterans Health Association:

- 8 million veterans
- 350k medical & administrative staff

Ability to connect with biometric devices



# CONTACT INFORMATION

*GET IN CONTACT FOR FURTHER COOPERATION*

- \* Key-note presentations
- \* Company and government consultations
- \* Business proposals
- \* Round tables and discussion groups

*“Accelerating innovation  
saves healthcare”*

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# THANK YOU

Have a nice day!