IEEE SA
STANDARDS ASSOCIATION

HEALTHCARE & LIFE SCIENCES

THE FUTURE OF mRPM

ConV2X Symposium 2021 - 10 November 2021

IEEE

The Future of mRPM

MODERATOR

MARIA PALOMBINI
Healthcare Life Sciences Practice Leader, IEEE SA

MICHAEL CARTER
Program Director, Mass General Brigham

SHAYAN VYAS, MD
VP, Medical Director, Teladoc Health

NARENDRA MANGRA
Principal, Globenet LLC; Co-Chair various IEEE programs

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ABOUT IEEE

ABOUT THE IEEE

Mission

- The core purpose of IEEE is to foster technological innovation and excellence for the benefit of humanity

Vision

- IEEE will be essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions

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IEEE BY THE NUMBERS

400K+
MEMBERS

160+
COUNTRIES

46+
TECHNICAL SOCIETIES & COUNCILS

1900+
ANNUAL CONFERENCES

5M+
TECHNICAL DOCUMENTS

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ADVANCING TECHNOLOGY FOR HUMANITY

ABOUT IEEE

- Inspiring a global community of innovation
- Where forward-thinking professional collaborate
- Discover what's next in tech innovation
- Build technical communities
- Shape and share research
- Create global standards
- Engage in Humanitarian activities

IEEE

#IEEEHLS

HEALTHCARE AND LIFE SCIENCES

To improve the global standard quality of life at every step through affordable healthcare and access to medicines; support innovation to improve overall wellness and improve societal outcomes; and to enable innovation through open and standardized means.

Three Major Branches of Focus

1. Pharma/Biotech
2. Clinical Health
3. Global Wellness

https://ieeesa.io/hls

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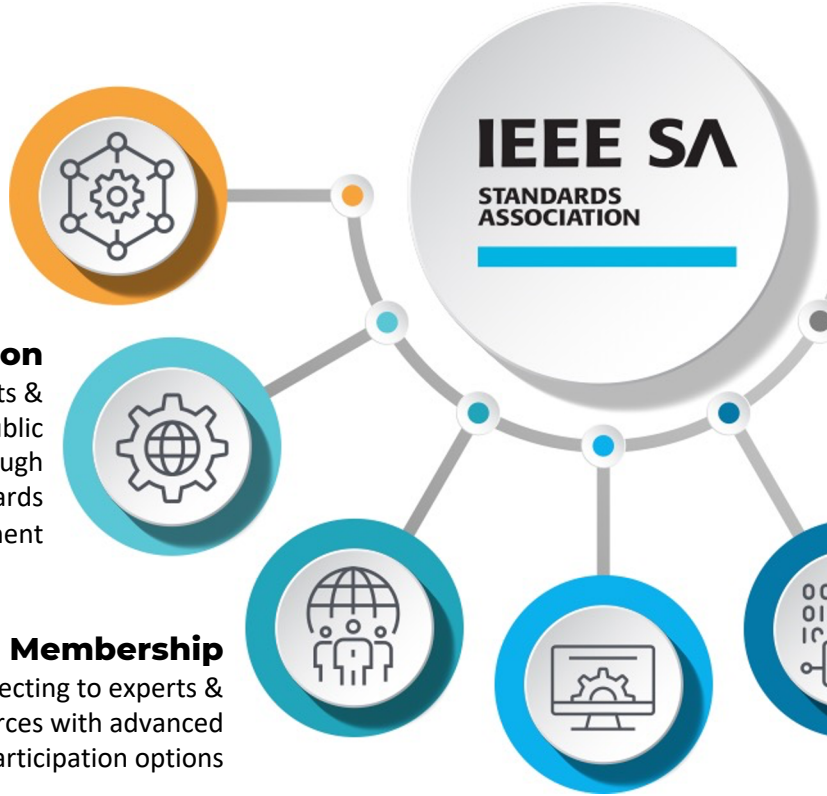
RAISING THE WORLD'S STANDARDS

PORTFOLIO OF PROGRAMS & SERVICES



Industry Connections
Exploring & incubating new tech & its use

Standardization
Creating markets & protecting public safety through standards development

Membership
Connecting to experts & resources with advanced participation options

Conformity Assessment
Providing confidence & assurance & accelerating market adoption

Open Source
Providing a community-powered platform to support open source projects

Alliance Management
Providing support to alliances & trade associations

Registries
Providing unique identifiers to support global compatibility & interoperability

Numbers for RPM Consideration

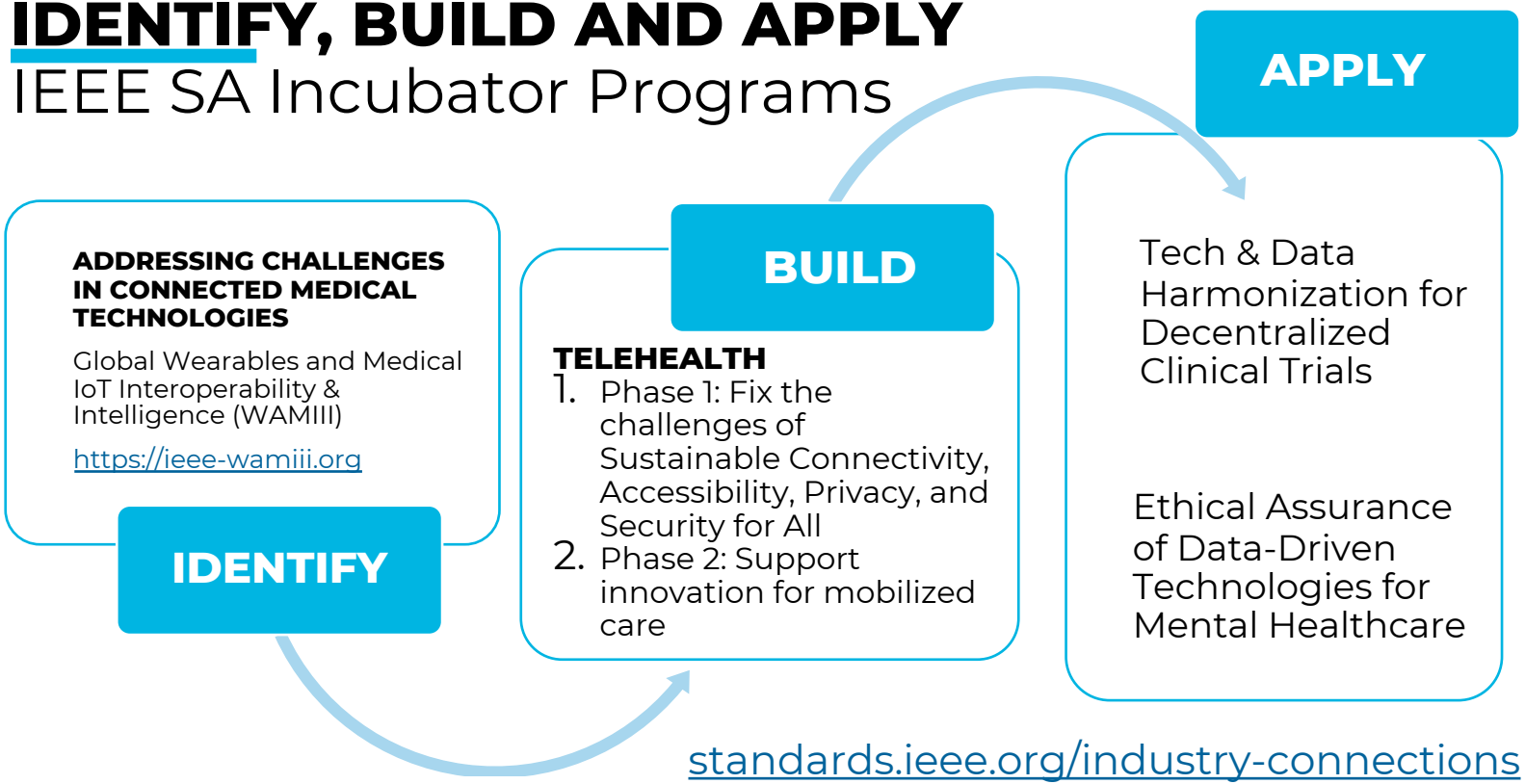
- **30 million US patients, or 11.2%** of the population, will use RPM tools by 2024—marking 28.2% growth from 23.4 million patients in 2020 (Insider Intelligence)
- **703 million people aged 65 years or over** (2019). **1.5 billion projected (**2050). The constant increase in the geriatric population will further support the growth of the remote patient monitoring market (World Population Ageing)
- As of July 2021, Telehealth utilization stabilized at levels **38X higher than before the [Covid 19] pandemic** (McKinsey & Company)
- **87% of physicians** say RPM will be a key part of the patient experience in the future and will most likely **double in the next 5 years** [by 2026] (Accenture)
- **"Cyberattacks on IoT devices surged 300% In 2019, now measured In billions"** (Forbes.com)

Things to Think About During this Discussion

- Understanding the growth in innovation and use of RPM in healthcare delivery and clinical research
- Clarification on how RPM is more than just the “device” – how do we transition to a patient-centered remote patient monitoring system
- Making the differentiation between m/RPm. Are the lines too fuzzy to differentiate?
- In innovation what should we be seeking and/or requiring.

IDENTIFY, BUILD AND APPLY

IEEE SA Incubator Programs



standards.ieee.org/industry-connections

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GET INVOLVED

Transforming The Telehealth Paradigm: Sustainable Connectivity, Accessibility, Privacy, and Security for ALL

Current and Upcoming Pre-Standards Workstreams:

- Healthcare Technologies
- Telehealth/Virtual Care Lexicon
- Publications and Education
- Emergency Healthcare Communication “Lanes”
- Rural Connectivity and Access for Healthcare
- Telehealth Inequity and Healthcare Disparity

EXPRESS YOUR INTEREST TOWARDS BUILDING SOLUTIONS!

https://standards.ieee.org/industry-connections/transforming-telehealth.html

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COMPETING TO MAKE IMPACT: RPM SOLUTIONS WANTED

Live Virtual Pitch Date: 8 February 2022

Submission Acceptance: thru 19 January 2022

https://ieeesa.io/telehealthcomp

The Future of mRPM

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Mass General Brigham

mRPM

Michael Carter, MBA
Program Director, Digital Health and Information Systems
Mass General Brigham

The Promise of mRPM

Mobile Remote Patient Monitoring (mRPM) can be defined as the collection of biometric and other health data in real-time, from outside or inside the clinic/hospital.

It touches the entire Care Continuum

Like the many other aspects of digitization, the opportunity here is putting this data in the hands of consumers and care teams to make decisions that will:

- **Improve patient communication feedback, engagement, adherence and self-care**
- **Allow care teams to work at the top of their license, allowing for assessment and intervention as needed**

The Versatility of mRPM

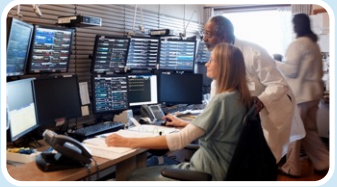
Can be initiated from several sources:

Patient

Provider

Population Health

Research



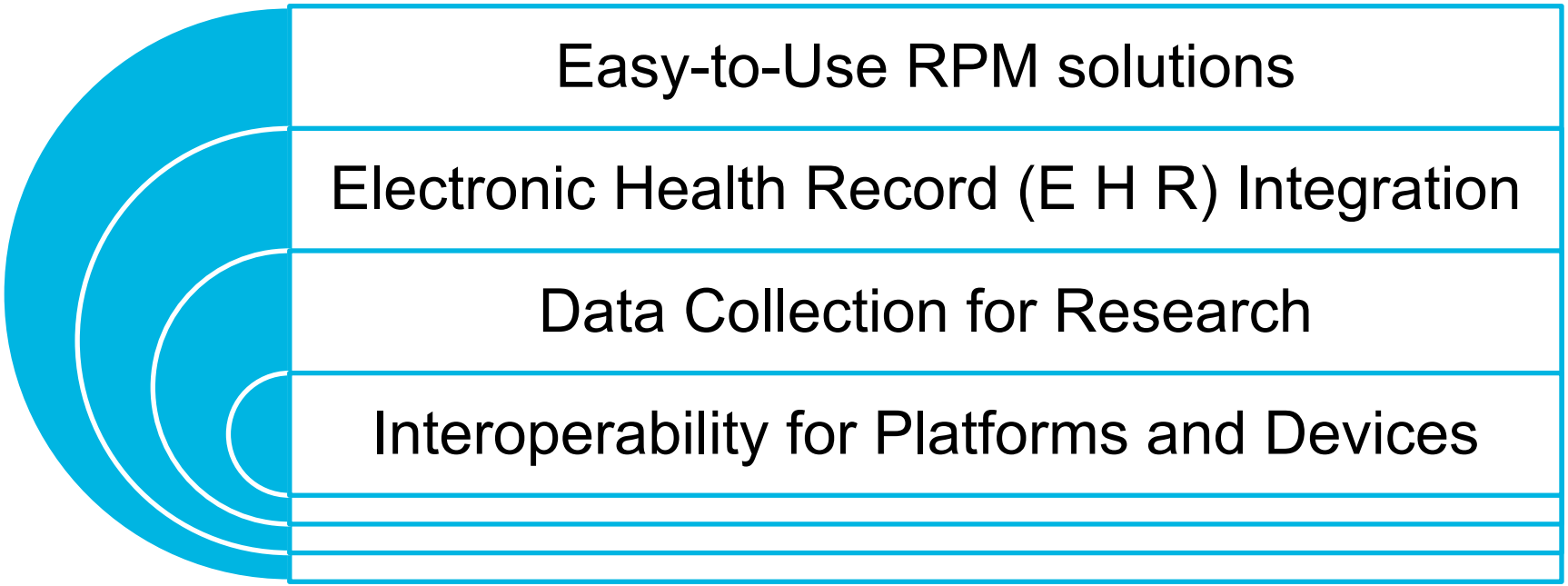
Acute Care

Sources: Getty Images/iStockphoto

The Challenges

- Highly differentiated solutions make technology decisions challenging
- RPM solutions can add to burden of healthcare workers contributing to burnout if not assessed carefully
- Patient equity as it relates to access to technology, internet, technical literacy
- Regulatory and billing requirements need to be accounted for in order to collect revenue
- Security and Privacy rules related to devices, growing AI and ML in this space, and data management

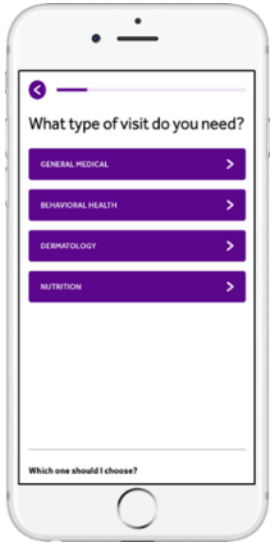
The Future of mRPM



Teladoc HEALTH

Our mission is to empower all people everywhere to live their healthiest lives by transforming the healthcare experience.

TELADOC.



InTouch Health

Livongo

Recognized as the world leader in whole-person care

+52M

U.S. paid access members as of Q2 2021

+715K

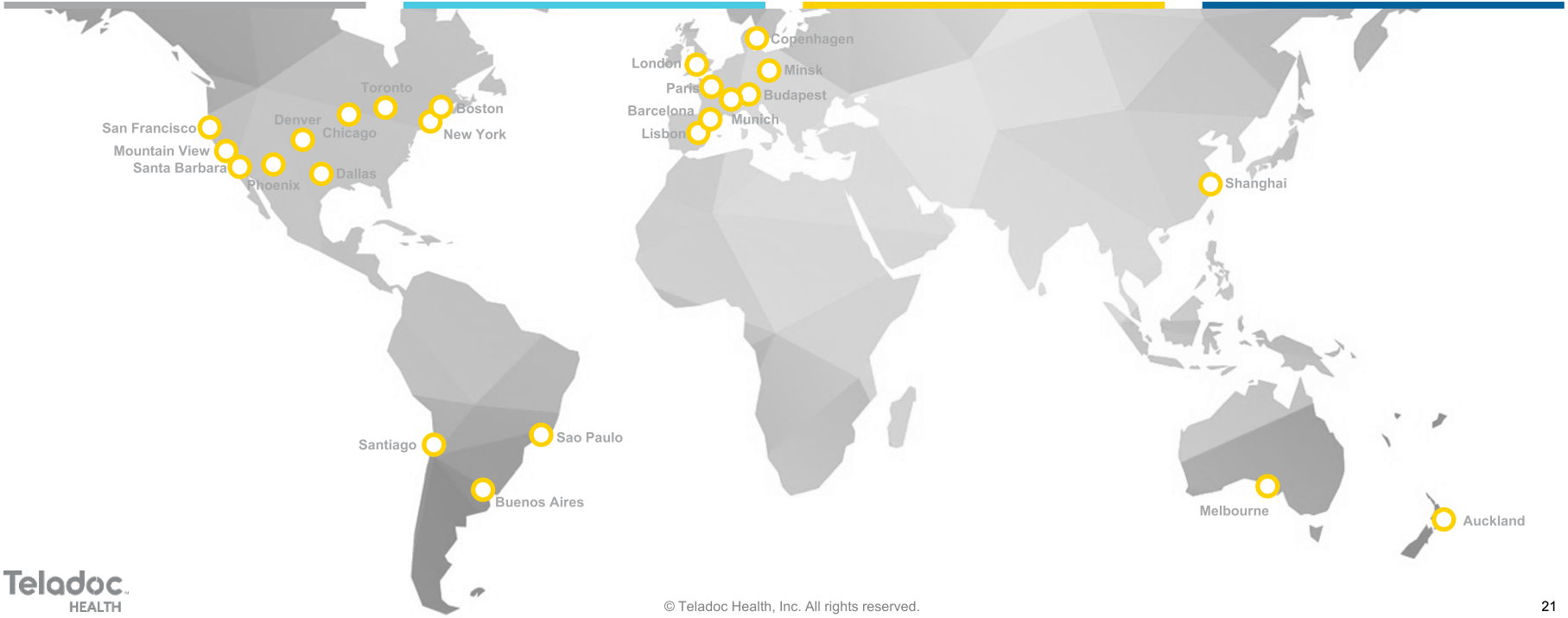
members enrolled in chronic care programs as of Q2 2021

+10M

virtual visits delivered in 2020

+2M

platform-enabled sessions in 2020



Teladoc HEALTH

Entrusted to serve more than 12,000 clients worldwide

Global employers

Making high-quality healthcare available to employees worldwide

Health plans

Expanding access to care and improving health outcomes

Global insurers

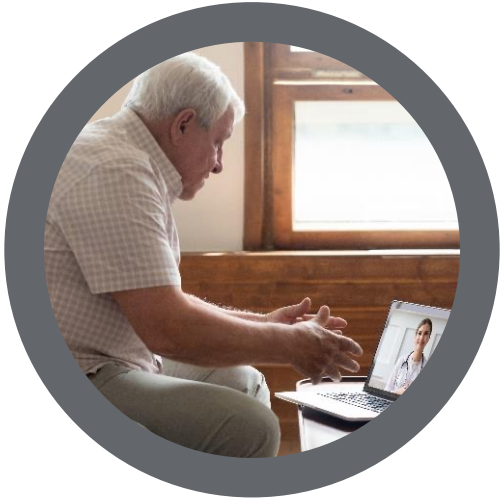
Offering protection and peace of mind for policy holders

Hospitals and health systems

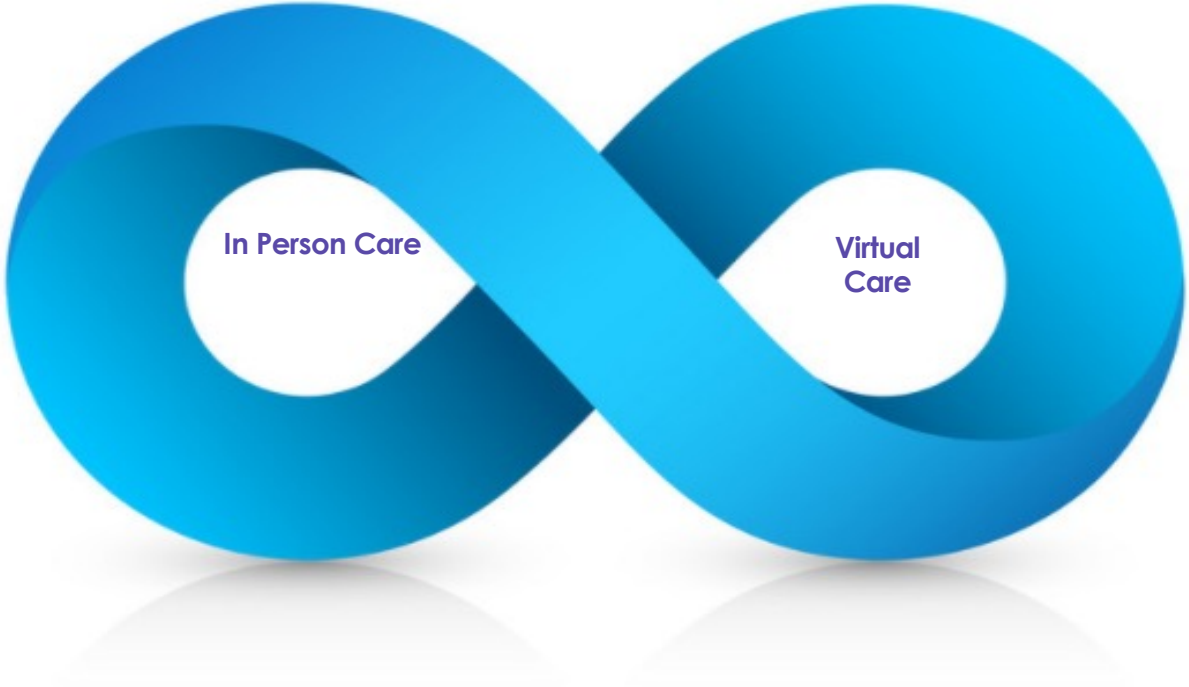
Delivering convenient and secure virtual care at unmatched quality and scale

Teladoc HEALTH

How Virtual Care Can Enable Healthcare Transformation



The Future of Health & Care May Be Digital First, But NOT Digital Only



Teladoc HEALTH

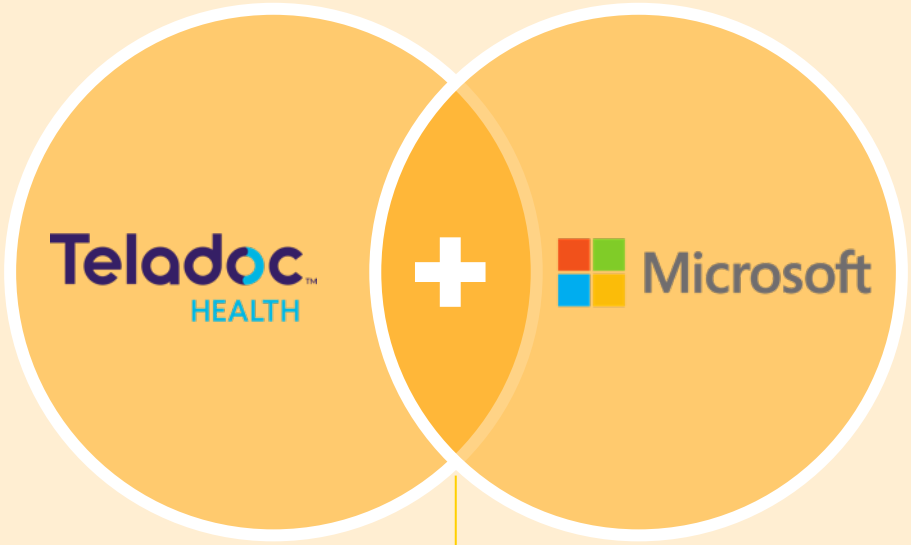
Whole-person care that spans every stage in a person's health journey

Partnerships That Matter

Purpose Built for Healthcare

Trusted and Proven Solutions

Global Leader in Virtual Care



Trusted Global Cloud Partner

Communications and Collaboration expertise

Partner-first company

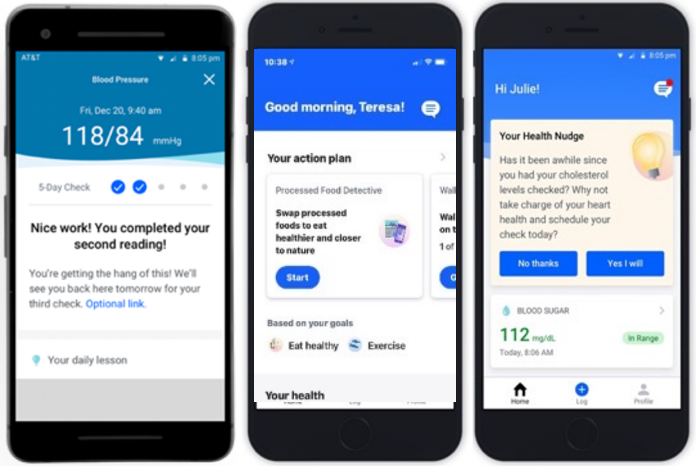
DEEP IMPACT

Delivering a seamless, integrated, enterprise solution for clinicians that makes healthcare better across the care continuum

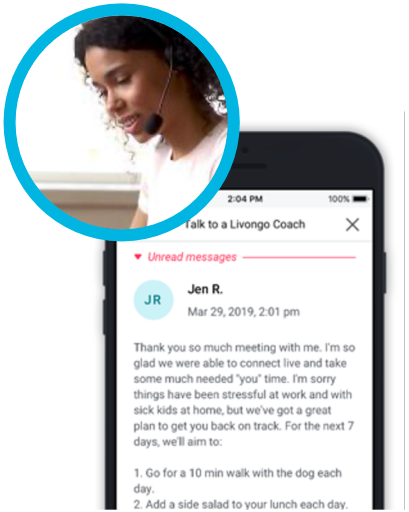
The Livongo Platform

Effortless Data Collection

Personalized Health Signals



Human-Centered Approach



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Livongo Chronic Care Management

	Heart Failure	Chronic Kidney Disease	Diabetes	Prediabetes	Cardiovascular
Target population (anchor condition)	People living with heart failure	People living with CKD + diabetes and/or hypertension	People living with diabetes	People living with prediabetes	People living with hypertension
Additional conditions enrolled (all members enrolled)	• BP Monitoring • Weight Monitoring**	• Weight monitoring** (late stage only)	• N/A	• N/A	• N/A
Additional conditions covered (based on individual member need)	• Diabetes • Dyslipidemia • Behavioral Health*	• Hypertension • Dyslipidemia • Behavioral Health* • Diabetes	• Hypertension • Dyslipidemia • Weight Management • Behavioral Health*	• Hypertension • Dyslipidemia • Weight Management • Behavioral Health*	• Dyslipidemia • Weight Management • Behavioral Health*
Standard platform features (available across all solutions)	 **Effortless Data Collection** Apps and cellular devices per conditions covered	 **Personalized Health Signals** Lifestyle change, medication adherence, emotional support	 **Human Centered Approach** Digital and expert coaching adapts to Member needs		

*Offered through myStrength programs

**Weight monitoring is not equivalent to weight management as weight loss can be harmful to patients with heart failure.

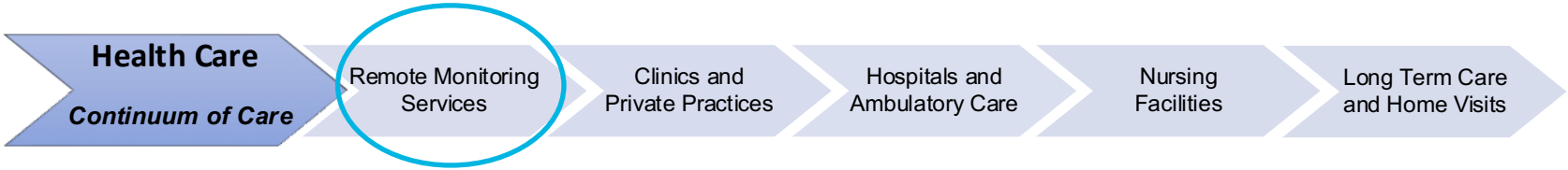
Teladoc HEALTH

Mobile Remote Patient Monitoring (mRPM)

Narendra Mangra, Co-Chair, IEEE SA Telehealth Industry Connections
Transforming the Telehealth Paradigm: Sustainable Connectivity, Accessibility, Privacy, and Security For All

5th Annual ConV2X Symposium
Nov 9 -11, 2021

Continuum of Care and Mobile Remote Patient Monitoring (mRPM)



Mobile Remote Patient Monitoring (mRPM)

Access

- **Connectivity and Accessibility for mRPM services**
  - *Consumer Broadband Access* – rural and/or low-income consumers.
  - *Health Care Provider Broadband Access* – aggregated consumer demand and inter-hospital communications, e.g., video, health care data, remote patient monitoring for expecting mothers or to treat mental health conditions, etc

Service Delivery

- **Capabilities for mRPM Services**
  - *Network Equipment* - specialized equipment to support synchronous, asynchronous, and remote telehealth services
  - *End User Equipment* - sensors, medical devices, mobile devices

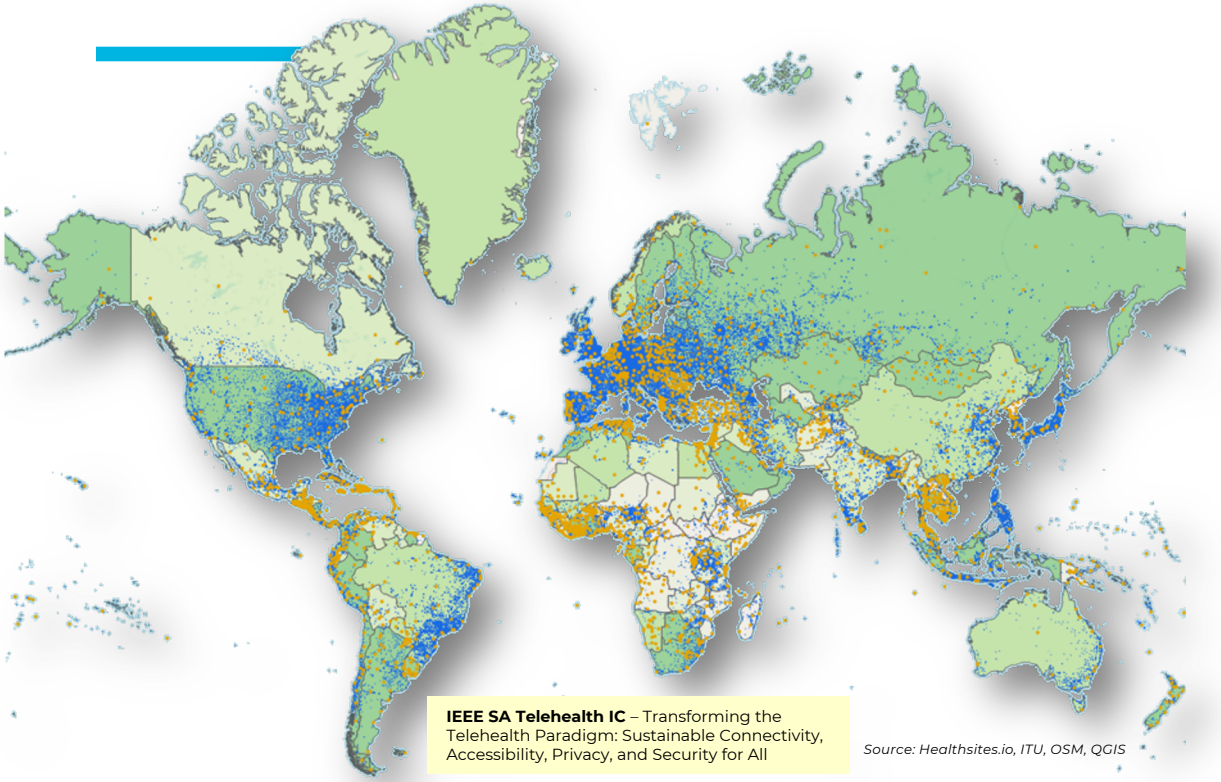
Patient and Provider Operations Management

- **Patient / Provider Experience**
  - *IT Systems* - EHR, health informatics, records management, equipment, etc
  - *Personnel* – training, digital literacy
  - *Operations and Support* - third party engagements including payers

Health Care Hubs and Interoperability

- **Handoff from mRPM to other stage and/or service providers**
  - *Continuum of Care* - includes health care consultations, advanced professional care, ambulatory care for emergencies, etc.

Transdisciplinary Example for Global Telehealth Services



IEEE SA Telehealth IC – Transforming the Telehealth Paradigm: Sustainable Connectivity, Accessibility, Privacy, and Security for All

Source: Healthsites.io, ITU, OSM, QGIS

City Centers – tends to have better connectivity with some diversity of health care options. Capacity and accessibility may still be an issue.

Health Care Delivery Points – some areas may lack access to basic healthcare, diversity of health care options. Connectivity and accessibility may be an issue in rural areas.

Mobile Penetration Rate – varies within and among countries. Countries with high mobile penetration rates may still have pockets of unserved or underserved areas.

Urban and rural areas may use telehealth services to address inequalities and social vulnerabilities.

Telehealth services may be used to:

- **Increase the geographic / demographic reach**
- **Increase frequency of synchronous, asynchronous and remote care**
- **Increase portfolio of health care services offered**
- **Reduce operating costs**
- **Reduce travel related time and expenses**

mRPM addresses a critical stage within the continuum of care.

It has the potential to serve across large geographical areas for a specific sets of telehealth services.

IEEE SA Telehealth Industry Connections Initiative

Transforming the Telehealth Paradigm: Sustainable Connectivity, Accessibility, Privacy, and Security For All

Connectivity and Accessibility

- Areas of interest include technology convergence, urban and non-urban access to broadband communications and services, and health emergency communications.

Telehealth as a Strategic Enabler for Health Care Services

- Areas of interest include telehealth services to increase the reach and depth of health care services across the continuum of care.

Health Care Technologies

- Areas of interest include health care provider and end user access equipment and devices, and health care provider capabilities for telehealth services.

Security and Privacy

- Areas of interest include trust, privacy, security, and data governance models.

Telehealth Lexicon

- Areas of interest include a lexicon framework that includes telehealth, virtual care, etc.

Education and Communications

- Areas of interest include telehealth and related technology education, digital literacy, outreach, and infographic development

IEEE Telehealth Related Initiatives

IEEE has many telehealth related initiatives:

- Multiple health care standards development initiatives
- *International Network Generations Roadmap (INGR) that includes* a 10-year forecast horizon
  - Includes Applications and Services, Connected the Unconnected, Satellite, Security, etc.
- *Transdisciplinary Framework IC* that addresses ecosystems including health care, technologies and governance
- *Public Safety Technology Task Force* that includes emergency medical services and public health scenarios
- *P1950.1 Smart Cities Architecture* that includes the health care ecosystem in urban areas
- *Rural Development IC* addresses technology and applications in rural areas
- ***Telehealth IC: Transforming the Telehealth Paradigm: Sustainable Connectivity, Accessibility, Privacy, and Security For All***
- and many more

TRANSFORMING THE TELEHEALTH PARADIGM: SUSTAINABLE CONNECTIVITY, ACCESSIBILITY, PRIVACY, AND SECURITY FOR ALL

Maria Palombini - Director, Healthcare and Life Sciences Practice Leader, IEEE SA

Bruce Hecht, Co-Chair, IEEE-SA Telehealth IC

Narendra Mangra, Co-Chair, IEEE-SA Telehealth IC

IEEE SA Telehealth IC
https://standards.ieee.org/content/ieee-standards/en/industry-connections/

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OPEN DISCUSSION

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LET'S TALK

25+ sessions on-demand

Bringing together a global community of multi-disciplinary stakeholders to discuss the challenges in security, privacy, interoperability, accessibility of connected wireless medical devices. ieeesa.io/wamiiisessions

Exploring new tools, technologies and applications to re-think the approach to better health for all.

SEASON 2 JUST RELEASED!
Global Perspectives on Cybersecurity for Connected Health

Tune in @ ieeesa.io/healthpodcast

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THANK YOU

GET INVOLVED:
Write about it, talk about it, develop solutions…make an impact.

MARIA PALOMBINI
Healthcare & Life Sciences
Practice Lead, IEEE SA

m.palombini@ieee.org

Linkedin.com/in/mpalombini

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APPENDIX

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Virtual Events

Series Finale: 17 Nov

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HEALTHCARE AND LIFE SCIENCES PRACTICE

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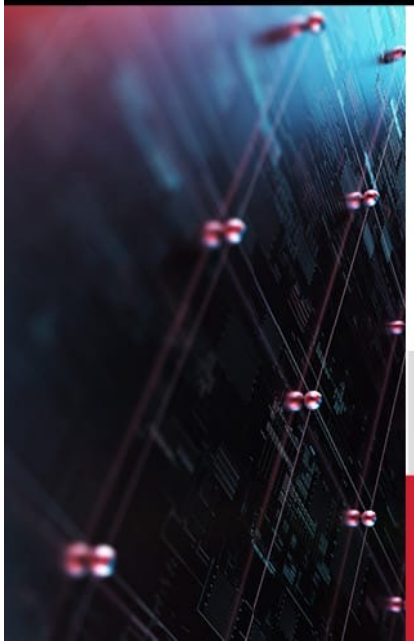

Global Connected Healthcare Cybersecurity Virtual Workshop Series

W1: 24 FEB | W2: 28 APR | W3: 16 JUN | W4: 22 SEPT | W5: 17 NOV

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INDUSTRY CONNECTIONS – HEALTHCARE & LIFE SCIENCES PROGRAMS

- Tech & Data Harmonization for Decentralized Clinical Trials
- Digital Inclusion, Identity Trust and Agency (DIITA)
- Connectivity Harmonization of the Digital Citizen/ (WAMIII)
- Neuro Tech for Brain-Machine Interfacing
- Transforming the Telehealth Paradigm
- Responsible Innovation of AI in Life Sciences
- Global Initiative on Blockchain-based Omnidirectional Pandemic
- Transforming Digital Personalized Medicine
- Ethical Assurance of Data-Driven Technologies for Mental Healthcare
- IoT Ecosystem Security
- Surveillance AI Systems for Governance for Cities

https://standards.ieee.org/industry-connections/activities.html

IEEE STANDARDS PROJECTS RELATIVE TO TOPIC…CONT

- IEEE 11073 Suite –Health Informatics - Personal Health Device Communication - Device Specialization
- P1752.1 - Standard for Mobile Health Data for Sleep Monitoring
- P1752.2 – Standard for Mobile Health Data for Cardiovascular Activity
- P2550 - Standard for Remote Monitoring of a Neonate and the Mother Post-Partum in a Non-Clinical Healthcare Setting
- P2650 - Standard For Enabling Mobile Device Platforms To Be Used As Pre-Screening Audiometric Systems
- P2144.1 - Standard for Framework of Blockchain-based Internet of Things (IoT) Data Management
- P2144.2 - Standard for Functional Requirements in Blockchain-based Internet of Things (IoT) Data Management
- P2144.3 - Standard for Assessment of Blockchain-based Internet of Things (IoT) Data Management
- P2418.1 - Standard for the Framework of Blockchain Use in Internet of Things (IoT)
- P1451-99 - Standard for Harmonization of Internet of Things (IoT) Devices and Systems

IEEE STANDARDS PROJECTS RELATIVE TO TOPIC…CONT

- P1528.7 - Guide to Assess the Electromagnetic Fields (EMF) Exposure of Internet of Things (IoT) Technologies/Solutions
- P2802 - Standard for the Performance and Safety Evaluation of Artificial Intelligence Based Medical Device: Terminology
- P2418.6 - Standard for the Framework of Distributed Ledger Technology (DLT) Use in Healthcare and the Life and Social Sciences
- P2933 -Standard for Clinical Internet of Things (IoT) Data and Device Interoperability with TIPPSS (Trust, Identity, Privacy, Protection, Safety, Security)
- IEEE 2791-2020 - IEEE Standard for Bioinformatics Analyses Generated by High-Throughput Sequencing (HTS) to Facilitate Communication
- P2968.1 - Trial Use Recommended Practice For Decentralized Clinical Trials Patient Safety
- P2968.2 - Trial Use Recommended Practice for Decentralized Clinical Trials Threat Modeling, Cybersecurity, and Data Privacy