THE DIGITAL FUTURE OF PHARMACY

Technology advancements that will change how we care for patients.

OBJECTIVES

Review changes in health care delivery that likely impact pharmacy practice.

Describe current trends in contemporary pharmacy practice as they relate to interprofessional collaboration.

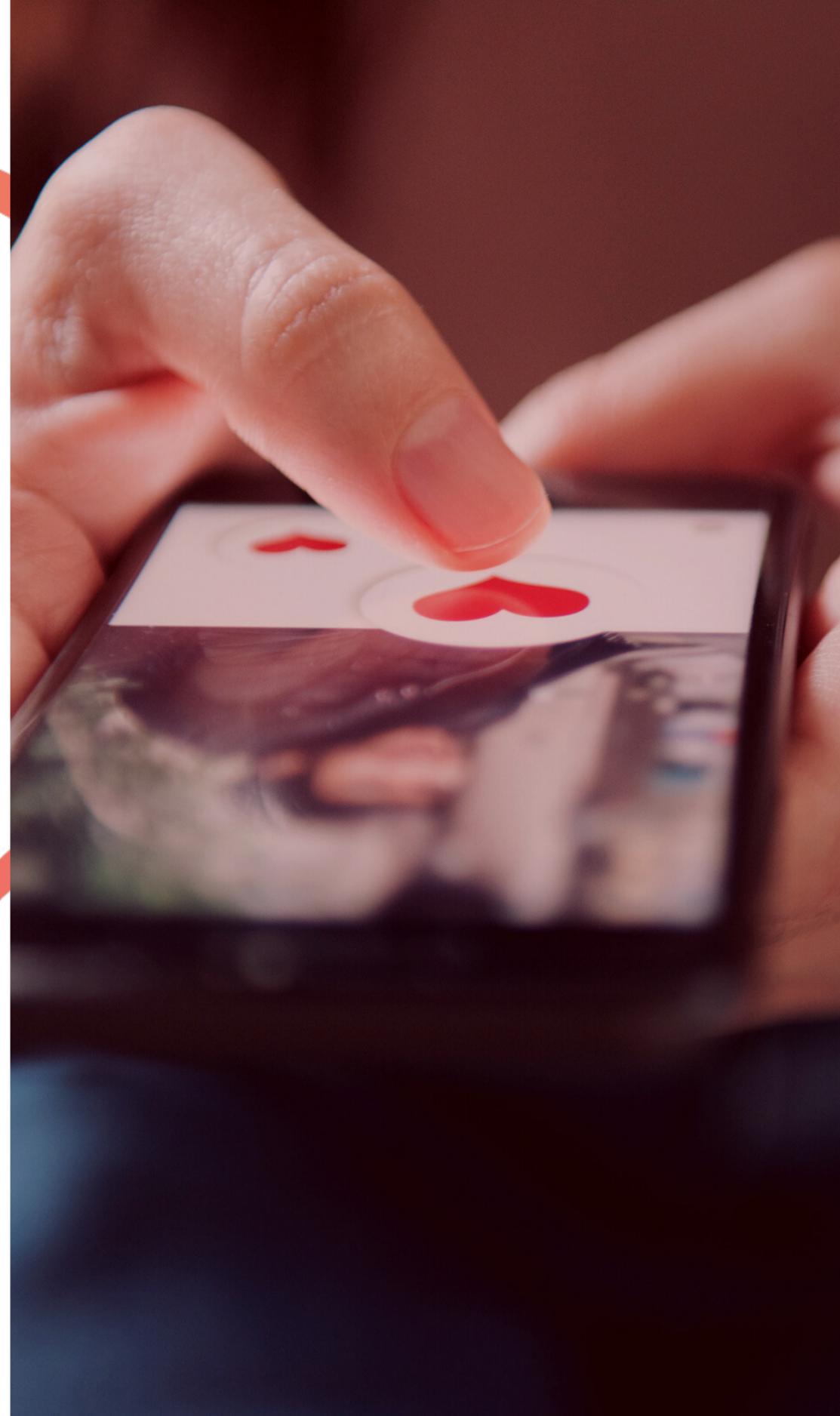Discuss practice innovations designed to improve health outcomes.

Discuss role delineation for pharmacists on the interprofessional health care team.

WHAT CAN'T WE DO WITH TECHNOLOGY?

It can be presumed that rapid advancements will continue to outpace expectations. After all, what comes after the smartphone?

02

TECHNOLOGY IS CHANGING HOW PATIENTS REGARD THEIR HEALTHCARE

80%

PATIENTS NOW USE THE INTERNET TO LOOK UP HEALTH INFORMATION.

Pew Internet & American Life Project

42%

OF ADULTS ENGAGE IN DIGITAL
HEALTH TRACKING.

PATIENTS WOULD RATHER USE YOUTUBE THAN TALK TO A PROVIDER

>50%

Of patient submitted videos on medication usage were found preferential for viewing...

27.5%

But injection instructional videos uploaded to YouTube had misleading information based on clinical review.
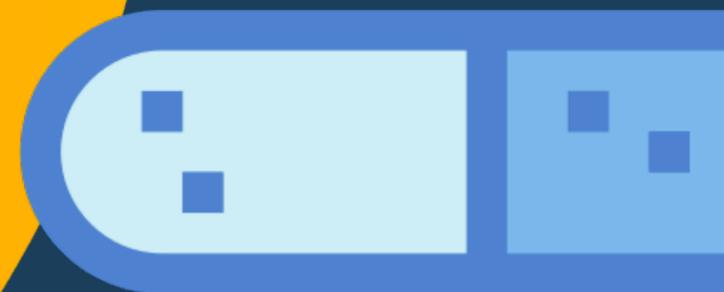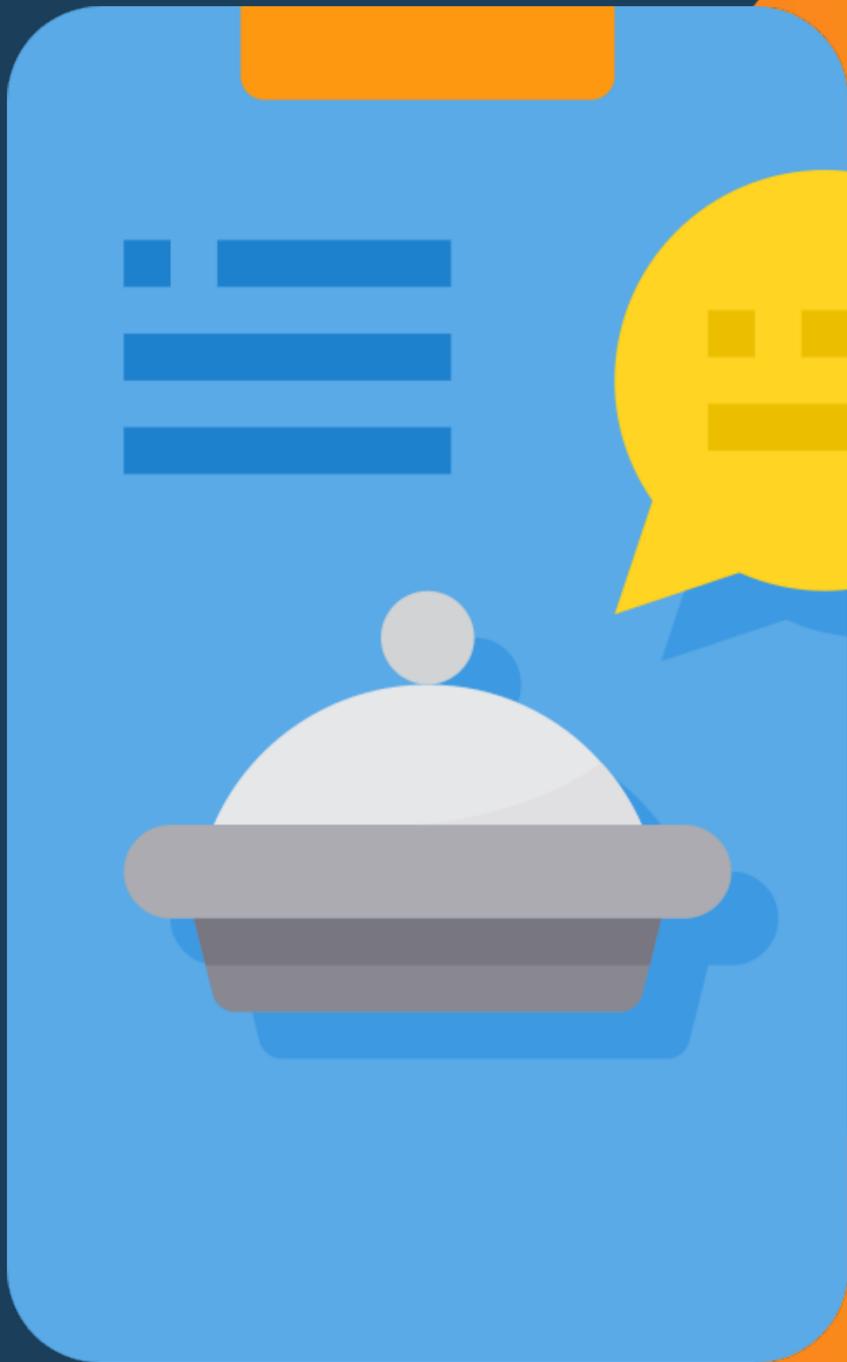
Rittberg R, et al. Clin Rheumatol. 2016;35(5):1329–1333.
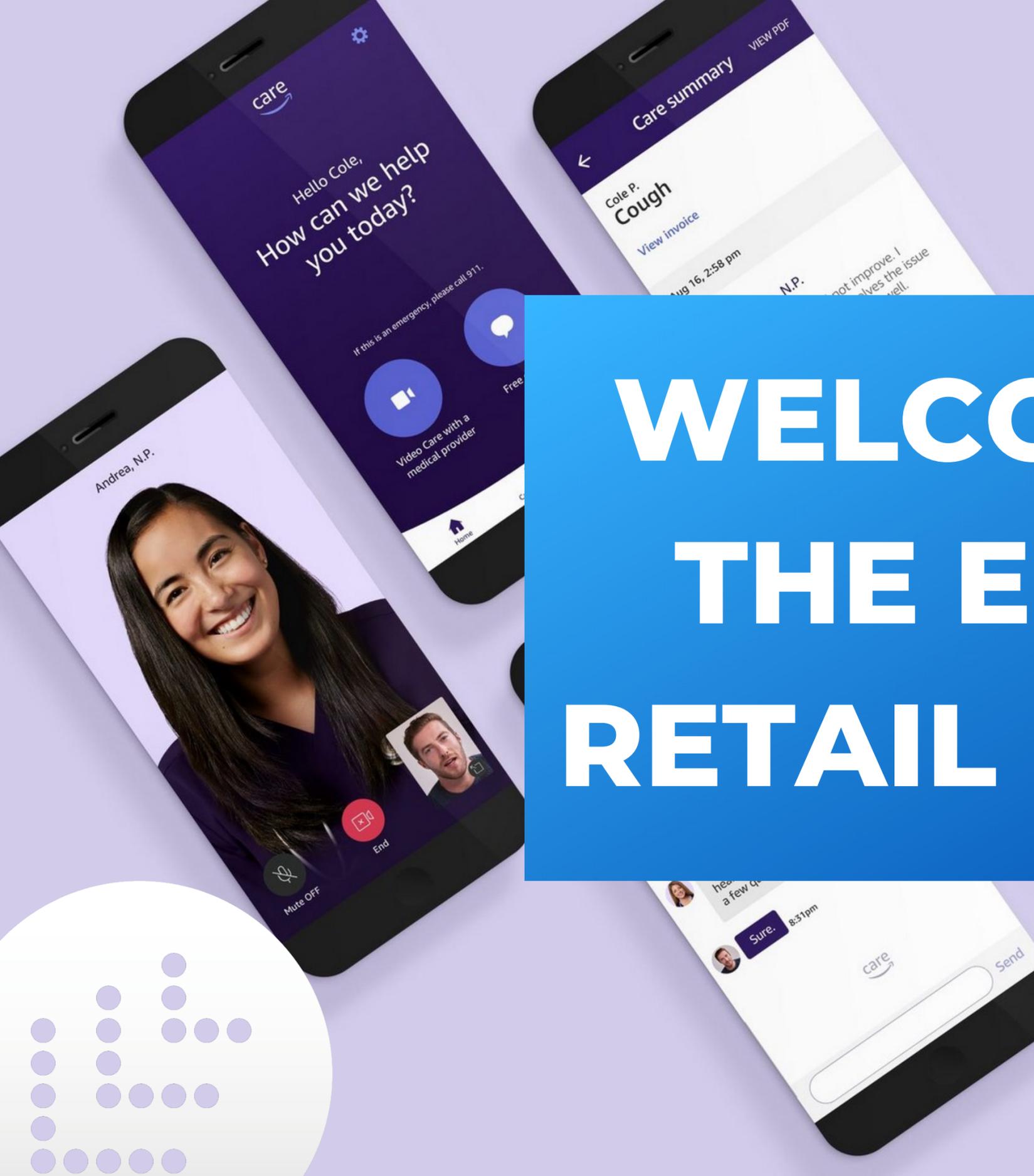Tolu S, et al. Rheumatol Int. 2018;38(7):1285–1292.

PATIENTS ARE NOW CONSUMERS OF HEALTH.

Patients recognize there are a plethora of services offered via apps and online companies aiming to make access to healthcare more convenient and transparent compared to traditional healthcare players initiatives.
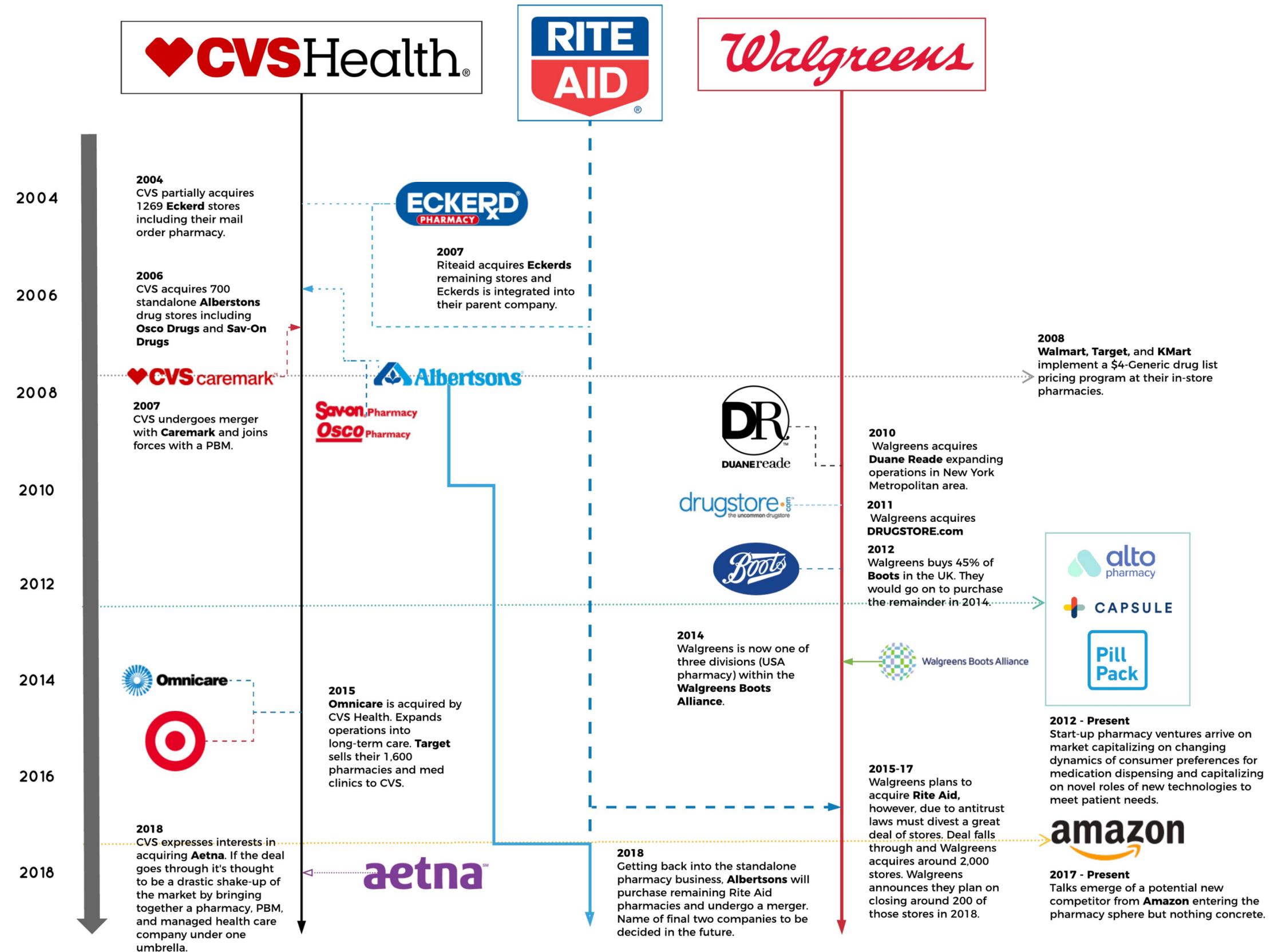
IF I CAN ORDER FOOD ON THE GO, WHY NOT MY MEDICATIONS?

WELCOME TO THE ERA OF RETAIL HEALTH

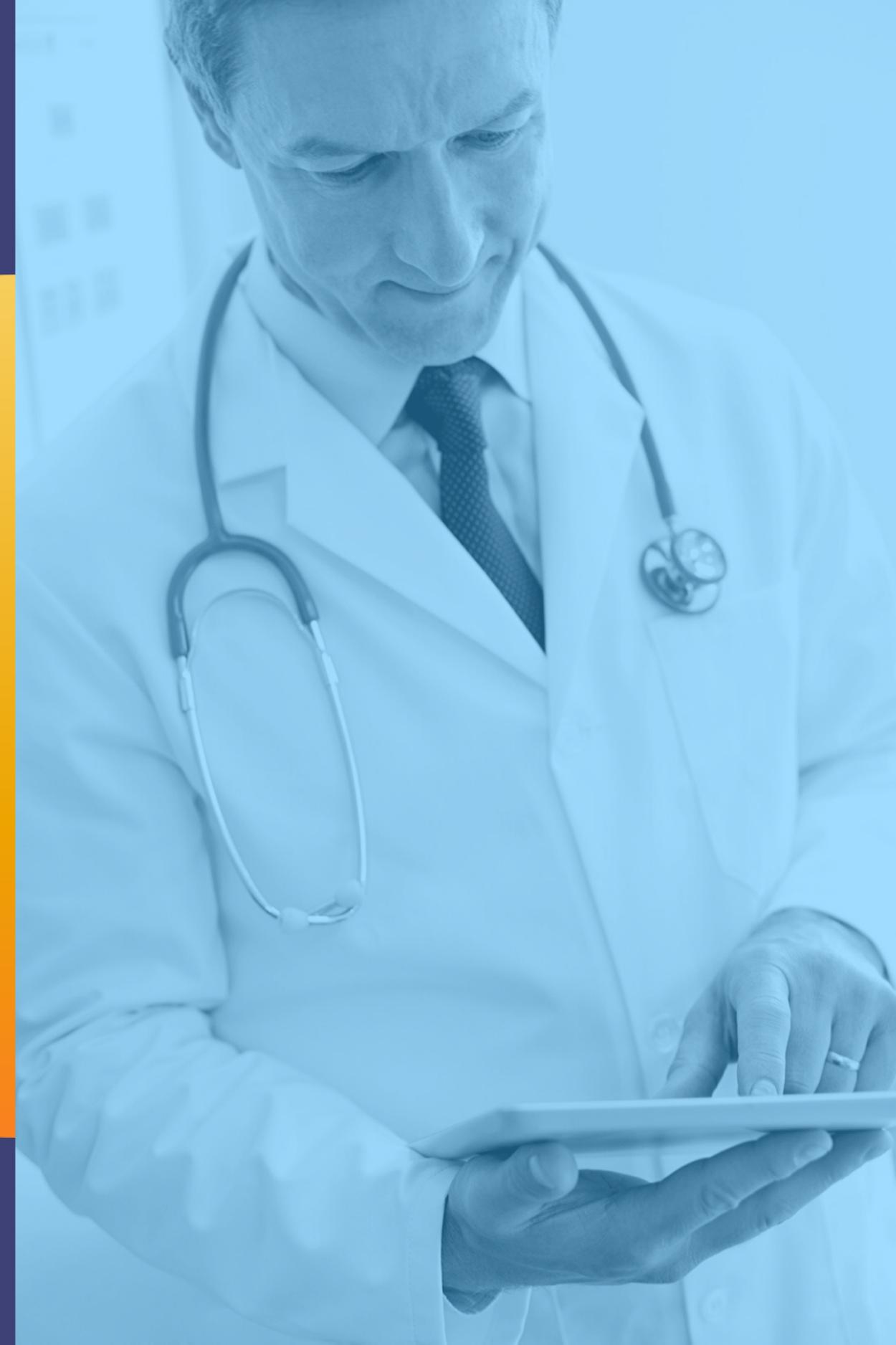# Pharmacy companies will continue to expand and offer a 'consumer' first model.

CVS Health

RITE AID

Walgreens

2004
2004
CVS partially acquires 1269 **Eckerd** stores including their mail order pharmacy.

ECKERD PHARMACY

2007
Riteaid acquires **Eckerds** remaining stores and Eckerds is integrated into their parent company.

2006
2006
CVS acquires 700 standalone **Alberstons** drug stores including **Osco Drugs** and **Sav-On Drugs**

2008
CVS caremark

Albertsons

Savon Pharmacy
Osco Pharmacy

2008
Walmart, **Target**, and **KMart** implement a $4-Generic drug list pricing program at their in-store pharmacies.

2007
CVS undergoes merger with **Caremark** and joins forces with a PBM.

DR DUANEreade

2010
Walgreens acquires **Duane Reade** expanding operations in New York Metropolitan area.

2010

drugstore.com
the uncommon drugstore

2011
Walgreens acquires DRUGSTORE.com

Boots

2012
Walgreens buys 45% of **Boots** in the UK. They would go on to purchase the remainder in 2014.

alto pharmacy

CAPSULE

Pill Pack

2012

2014
Walgreens is now one of three divisions (USA pharmacy) within the **Walgreens Boots Alliance**.

Omnicare

Walgreens Boots Alliance

2014

2015
Omnicare is acquired by CVS Health. Expands operations into long-term care. **Target** sells their 1,600 pharmacies and med clinics to CVS.

2012 - Present
Start-up pharmacy ventures arrive on market capitalizing on changing dynamics of consumer preferences for medication dispensing and capitalizing on novel roles of new technologies to meet patient needs.

2016

2015-17
Walgreens plans to acquire **Rite Aid**, however, due to antitrust laws must divest a great deal of stores. Deal falls through and Walgreens acquires around 2,000 stores. Walgreens announces they plan on closing around 200 of those stores in 2018.

amazon

2018
CVS expresses interests in acquiring **Aetna**. If the deal goes through it's thought to be a drastic shake-up of the market by bringing together a pharmacy, PBM, and managed health care company under one umbrella.

2018

aetna

2018
Getting back into the standalone pharmacy business, **Albertsons** will purchase remaining Rite Aid pharmacies and undergo a merger. Name of final two companies to be decided in the future.

2017 - Present
Talks emerge of a potential new competitor from **Amazon** entering the pharmacy sphere but nothing concrete.

Patients now have access to over 20 online Direct-To-Consumer Prescription Services

THE CONVENIENCE TO ACCESS OUR HEALTH ON OUR OWN TERMS IS KEY TO THE FUTURE OF HOW CARE IS DELIVERED

WHAT DOES DIGITAL HEALTH MEAN?

01 Sensors
Wearables, IOT enabled devices, and general approach to collecting data in realtime from use. Can be devices or directly from the body.

02 Mobile Apps
Apps are ubiquitous, but no more so than those that users have come to trust every day. These are becoming evidence based and gaining FDA clearance.

03 Telehealth
Reaching patients where they are remotely through devices and smartphones and computers may lower the logistical issues facing many for health needs.

04 Artifical Intelligence
Processing the sheer amount of data coming from all the devices and wearables and health records is imposing but possible with analytical engines.

05 Voice Assistants
Using voice to reach users directly aside from direct touch will likely supplant the need for patients to be always directly responsible for performing actions.

06 Robotics & Automation
Using automation with robotics and AI can pose a novel means to conduct services traditionally done by humans.

30%

Of patients now use a wearable health device on a daily basis.
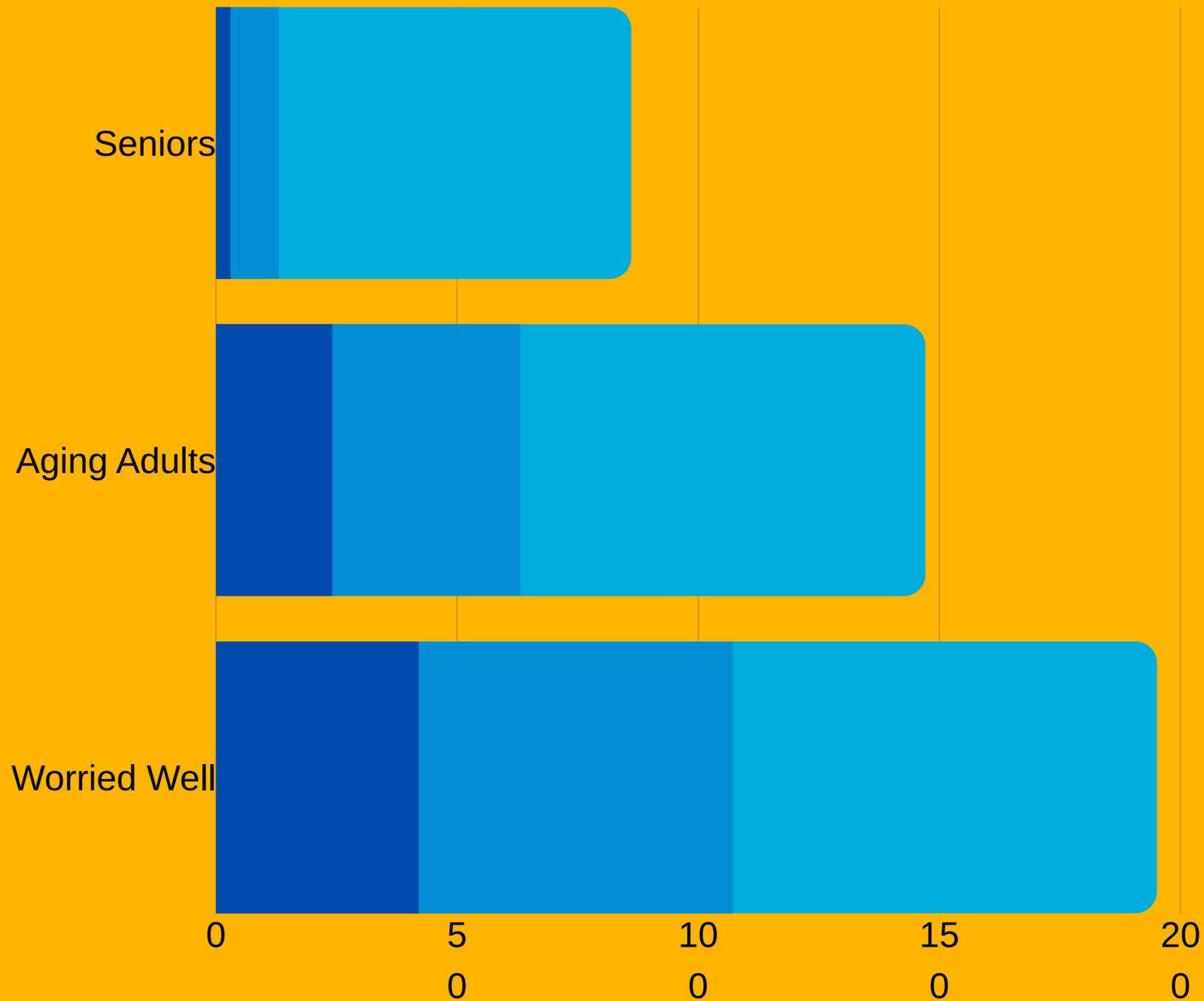
TELEMEDICINE
DIGITAL TRACKING
ONLINE HEALTH SEARCH

Chart categories: Seniors, Aging Adults, Worried Well

X-axis: 0, 50, 100, 150, 200
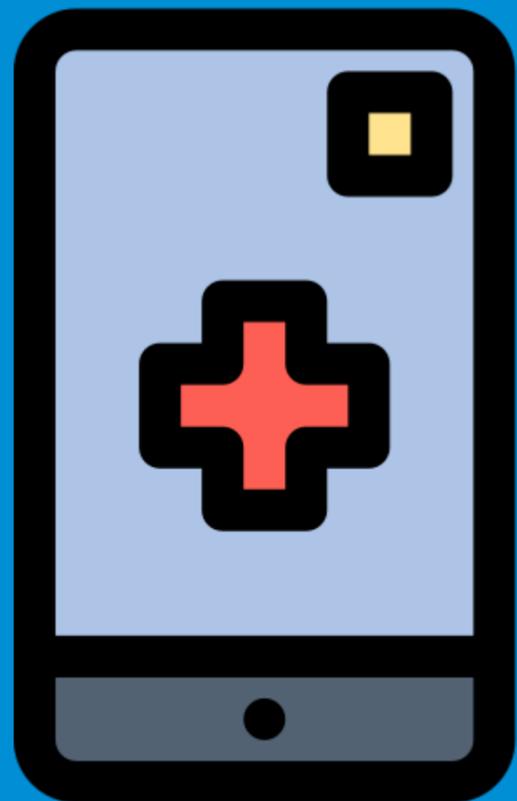
SENSORS FOR REALTIME PATIENT ASSESSMENT ARE NOW KEY TO CARE.

APPLE HEART STUDY

Over 400K patients enrolled over 8 months, with over 2000 patients notified of a irregular pulse. A positive predictive value of 0.84 was found with ECG confirmation. Future studies will likely look towards utilizing wearables such as the Apple Watch in RCTs.

We are now exploring the use of EKG measurement to track blood glucose and potassium measurements in real time.

MIHAELA PORUMB, ET AL. SCIENTIFIC REPORTS, 2020; 10 (1)
GALLOWAY CD, ET AL. JAMA CARDIOL. 2019;4(5):428–436.

WE CAN NOW MOVE FROM EPISODIC CARE TO REALTIME CARE

Home lab testing

Voice Assistants

"Did you take your medications today?"

120

100

Alexa, *cough* I'm hungry *sniffle* — 132   130

Would you like a recipe for chicken soup?

No, thanks

134 Ok, I can find you something else. By the way, would you like to order cough drops with 1 hour delivery?

110 That would be awesome! Thanks for asking!

No problem. I'll email you an order confirmation. Feel better!

Voice Data 136

Voice Processing Server(s) — 142

Network(s) — 140

Audio Content Server(s) — 144

User Device(s) — 146

Receive voice input — 150

Determine that user has an abnormal physical or emotional condition — 160

Determine audio content for presentation based at least in part on the abnormal condition — 170

Present audio content — 180

Robots & Health

04

TECHNOLOGY IS CHANGING THE APPROACH TO MEDICATION MANAGEMENT

MEDICATIONS ARE AN AREA OF HIGH INTEREST FOR DISRUPTION

CHANGING HOW WE THINK ABOUT ADHERENCE

Adherence is at most subjective based on patient reported adherence rates or by using data collected from billing data...

But can we go beyond that with Digital Health?

DIGITAL HEALTH MEDICATION ADHERENCE COMPANIES

What technology is available and how are they doing it?

TheDigitalApothecary.com

VIRTUALLY OBSERVED THERAPY (VOT)
Using a smart phone camera, these companies can help watch a patient take their medication virtually to check adherence.

- sureAdhere
- emocha MOBILE HEALTH INC.
- AiCure

SMART PILL ORGANIZERS
Devices or dispensers that help organize medications and dispense to patients. These may integrate blister packed or strip packaged medications as well.

- vaica
- elliegrid
- pilldrill
- livi
- MedMinder
- MedSentry
- tricella
- MedaCube By PharmAdva
- HERO
- pillpresso
- evondos
- karie
- my-uBox
- TINYLOGICS

PATIENT REWARD SYSTEM
Behavioral economics or gamification apps that reward patients for their medication adherence.

- wellth
- perx health
- Mango Health
- SEMPRE HEALTH
- HealthPrize Technologies

SMART PILL BOTTLES
Sensors that attach to a pill bottle or a whole complete unit that can detect when a medication is removed to track adherence.

- AdhereTech
- DoseSmart
- NantHealth
- pillsy
- SMRT.
- +NTENT SOLUTIONS
- TimerCap
- medikyu

SMART INHALERS
Sensors that enable inhaled medications to track their use in real-time by measuring actuation.

- adherium
- cohero health
- Propeller
- CONNECT'INH
- amiko

BLISTER PACK DEVICES
Devices or sensors that attach to blister pack medications to track adherence.

- CuePath Innovation
- Aavia

SMART INJECTABLE DEVICES
Products that attach as sensors to injectable medications or help streamline the adherence measurement of disposable injectables.

- COMMON SENSING
- YPSOMED SELFCARE SOLUTIONS
- BIOCORP
- insulog control it & free yourself
- smartplus intelligent insulin pen
- Companion Medical
- insulcloud
- DIABNEXT
- Emperra Digital Diabetes Care
- HEALTH BEACON
- pendiq intelligent diabetes care
- INNOVATION ZED

HOME ASSISTANT PILL DISPENSER
Home units that dispense medications to patients but also integrate other features such as teleservices or use alternative services to help patients care for themselves.

- spencer health solutions
- Omcare
- MediPENSE
- Catalia Health
- pillo

BIOINGESTIBLE SENSORS
Sensors that are taken alongside a medication to track objective adherence based on detection of ingestion.

- proteus DIGITAL HEALTH
- etectRx

WHERES THE MOBILE APPS?
The bottom line is there are to many to include here. Several companies I listed in patient reward systems, but I could have included others like **MediSafe** as well. Nonetheless, I recommend the research by Dayer and colleagues alongside others to see what apps are on the market.

- Lilly
- BAYER
- novo nordisk

Lilly and **Novo Nordisk** both will release smart insulin pens shortly (2019 est), while **Bayer** has created a smart injectable device (Betaconnect)

- teva

Teva has released their **Digihaler** system which is based on their acquisition of Gecko Caps early in 2000's. This enables tracking of actuations by a patient, but also measuring inspiration flow.
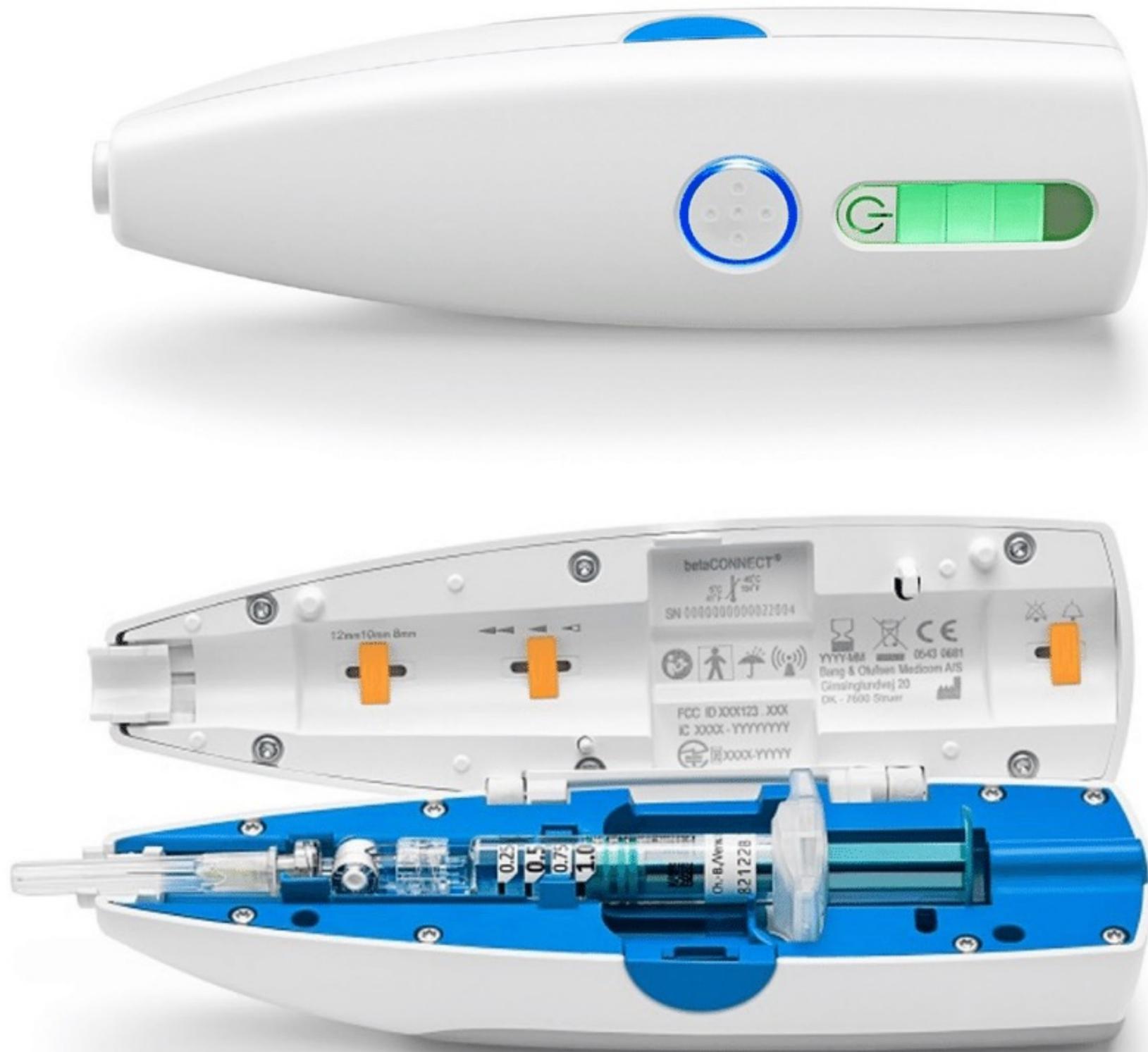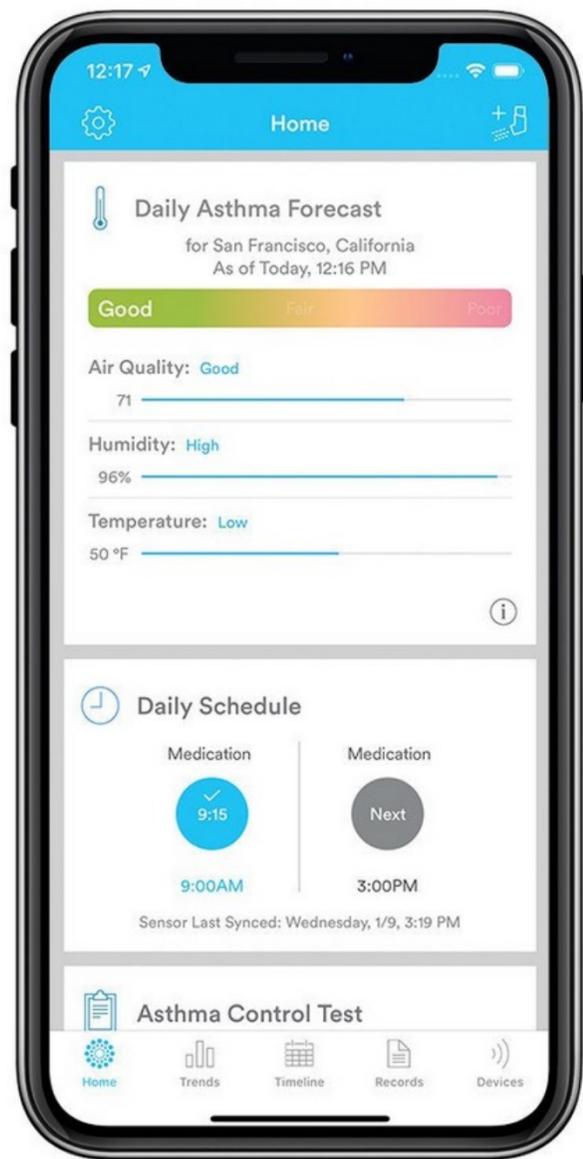
- Otsuka

Otsuka has worked with **Proteus** to create the first smart oral medication on the market, Abilify Mycite. Other drugs are likely to come to the market shortly.
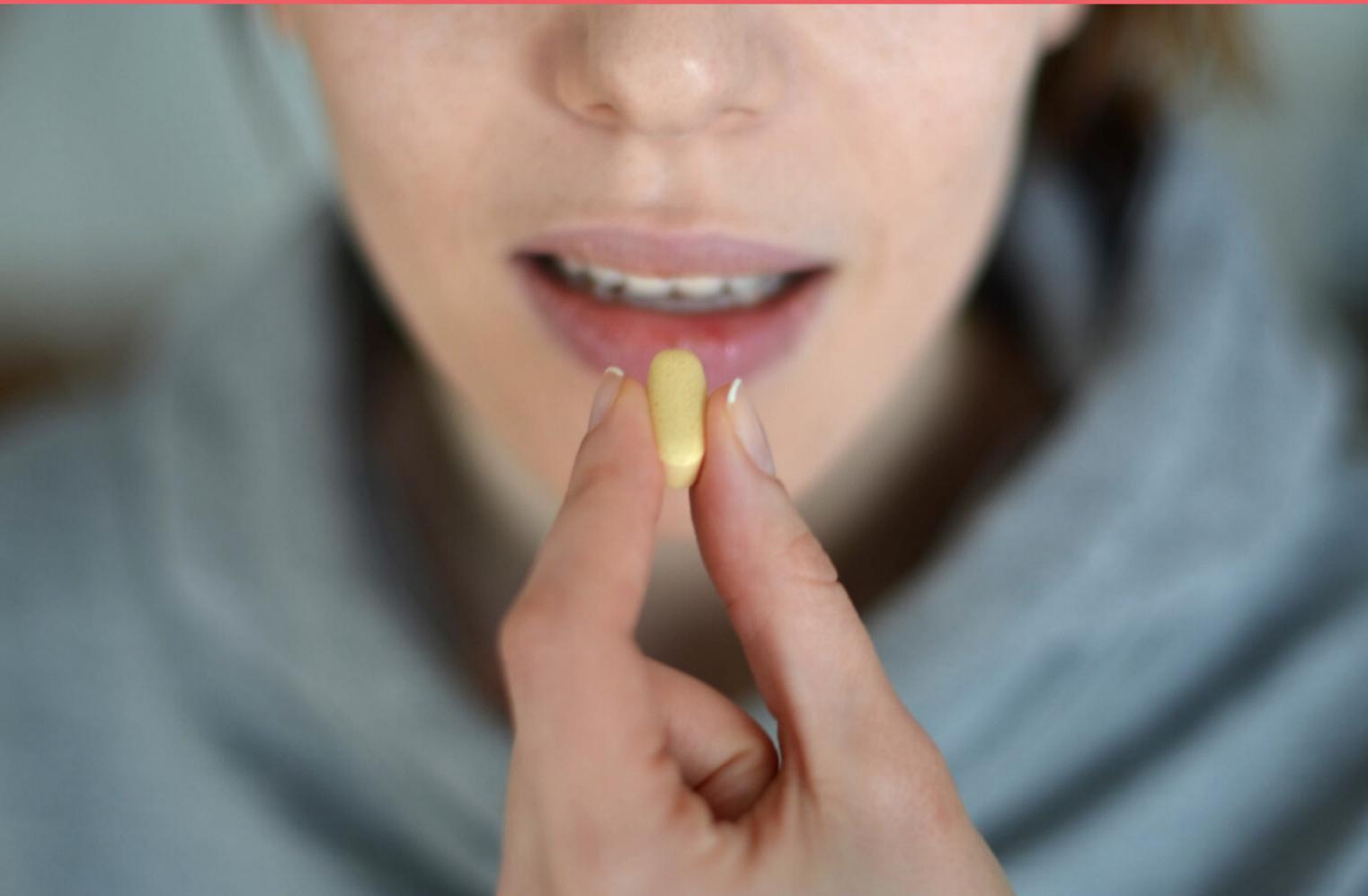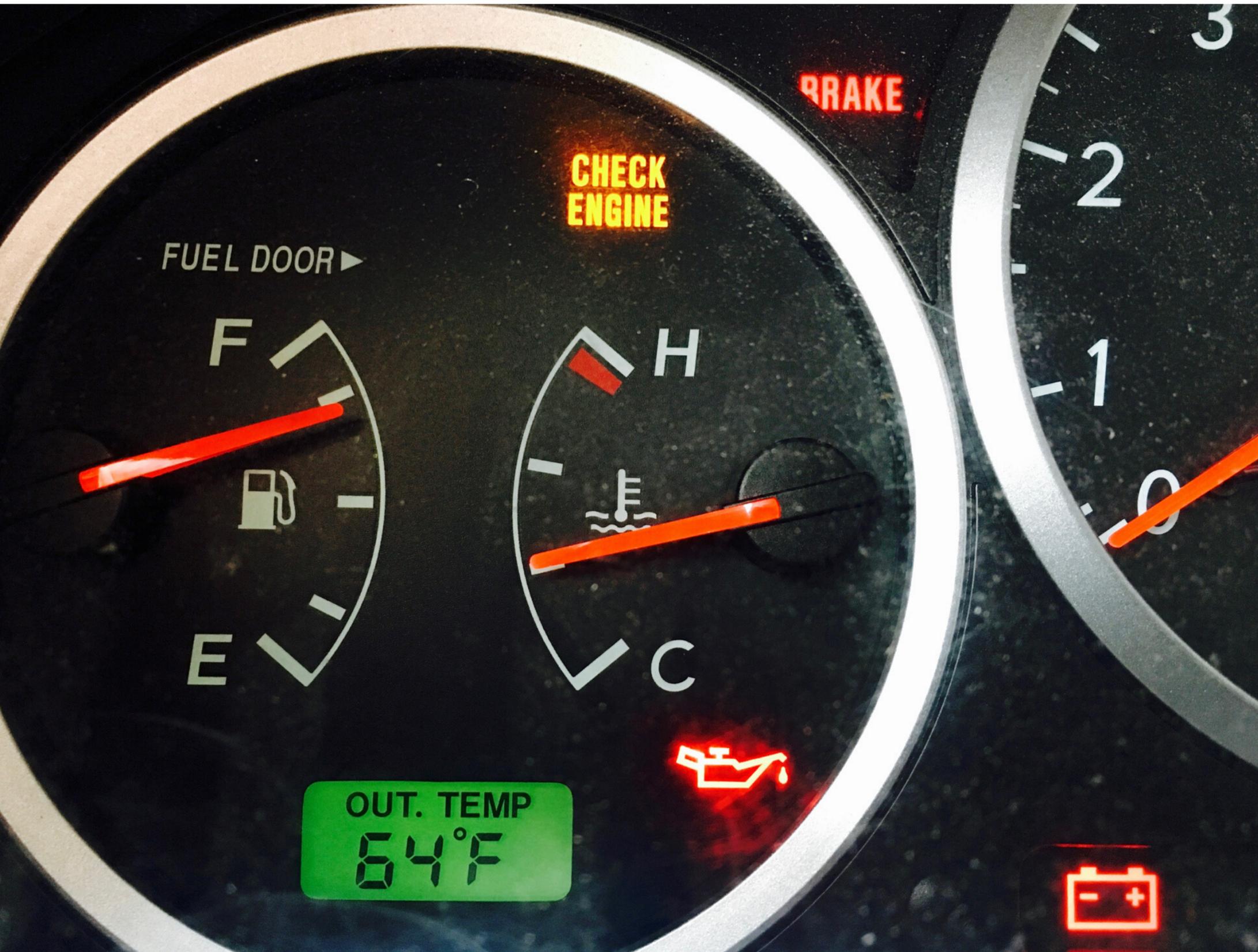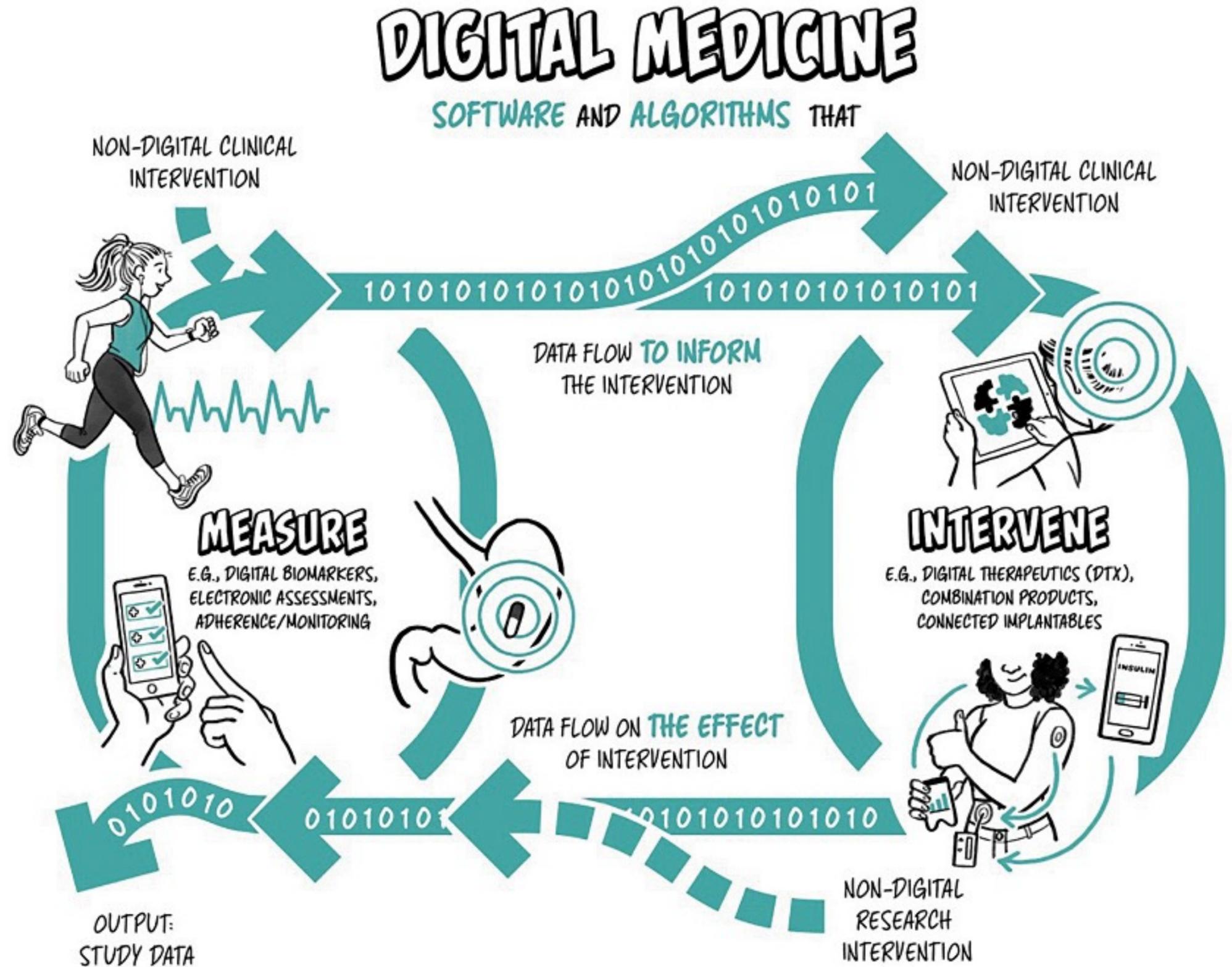
PHARMACISTS CAN PROVIDE PRECISION PATIENT

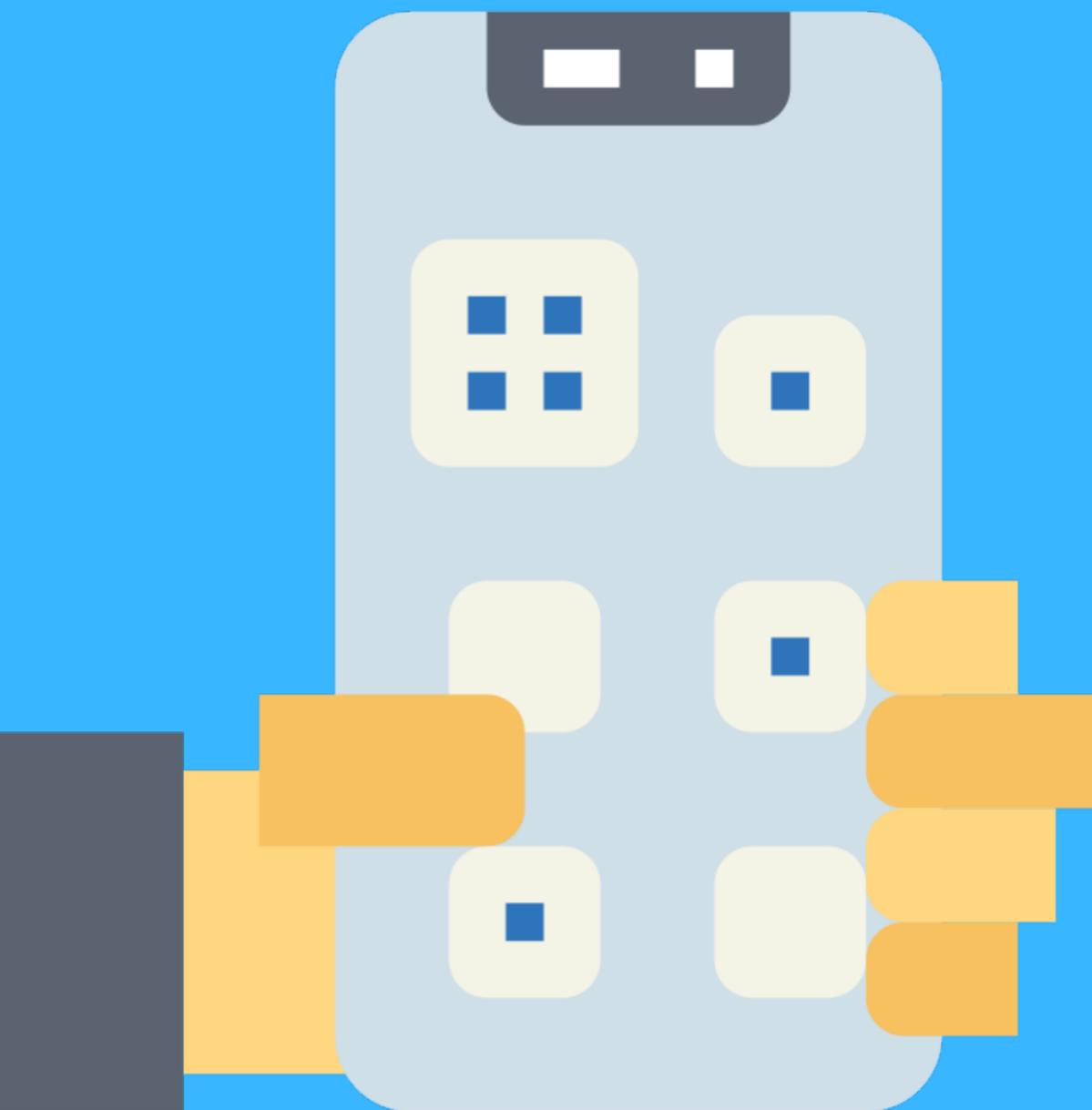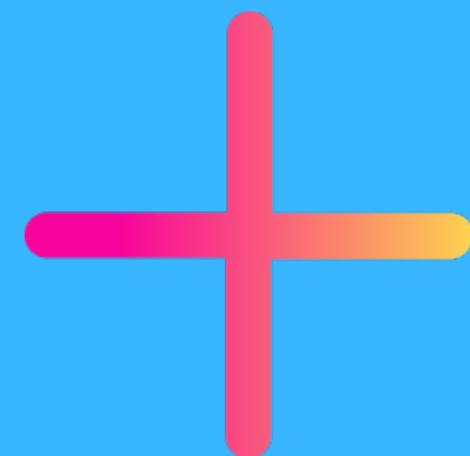Patients data can now be incorporated based upon multiple collection points to provide better care in real time.

IF YOUR CAR CAN ALERT YOU WHEN SOMETHING IS WRONG, WHY NOT DO THE SAME WITH YOUR HEALTH?

The goal of all this technology is to have it work in the background of our lives and only intervene when needed most.

DIGITAL MEDICINE
SOFTWARE AND ALGORITHMS THAT

NON-DIGITAL CLINICAL INTERVENTION

NON-DIGITAL CLINICAL INTERVENTION

DATA FLOW TO INFORM THE INTERVENTION

MEASURE
E.G., DIGITAL BIOMARKERS, ELECTRONIC ASSESSMENTS, ADHERENCE/MONITORING

INTERVENE
E.G., DIGITAL THERAPEUTICS (DTX), COMBINATION PRODUCTS, CONNECTED IMPLANTABLES

INSULIN

DATA FLOW ON THE EFFECT OF INTERVENTION

OUTPUT: STUDY DATA

NON-DIGITAL RESEARCH INTERVENTION

CORAVOS A ET AL. DIGIT BIOMARK 2019;3:31–71

WHO SAYS IT'S JUST DRUGS THAT CAN OFFER TREATMENT?

DIGITAL HEALTH		
	DIGITAL MEDICINE	
		DIGITAL THERAPEUTICS
DEFINITION	Digital health includes technologies, platforms, and systems that engage consumers for lifestyle, wellness, and health-related purposes; capture, store or transmit health data; and/or support life science and clinical operations.	Digital medicine includes evidence-based software and/or hardware products that measure and/or intervene in the service of human health.[1]	Digital therapeutic (DTx) products deliver evidence-based therapeutic interventions to prevent, manage, or treat a medical disorder or disease.[2]
CLINICAL EVIDENCE	Typically do not require clinical evidence.	Clinical evidence is required for all digital medicine products.	Clinical evidence and real world outcomes are required for all DTx products.
REGULATORY OVERSIGHT	These products do not meet the regulatory definition of a medical device[3] and do not require regulatory oversight.	Requirements for regulatory oversight vary. Digital medicine products that are classified as medical devices require clearance or approval. Digital medicine products used as a tool to develop other drugs, devices, or medical products require regulatory acceptance by the appropriate review division.	DTx products must be reviewed and cleared or certified by regulatory bodies as required to support product claims of risk, efficacy, and intended use.

1 https://www.dimesociety.org/index.php/defining-digital-medicine
2 https://www.dtxalliance.org/dtxproducts/
3 It is important to check with local regulatory requirements in each jurisdiction the product is manufactured, registered, or used in.
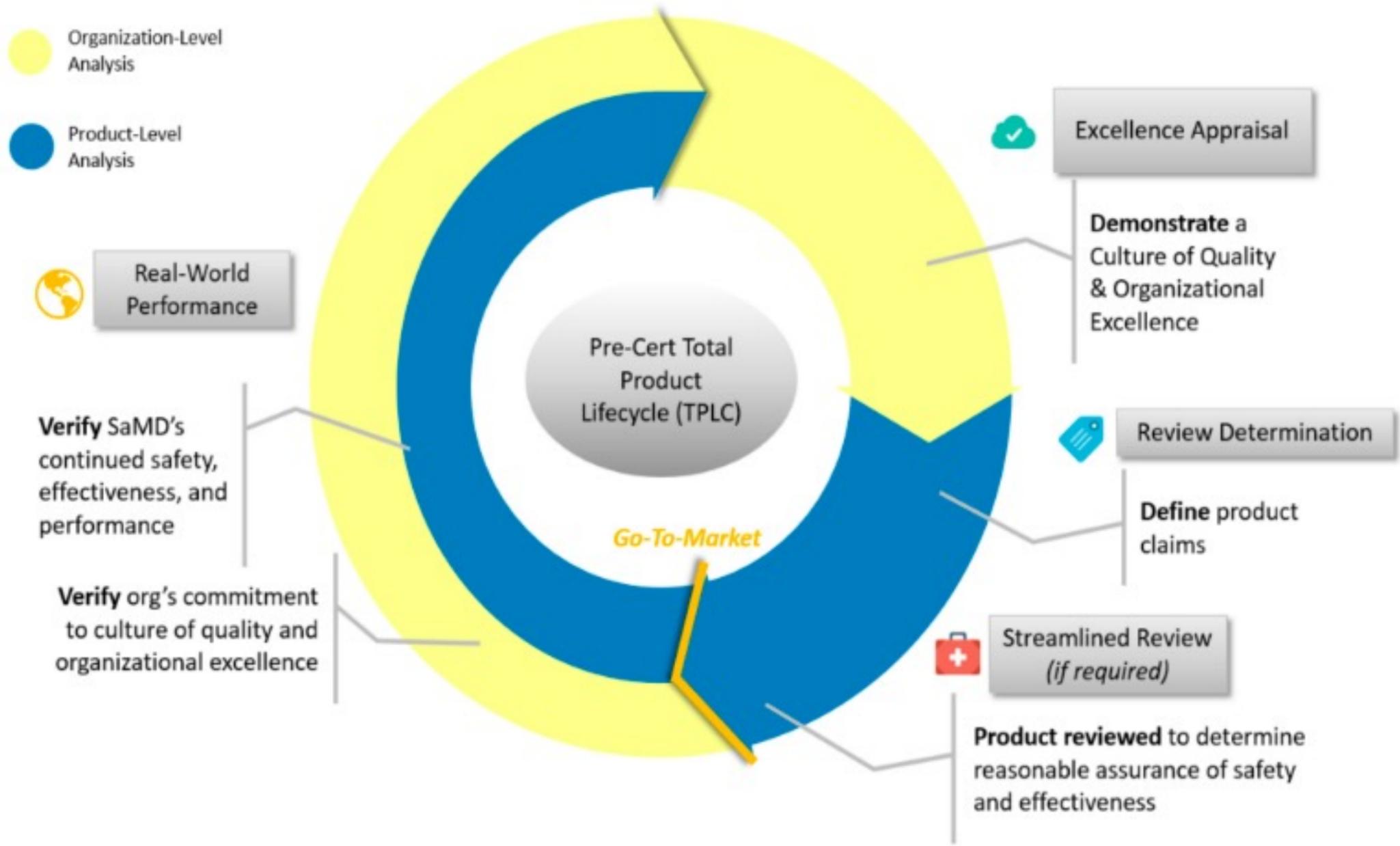
FDA Pre-Certification Program
- Excellence appraisal
- Review determination
- Streamlined review
- Real-world performance

Pre-Certification Companies
- Apple
- Samsung
- Fitbit
- J&J
- Pear Therapeutics
- Roche
- Verily
- Tidepool
- Phosphorus

# Sample DTx Pipelines

Pear Therapeutics

Click Therapeutics

RESET & RESET-O

DTx platform for management of substance use disorder and opioid use disorder. First FDA cleared DTx platform in the US. Used conjunctively with pharmacological therapy to help manage patients goals. Data collected from patients through mobile software then used in patient care plan by their provider.
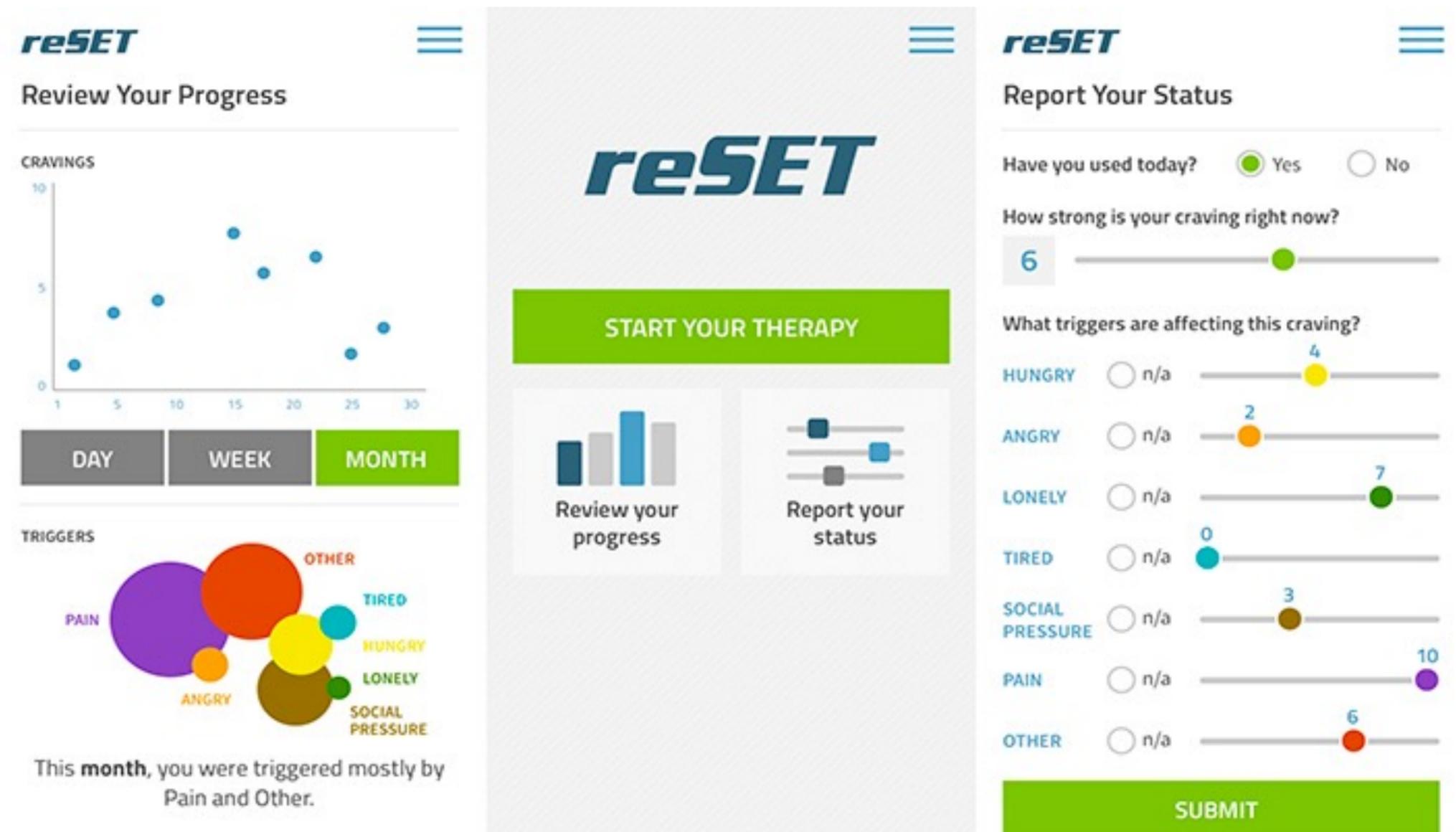
INSULIA

Platform for patients with type 2 diabetes. Collects data on blood glucose trends. Provider sets up the software goals for the patient. Patient is instructed via app how much insulin to use. Provider remotely follows data and augments care plan as needed.
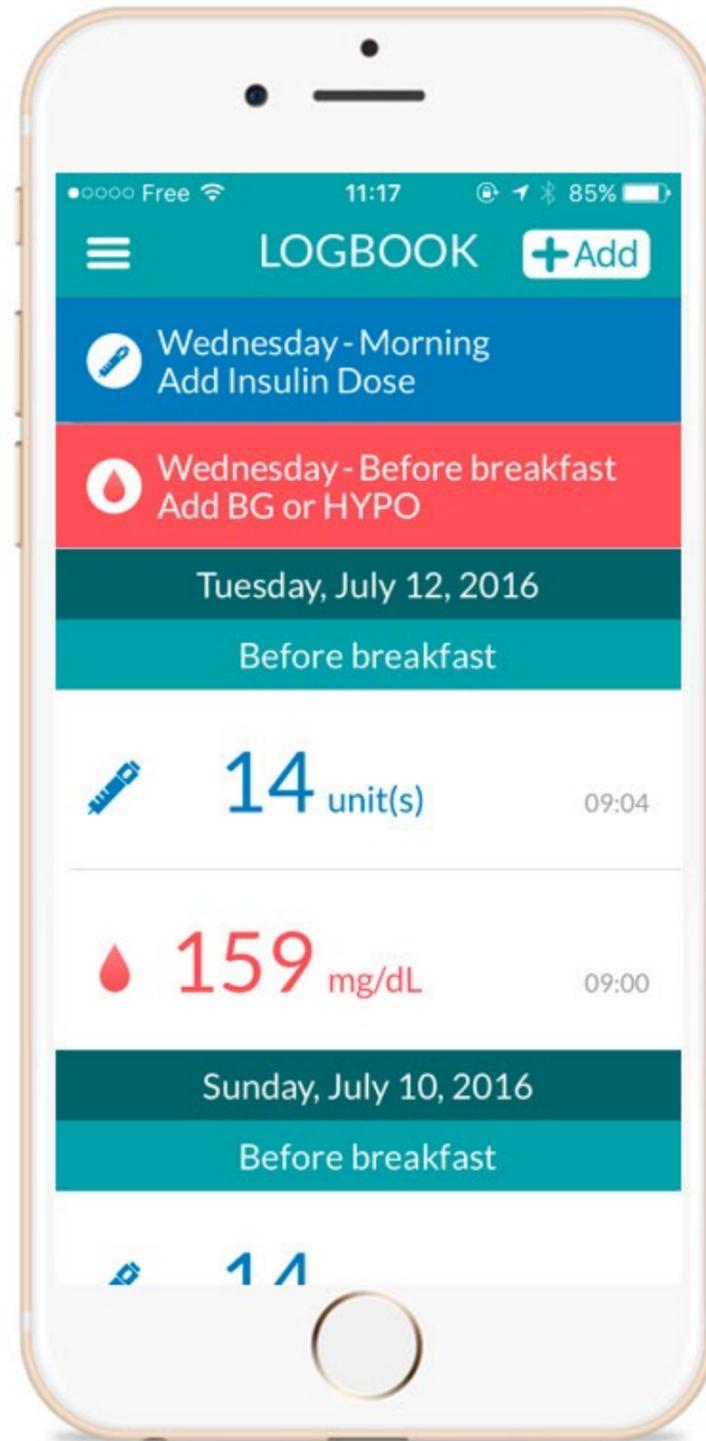
- Gives BG trend data to providers
- Personalized treatment plans
- Personalized dose recommendations for insulin
- Remote patient coaching

Voluntis. Available at: http://www.voluntis.com/en/news/news-1/news-1/voluntis-fda-clearance-and-ce-mark-for-insulia
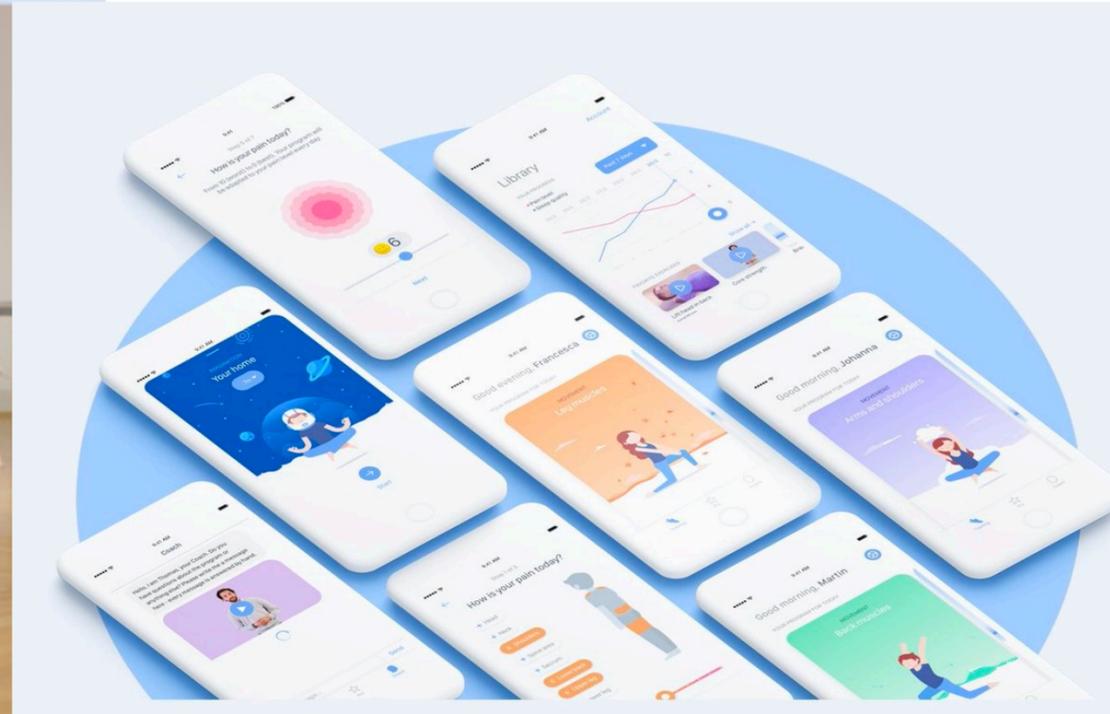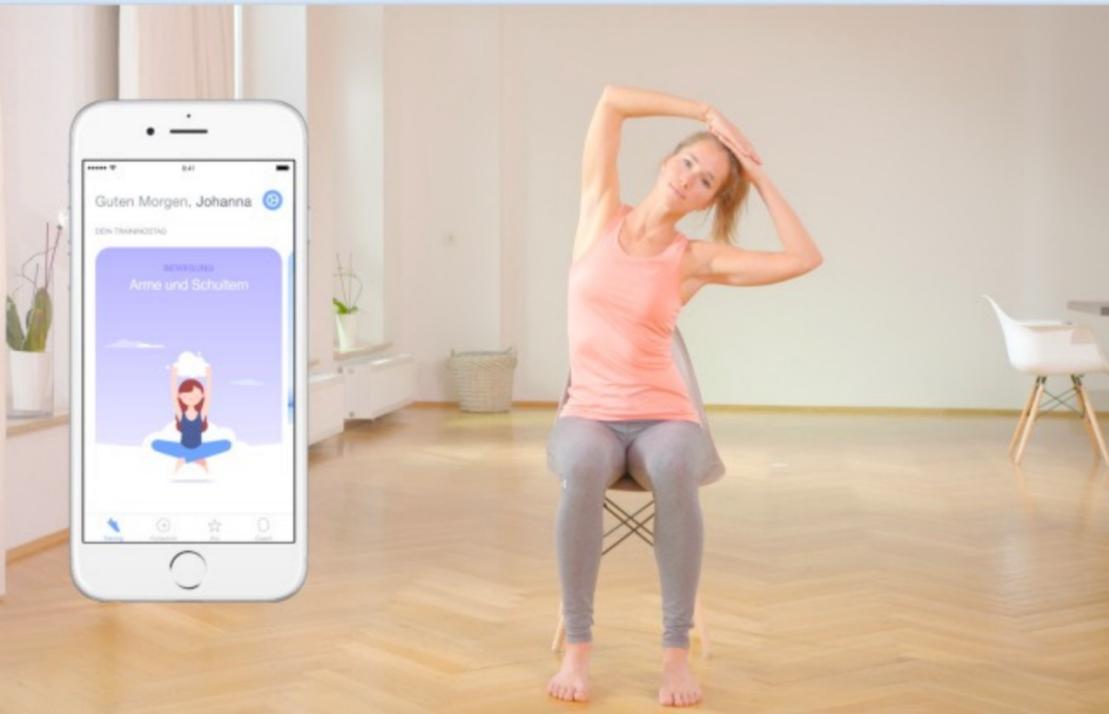
Kaia

Platform for chronic pain management, focused on lower back pain. Recent study highlights as effective as physical therapy (*superior to physiotherapy*) for treatment and will likely extend further for DTx interventions.

Toelle TR, Utpadel-fischler DA, Haas KK, Priebe JA. App-based multidisciplinary back pain treatment versus combined physiotherapy plus online education: a randomized controlled trial. NPJ Digit Med. 2019;2:34.
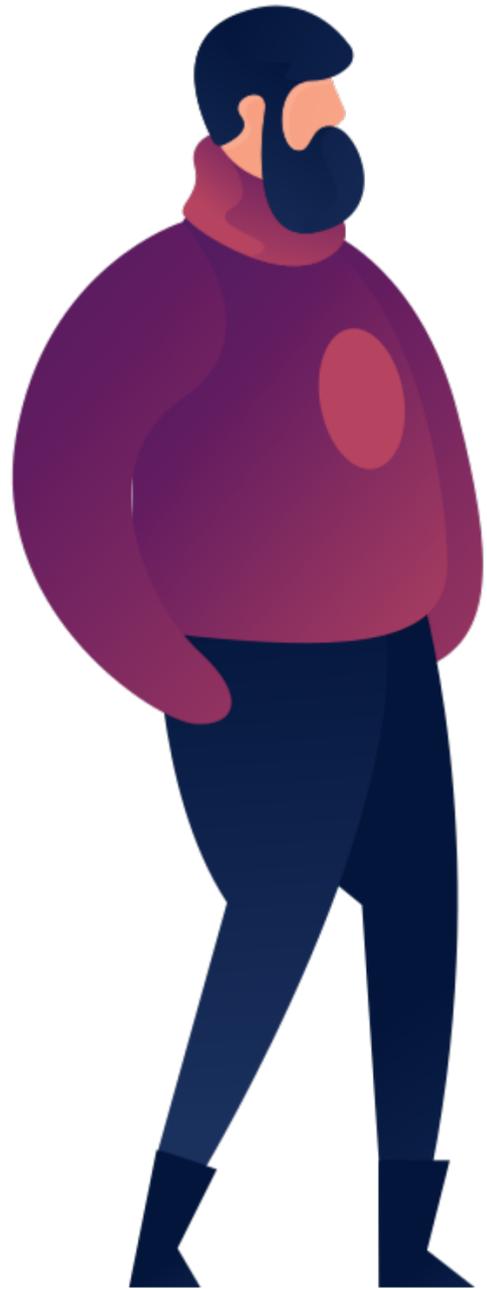
So, how do we incorporate all of these novel developments into patient care within the pharmacy space?

05

REINVISIONING PHARMACY SERVICES IN THE DIGITAL HEALTH ERA

THEY SAY DATA
IS THE NEW OIL...

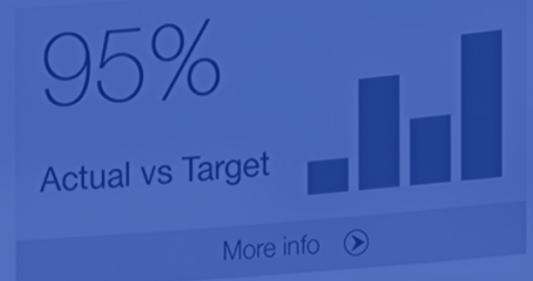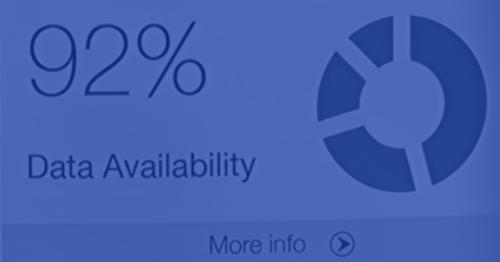...BUT OIL NEEDS TO BE REFINED TO BE USEFUL.

PHARMACISTS ARE IN A GREAT POSITION TO BE THE REFINERS.

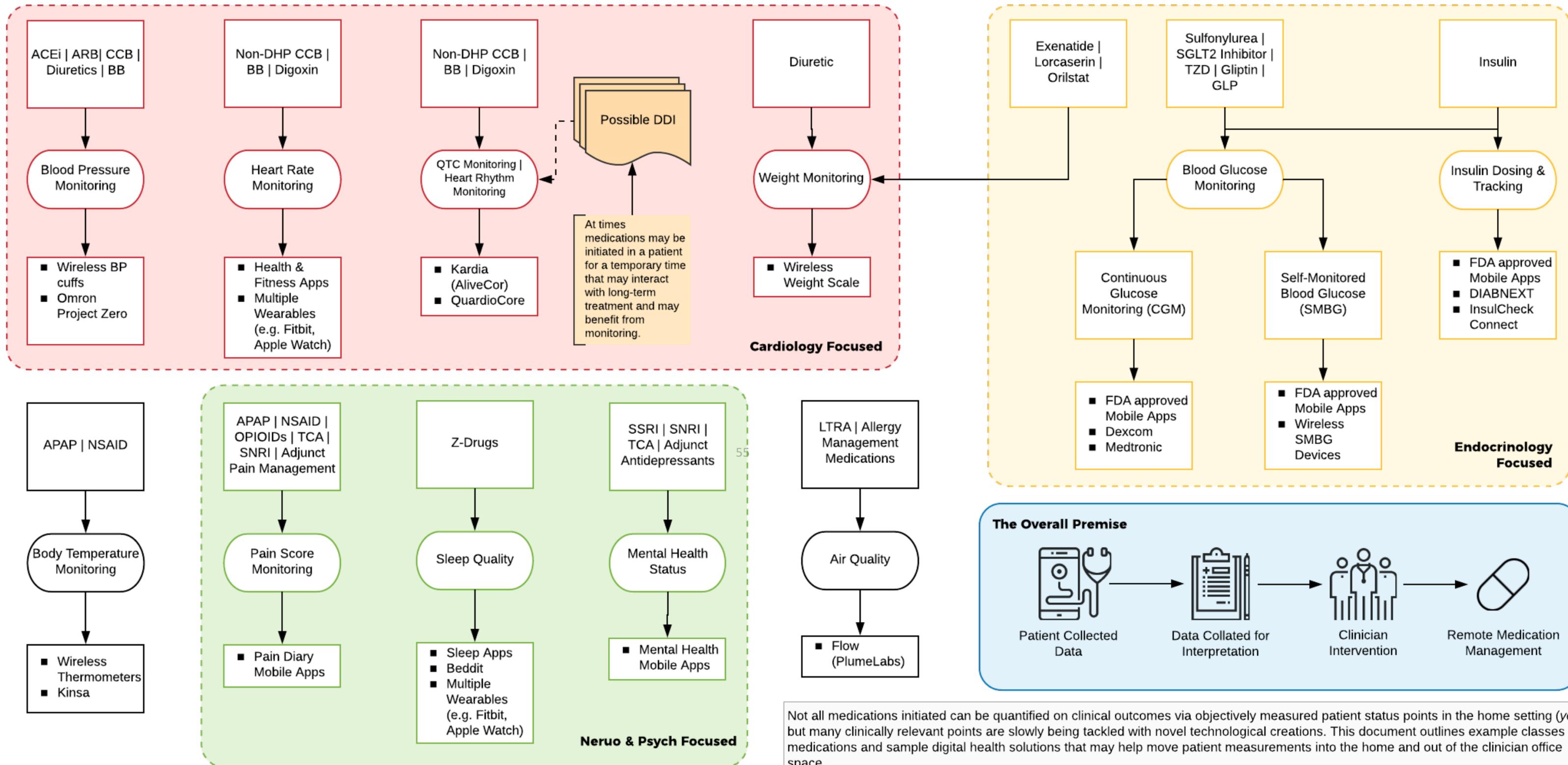INCORPORATE REAL TIME DATA FOR PATIENT CARE SERVICES AND LEVERAGE NEW TOOLS TO DO IT.

DIGITAL HEALTH GUIDED MEDICATION MANAGEMENT

Where can wearables and devices help meet clinical endpoints?

TheDigitalApothecary.com

Cardiology Focused

ACEi | ARB| CCB | Diuretics | BB → Blood Pressure Monitoring →
- Wireless BP cuffs
- Omron Project Zero

Non-DHP CCB | BB | Digoxin → Heart Rate Monitoring →
- Health & Fitness Apps
- Multiple Wearables (e.g. Fitbit, Apple Watch)

Non-DHP CCB | BB | Digoxin → QTC Monitoring | Heart Rhythm Monitoring →
- Kardia (AliveCor)
- QuardioCore

Possible DDI

At times medications may be initiated in a patient for a temporary time that may interact with long-term treatment and may benefit from monitoring.

Diuretic → Weight Monitoring →
- Wireless Weight Scale

Endocrinology Focused

Exenatide | Lorcaserin | Orilstat

Sulfonylurea | SGLT2 Inhibitor | TZD | Gliptin | GLP → Blood Glucose Monitoring

Insulin → Insulin Dosing & Tracking →
- FDA approved Mobile Apps
- DIABNEXT
- InsulCheck Connect

Blood Glucose Monitoring →

Continuous Glucose Monitoring (CGM) →
- FDA approved Mobile Apps
- Dexcom
- Medtronic

Self-Monitored Blood Glucose (SMBG) →
- FDA approved Mobile Apps
- Wireless SMBG Devices

Neruo & Psych Focused

APAP | NSAID → Body Temperature Monitoring →
- Wireless Thermometers
- Kinsa

APAP | NSAID | OPIOIDs | TCA | SNRI | Adjunct Pain Management → Pain Score Monitoring →
- Pain Diary Mobile Apps

Z-Drugs → Sleep Quality →
- Sleep Apps
- Beddit
- Multiple Wearables (e.g. Fitbit, Apple Watch)

SSRI | SNRI | TCA | Adjunct Antidepressants → Mental Health Status →
- Mental Health Mobile Apps

LTRA | Allergy Management Medications → Air Quality →
- Flow (PlumeLabs)

55

The Overall Premise

Patient Collected Data → Data Collated for Interpretation → Clinician Intervention → Remote Medication Management

Not all medications initiated can be quantified on clinical outcomes via objectively measured patient status points in the home setting (*yet*), but many clinically relevant points are slowly being tackled with novel technological creations. This document outlines example classes of medications and sample digital health solutions that may help move patient measurements into the home and out of the clinician office space.
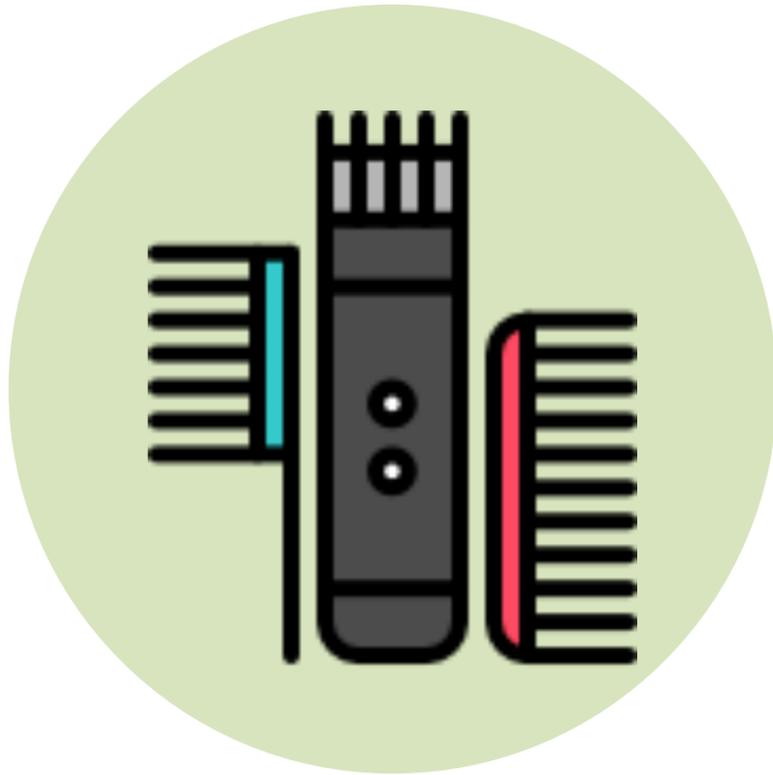
BARBERSHOP STUDY
Pharmacists with collaborative practice managed and reduced BP in a vulnerable population through targeted population interventions and social connections.

Victor RG et al. NEJM. 2018;378(14):12-91-1301.
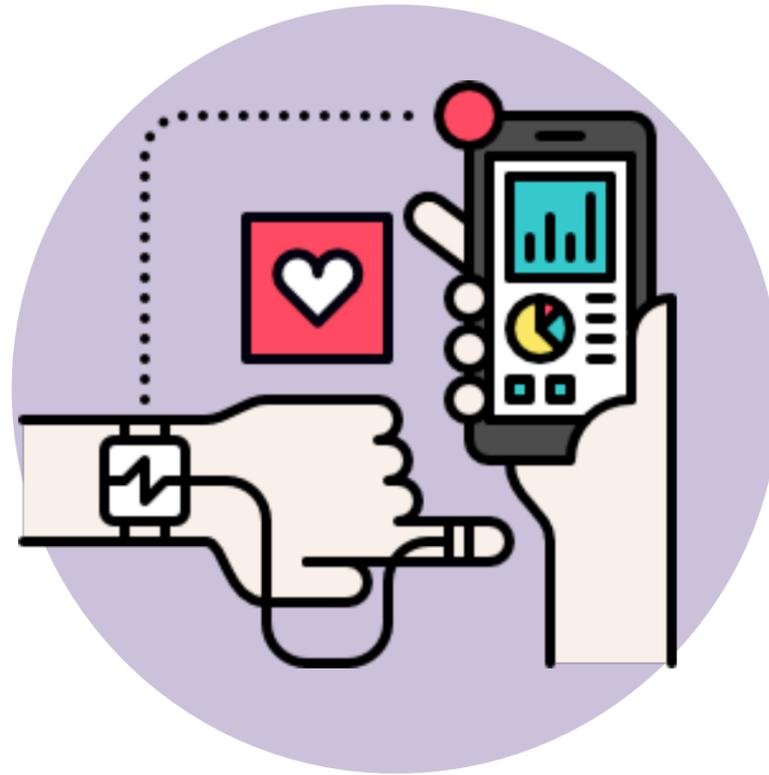
24-HOUR BP MONITORING
Blood pressure assessment in the ambulatory setting were more accurate in predicting mortality rates and tracking BP variabilities than reliance on in-clinic BP assessments.

Banegas JR et al. NEJM. 2018;378(16): 1509-1520

PHARMACIST BP STUDY
Pharmacists with collaborative agreements managed BP remotely through ambulatory BP assessments and reduced BP in patients.

Margolis KL et al. JAMA. 2013;310(1):46-56.

Future Pharmacist Directed Care through Digital Health

Current Health Monitoring

Varying Waiting Time

Doctor's Visit → Establish New Patient Goals → Adjust Care Plan → No Prescription Adherence Tracking → Unfamiliar Symptoms Appear → Schedule Doctor's Appointment
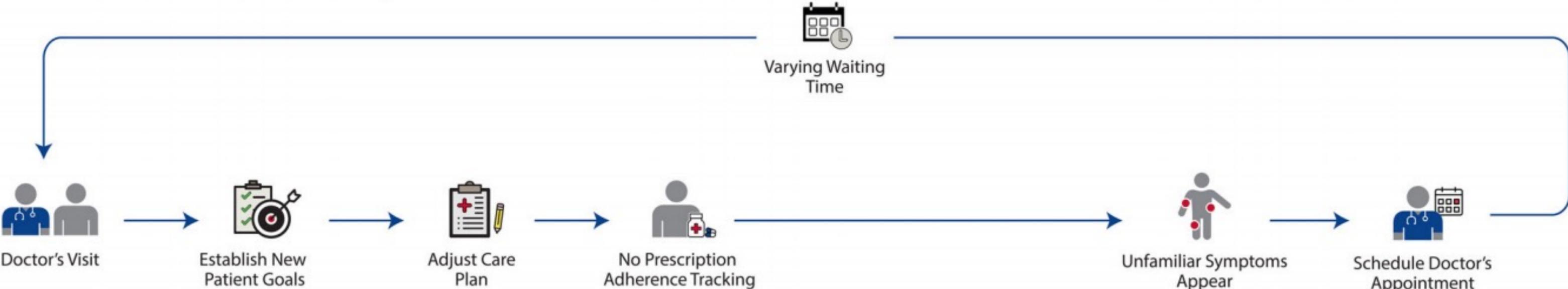
Digital Health Integration

CONVENIENT REMOTE MONITORING

Doctor's Visit → Establish New Patient Goals → Adjust Care Plan → Real-Time Patient Adherence Tracking → Real-Time Patient Data → Continuous Patient Outcome Assessment

Timely Remote Intervention ← Non-adherence ← Abnormal Patient Data ← Unfamiliar Symptoms Appear
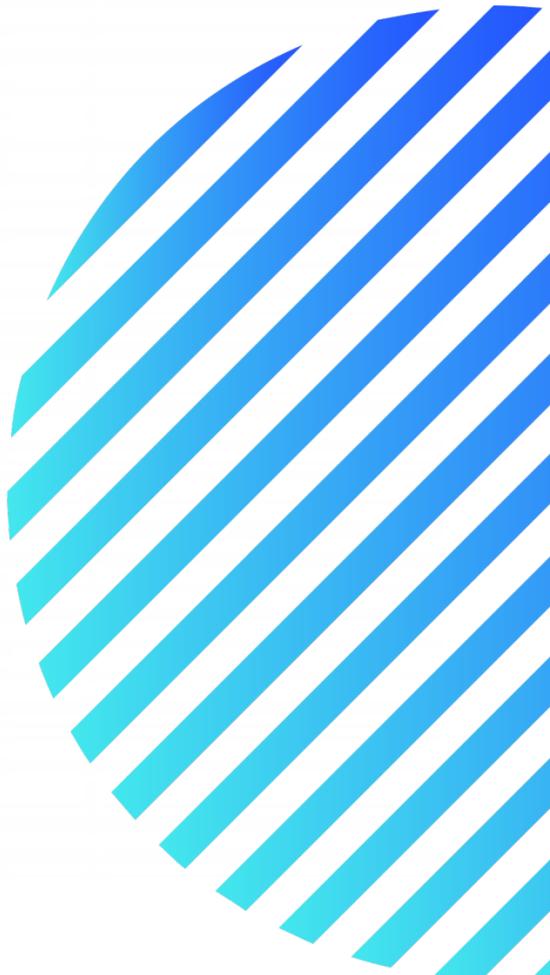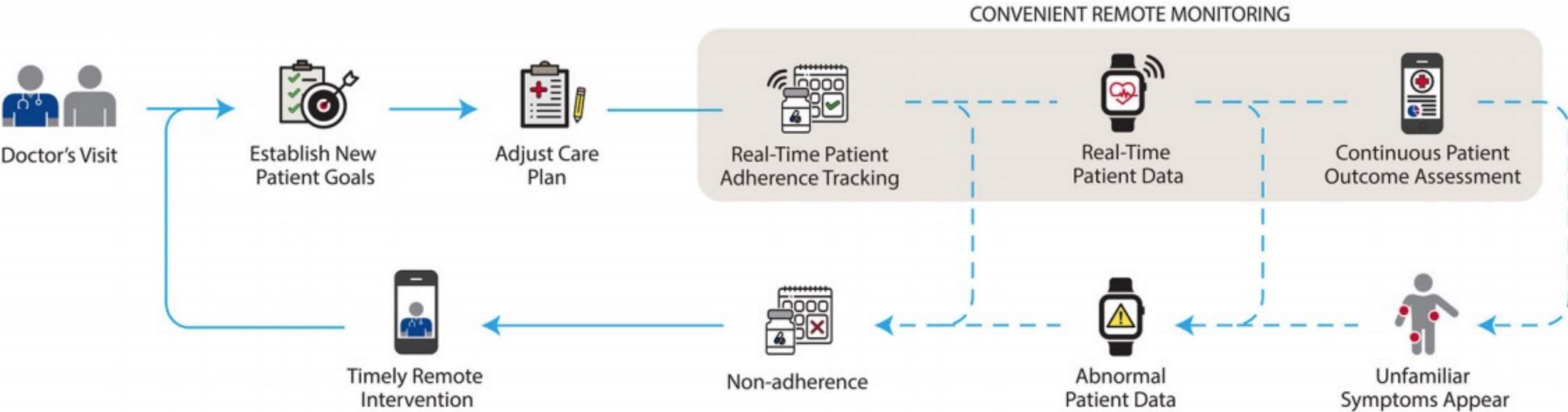
Tap into new mechanisms of drug delivery pathways that will come to the market and predict consumer demand.

On average, 15 prescriptions are written annually for every person in the US, costing us time, money and our health. @Daniel_Kraft is applying technology to pharmacy, using a 3D printer to intelligently design medicine based on each individual's needs #TEDSalon #OptumForum2018

3:02 PM - 2 Aug 2018

AT THE CORNER OF HAPPY & HEALTHY

Order Review

PROCESS ORDER   PAYMENT   DISPENSE
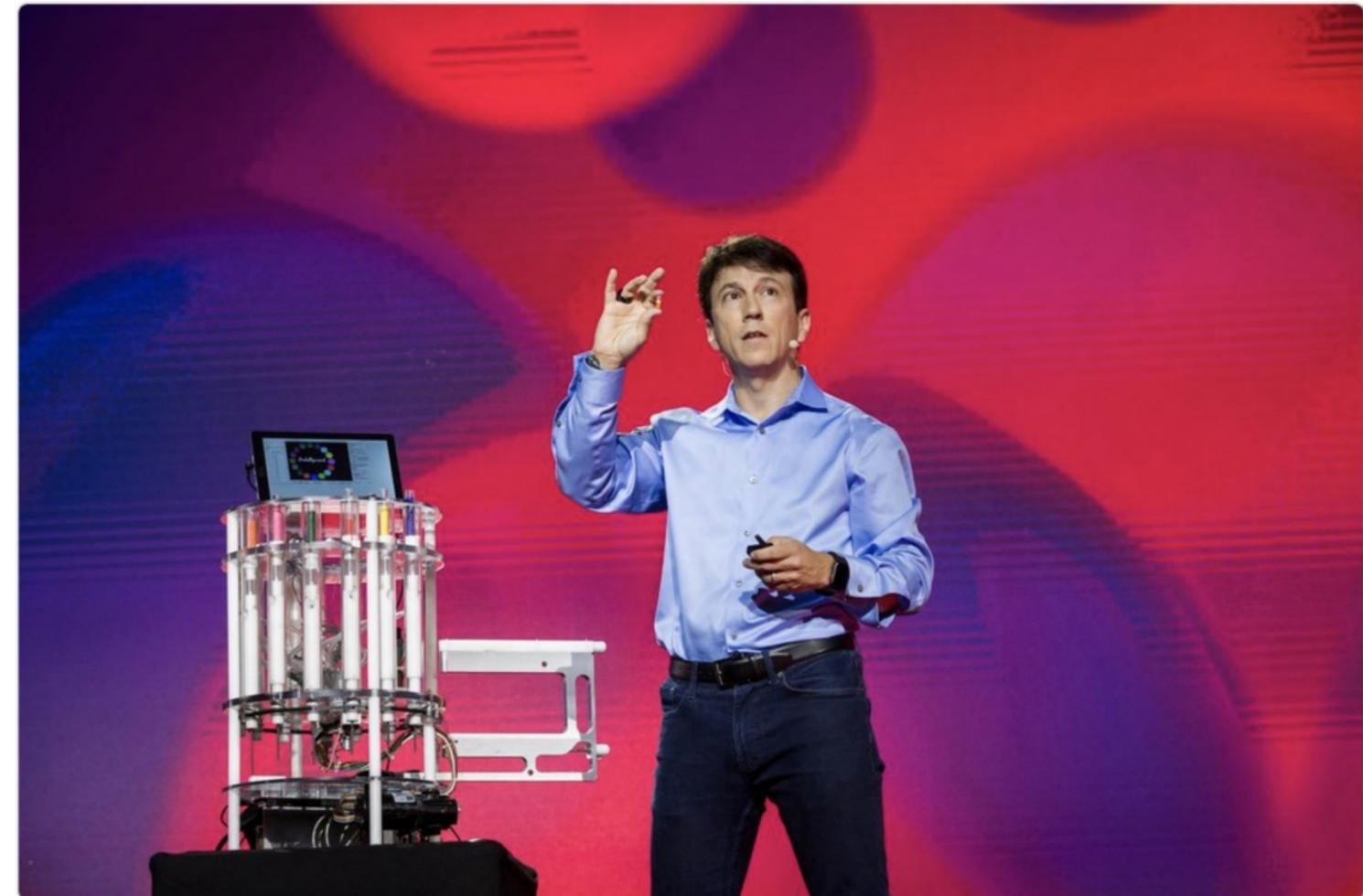
Processing Request

Skip the lines.
If you've ordered ahead and you're
paying by credit card, debit card
or ExpressPay, try it today.

P
H

try our new
self-service
pharmacy
kiosk

Simply touch the screen to begin

The Walgreens Prescription Center is a telepharmacy
supervised by pharmacist located in an Illinois licensed
facility at 8337 Southpark Circle, Orlando FL.

The pharmacist is required to talk with you, over an
audio/video communication link, each time you pick up a
prescription.

The site is a remote dispensing site licensed by the
Illinois Board of Pharmacy.

The Walgreens Prescription Center does not
contain cash or controlled medications.

For additional questions please contact the pharmacy
staff at 224-323-5099.

Walgreens Prescription Center
Store 16428

Hours of Operation:
24 Hours

MedAvail
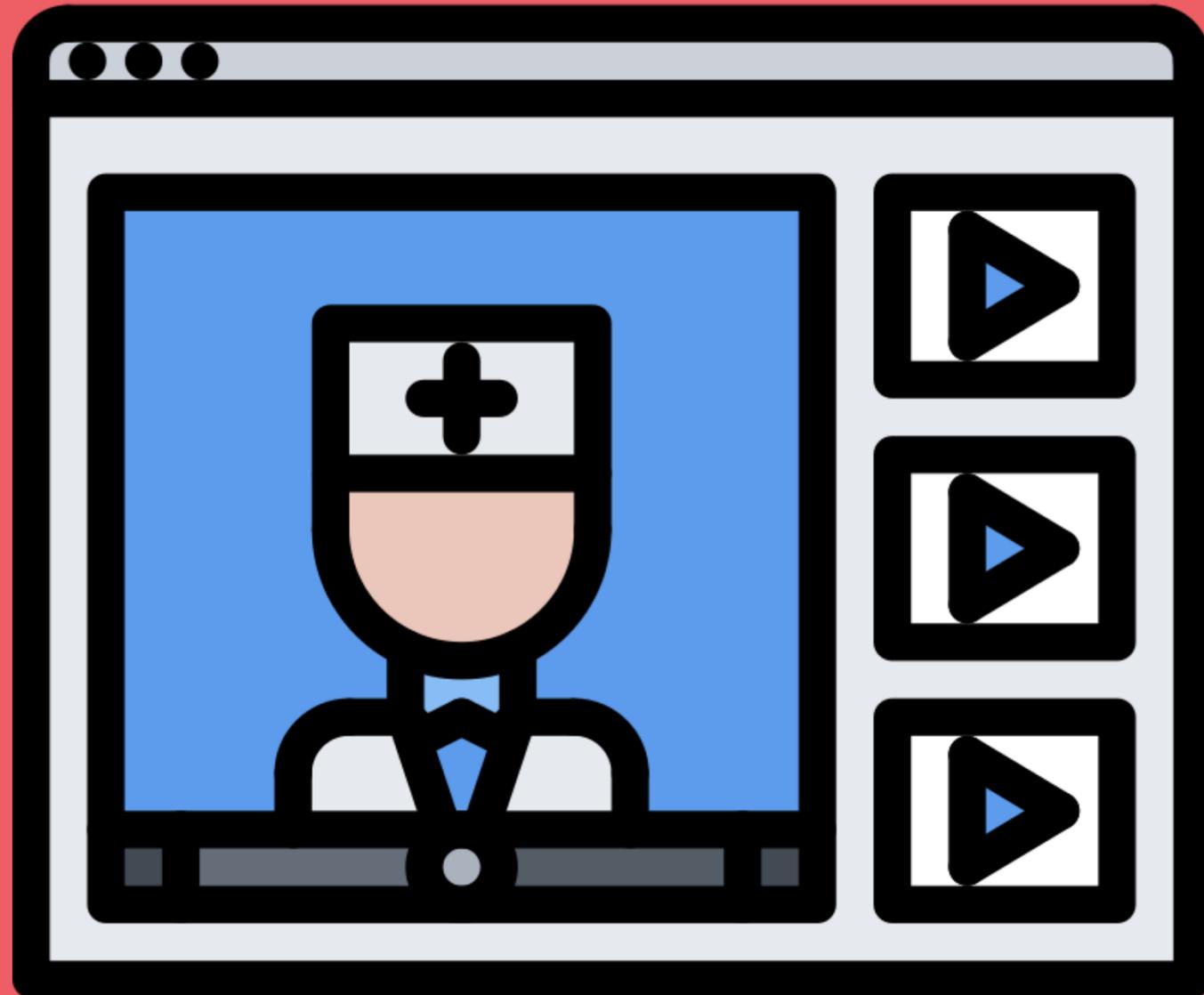
We need to reach patients where they are and how they consume media and goods. Change your marketing strategies for the patients you want in 10 years. Get personable.

Utilize new digital tools to provide patient directed care to stand out from the crowd.

We will leverage the devices that patients now trust everyday.

DIGITAL HEALTH EVENTUALLY JUST BECOMES A PART OF HEALTH CARE...

...AND IF PHARMA IS "THINKING BEYOND THE PILL," THEN PHARMACY WILL HAVE TO "THINK BEYOND THE FILL."

Which of the following statements is most correct about digital health in the current United States healthcare landscape?

a) Payers are the key user group that lead technology development
b) Digital health takes many forms based on the settings and users
c) The advances of technology always match the clinical needs in practice.
d) There is no guidance or regulation surrounding digital health tools
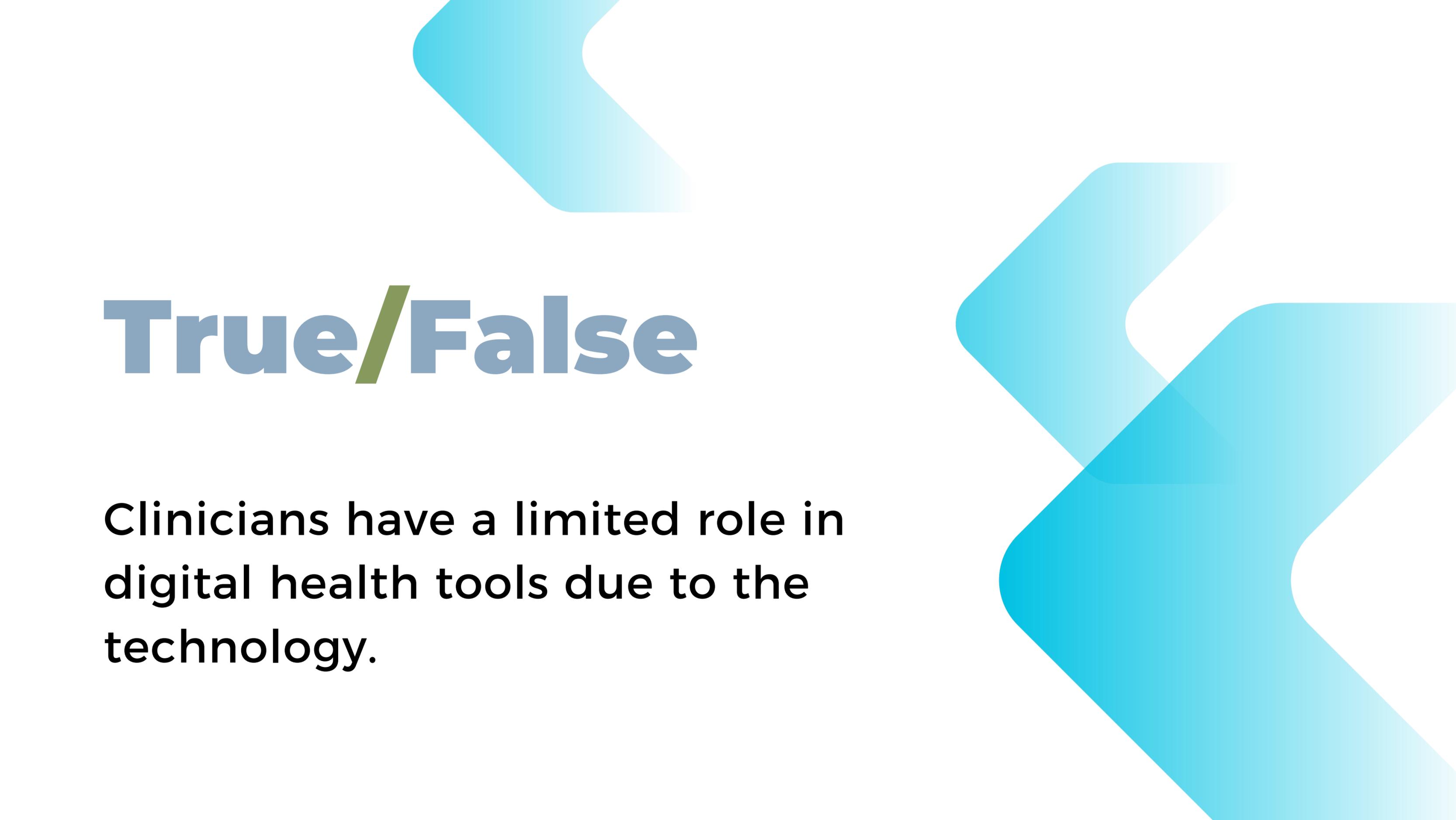
True/False

Clinicians have a limited role in digital health tools due to the technology.

What is a potential role for pharmacists in a digital health enabled health team?

a) Provide patient education on utilization of DTx products
b) Help the team select digital health products for patient care
c) Review data from patient use of digital health products to guide therapeutic care
d) All of the above