Pirouette, Not Pivot:
Tele-capability and Neurological Disease

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Disclosures

I have the following relevant financial relationship with a commercial interest to disclose:

- Scientific consultant regarding user interface design and usability to LifeImage (privately held teleradiology company)

- Co-I, The Impact of Telestroke on Patterns of Care and Long-Term Outcomes, NINDS (R01NS111952)

- Co-I, REACH-PC telepalliative care trial, PCORI (NCT03375489)

SUPPORTING THE SYSTEM STRATEGY VIA VIRTUAL DIGITAL TOOLS

There are five synergistic strategic priorities focused on broader impact, improved outcomes, and new revenue streams.

Recognition as "Go-To Place"	National & International Business Development	Innovation	Value-Based Model	Community Health Impact
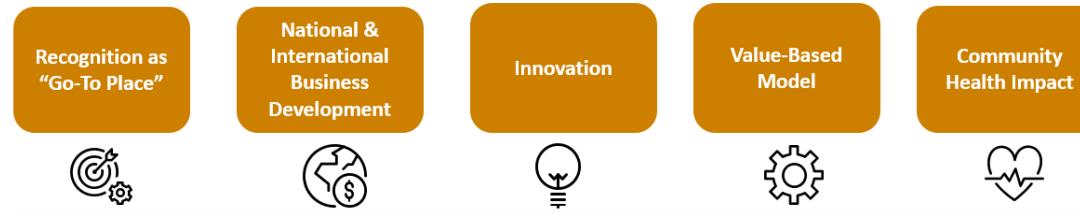
Seamlessly integrated systemwide virtual and in-person urgent care

Enhanced online second opinion and eConsult services to project our brand nationally/internationally

Integrated inpatient and outpatient specialty care access from within all enterprise locations

Advisory services to enable other health systems to implement virtual care solutions to manage their own populations as part of a portfolio of Mass General Brigham member services offerings

Partnerships with AI/ML teams within Mass General Brigham to help facilitate distribution of their innovations to enterprise scale, and with Research and Education Leaders to ensure well-supported virtual tools

Robust remote patient monitoring solutions that cross ambulatory and inpatient settings to collect patient-generated health data for
- o   clinical care (vital signs, lipids and other parameters for our navigator-driven programs and IPF and eCQM measures)
- o   research (mining human data for ML/AI and data sciences innovation and commercialization)

COVID-19 AS A DRIVING FORCE OF DISRUPTIVE INNOVATION
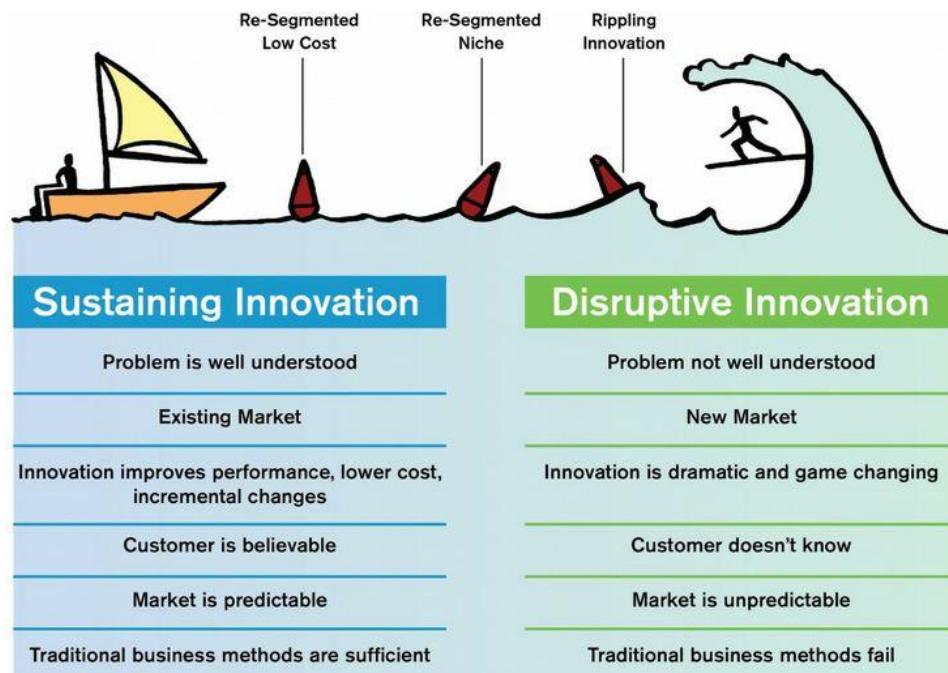
Innovation has outstripped support
- Many sites, especially community hospitals, lack the resources to adequately support these mission critical applications
- Due to COVID, many new applications and devices (iPads) have been deployed without the customary process of trainings, briefings, pilot adoption waves and formal launch
- There may be a need to reprioritize resources at sites to adequately support the clinical and administrative floor-based teams to ensure success
- Novel support models may be warranted, such as roving tech savvy teams, cross trainings of IS, Biomed and Epic-EHR personnel
- Apply quality surveillance to virtual care

Real-time
"Synchronous"

Store and Forward
"Asynchronous"

Hybrid
"Intermixed Temporal Modes"

Visits (Provider to Patient)

Virtual Visits

Real-time video interaction Provider to Patient

New or follow up video visits to patients at home or remote clinics for scheduled or unscheduled (urgent) care

eVisits

Digital exchange of medical information between Provider and Patient

Provider or Patient initiated communication (e.g., secure text, portal) for ongoing care management

(Machine to Patient)

Remote Monitoring

Digital exchange of patient-generated health data between Machine, Patient and Provider

Provider- or Patient-initiated remote monitoring for ongoing care management

Consults (Provider to Provider)

Virtual Consults

Real-time interaction Provider to Provider (+/- Patient)

New or follow up consults to another Provider for Patients located in another facility (ED, ICU, SNF)

eConsults & Second Opinions

Digital exchange of medical information Provider to Provider (+/- Patient)

eConsults (low complexity medical opinions to specialists) and 2nd Opinions (high complexity medical opinion with extensive record review)

(Machine to Provider)

Predictive Analytics

Provider clinical decision support and event prediction

Provider data visualizations and actionable alerts leveraging AI + machine learning to support effective clinical interventions

TAXONOMY OF VIRTUAL CARE ENCOUNTERS

Vision
Bring patients and providers together in new ways, at new times, and from new places so that healthcare isn't something we *consume* but rather something we *embrace*.
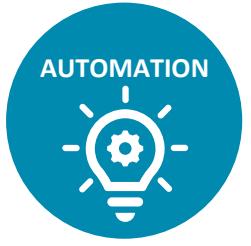
Mission
For every patient, enabling reliable access to world-class healthcare whenever, wherever and however it is needed
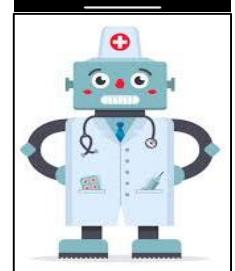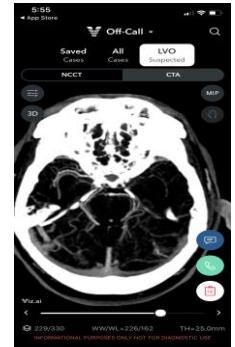
Phases of Work (No Margin, No Mission)
Define business models for each area
Identify key investments and true costs, and align with those to whom benefits accrue
Map to increased productivity where possible
Advocate for payment /regulatory reform and modernized payor contracts
Maximize savings and revenue opportunities
Build robust enterprise compliance framework

PROVIDER-TO-PROVIDER

PROVIDER-TO-PATIENTS

PATIENTS-TO-OTHERS

AUTOMATION

Virtual Consults, Virtual Rounds eConsults

Virtual Visits, Video Intercom System, Virtual Urgent Care, Remote Monitoring, eVisits

Patient Connect

Robotic Process Automation and ML/AI processes

ENSURING THE QUALITY OF VIRTUAL CARE ENCOUNTERS

Keeping the Patient in the Virtual Center

Ensure Equity

Ensure dashboards can measure variation in adoption

Limited English proficiency, digital literacy or access to technology or Wi-Fi

Visual/cognitive/physical impairments

Integrate patient feedback and survey data into enterprise quality framework

Adapted from a visual concept of *Keeping the Patient in the Virtual Center* by Lee Schwamm, M.D. (2021). Massachusetts General Hospital, Boston.

BRINGING EXPERTS TOGETHER TO DRIVE CONSENSUS ON TEACHING COMPETENCY

https://www.virtualcarecompetency.com

MAKING INFORMATION ABOUT VIRTUAL CARE EASILY ACCESSIBLE TO ALL PROVIDERS

[Virtual Care Resource Center - NEW](#)

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VIRTUAL CARE IMPACT ON AMBULATORY ACCESS
From 0.6% to 62% of Ambulatory Care in 6 Weeks.
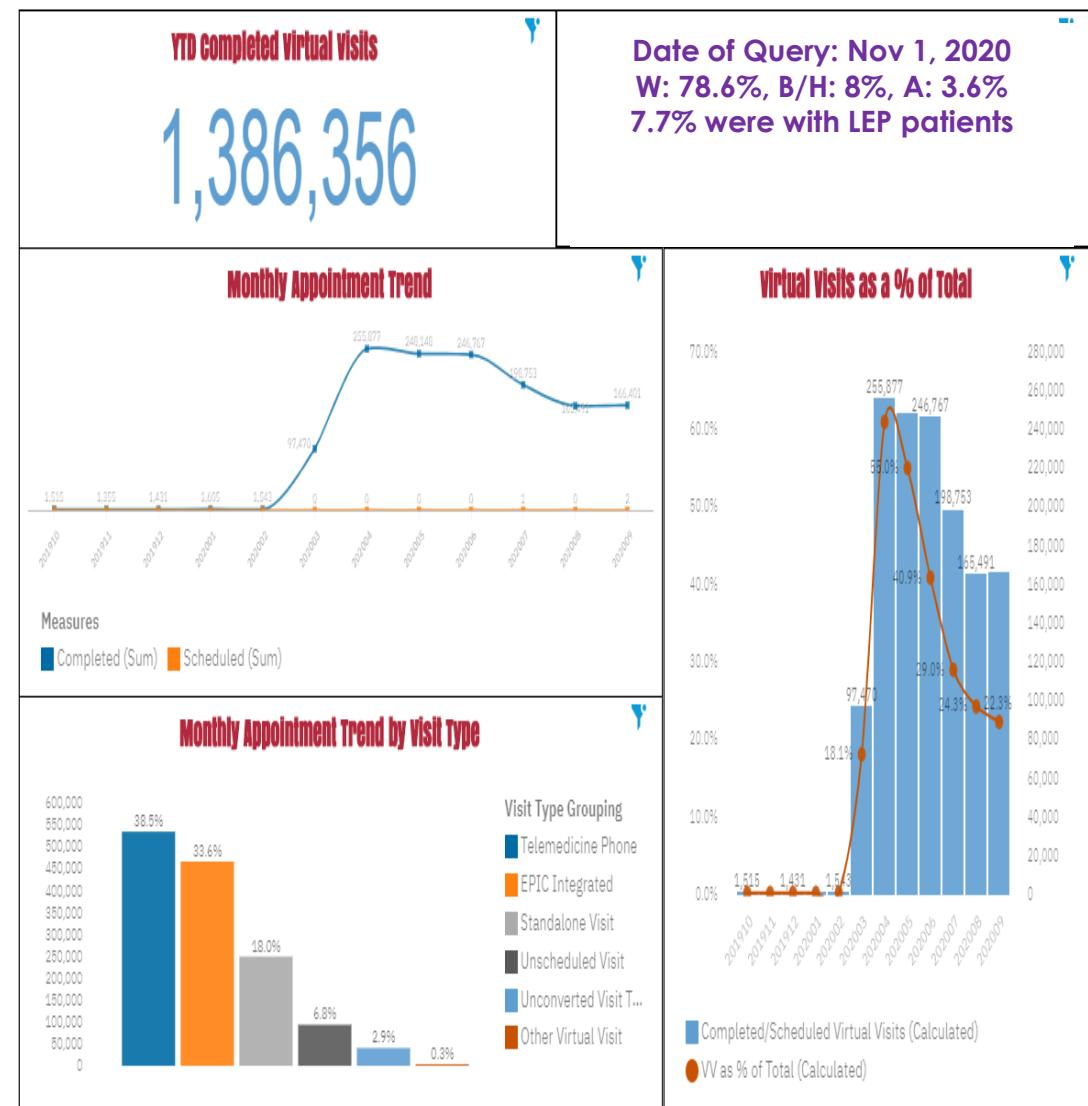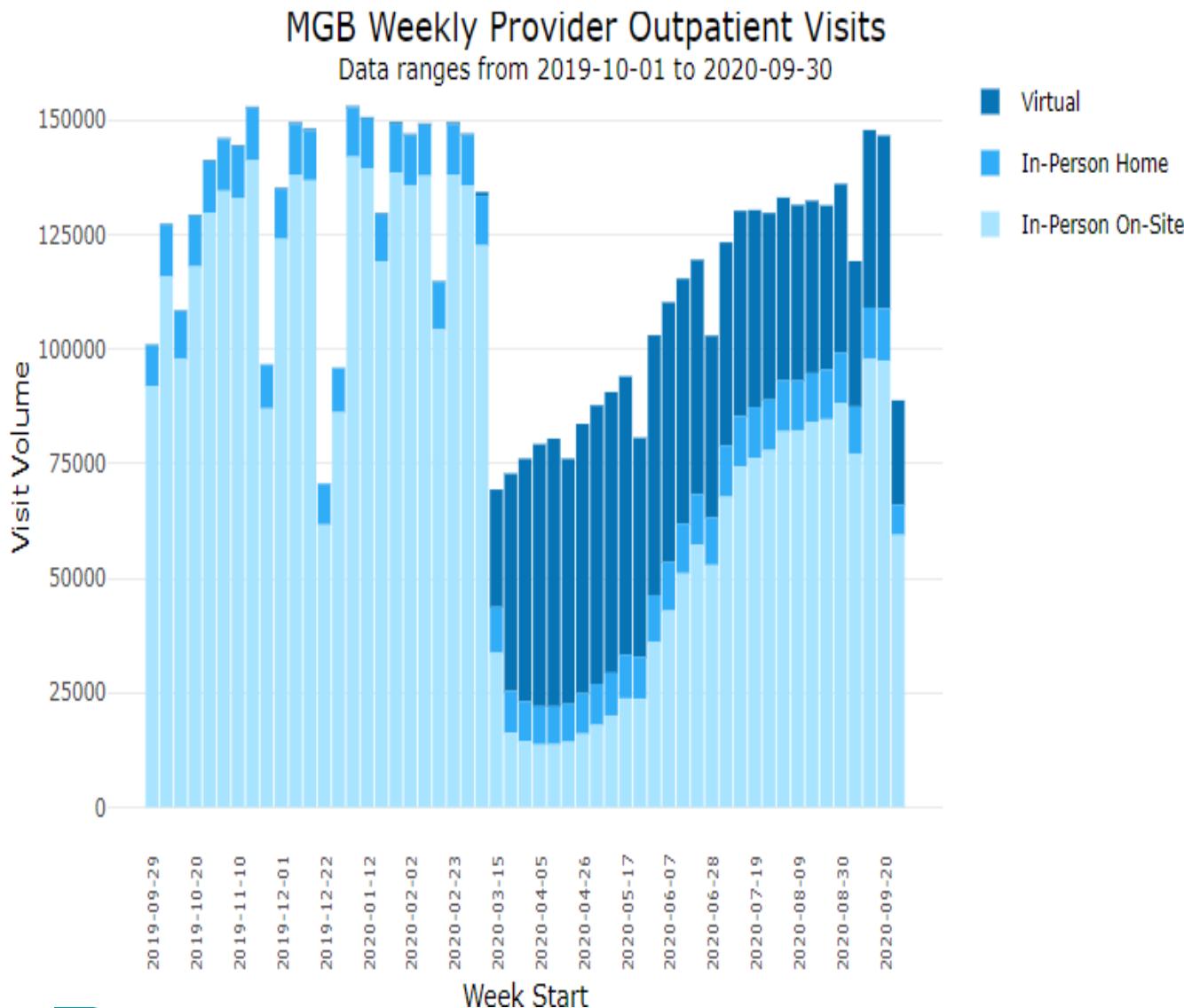
SOCIAL DETERMINANTS OF HEALTH IMPACT VIRTUAL CARE ACCESS

Patient Visits by Race/Ethnicity Before and After Telemedicine Scale-Up

This chart shows the proportion of patient visits seen by patient race/ethnicity prior to (2/17–2/28/2020) and after (3/23–4/3/2020) scaled-up telemedicine implementation to address the Covid-19 pandemic at the UCSF General Internal Medicine Primary Care Practice (P=0.006 using chi-squared test). A smaller proportion of visits with vulnerable populations occurred after implementation.
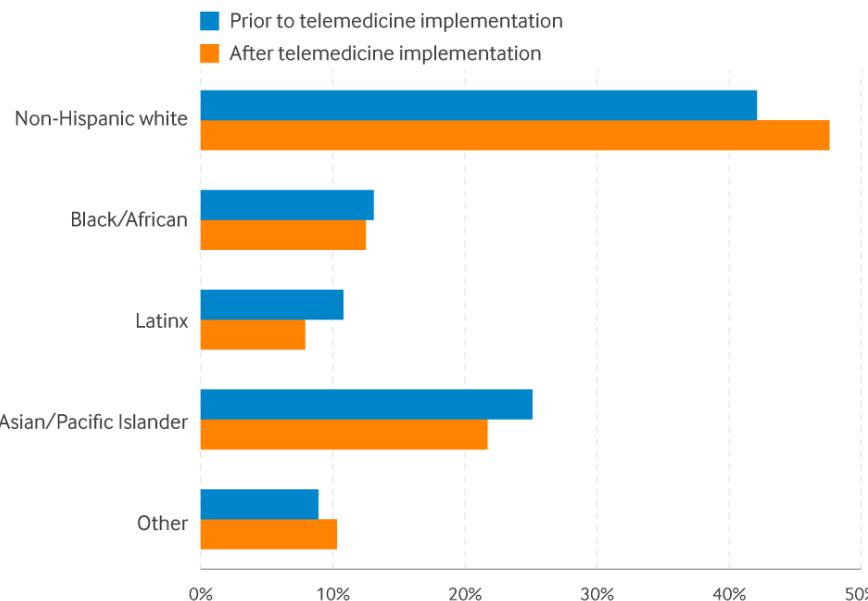
Source: The authors
NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

Patient Visits by Age, Language, and Insurance Before and After Telemedicine Scale-Up

This chart shows the proportion of patient visits seen by age, language preference, and insurance type prior to (2/17–2/28/2020) and after (3/23–4/3/2020) scaled-up telemedicine implementation to address the Covid-19 pandemic at the UCSF General Internal Medicine Primary Care Practice (P=0.002 for age ≥65 and P<0.001 for other comparisons). A significantly smaller proportion of visits after scaled-up telemedicine implementation were with vulnerable patients.
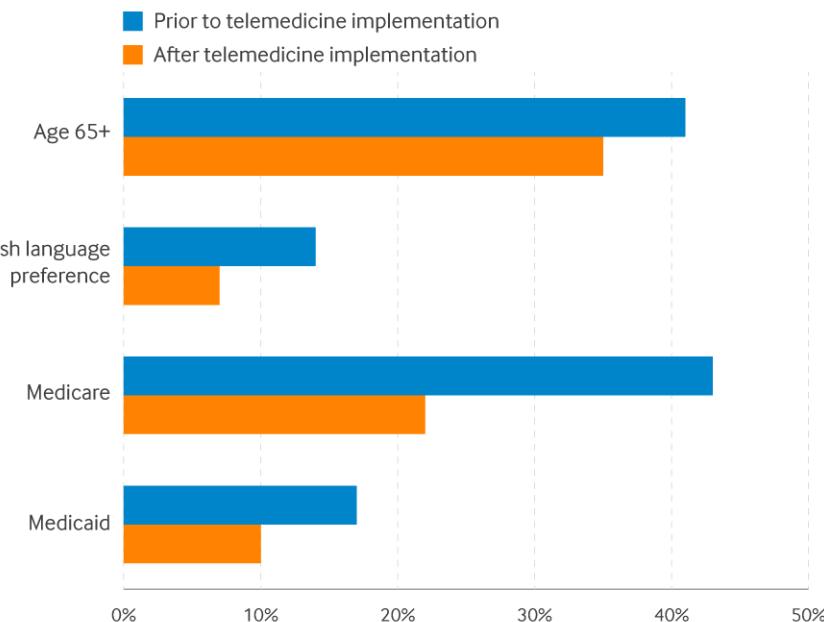

Source: The authors
NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

VIRTUAL VISITS AND SVI BY GEOCODED LOCATION
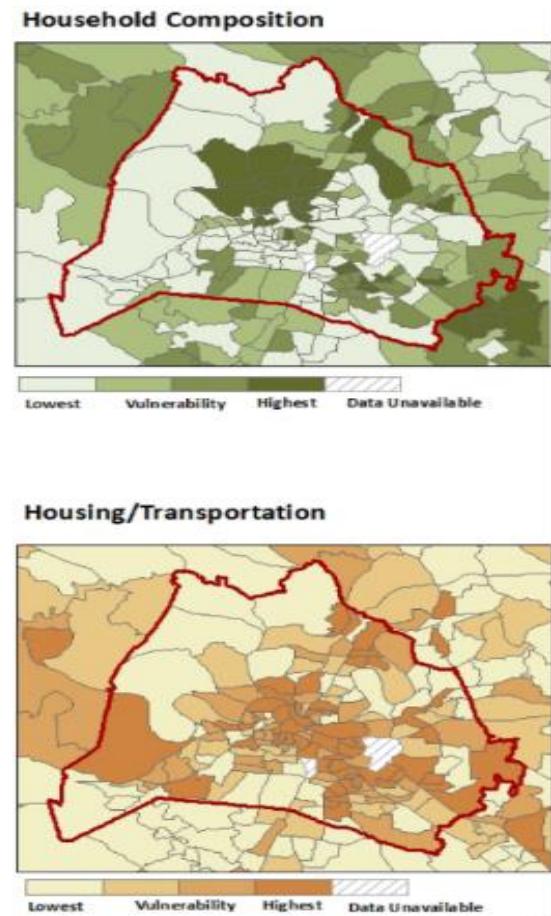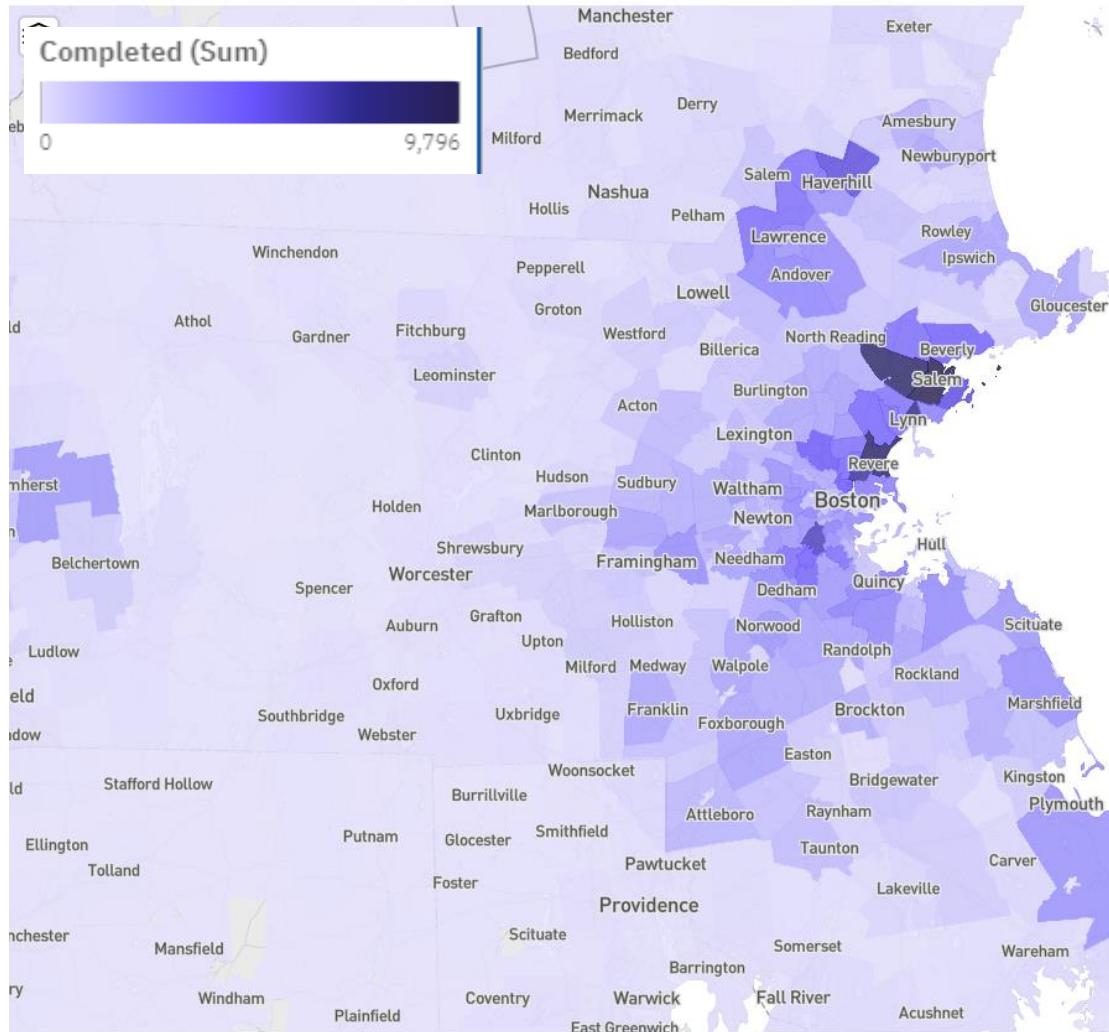
MULTILINGUAL INTERFACE FOR PATIENT-FAMILY SUPPORT

EPIC-INTEGRATED VIRTUAL CARE OFFERINGS
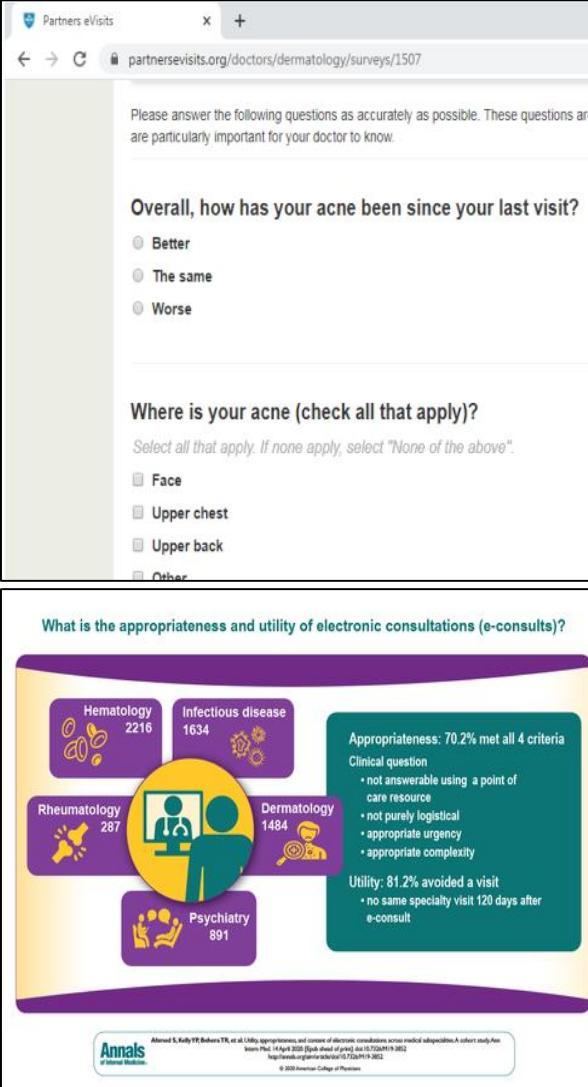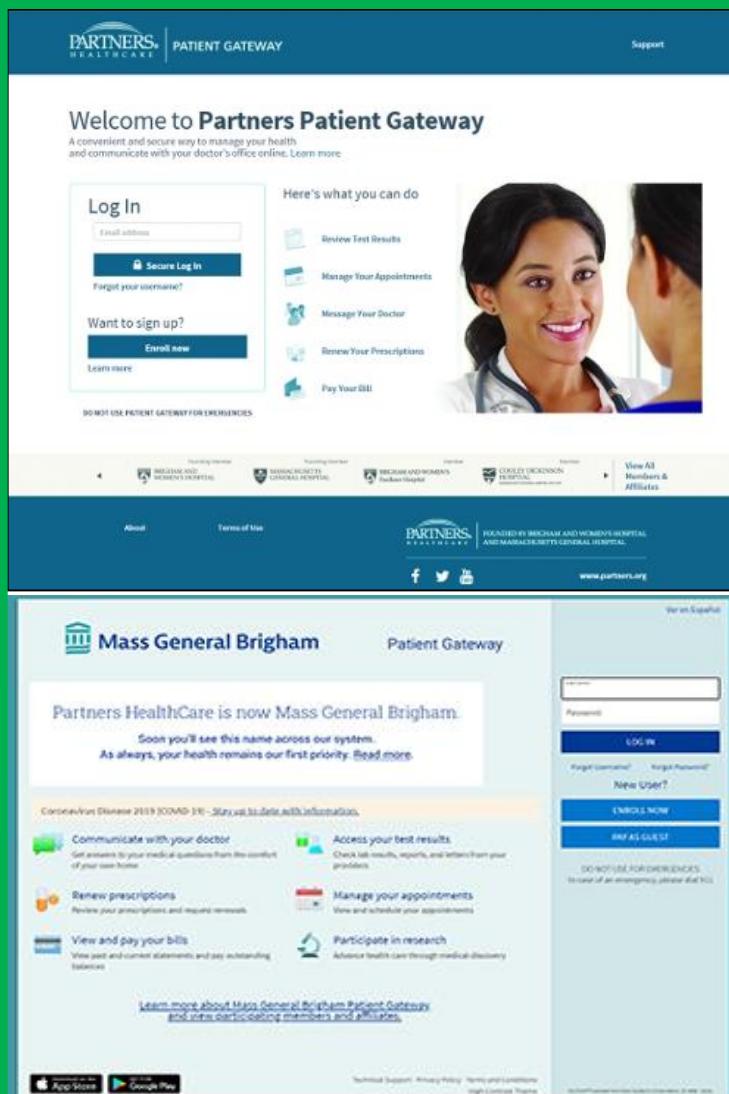
EPIC-INTEGRATED VS STANDALONE VIDEO CLIENT?

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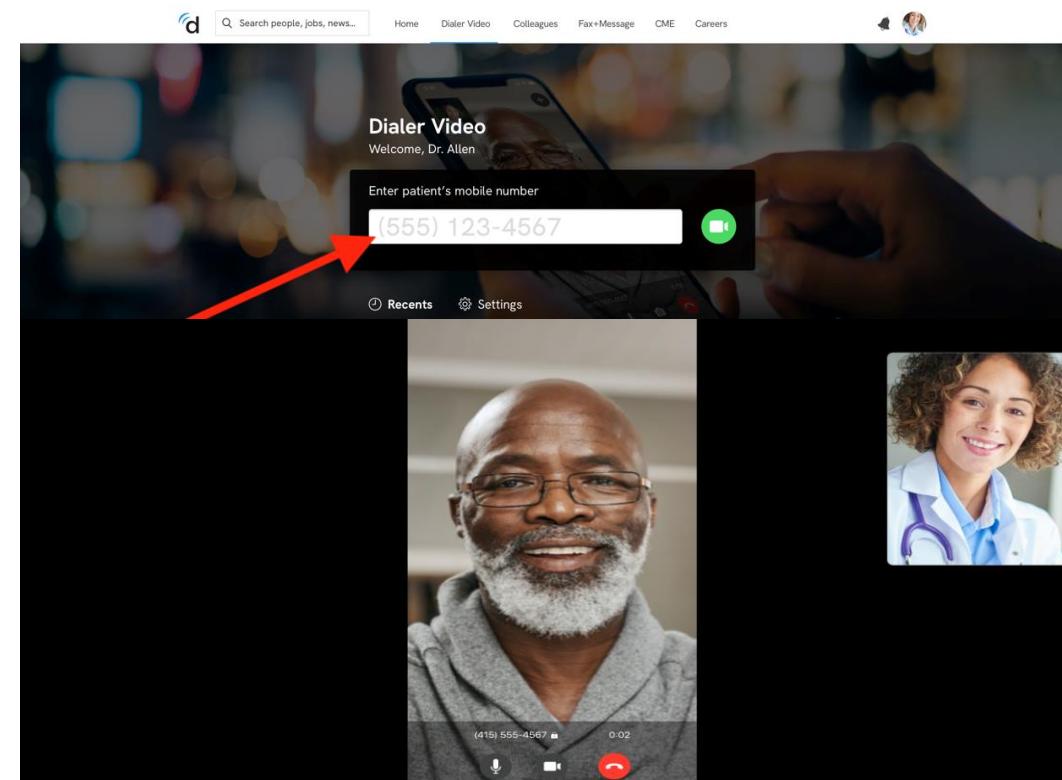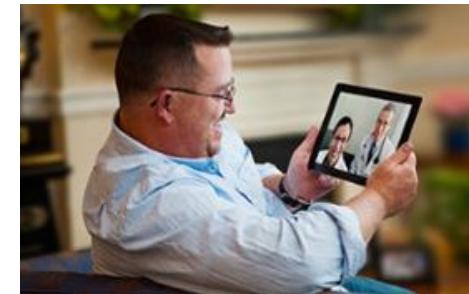
PROJECTING OUR EXPERTISE THROUGH ONLINE SECOND OPINIONS/ECONSULTS

- Since 2002, MGH has developed a best-in-class, market differentiated TeleHealth Portal to support service-specific clinical consultations, transfers and 2nd opinions

- POSO is a robust platform that offers national and international second opinions direct to consumers or via aggregators, but lacks a sophisticated administrative back end to support scalability

- An informal market review and RFP identified a hybrid integration of the TH Portal and POSO as the best solution for Mass general Brigham

- As digital health solutions / offerings become an increasingly prominent aspect of care delivery, our institution recognizes the need for an integrated platform for all providers

PARTNERS® HEALTHCARE | ONLINE SECOND OPINIONS

29,000+ consults
10,500+ via videoconference and 18,500+ via telephone, with over 20,500 remaining in their local community hospital

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VIRTUAL URGENT CARE
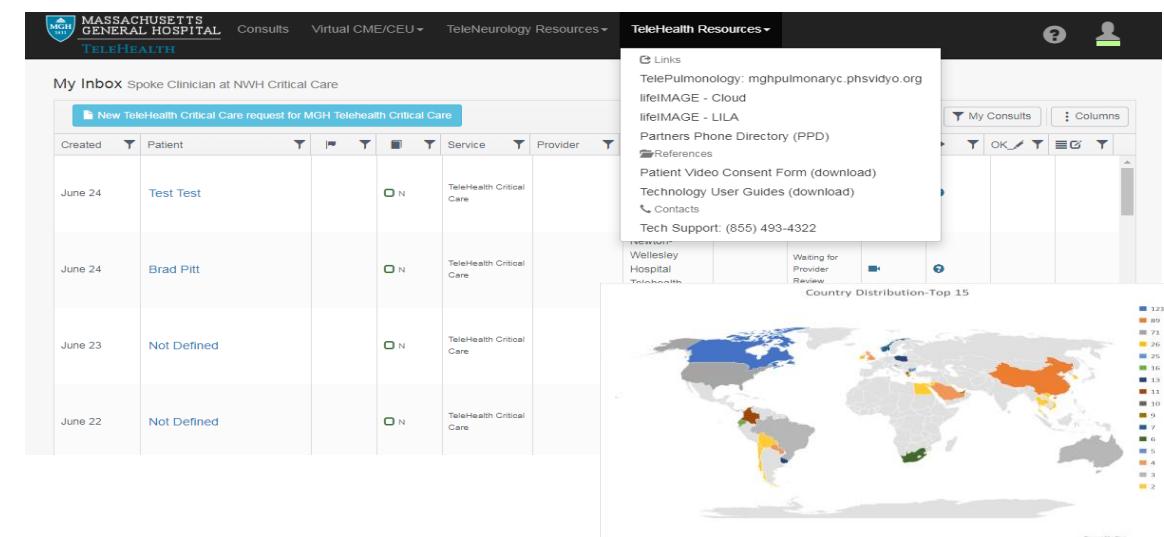
Healthcare on Demand Volume Trend

Chart showing volume trend for FY19, FY20, FY21-P with legend: Teladoc, MGB
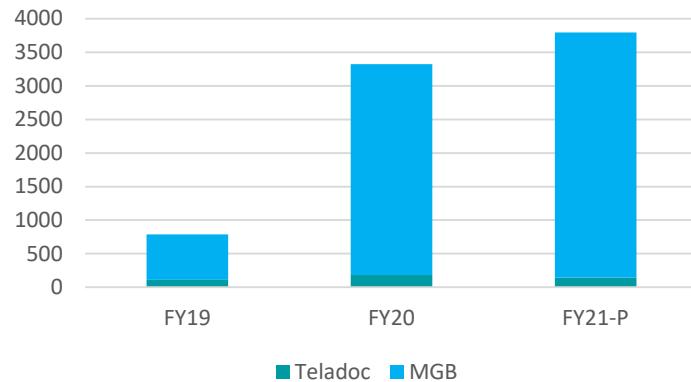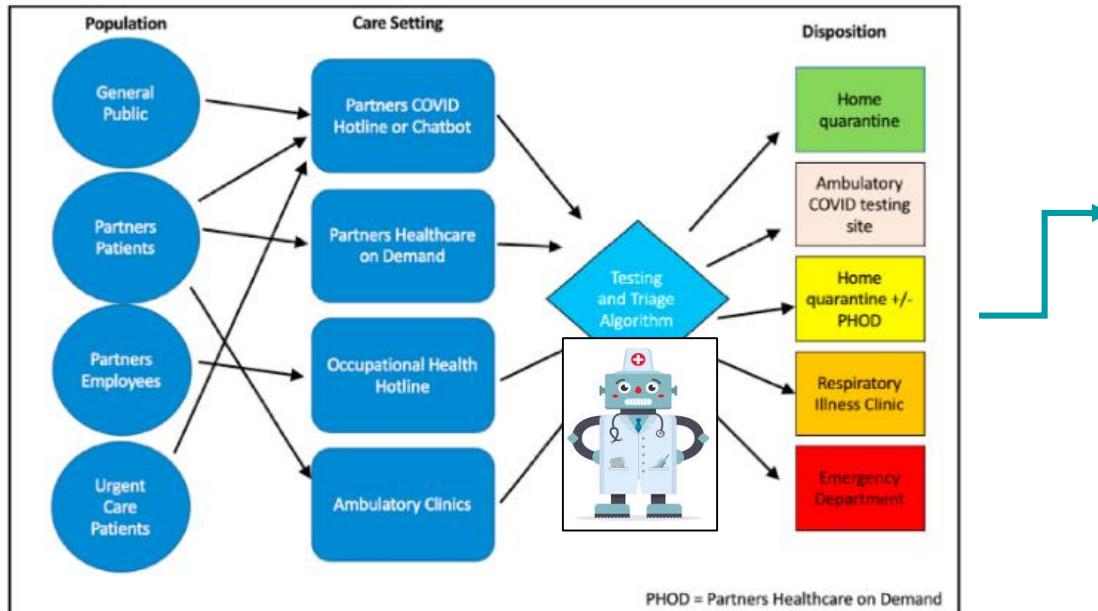
PHOD = Partners Healthcare on Demand

Log In

Virtual urgent care for COVID-19 and minor illnesses and injuries is available to established Partners HealthCare patients in Massachusetts and all commercially insured AllWays Health Partners members (ages 3+). Many insurers are currently waiving cost-sharing for COVID-19 related care.

REMOTE MONITORING OF HEALTH CONDITIONS

We disrupt healthcare delivery through insightful, research-based digital health solutions that help people live healthier lives.
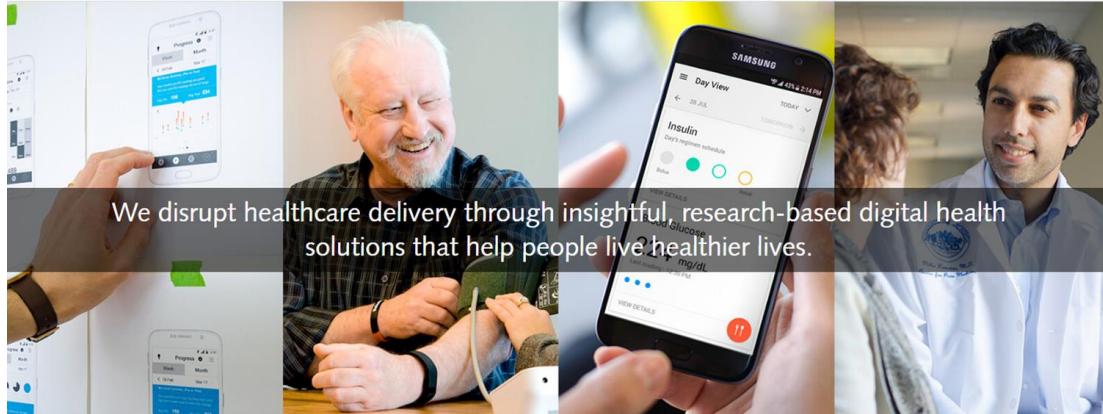
Commercial/Wellness	Device Only	Reimbursement	VBP/Outcome/ Home Health	Extended Service Lines
A&D Medical	2net by Qualcomm Life / PHILIPS	Clear Arch Health	AMC Health	AMC Health
WATCH	Anelto	CLOUD DX	care innovations	care innovations
fitbit	BodyTrace	Connect America	Clear Arch Health	Medtronic
GARMIN	Clear Arch Health	HRS Health Recovery Solutions	Raziel HEALTH	PHILIPS
MISFIT	optimize.health	optimize.health	Vivifyhealth	Trapollo A Cox Business Company
OMRON	optimize.health	Raziel HEALTH	Connect America	Vivifyhealth
QARDIO		Vivifyhealth	HRS Health Recovery Solutions	VRI
SAMSUNG		Trapollo A Cox Business Company	resideo life care solutions	

PGHD Connect Workflow
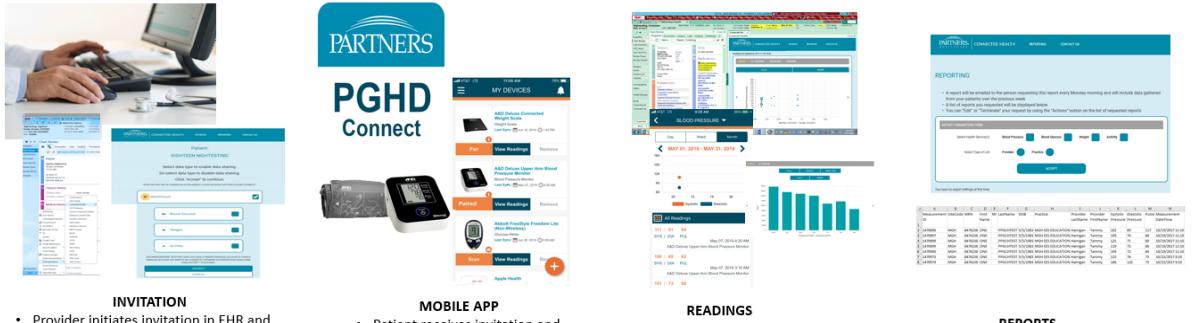
INVITATION
- Provider initiates invitation in EHR and selects data type(s) for sharing.
- Sends Smart Phrase invitation with instructions on how to share data to patient portal (PPG).
- Provider has option to send patient SMS message with link to download PGHD Connect mobile app.
- Provider can stop the flow of data by uninviting the patient from within the EHR.

MOBILE APP
- Patient receives invitation and instructions via PPG.
- Patient downloads PGHD Connect mobile app, creates an account and connects their device(s).
- Patient takes a reading.
- A patient can stop the flow of data by removing their device from the mobile app.

READINGS
- Readings are viewable by the provider in the EHR.
- Patient data can be accessed individually or through the PGHD Connect Patient List.
- Patients can view their data in the mobile app and PPG.
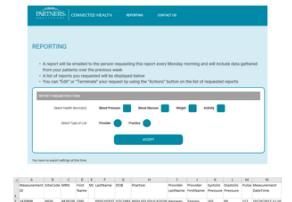
REPORTS
- Providers can automatically request a weekly raw data report of their patient(s) data via email.
- Data can be presented by provider or practice.

Centralize
Activate all digital tools from one location to easily manage and change assets

Order
Easily order relevant digital tools from existing clinical workflow

Deliver
Send orders directly to patient via email and patient portal

Monitor
Quickly access data and usage for an individual patient, or across all solutions

Analyze
Measure utilization and impact across all digital health programs

CREATING A "DIGITAL BIOBANK" WITH PATIENT GENERATED HEALTH DATA
THE TECHNOLOGY BEHIND THE MGB DIGITAL PATIENT JOURNEY

Continuous Monitoring · Convenient Care · Connected Home · Auto Patient Access · Virtual Care Circles · Omnichannel Experience · Intelligent Treatments · Me, My Data & I

Virtual Care Team · Connected Care · Coordinated Ecosystems · Augmented Wayfinding · Seamless Financing · Intelligent Machines

PERSONAS +

Today · 12 Months

With permission from Accenture
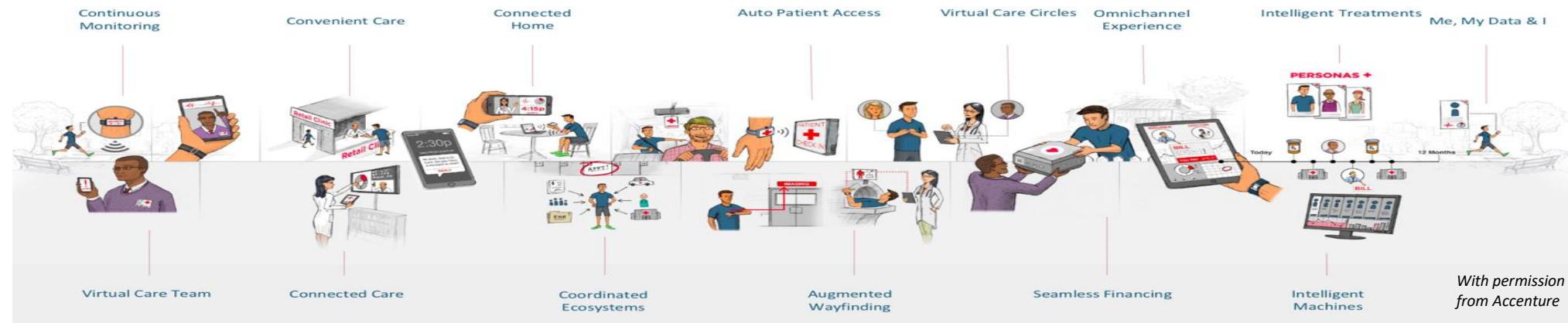
Health Providers Engage Appropriate Patients

Digital Navigators Interact w/Patients

Digital Health Teams Interact w/Data

Broad Interaction w/Patients via EHR Integration and Clin Decision Support

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Ⓥ Device Vendors and Technology Support Vendors

Ⓥ Data visualization apps/services

🏛 Middleware & Venture Devt

🏛 EHR APIs | CDS | Predictive models

Primary Patient Sensors/Devices Medical and Consumer Grade	Device Connectivity Interfaces and Channels	Data Aggregators or Integrators		Open Standards Interface Engine		EPIC Data Ecosystem

Primary Patient Sensors/Devices Medical and Consumer Grade

- Activity motion sensors
- GPS location mapping
- Vital Signs (BP, HR, O2Sat, Weight) Capture Devices
- Glucometers
- Sleep sensors
- Digital phenotyping
- Novel sensors

Device Connectivity Interfaces and Channels

Connecting to:
- Smartphone Hub, Vendor Hubs or Agnostic Servers

Via
- Bluetooth
- NFC
- Cellular/LTE
- WiFi
- POTS
- IVR/SMS/Photos

Data Aggregators or Integrators

- Apple Health Kit Google CommonHealth
- 3rd Party Device App/Cloud Servers (Fitbit, Omron)
- MGB Developers, ML/AI Labs
- Epic Care Companion
- Agnostic Servers (Validic, Bridge Connector)
- Integrators (Xealth, Phillips)

Open Standards Interface Engine

- Data and MetaData Inputs
- Data and MetaData Outputs
- FHIR and Other APIs, HL7 Read/Write-Back Capabilities

"Digital BioBank" Data Lake
- Read/Write-Back To Interface Engine
- Advanced AI/ML Analytics
- Data Curation

EPIC Data Ecosystem

- Selected Flowsheet Data and Externally Generated Action Writeback
- Data Visualizations and IPF/eCQM Reporting Tools
- Clinical Decision Support and Actionable Alerts
- Epic Predictive Analytics
- RPDR / Genetics Data Linkage

INPATIENT VIRTUAL CARE SUITE REDESIGN

VIDEO INTERCOM COMMUNICATION SYSTEM

- Provider outside the patient room with an AV device (desktop/laptop/smartphone)
- Patient in the room with an iPad mounted on an IV pole
- Simple, easy to use and quiet connection in a loud chaotic environment
- Reduces clinical staff contact with COVID-19 patients and the use of PPE

IMAGINE YOU'RE A PATIENT IN THE HOSPITAL…

I Want to See My Loved Ones
- *You can video call your loved ones or virtually include them in your care plan*

I'm Hungry
- *Online ordering makes mealtime easy and convenient*

It's Game Time!
- *Connect over video, and you can watch the game with your spouse/friends, just like you always do*

I Need an Escape
- *You have lots of time on your hands. You can access your favorite shows on Netflix*

I Forgot What My Clinician Said During Rounds
- *You can access your health information with MyChart bedside to review your care plan and what comes next*

How can an in-room connected device help you?

Inpatient Virtual Care Vision and Strategy

- **Future vision**: A connected device integrated into every room

- **Low-cost retrofit solution**: an iPad in every room

- **Current Application Suite**:
  - CareTeam Connect for care team interactions, family meetings, friends & family calls, interpreter services, PCP followup and expanded presence at rounds
  - Epic integration via MyChart Bedside

- **Future Use Cases**
  - Digital navigation, Education and Entertainment
  - TeleSitters and Video Rapid Response
  - Biotelemetry hub with digital phenotyping and early event detection
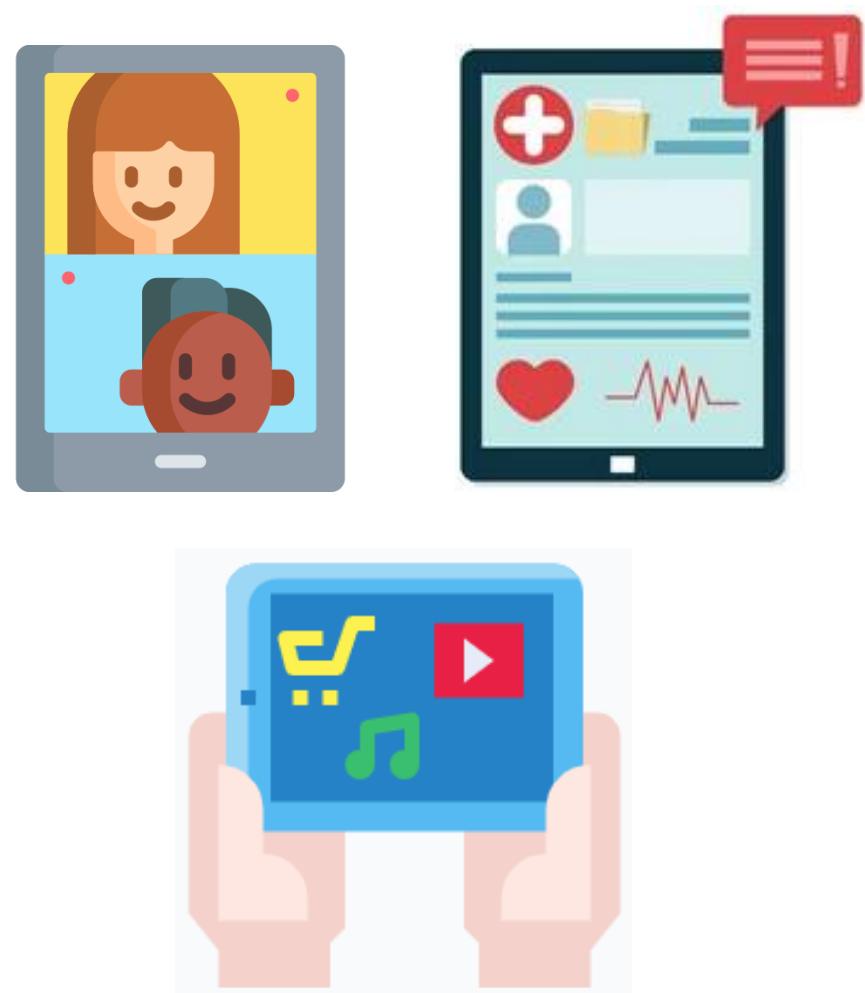
Inpatient Vision and Strategy

Value for Staff & Patients

Ground Work & Limited Deployments

Health Record

Care Team Video Communication and Observation

Pilot

Scale

Add Apps

Interpreters

Entertainment

Pilot

Scale

Sky is the Limit!

Room Service

Patient Education

Pilot

Scale

Edited from source: J. Theriault