



Digital Health Innovation and the “Future” of Stroke Care

Peter A. Rasmussen, MD, FAHA, FAANS, FSNIS
Chief Clinical Officer, The Clinic by Cleveland Clinic
Professor of Neurosurgery
Staff, Cerebrovascular Center and Dept. of Neurosurgery
Cleveland Clinic

The Year 2024....

Mr. Smith living in Dover, Ohio

Sudden onset of difficulty speaking, right
sided weakness, and confusion

EMS transports to the local tPA capable
hospital

@Emergency Dept

- Automated alert for Telestroke consult
- Artificial Intelligence Imaging Interpretation – high probability stroke, no ELVO
- IV tPA indicated
- Patient remains at local hospital



@Admission

- Hypertensive
- Social Determinants of Health (social, behavioral, financial, medical, psychological) are obtained by scanning his smartphone, email, browser search history...
 - mild depression
 - recent death of spouse

Inpatient Stay

- Remote Telemetry Central Monitoring Unit identifies episodes of A-fib



- Virtual Inpatient Consult for Cardiac Electrophysiology



Inpatient Stay

- Stroke Neurologist makes Virtual Rounds to ensure adherence and progress on digitized Stroke Care Path
- No additional therapy necessary

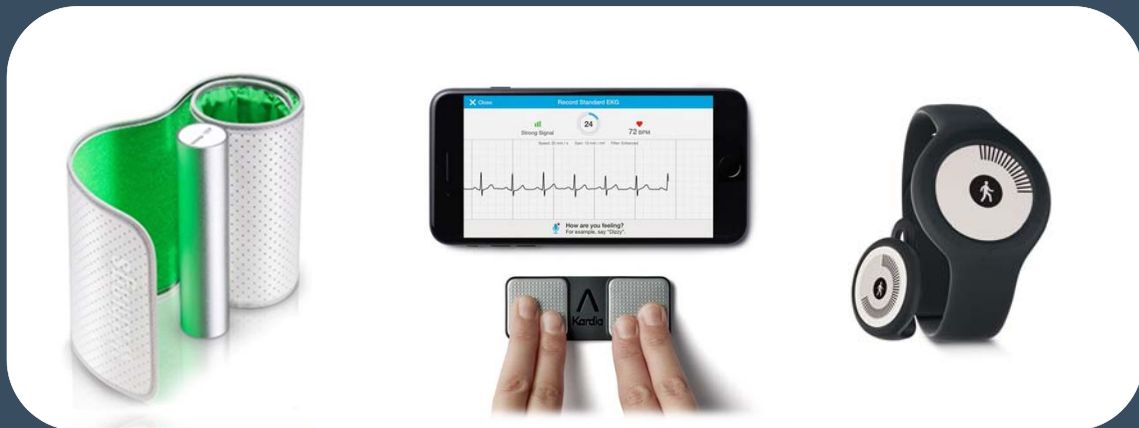


During Inpatient Admission

- Continuous emotional state detection facial recognition software and real-time Patient Experience scores indicate:
 - Poor patient experience - Automated alerts to PE team for service recovery
 - Depression identified
 - Virtual Psychiatry consult performed
 - Depression Treatment: Mood Modifying Digital Therapeutic prescribed and deployed to in hospital room screen

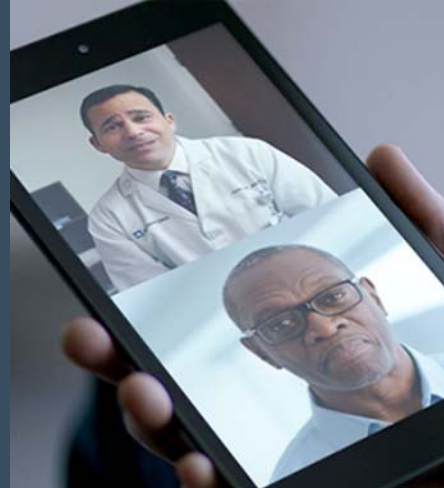
Discharge to Home

Sent home with Connected Home Monitoring Services for BP, A-fib, Physical Activity



While @Home

- Virtual Visits to home include PT, OT, Speech, Stroke Neurology and Electrophysiology
- Chronic Care coordinators
 - monitoring BP, Activity, Cardiac Rhythms remotely
 - Note of decreased activity and reported less enjoyment of daily activities



@Home

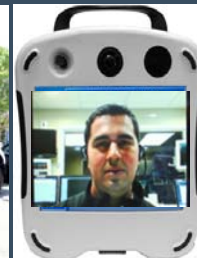
- Same-day tele-psychiatry virtual visit notes worsening depression
- Prescriptions arrive on the doorstep via drone delivery



Currently deployed technologies...

“Telestroke”

- Emergency response by remote stroke neurologist
 - Page to callback: average 2 min; frequently <60 sec
 - Page to neurologist “bedside”: average 8 min
- 15 spoke sites (Ohio, PA, FL)
- Video consult volume 2020: ~2,800



*since 2010

Mobile Stroke Treatment Unit: Diagnosis, Emergency Treatment and Triage

- Don't wait for the patient to get to the ED
- Bring the ED, CT scanner, lab, and stroke expertise to the patient
- Initiate treatment at the scene
- Dramatically cut time-to-treatment decisions (40 mins)
- Near perfect triage to appropriate stroke resource



Patient Location Determines Type of Virtual Video Interaction

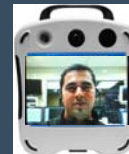
Outpatient
on patient's
mobile devices



Inpatient Critical
Care Management



Acute / ED/
Post-Acute
Subspecialty
Consults



Outpatient
in retail/ community settings



Inpatient
Consults



Digital Inpatient Consults

- Nurse rounds with virtual med video cart assisting with live neurological exam
- Physician guides process remotely, interacts with patient, and views test results/recommends in EHR
- Late Dr. Tom Gretter on Neurology Virtual Rounds:

Current offerings

Neurology
Urology
Neonatal ICU
Pediatrics
Behavioral Health
Genetics



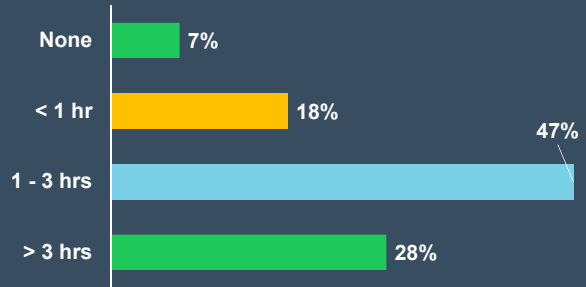
The screenshot shows the Cleveland Clinic Express Care Online website. At the top, there is a navigation bar with links for Home, My Health, My Providers, and Test My Computer. Below the navigation bar is a large banner image featuring five healthcare professionals in white coats. The banner includes the Express Care logo and the text: "Express Care Online is a simple and easy way for you to talk to a provider at any time, from your own home or wherever you are." Below the banner, there is a section titled "See the first available provider" with the subtext "The quickest way to start your visit." and a green "Get Started" button. To the right of this section is a "My Services" sidebar with a list of services: Express Care, Bariatric & Metabolic Institute, Brain Aneurysm / AVM, Brain Tumor & Neuro-Oncology, Heart & Vascular Medicine, and Heart & Vascular Surgery. Below the "Get Started" button is a "Find a Specific Provider" section with a search bar and three provider cards. Each card includes a photo, name, title, and a "Start Visit" button. The providers listed are Jeff Arnovitz CNP (Adult Nurse Practitioner), Daniel Rivas DO (Hospital Medicine), and Ava George DO (Cleveland Clinic All Ages).

Patient Experience

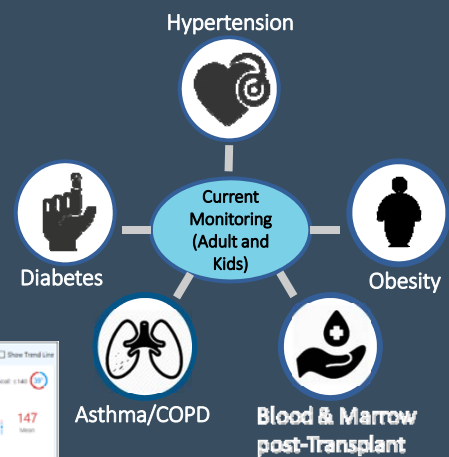
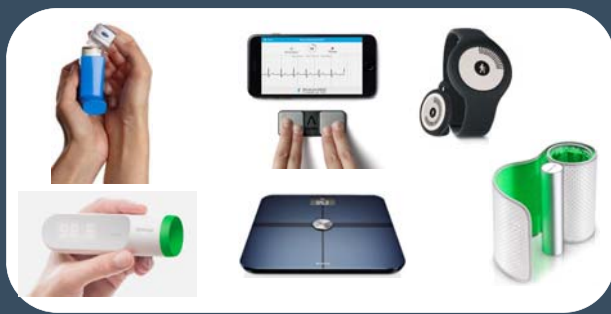
Overall, were you satisfied with your visit on Express Care Online?

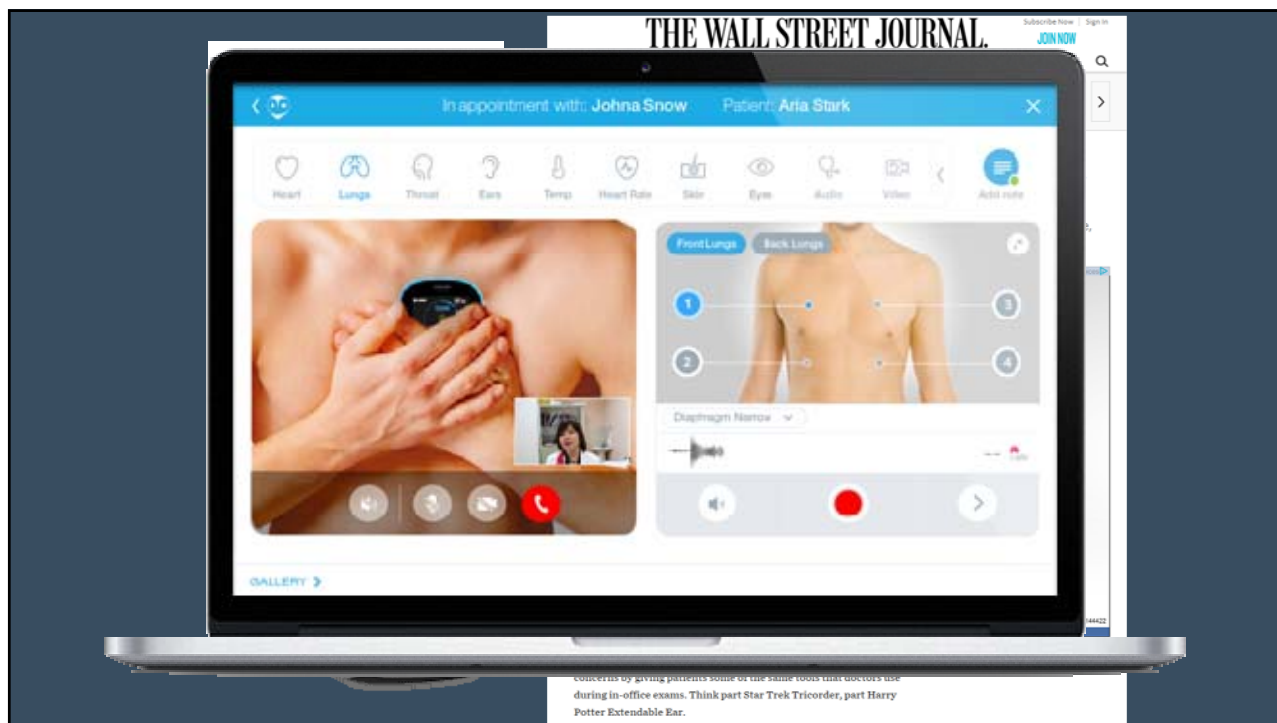


How much time did your online visit save you?

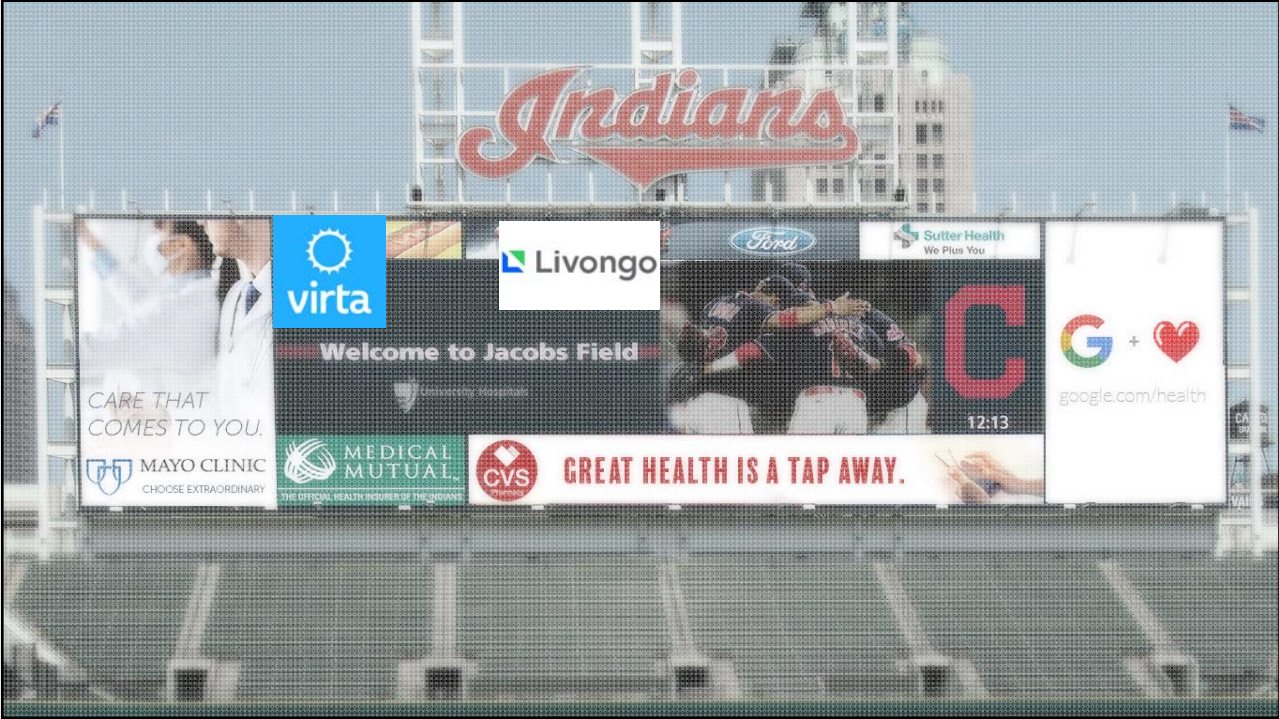
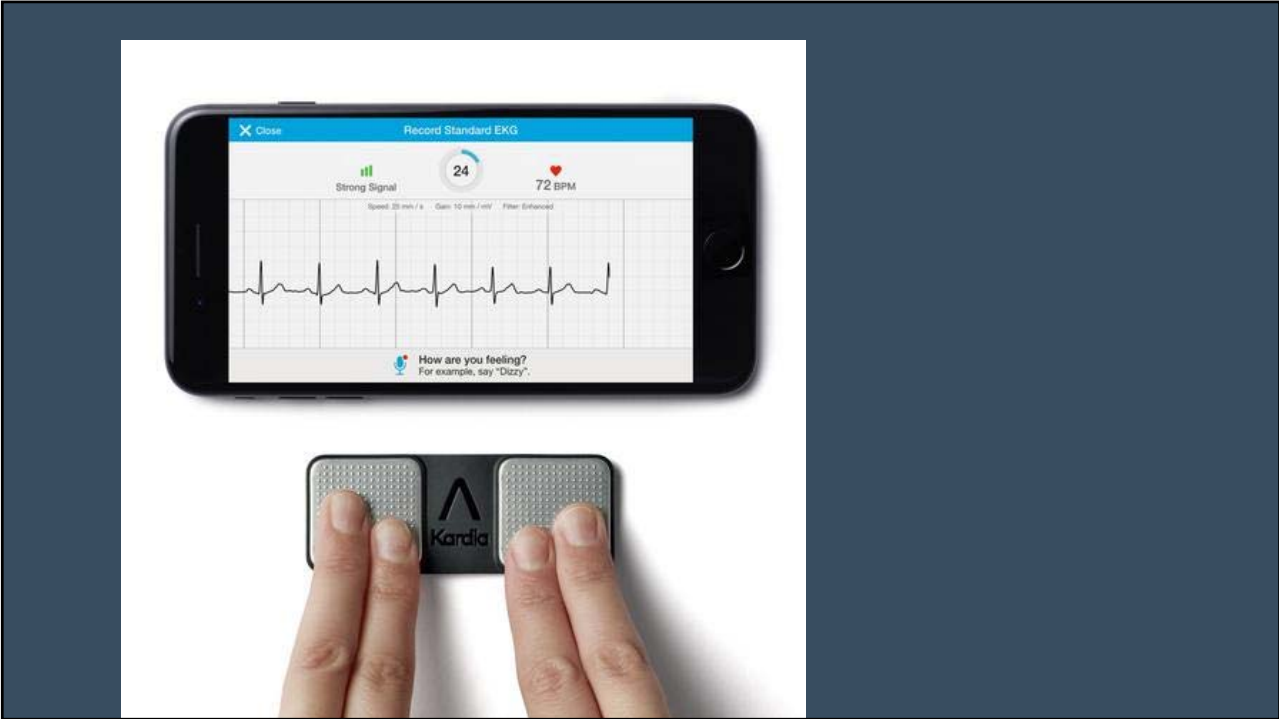


Remote Monitoring/Chronic Disease Management





concerns of giving patients some of the same tools that doctors use during in-office exams. Think Star Trek Tricorder, part Harry Potter Extendable Ear.





Evolution Of Remote Endovascular Intervention



Same Hospital
Procedure Room



Same Hospital
Control Room



Same Hospital
Multiple Room Control



Different Hospital
Remote Site



Connection

Hardwired
8' from Patient

Hardwired
30' from Patient

Fiber
200' from Patient

WiFi/Fiber
100 Miles from Patient

If I had asked the
people what they
wanted they would have
said, 'faster horses'.

Henry Ford

@prasmussenMD



Every life deserves world class care.