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Telehealth—A Technology-Based Weapon in the War Against the Coronavirus, 2020

Social Distancing Needs will Present Both Growth Opportunities and Challenges

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Contents

Contents (continued)

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Executive Summary

Key Findings

The COVID-19 pandemic has disrupted the practice of medicine and the delivery of healthcare worldwide. Ironically, the urgency to deploy social distancing has opened the door to and created an unanticipated demand for telehealth as a critically important technology that may be used to evaluate, manage, and track certain COVID-19 patients without the need for an in-person exam.

Telehealth involves the use of communications technology to provide medical services or monitoring for patients who are not visiting with their healthcare provider in person. Providers large and small are reaching out to their patients with announcements that they can meet with some via telehealth even while their offices are closed or unavailable for elective procedures or health maintenance visits.

An initial reforecast of the telehealth market indicates a huge spike in usage in 2020. The full virtual care market in the United States now is projected to display a 2019–2025 compound annual growth rate (CAGR) of 38.2%. The pre COVID-19 CAGR was 28.2%. The most noticeable change has been the year-over-year growth in 2020.

- The US telehealth market now is forecast to achieve a 64.3% growth in 2020. The pre-COVID-19 forecast was 32.3%. This indicator points to a 100% increase in growth based on dramatically higher demand as a result of the COVID-19 pandemic.

- Remote patient monitoring (RPM) is forecast to grow by 150.3% in 2020, while virtual visits are forecast to grow by 124.2% in 2020.

Source: Frost & Sullivan

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Key Findings (continued)

The incredible growth also presents some challenges. It is unclear whether telehealth providers can meet the demand for virtual visits. For example, it was reported by the *Wall Street Journal* that patients experienced wait times of as long as 22 hours with a leading virtual visit provider.

Hospitals will postpone or divert basic maintenance or elective procedures, which could result in reduced revenue opportunities for providers. The impact of this dynamic on telehealth is unclear.

Many people use the terms "telehealth" or "telemedicine" without understanding the ecosystem that is involved. This study will clarify the many components that are needed in order to implement telehealth.

Source: Frost & Sullivan

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Benefits of Telehealth

- Telehealth eliminates the need for physical contact between patient and provider.

- Virtual visits can be scheduled quickly, and many more patients can be seen in a day.

- Some patients may be virtually treated and tracked with RPM.

- Highly contagious patients can be triaged and handed off to a specialized first responder team.

- Medicine, if available, can be e-prescribed and adherence tracked.

- Tools that help a patient self-examine during or before a virtual visit are becoming available.

- Important patient-generated health data can be gathered and analyzed. These data may be uploaded to an electronic health/medical record (EHR/EMR), sent to a specialist for further review, anonymized and utilized by clinical decision support systems, or sent to population health management (PHM) systems or fed to predictive analytics systems.

- Telehealth can be used to provide essential services to patients who reside in areas that do not have enough primary care physicians or specialists.

- Telehealth technology can be used in a clinical trial or post-market (Phase 4) trial.

- Primary care physicians and specialists can consult with each other regardless of their location.

Source: Frost & Sullivan

Benefits of Telehealth (continued)

- Mobile health (mHealth) devices or personal emergency response systems (PERS) can trigger alerts.

- Specialized apps can increase coverage and communication with a patient. In some configurations, patients may use their own devices as part of an RPM system.

- Providers, caregivers, and family members can communicate regardless of location.

- Patients in a medical facility can benefit from RPM and be tracked from their room.

- Patient or caregiver questions can be answered quickly using messaging or video links.

Source: Frost & Sullivan

Challenges to Implementing Telehealth

Simply put, telehealth is not one thing, rather, it includes a universe of platforms, systems, devices, enablers, networks, data centers, and medical professionals in an ecosystem. Telehealth is not the solution for all patients; certain examinations and procedures must be performed in person.

- It was not designed to manage infectious diseases.

- It has not been fully reimbursable.

- A definition is not standardized. This is especially visible in the state-level differences of what is considered RPM, virtual visits, or video-enabled visits.

- Not all providers, patients, or payors are advocates.

- A major question concerns the scalability of RPM systems and whether the supply of available physicians in virtual visit networks can meet a sudden surge in demand for services.

- Patients in some rural areas of the United States do not have access to the broadband networks that are required to achieve functional telehealth services.

- HIPAA regulations apply, yet privacy and security have been long-standing issues.

Source: Frost & Sullivan

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Telehealth Functional Review

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Market Definitions

Virtual Visits: Remote medical exams that can assess, treat, or triage certain conditions. Providers can offer services similar to those of a primary care physician, or specializations such as tele-dermatology or telemental health.

RPM: Remote, medical-grade monitoring of certain biometric indicators. RPM systems may be supplied by medical device makers or include patient-owned devices.

mHealth: Mobile technologies that use wireless networks, apps, devices, and wearables to deliver telehealth services to patients.

PERS: Consumer-focused technologies that allow users to initiate an emergency response when they have fallen or suffered a medical emergency. Some require a user to press a button; advanced systems do not require the user to engage it.

Source: Frost & Sullivan

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Indicators from Recent Company Statements

Virtual visit provider [Teladoc Health](#) reported March 13:

"Patient visit volume spiked 50% over the prior week and continues to rise ... to as much as 15,000 visits requested per day. Teladoc Health has provided approximately 100,000 virtual medical visits to patients in the United States in the past week, helping to alleviate pressure on the broader health care system."

Virtual visit provider [Amwell](#) reported March 24:

"Last week, Amwell's weekly activity was up about 158% overall nationally compared to projected traffic volume. In Washington, where the COVID-19 outbreak originated in the U.S., usage is up 600%."

RPM services provider [Medtronic](#) stated March 27:

"Using technology for self-reported symptom monitoring may play an important role in slowing the spread of the disease and helping escalate patient needs to their provider when appropriate."

Source: Frost & Sullivan

Telehealth Virtual Visit Value Proposition—Isolation from Germs

Key Takeaway: In the pre-pandemic world, remote visits were considered to be an important way to reduce exposure to contagious patients. This benefit has become critical in today's social distancing programs.

Traditional Medical Office Scenario

- Waiting room shared by many patients—some of whom may be sneezing and coughing (especially during the cold and flu season). Long waiting times increase level of exposure

Virtual Medicine Scenario

- No trip to an office
- Wait in the comfort of your home or workplace
- Lower disease exposure
- Prescriptions ordered as you wait
- Critical triage opportunity

Source: Frost & Sullivan

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Telehealth Virtual Visit Technology View

Key Takeaway: Although easy to access, many components are required to set up virtual visits.

Network of Doctors

Cloud-based Network Platform

Patient at Home

EHR/EMR

Service Provider

Systems:
- Scheduling
- Billing
- Claims Management
- Revenue Cycle Management

Communications Link

Tools:
- Wearables
- RPM
- Phone
- Internet
- Webcam
- Video

Source: Frost & Sullivan

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Video Conferencing Elements of a Virtual Visit

Key Takeaway: Numerous elements are required to enable a video conference. The user may be unaware of many of them.

Connectivity	Equipment	Session Management	Infrastructure
• Network	• Video Codec	• Scheduling	• Video Conferencing Infrastructure
• Authentication	• Camera	• Clinical Operations	• Firewall
• Bandwidth	• Speaker	• User Interface	• Security
• Quality of Service	• Microphone	• Medical Device Connectivity	• Privacy
	• Monitor	• EMR	
	• PC		
	• Carts		
	• Tablet		
	• Smartphone		
	• Laptop		

Source: Frost & Sullivan

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Description of an RPM Solution

1. A mix of clinical medical device, consumer wearable, connected home, and car-based sensors enabled by wireless communications to measure physiological and some behavioral parameters; and an integrated platform leveraging a smartphone that acts as a gateway and securely transfers data to a centralized repository.

2. A cloud-based command center where patient data from gateways and diagnostic applications are stored and analyzed.

3. Direct transfer/access to patient data, analytics-based optimization parameters, and provider alerts to an enterprise healthcare IT system.

4. Visualization and display software at the healthcare provider site or monitoring center that can generate treatment recommendations and intervention alerts based on analyzed data.

5. Simultaneous direct notification of "intervention needed" alerts to individual patient care team members, leveraging multiple types of mobile and smart devices depending on individual practitioner preference.

6. Selected patient data that is transferred to family/loved ones leveraging an mHealth application tied to the RPM platform.

Source: Frost & Sullivan

RPM is a Component of Healthcare's Transformation

PHM

- Integrates large data sets including patient-generated data from RPM

- Will utilize data to enable smart preventive care

Care Coordination

- Features connected healthcare specialists

- RPM enables real-time actions that can prevent the need for hospitalization

Patient Engagement

- Patient becomes an active part of a care team

- RPM data keeps the full care team aware of the most recent biometric indicators

Outcomes-Based Medicine

- Supports the goals of the "triple aim*"

- Fits well in the value-based reimbursement model

*Improve the patient experience of care; improve the health of populations; reduce the per capita cost of healthcare

Source: Frost & Sullivan

RPM Process Flow

A Typical RPM Model

Collect → Transmit → Evaluate → Notify → Intervene → **The Cloud** → **Analyze Predict Pre-empt**

Improved:

- Cost
- Quality
- Outcomes

Evolving to the Next Level:

- The smartphone and apps play a greater role in managing biometric data capture.

- Patient portals provide a range of interface options for the care team and the patient.

- 5G wireless technology will vastly increase the bandwidth and speed that will enable more devices and patients to be monitored from their home or other locations.

- Artificial intelligence (AI) will be a game changer based on the potential to improve data collection, filtering, and analysis; offer a virtual assistant as a user interface; and enable greater scalability.

Source: Frost & Sullivan

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Telehealth—Impact of the COVID-19 Pandemic on Growth

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5-Step Process to Transformational Growth

Key Takeaway: The challenges presented by the COVID-19 pandemic has obliterated the normal growth sequence for telehealth.

Growth Environment	Visioning Scenarios	Growth Pipeline	Growth Strategy	Growth Implementation

Where are we?
- Market analysis
- Fact foundation

What might the future bring?
Macro to micro

Generation, evaluation, and prioritization of opportunities

How do we get there?

Best practices implementation

Scope of This Study

- Deep analysis of the market
- Predicting the future of this market
- Determination of opportunity universe
- Strategic options framework

Customized Solutions for Your Company

- Prioritization of growth opportunities
- Translation into cogent strategies
- Planning and implementation
- Monitoring and optimization

Source: Frost & Sullivan

Strategic Imperatives During the Coronavirus Pandemic

Strategic Imperatives for Telehealth Providers

Quantify performance. Telehealth services appear to have achieved success, but there is no core study that all suppliers can present as proof of concept. Use the global pandemic to prove the value of telehealth.

Rise to the challenges and capture the opportunities resulting from the coronavirus pandemic. The COVID-19 crisis could be the breakthrough driver that will propel telehealth to capture an embedded position across healthcare.

Develop the telehealth business model that demonstrates its economic value in value-based reimbursement models. Lobby government officials and regulatory agencies to support telehealth.

Define and model telehealth as a solution to actively support health and wellness and demonstrate how expanding telehealth programs could reduce current estimates for the prevalence of chronic conditions.

Permanently remove the barriers that diminished the potential of telehealth in the pre-pandemic healthcare market.

Source: Frost & Sullivan

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Opportunities for Telehealth Suppliers to Battle COVID-19

Growth Opportunity	Brief Description
Virtual Visits	Remote evaluation of patients with non life-threatening symptoms or known history of direct contact
RPM	Tracking of temperature and other biometric indicators for flagged patients; those on watch list receive intervention if needed
mHealth Wearables and Apps	Education, management, and oversight of patients; medication adherence can be closely monitored.
PERS	Management of patient well-being and sleep patterns, and response to falls or emergencies
Remote Consultation Services	Virtual meetings of medical experts to share views on selected patients; infectious disease experts can have input in more lives than usual
Data Analytics	Leveraging meeting media and content, as well as contextual information from third-party apps
Virtual Triaging	Determining which patients must be seen first
Robotics	Robotic attendants that can enter high-risk environments and attend patients as needed

Source: Frost & Sullivan

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Telehealth Market Overview

Drivers and Restraints

Telehealth Market: Drivers and Restraints, US, 2020–2025

		1–2 Years	3–4 Years	5–6 Years
Market Drivers	Need to divert a defined population away from provider offices and the ER	H	H	H
	Removal of regulatory constraints for COVID-19 patients	H	H	H
	Ability to perform accurate remote exams on highly contagious patient population	H	H	H
	Value-based reimbursements or direct-to-consumer offerings at out-of-pocket rates	H	H	H
	Employee telehealth offerings at per-member, per month rates, plus usage rates	M	M	M
Market Restraints	Lack of standard reimbursement rates	H	H	H
	Scalability challenges magnified in a sudden ramp-up to combat COVID-19.	H	H	H
	Mix of medical- and consumer-grade solutions	H	H	H
	Concerns about security and privacy	H	H	H
	Interoperability and integration issues/concerns in multi-vendor environments	H	H	H

Impact: **H** High   **M** Medium   **L** Low

Source: Frost & Sullivan

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Regulatory Issues

On March 30, The [Centers for Medicare and Medicaid Services](#) (CMS) announced that the Trump administration made sweeping regulatory changes to help the US healthcare system address the COVID-19 patient surge. This will have a great and temporary impact on the ability of Medicare beneficiaries to use telehealth and providers to file for reimbursements. However, private plans will have to assess the requirements per state.

The regulatory barriers prior to COVID-19 included:

- Parity laws for telehealth (state level)

- Reimbursement formulas (state level)

- Mental health coverage (Mental Health Parity and Addiction Equity Act (MHPAEA) 2008)

- Origination site regulations

- Coverage of RPM at the state level

- Several federal legislation efforts, passed or pending

- State licensure restrictions

Although there appears to be great momentum to quickly change the regulatory muddle, there may be more complexity involved in fixing these many problems than one simple right of passage from a government agency.

Source: Frost & Sullivan

Emergency Regulatory Relief to Address COVID-19

- CMS is broadening the application of telehealth through the Center for Medicare and Medicaid Innovation (CMMI), which tests new payment and care delivery models and their impact on quality and cost of care. For example, CMMI's value-based insurance design model examines how Medicare Advantage plans can use telehealth to meet network adequacy requirements. In addition, the Next Generation Accountable Care Organization model has the same telehealth flexibilities recently afforded to MA and the Medicare Shared Saving Program. Focusing on improving quality and cost of care will encourage payers, providers, and patients to use telehealth services. Furthermore, CMMI examines insurance models to incorporate telehealth into Medicare plans, which will boost usage of services as Medicare users are well suited to using telehealth services.

- Following the Trump administration's declaration of a state of emergency in response to the COVID-19 pandemic, the CMS started approving Medicaid Section 1135 waivers, easing certain restrictions that will allow states to respond more effectively. As of March 24, a total of 13 states have had requests for the waivers approved, and more are expected to follow. The removal of reimbursement barriers will ensure prompt COVID-19 to contain the spread.

Source: CMS, Modern Healthcare; Frost & Sullivan

A Quick Review of Telehealth Regulations

- **Mental Health Parity and Addiction Equity Act 2008**: A federal law that makes it mandatory for insurers to provide proper coverage for mental health treatment. The impact arises from the fact that it raises awareness around the relatively neglected area of mental illness.

- **Bipartisan Budget Act 2018**: A federal law that expands telehealth treatment and coverage. Mainly concerning Medicare, it particularly outlines telehealth care for kidney and stroke care.

- **Home Health Payment Innovation Act of 2019** (pending): The bill would preserve Medicare recipients' access to home healthcare services and provide a pathway for innovating approaches to using these services. It makes a series of changes relating to payment and coverage of home health services under Medicare and Medicare Advantage.

- **Creating Opportunities Now for Necessary and Effective Care Technologies for Health Act of 2019** (pending): The act would allow the secretary of health and human services to waive any restriction (geographic, originating site, modality limitation, provider type and service requirements) applicable to telehealth provided that it would reduce spending without reducing the quality of care or improve quality of care without increasing spending, or apply to telehealth services furnished in originating sites located in a high-need health professional shortage area. The secretary would be required to establish a process for stakeholders to submit comments on the waivers and on a biennial basis post on the CMS website specific information pertaining to the waiver.

Source: National Consortium of Telehealth Resource Centers; Frost & Sullivan

A Quick Review of Telehealth Regulations (continued)

- **Interstate Medical Licensure Compact**: The compact allows qualified physicians to obtain licenses to provide services across states. As of 2020, the agreement includes 29 states, the District of Columbia, and the US territory of Guam. The increase in the number of eligible care providers will especially benefit patients in underserved or rural areas by giving them access to specialist care through telehealth services.

- **Opioid legislative efforts**: Various initiatives introduced by Congress to tackle the rising opioid epidemic would increase access to telehealth services for Medicare treatment of substance use disorders.

Source: Frost & Sullivan

Telehealth Provider Landscape

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Telehealth Provider Landscape—Short List

Virtual Visits	RPM	mHealth	PERS	Platforms
• Amwell	• A&D Medical	• Apple	• ADT	• AMD Global Telemedicine
• Doctor on Demand	• Abbott Laboratories	• AT&T	• AT&T Business	• Care Innovations
• CareClix	• AMD Global Telemedicine	• Celltrust	• AlertOne Services	• Capsule Tech
• MDLive	• Boston Scientific	• Fitbit	• Bay Alarm Medical	• Medtronic Care Management
• Teladoc	• Care Innovations	• GoodRx	• Connect America	• Vivify Health
• Talksession	• Capsule Tech	• Google	• GreatCall	• Zipnosis
• Talkspace	• Dexcom	• Jawbone	• LifeAlert	
• Vidyo	• Ideal Life	• Kinosis	• Medical Guardian	
• VSee	• Intel	• Microsoft	• Numera	
• WeCounsel	• Medisante	• Samsung	• Philips Lifeline	
	• Medtronic	• Tactio	• Rescue Alert	
	• Philips Health Suite	• Verizon	• Tunstall	
	• Resideo	• Walgreens	• VRI	
	• Somatix	• Wolters Kluwer		
	• TytoCare	• Zynx		
	• Validic			
	• Vivify Health			

Source: Frost & Sullivan

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Description of Profiled Companies

Telehealth services are provided by a wide array of companies that are in various stages of development. Telehealth includes virtual visit services, RPM, mHealth, and PERS to evaluate, treat, triage, or track patients in their home or a long-term care facility. The Internet of Medical Things (IoMT) will be increasingly used to track patients who are outside of their homes.

Virtual visit companies include service providers and technical enablers.

RPM businesses includes medical device makers, app developers, services, and platform suppliers that are creating customized service models.

mHealth businesses range from suppliers of wearable devices to apps. Areas of focus include medical-grade monitoring, virtual exam tools, medical specialist networks, behavioral health, coaching, and IoMT enablers.

Frost & Sullivan has identified approximately 400 companies that offer medical-grade products and apps. This section presents snapshots of selected companies that represent key telehealth capabilities. This is not an attempt to list all telehealth industry participants; rather, the purpose is to provide a high-level view of capabilities that are components of the telehealth ecosystem. The companies listed are visible participants in this ecosystem.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role

Company/ Specialty	Capabilities
AliveCor RPM, mHealth, platform	AliveCor is developing medical-grade solutions that work with a smartphone to provide electrocardiogram (ECG) readings. The company's KardiaMobile has been cleared by the US food and Drug Administration (FDA) to offer a mobile ECG solution. It is used by cardiologists globally to deliver for accurate ECG recordings. AliveCor markets the KardiaMobile EKG family of handheld heart rate monitors that connect to a mobile app. KardiaMobile 6L, which offers more data than the company's first KardiaMobile product, launched in 2019. The company has benefited from some visibility with the Apple Watch in a Stanford University heart monitoring trial. However, Apple later utilized its home-grown solution. In October 2019, AliveCor announced a partnership with Huami Corporation of China to co-develop medical-grade wearables. Kardia Pro is described as the first AI-enabled platform for doctors to monitor patients for the early detection of atrial fibrillation. This solution can be an important tool for monitoring COVID-19 patients who have comorbid cardiology issues.
AMD Global Telemedicine Virtual visit continuum, diagnostic telemedicine, direct-to-consumer telehealth	AMD Global Telemedicine develops clinical telemedicine encounter management solutions (TEMS) used by more than 10,000 patient endpoints in more than 100 countries. AMD products bring medical care to rural and underdeveloped areas. Its onDemand Visit is an all-in-one, direct-to-consumer telehealth platform. The enterprise-wide virtual care solution can replace the in-person medical visit. Products include examination cameras, medical scopes and camera illumination systems, stethoscopes, vital sign monitors, ECGs, spirometers, Holter monitors, retinal cameras, and ultrasound probes. AMD claims to have a track record for partnerships that feature superior video & audio quality when compared to other systems. AMD telemedicine technology includes solutions that allow for remote healthcare in severe weather and battlefield conditions. It will likely be a huge contributor in the war against COVID-19.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
AT&T Business mHealth, telehealth connectivity	AT&T Business provides connectivity for healthcare organizations. Its 4G wireless and fiber optic products enable secure connectivity for fixed and mobile healthcare delivery applications. The introduction of 5G networks will offer healthcare providers new capabilities to support applications such as high-resolution image delivery and telehealth services to clinics in rural areas. AT&T Business provides emergency communication services to first responders through the First Responder Network Authority (FirstNet) network. AT&T describes it as a reliable, highly secure, interoperable, and innovative public safety communications platform. The Aira service allows a hospital to establish virtual boundaries around physical locations so that patients using their smartphones can access information specific to that location, such as wait times at a treatment facility. This is a critical capability in efforts to manage certain COVID-19 patients.
Amwell Virtual visits and telehealth platform	Amwell offers telehealth directly to consumers, employers, and health plans. It is often a white-label provider to health systems. Products include virtual visits, EHR integrations, telemedicine carts, peripherals, kiosks, and software development kits. Its Exchange removes the barriers that prevented patients from accessing healthcare providers beyond their health system. Amwell has made 2 acquisitions: Avizia, a provider of acute care telehealth; and Aligned Telehealth, a provider of behavioral telehealth services. Amwell has participated in major studies, such as the tele-epilepsy study with the Cleveland Clinic. The patient experience score was 4.72 out of 5. The trial revealed a notable increase in the demand for tele-neurology. Amwell has extended its potential for virtual care to include specializations such as behavioral health. The company has also extended its practice to include both remote and in-hospital products and solutions. Amwell offers capabilities for virtual assessment and virtual acute care—critical capabilities that can be used to manage certain COVID-19 patients remotely.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
Capsule Technologies RPM, data, device integration, clinical surveillance, platform	Capsule was most recently a part of Qualcomm Life, which was acquired by the private equity firm Francisco Partners. The company connects data generated from remote and hospitalized patients to clinical workflows. These solutions improve operational efficiencies and enable informed interventions across the care continuum. Capsule's 2Net and Capsule platforms capture, connect, and analyze data and integrate it into hospital EMRs and other enterprise systems for rapid and secure management. Capsule's medical-grade platforms and open ecosystem allow healthcare companies to scale their solutions and realize the benefits of secure, near-real-time patient and consumer data. Capsule can play an important role in the efforts to halt the spread of COVID-19 by ensuring that critical patient-generated data receives secure transport to a third-party command center or directly to a provider. The ability to learn from the most recent data will ensure that patients benefit from the lessons learned on the front lines of treatment.
Conversa Health Instant messaging, digital conversations	Conversa specializes in technology that enables digital conversations. Its conversational AI technology leverages a clinical content library of more than 750 "clinically intelligent" conversations that cover chronic care, pre- and post-surgical care, post-acute care, and prevention and wellness scenarios. The Conversa Conversation Platform can add an important dimension to an RPM system. The Conversa Chats platform provides a new way to automate the collection of patient-generated health data; healthcare teams that use it are completely aware of the latest details concerning their full roster of patients. The company recently announced a partnership with El Camino Health's pulmonary health unit to launch Conversa Health's personalized virtual health assistant technology to patients with chronic obstructive pulmonary disorder (COPD). The service will be available as the 2 BREATHE Chat. 2 BREATHE enables patients with COPD, asthma, and other respiratory illnesses to be monitored remotely by their care team. This represents a very timely capability given the fact that COVID-19 targets the respiratory system.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
Dexcom RPM, continuous glucose monitoring (CGM), diabetes management	Dexcom specializes in the design, development and commercialization of CGM technology to help patients manage diabetes and support better outcomes. Products include the G6 CGM System, G5 Mobile CGM System, Clarity diabetes management software, CGM apps, and Studio glucose and diabetes management software. In March 2018, Dexcom achieved marketing authorization from the FDA de novo process for the G6 CGM—the first authorization for a CGM that may be part of an integrated system of automated insulin dosing systems, insulin pumps, blood glucose meters, or other electronic devices used for diabetes management. Underlying diabetic conditions increase the risk of COVID-19 mortality. Dexcom's CGM will be an important component of the potential for telehealth and RPM to monitor high-risk patients based on reliable readings.
GlobalMed Hardware and software solutions for telemedicine	GlobalMed designs and manufactures integrated software and hardware telemedicine solutions for advanced virtual health programs that support a patient at any point in the continuum of care. Features include scheduling, patient eligibility, payments, ICD-10 codes, and mobile messaging. GlobalMed enables workflows for patient acquisitions, price setting, and billing for services. The company supports the clinical workflow, including video, phone, in-home, or office consultations. GlobalMed offers connected devices for diagnostics and workflow along with eNcounter telemedicine software. Of critical importance to COVID-19, telemedicine medical stations function as a hub for a secure, integrated telemedicine capability. Virtual assessments can be deployed from a medical clinic or hospital, remote site, home, workplace, school, military environment, or correctional facility.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/Specialty	Capabilities
Health Tap Virtual care platform	HealthTap provides an online platform that allows patients to receive health education and content, and 24x7 access to medical experts who can provide health advice. Customers include employers, insurance companies, and health systems around the world. More than 144,000 doctors and 7.6 million consumer members utilize HealthTap's free mobile app. HealthTap offers an augmented intelligence system that personalizes users' care and enables an instant connection to doctors from 163 specialties. HealthTap claims the largest library of doctor-authored content, a personalized AI-powered symptom checker, treatment plans, prescriptions, and treatment reminders. All of these capabilities will be needed in the effort to manage COVID-19 patients remotely, whenever possible.
Medtronic Care Management Services RPM devices, services, and platform	Medtronic Care Management Services features peripheral devices connected to patient platforms to monitor biometrics, vital signs, and patient-submitted symptom information. Connected devices include weight scales, glucometers, blood pressure monitors, and pulse oximeters. The NetResponse interactive health system can access patient data that is stored on Medtronic RPM platforms. The web- and app-based health system can be used with smartphones, tablets, or personal computers. Data submitted to the platform can be forwarded to a provider around the clock for review and recommendations. Medtronic is a global medical device company that is a major maker of remote patient monitors. It has a long list of devices that can be used in assessing certain COVID-19 patients. These systems can also be used to monitor underlying medical conditions that can put the patients at greater risk of death.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
Resideo RPM	Resideo Technologies is a global provider of residential comfort and security solutions, and a distributor of low-voltage and security products. It became a stand-alone, publicly traded company following its spinoff from Honeywell International. Included in this transaction is Honeywell Life Care solutions, which feature Genesis RPM devices and LiveStream patient management, analytics, and connectivity solutions; as a result, Resideo now includes an array of RPM products that were among the market leaders in the telehealth space. Resideo joined The Zigbee Alliance, an organization of hundreds of companies creating, maintaining, and delivering open, global standards for the Internet of Things. This has implications for the use of RPM for patients on the move. Remote care via virtual visits and RPM as a component of a smart building could become a strong value proposition for Resideo's ability to support the battle against COVID-19 in large cities.
Philips Healthcare RPM, data analytics, digital platform	Philips, a leader in the RPM space, extended into PHM following the 2016 acquisition of Wellcentive, a PHM leader. Philips Healthcare RPM is housed in its HealthSuite digital platform. It offers a cloud-based infrastructure that includes the core services required to deliver connected healthcare applications. HealthSuite connects data to clinical databases, ensuring patient privacy, meeting healthcare industry standards and protocols, and delivering personal and population data visualizations. Philips is positioning HealthSuite as a connected health ecosystem. The company envisions RPM as a key component of the data infrastructure needed to deliver PHM. In line with this, Philips acquired VitalHealth, a telehealth company specializing in population health technology, in late 2017. VitalHealth adds robust care management and care coordination capabilities. Philips RPM, data analytics, and eICU services will be vital to the COVID-19 strategy.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
Somatix Inc. RPM platform	Somatix provides wearable-enabled, AI-powered RPM solutions for healthcare providers. Its SafeBeing is unique to in that it uses patented gesture detection technology from a smartband or other wearable device, machine learning algorithms, and advanced analytics to passively analyze a user's movements, activities, and events in real time. This data delivers important clinical insights to healthcare providers, helping them make earlier interventions with patients that are demonstrating signs of deterioration. Hospitals, nursing homes, senior living facilities, subacute short-term care facilities, and substance abuse rehabilitation centers are using the technology with great success. SafeBeing makes it safer and easier for resource-constrained healthcare providers to passively monitor patients remotely 24/7, including those in isolation in healthcare facilities or at home due to COVID-19.
Teladoc Virtual visits, remote post-acute care	Teladoc serves 130 countries and is available in 30 languages. Its virtual visits more than quadrupled from 576,000 in 2015 to 2.6 million in 2018. Patients come largely from per-member-per-month subscriptions to employers and health plans or direct services to patients. The company has grown by expanding into the behavioral medicine space. Its acquisitions include InTouch, a provider of an integrated suite of technology, software, purpose-built devices and a secure global network offering a high-quality managed experience for global healthcare providers; and Best Doctors, a provider of virtual access to specialists. The Virtual First™ program promises a shared-patient experience in an effort to accelerate adoption across all client channels that includes employers, payers, providers and consumers. The portfolio of services that Teladoc has developed is ideal for the COVID-19 crisis. Teladoc expected visits to total between 3.9 million and 4.1 million for 2019; this estimate will be dwarfed by the need for virtual visits during the pandemic.

Source: Frost & Sullivan

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Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
TytoCare Virtual visit remote diagnostic exam tools	TytoCare provides home medical examination tools that support accurate virtual visits, allowing patients to accurately examine their heart, lungs, throat, ears, skin, abdomen, heart rate, and body temperature. For example, the Tyto Stethoscope allows the physician to hear the heart sounds of a remote patient, while the Tyto Otoscope can capture high-quality images and video of the patient's ear canal and eardrum. The TytoVisit platform includes the TytoApp and Clinician Dashboard for live video telehealth exams, reviewing exams, and communication with patients. TytoHome™, which may be used to diagnose certain conditions, monitor chronic conditions, and track post-procedure progress; and TytoPro™, which is geared to the comprehensive needs of a physician, are important resources that can add to the quality and accuracy of virtual visits in the battle against COVID-19.
Validic Health mHealth, RPM data analytics, RPM data platform	Validic was started in 2010. It provides scalable and secure solutions that allow providers to access, manage, and utilize device-generated data. Validic's Impact RPM solution is built on its core data connectivity platform called Inform. The secure, cloud-based platform provides access to and integration of personal health data. Impact offers seamless remote monitoring capabilities for existing clinical and care management systems, providing the dashboards, rules engine, and enrollment flows needed to manage a chronic and post-acute condition. It is building an ecosystem of device manufacturers and healthcare providers. As the COVID-19 pandemic evolves, the value of data will soar as the fuel needed to support ongoing research. Validic will also continue on its pre-crisis trajectory to focus on PHM and new predictive analytic services.

Source: Frost & Sullivan

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Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
Vidyo Virtual visits, video conferencing solutions	Vidyo, recently acquired by Enghouse Systems, offers high-quality telehealth video conferencing capabilities. Vidyo is deployed in about 400 hospital networks. The Vidyo platform is used by leading services such as Amwell. Among Vidyo's strengths are its secure and scalable technology and cloud-based services. It claims its patented platform can integrate with virtually any network and device. The robust need for video due to COVID-19 should spark new opportunities for Vidyo; it is offering temporary licenses for its platform at no cost to help organizations during the global crisis.
Vivify Health RPM, platform, advisory services	Vivify (acquired by Optum Health in 2019) provides a comprehensive RPM platform that enables payers and providers to benefit from its suite of connected medical devices and mHealth apps. Vivify was founded in 2009, and developed the first end-to-end remote care management platform to utilize consumer electronics, wireless health devices, and the cloud to enable "the last mile of population health." Vivify offers Vivify Pathways, a connected health platform for managing remote care; Vivify Pathways +API, a remote care app that permits customers and partners to create apps that leverage the platform; Vivify Pathways +Home; Vivify Pathways +Go (a BYOD platform for mobile patients); and Vivify Pathways +Active (wearables for active patients). The company also performs advisory services. Vivify is offering a remote screening pathway, at no cost, in the battle to defeat COVID-19.

Source: Frost & Sullivan

Selected Telehealth Providers and Their Role (continued)

Company/ Specialty	Capabilities
VSee Telemedicine platform	VSee, founded in 2008, provides video conferencing services for healthcare providers. Products include the VSee Clinic, which provides secure HD video, secure messaging and a virtual waiting room; VSee Messenger for Healthcare that includes; simple, secure video, text chat, document sharing, and peripheral streaming; software development kits that permit users to create secure chat and video communications into their own app or website; and telemedicine carts and kits. An ultra-lightweight kit features a pulse oximeter, single-lead EKG, digital stethoscope, otoscope with lens, otoscope w/o lens, dermatoscope, blood pressure cuff, and glucometer. VSee has been used globally and on the International Space Station. VSee provides a low-bandwidth service that enables users with slower internet connections get value from their VSee conference and collaboration tools. This could prove useful to potential COVID-19 patients who do not have the highest-quality network.
Zipnosis Telemedicine platform, asynchronous virtual care	Zipnosis offers an asynchronous virtual care platform that helps health systems use adaptive interviews to quickly interact with patients. Zipnosis white labels its solutions. The technology collects symptoms and enables a diagnosis and recommended treatment quickly. The system permits providers to integrate the EHR, patient portal, claims processes, and scheduling systems. Users can achieve multimodal care which includes an asynchronous online interview, video and phone consultations, and real-time chat. The platform can extend beyond urgent care to offer service areas such as behavioral health, post-operative care, and occupational medicine. Zipnosis states that the average clinical work time is only 89 seconds and it powers its health system partners to scale to meet the growing needs of this pandemic. There may be some delay in response time due to COVID-19, but it is much less than the huge delays reported by virtual visit providers.

Source: Frost & Sullivan

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Market Forecasts

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Impact of COVID-19 on US Telehealth Market Forecasts

The demand for telehealth services will increase dramatically as a direct result of the COVID-19 pandemic. This surge will be visible through mid-2021. Frost & Sullivan expects:

- Telehealth revenue to be 64.3% higher in 2020 than the previous year.

- Virtual visit revenue to increase 124.2% in 2020 and 71.6% in 2021.

- RPM revenue to grow by 150.3% in 2020 and 40.3% in 2021.

- mHealth revenue to climb by 56.9% in 2020.

Telehealth will be a front-line solution in the war against COVID-19. These forecasts assume that telehealth providers and equipment suppliers will be able to meet the unanticipated demand.

The surge in demand for virtual visits will be counterbalanced by the availability of physicians. Previous reports from expert sources including Frost & Sullivan have warned of physician shortages.

Also important, non-COVID-19 related healthcare visits and procedures may be postponed during the crisis, which may suppress certain demand factors considered in previous forecasts.
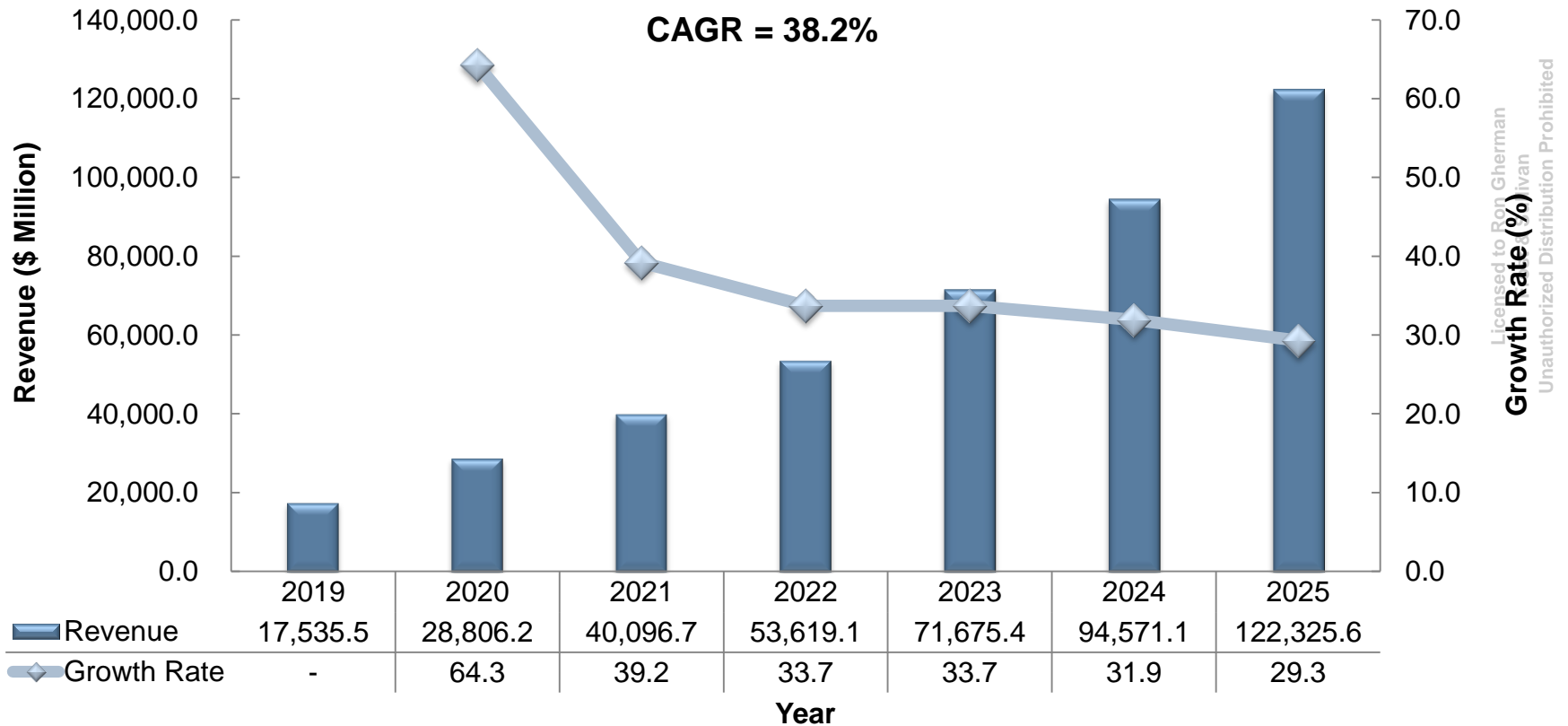
Source: Frost & Sullivan

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Revenue Forecast

Key Takeaway: Significant year-over-year growth is projected for 2020 and 2021. Although telehealth will prove its value, growth will level off beginning in 2022.

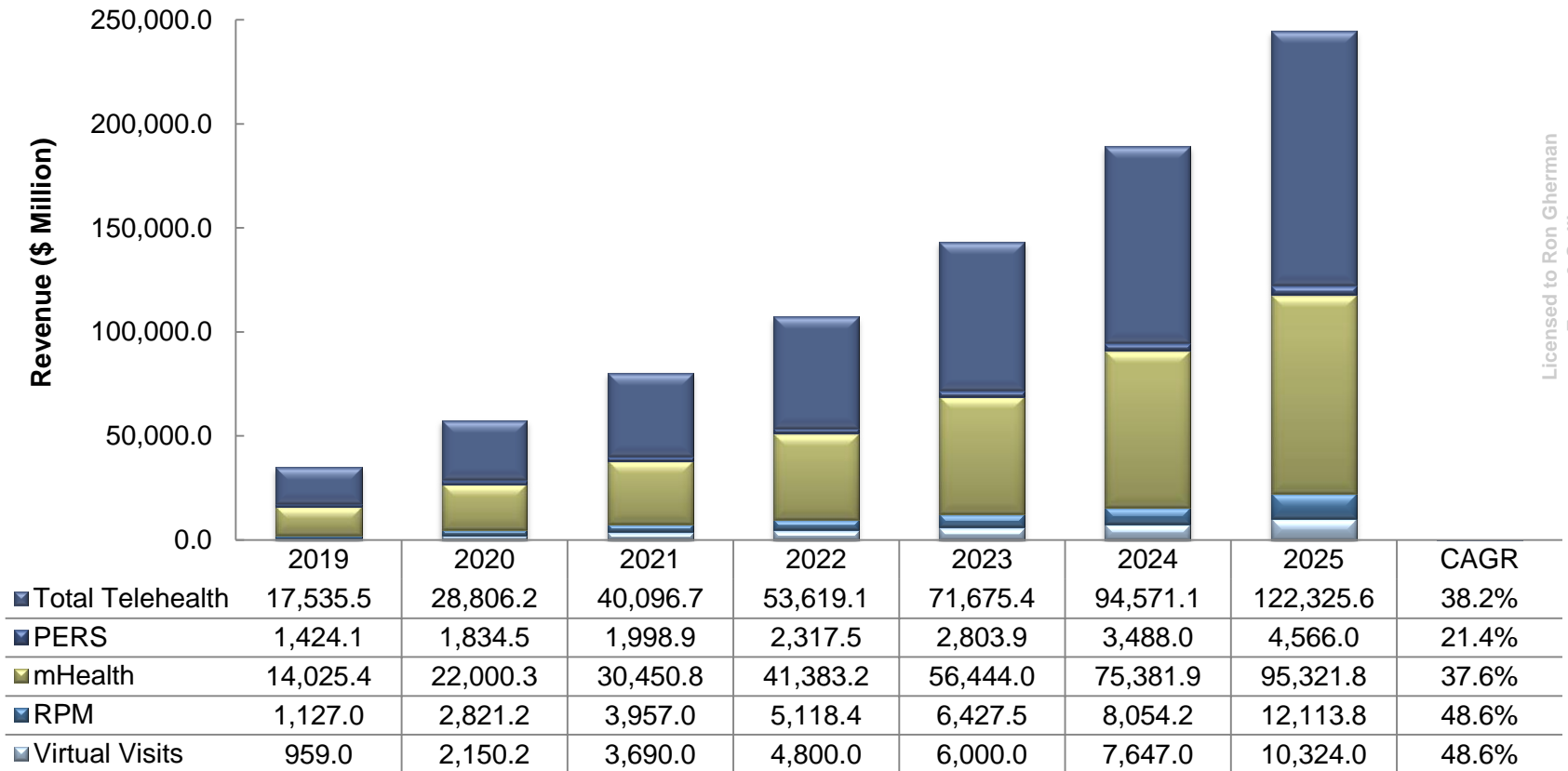## Telehealth Market: Revenue Forecast, US, 2019–2025
CAGR = 38.2%

	2019	2020	2021	2022	2023	2024	2025
Revenue	17,535.5	28,806.2	40,096.7	53,619.1	71,675.4	94,571.1	122,325.6
Growth Rate	-	64.3	39.2	33.7	33.7	31.9	29.3

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

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Revenue Forecast by Segment

Key Takeaway: Revenue shows growth across all segments driven by the global pandemic.

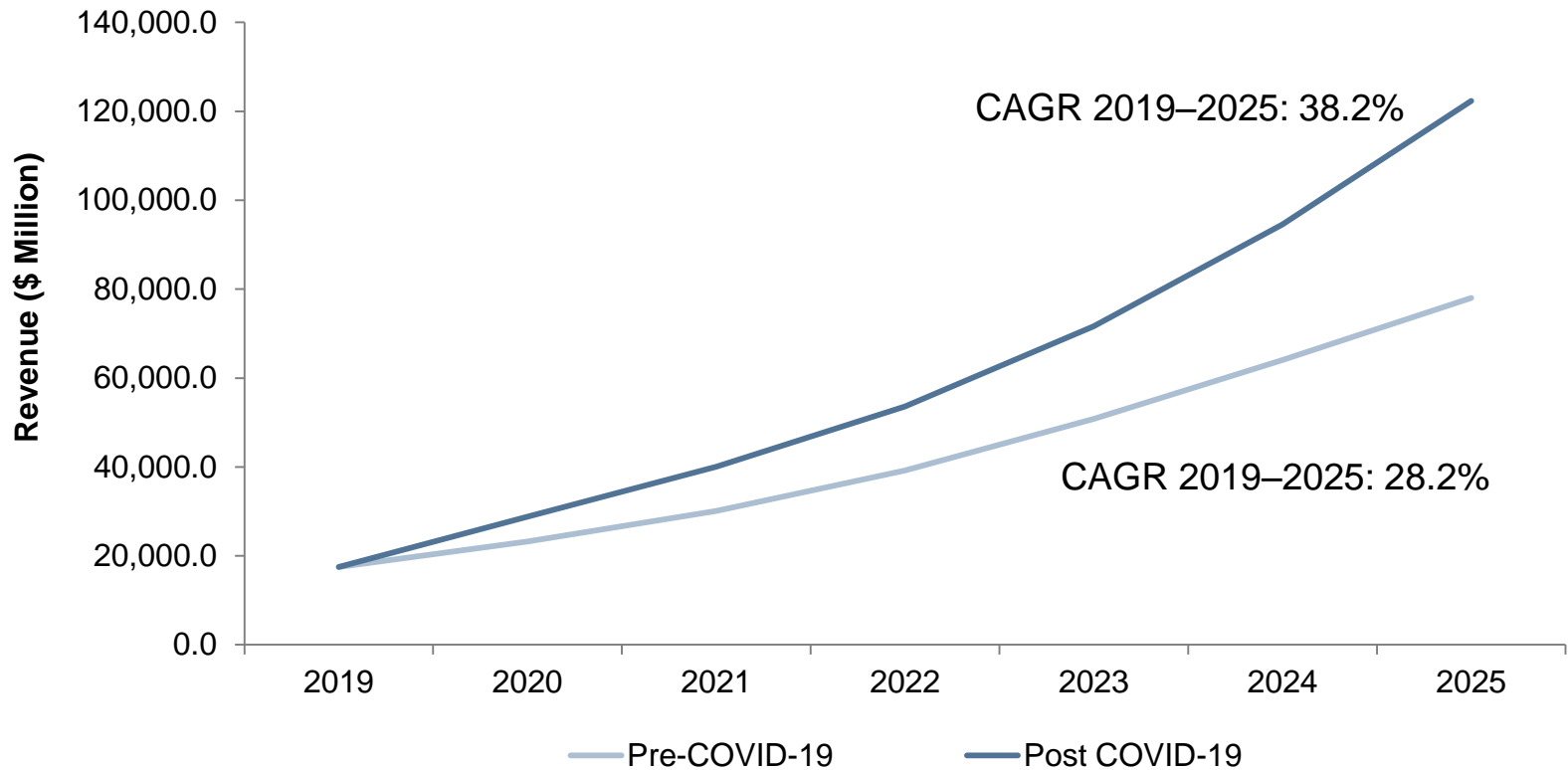## Telehealth Market: Revenue Forecast by Segment, US, 2019–2025

	2019	2020	2021	2022	2023	2024	2025	CAGR
■Total Telehealth	17,535.5	28,806.2	40,096.7	53,619.1	71,675.4	94,571.1	122,325.6	38.2%
■PERS	1,424.1	1,834.5	1,998.9	2,317.5	2,803.9	3,488.0	4,566.0	21.4%
■mHealth	14,025.4	22,000.3	30,450.8	41,383.2	56,444.0	75,381.9	95,321.8	37.6%
■RPM	1,127.0	2,821.2	3,957.0	5,118.4	6,427.5	8,054.2	12,113.8	48.6%
◻Virtual Visits	959.0	2,150.2	3,690.0	4,800.0	6,000.0	7,647.0	10,324.0	48.6%

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

Comparative Revenue Forecasts

Key Takeaway: The revised revenue forecast CAGR is 10.0 percentage points higher.

Telehealth Market: Comparative Pre- and Post-COVID-19 Forecasts, US, 2019–2025

CAGR 2019–2025: 38.2%
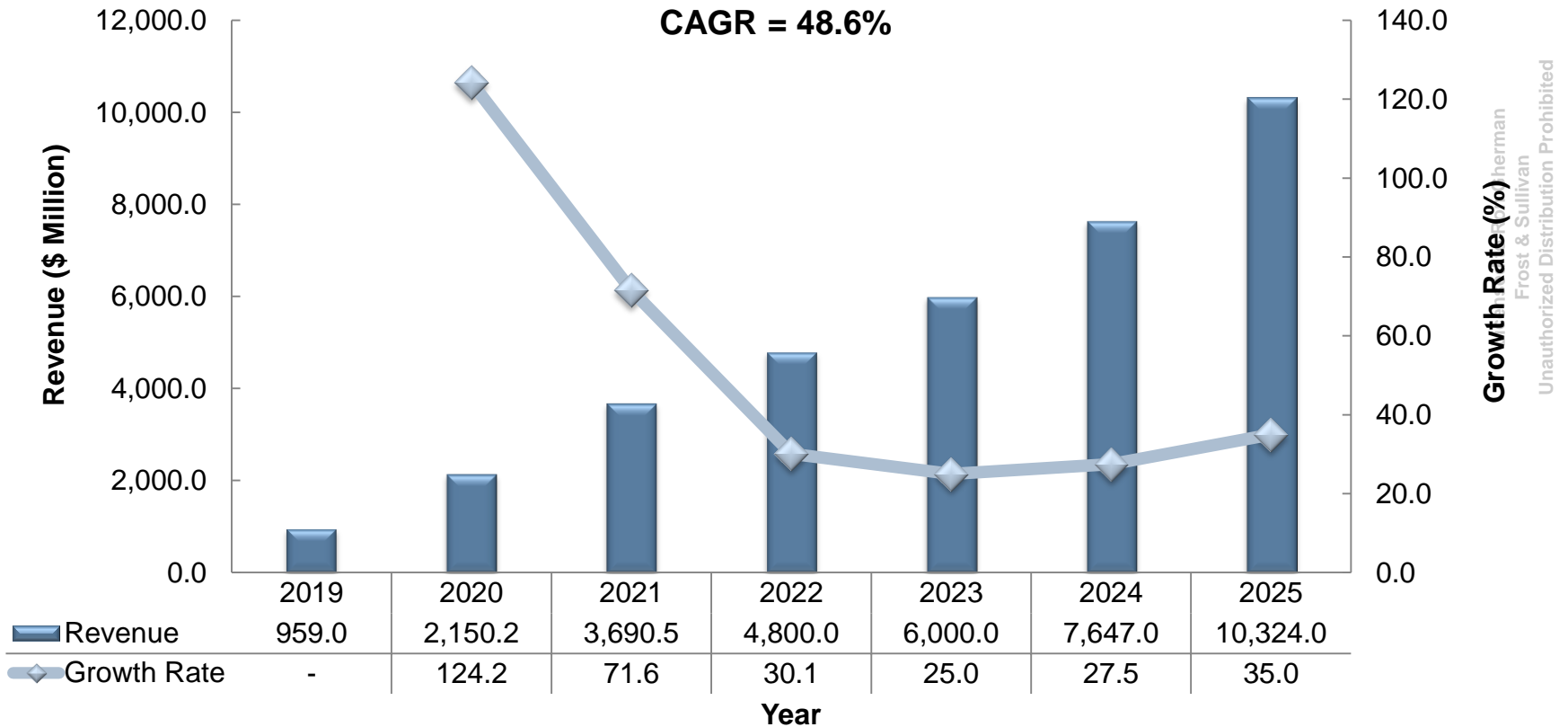
CAGR 2019–2025: 28.2%

Pre-COVID-19 — Post COVID-19

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

Virtual Visit Revenue Forecast

Key Takeaway: There will be a staggering year-over-year growth opportunity for virtual visits in 2020 and 2021 as providers divert established patients to remote exams.

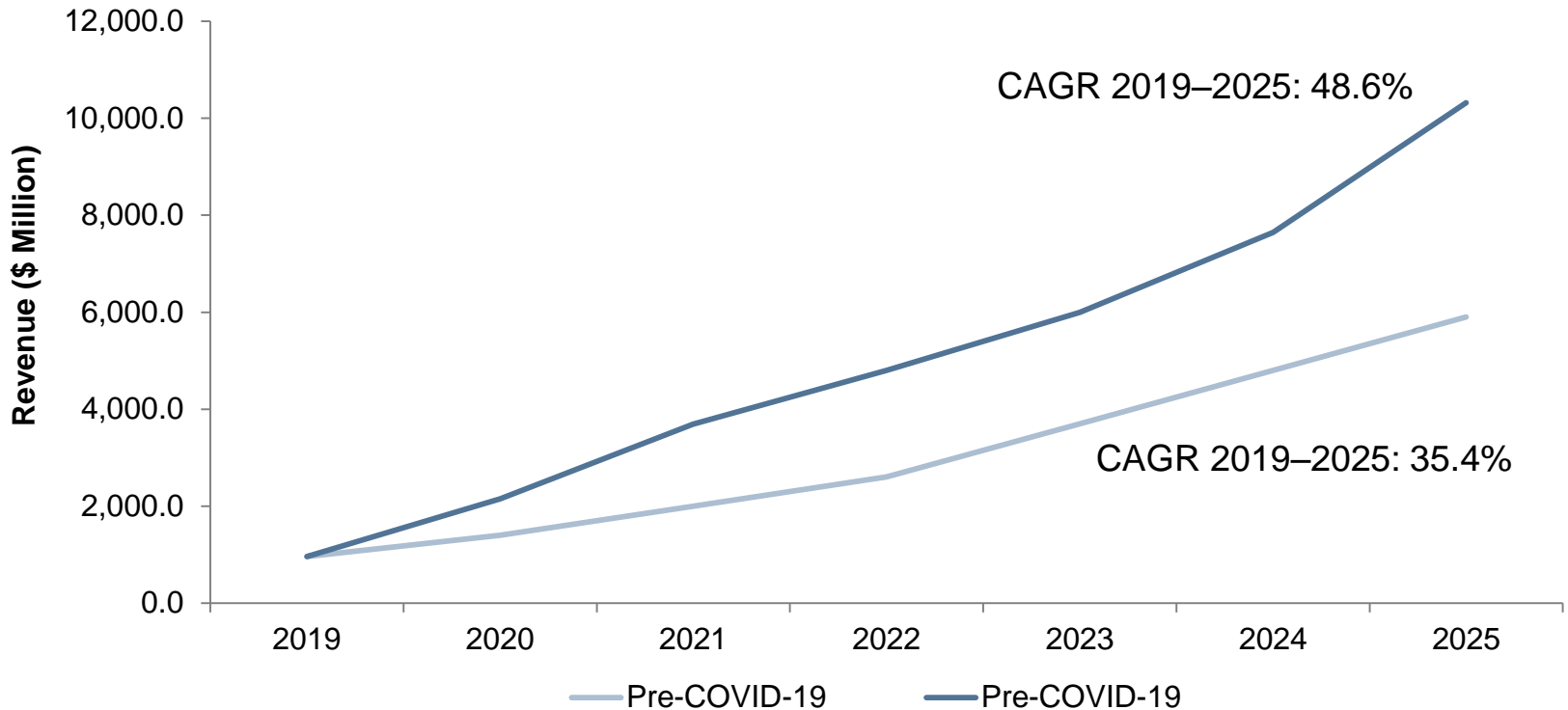### Virtual Visit Segment: Revenue Forecast, US, 2019–2025

CAGR = 48.6%

	2019	2020	2021	2022	2023	2024	2025
Revenue	959.0	2,150.2	3,690.5	4,800.0	6,000.0	7,647.0	10,324.0
Growth Rate	-	124.2	71.6	30.1	25.0	27.5	35.0

Year

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

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Virtual Visit Comparative Revenue Forecasts

Key Takeaway: COVID-19 will drive an unprecedented uptake of virtual visit services. The revised 2020–2025 revenue CAGR is 13.2 percentage points higher.

Virtual Visit Segment: Comparative Pre- and Post-COVID-19 Forecasts, US, 2019–2025

CAGR 2019–2025: 48.6%

CAGR 2019–2025: 35.4%

Revenue ($ Million)

Pre-COVID-19   Pre-COVID-19

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

RPM Revenue Forecast

> **Key Takeaway: RPM usage will take off in 2020 and 2021, similar to virtual visits, as providers, payers, and patients endorse the increased value in tracking patient data.**

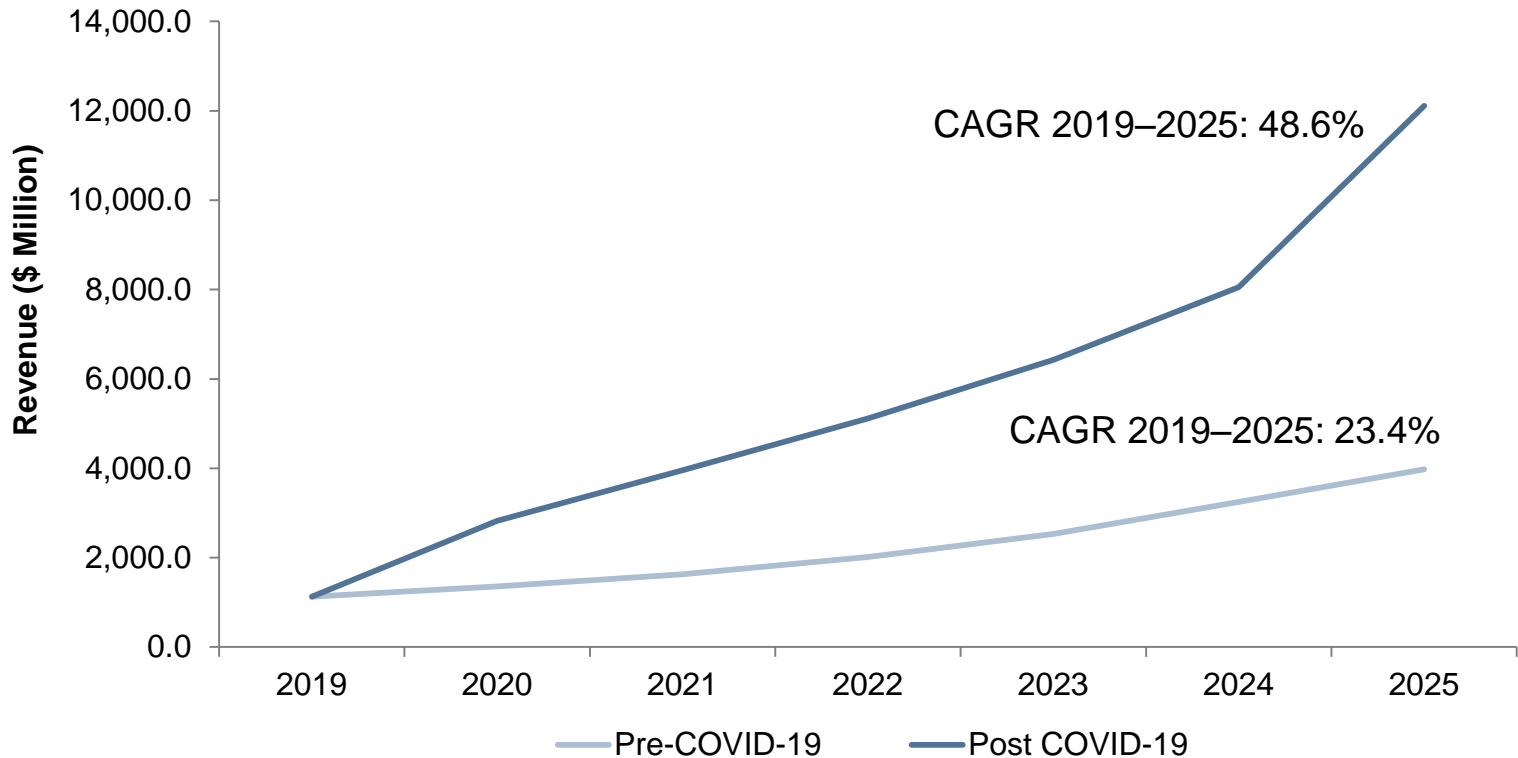**RPM Segment: Revenue Forecast, US, 2019–2025**

CAGR = 48.6%

	2019	2020	2021	2022	2023	2024	2025
Revenue	1,127.0	2,821.2	3,957.0	5,118.4	6,427.5	8,054.2	12,113.8
Growth Rate	-	150.3	40.3	29.4	25.6	25.3	50.4

Year

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

RPM Comparative Revenue Forecasts

Key Takeaway: The revised RPM revenue CAGR is 25.2 percentage points higher than the original.

RPM Segment: Comparative Pre- and Post-COVID-19 Forecasts, US, 2019–2025

CAGR 2019–2025: 48.6%

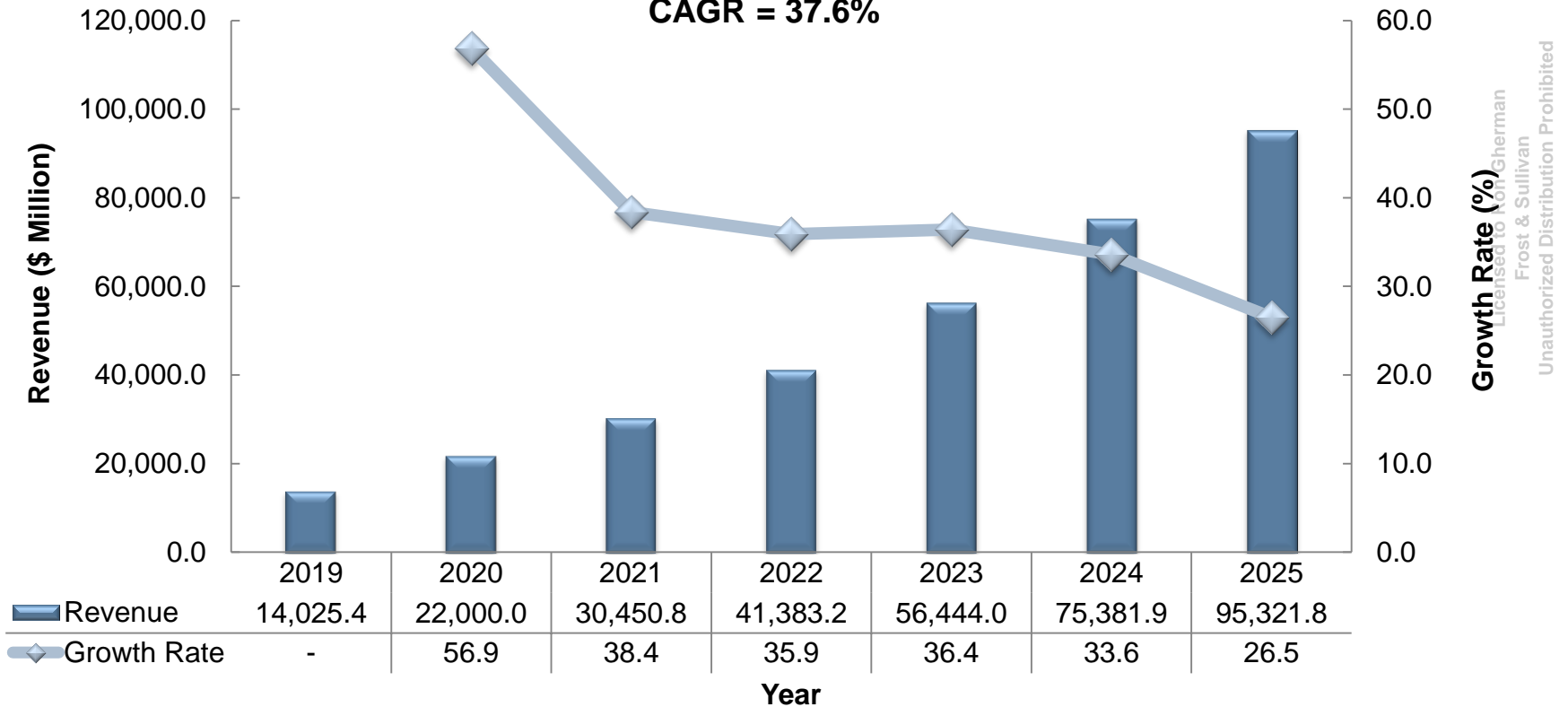CAGR 2019–2025: 23.4%

Legend: Pre-COVID-19 ——— Post COVID-19

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

mHealth Revenue Forecast

> **Key Takeaway: mHealth, the largest revenue generator across telehealth, will see significant growth in 2020, although not at the level of virtual visits and RPM.**

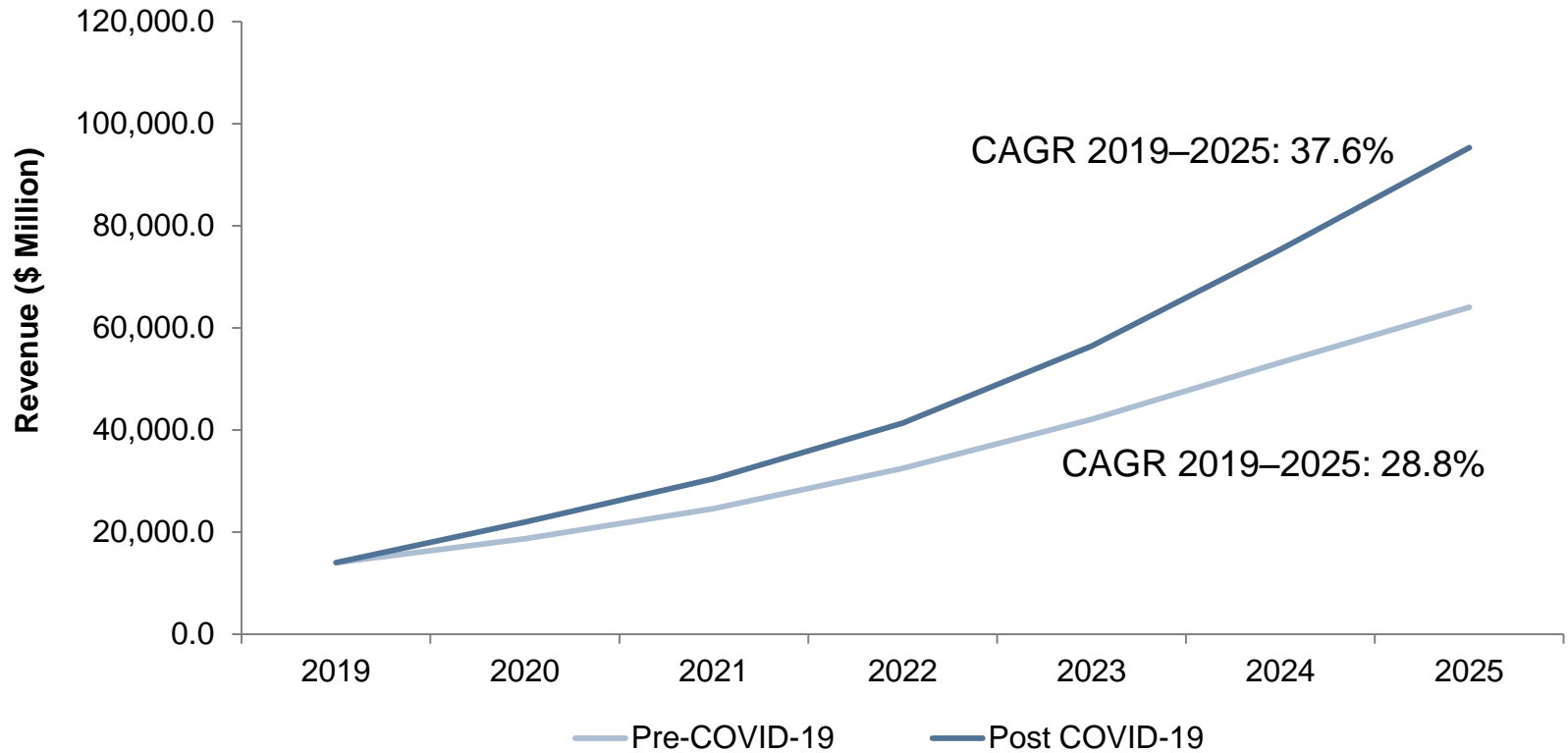**mHealth Segment: Revenue Forecast, US, 2019–2025**

CAGR = 37.6%

	2019	2020	2021	2022	2023	2024	2025
Revenue	14,025.4	22,000.0	30,450.8	41,383.2	56,444.0	75,381.9	95,321.8
Growth Rate	-	56.9	38.4	35.9	36.4	33.6	26.5

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

mHealth Comparative Revenue Forecasts

Key Takeaway: COVID-19 will accelerate the need for mHealth monitoring, devices, and video as 5G networks increase the capabilities of wireless technology.

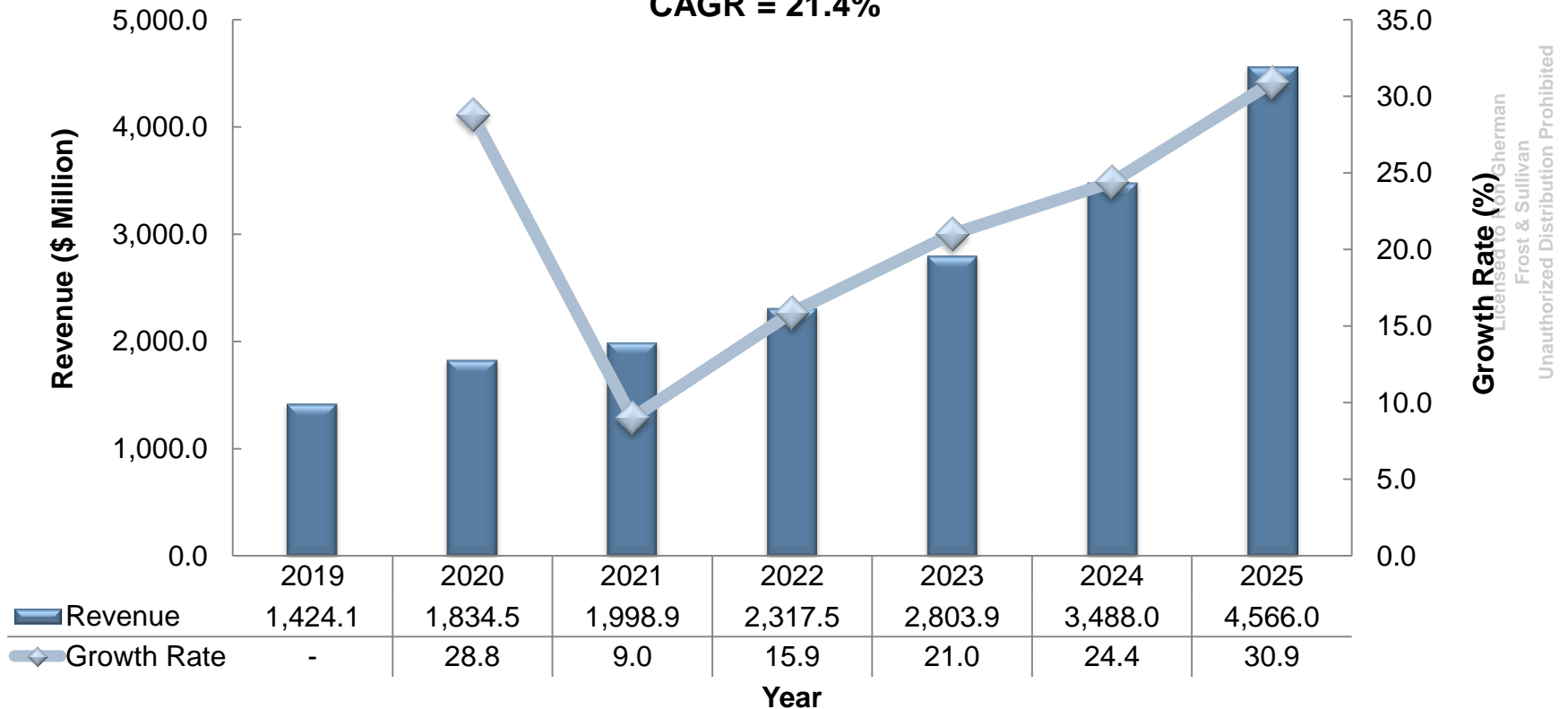**mHealth Segment: Comparative Pre- and Post-COVID-19 Forecasts, US, 2019–2025**

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

PERS Revenue Forecast

> **Key Takeaway: While mHealth, RPM, and virtual visits may steal some opportunities from PERS, segment revenue will rebound in 2021 driven by the aging population.**
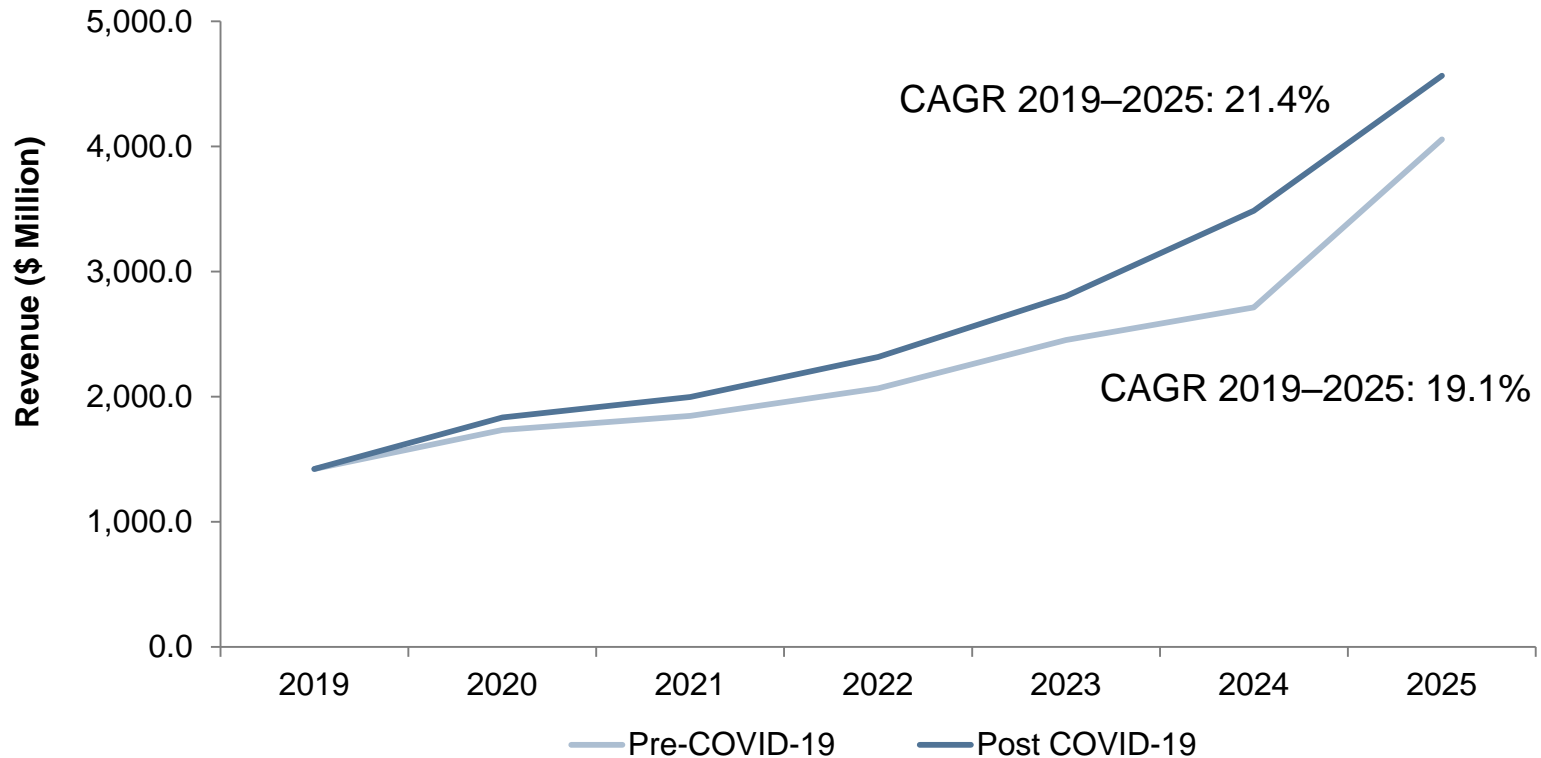
PERS Segment: Revenue Forecast, US, 2019–2025
CAGR = 21.4%

	2019	2020	2021	2022	2023	2024	2025
Revenue	1,424.1	1,834.5	1,998.9	2,317.5	2,803.9	3,488.0	4,566.0
Growth Rate	-	28.8	9.0	15.9	21.0	24.4	30.9

Year

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PERS Comparative Revenue Forecasts

Key Takeaway: Basic PERS services and equipment will track closely with the pre-COVID-19 forecast as medical-grade and BYOD for RPM overlap the capabilities.

PERS Segment: Comparative Pre- and Post-COVID-19 Forecasts, US, 2019–2025

CAGR 2019–2025: 21.4%

CAGR 2019–2025: 19.1%

Legend: Pre-COVID-19, Post COVID-19

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan

Visioning Scenarios

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COVID-19 and the US Telehealth Market

New Business Models

As the COVID-19 pandemic disrupts the healthcare market, it creates enormous opportunities for telehealth to utilize communications as a way to manage social distancing between patient and provider.

Telehealth equipment makers, service providers, and technology enablers will be in an uphill battle to meet this sudden demand. Business models across the telehealth ecosystem will have to be revised.

Existing communications network infrastructures will be stressed as intense usage patterns prevail. Other industries, such as education, are reporting Internet connection troubles as the tremendous increase of streaming media slows video transmissions.

Privacy and security services will be critical components of the new telehealth world. Hackers will enjoy new opportunities to prey on public panic.

User-friendly sensors and remote diagnostic equipment will be needed to ensure the success of virtual visits focused on the war with COVID-19.

Source: Frost & Sullivan

Predictions for the US Telehealth Market

1 Telehealth technology will receive post-pandemic accolades for its contributions to the victory over COVID-19.

2 RPM and virtual visit providers will be integrated as the crisis drives demand for one-stop solutions. Large medical device suppliers and payers will acquire the most promising companies.

3 Although they ultimately will be successful, telehealth participants will be put to the test to meet the unanticipated demands resulting from the pandemic.

4 Overall healthcare revenue will decline as many elective and non life-saving procedures and visits are postponed and the cost to deliver anti-virus services surges.

5 Telehealth will expand to include robotics and virtual assistants. AMD Global Telemedicine and Teladoc's acquisition of the inTouch Vici will provide critical capabilities for both companies in the battle against COVID-19 that will be used to prevent avoidable risks to healthcare workers.

6 Machine-generated and -managed clinical trials will emerge as the AI-driven solution that will be used to develop a faster, yet safe clinical trial process.

Source: Frost & Sullivan

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