



INNOVATIONS

04/2022

Telemedicine & digital health applications



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Telemedicine & digital health applications

– History, facts, trends and areas of application –

Telemedicine and digital health apps (DiGAs) as tools of digitalisation have not only changed the structures of medicine, but also maintained access to healthcare during the Covid 19 crisis. But what is actually behind the term telemedicine and what is meant by digital health applications?

Telemedicine is the provision of medical care and counselling services where the patient and doctor or therapist are physically separated. These remote services allow patients with limited mobility to easily exchange information with their medical contact during routine appointments using a reliable internet connection. Telemedicine services include the provision and support of medical health interventions, specific medical and general health education, general public health interventions and administrative functions.

Even though telemedicine platforms have only gained awareness and importance in recent years and are thus considered a new technology, the principle has actually existed for much longer. For half a century, healthcare providers and tech companies have been researching and developing the provision of remote services for the medical sector. To better understand the technology behind it, it is worth taking a look at the origins of telecommunications technology.

While the birth of the telephone, radio and telegraph dates back to the late 19th century, by the turn of the century the technology had already expanded and was also being used for medical purposes. An 1879 article in the medical journal „The Lancet“ predicted that the telephone could reduce the number of visits to the doctor’s office in the future. In 1925, Hugo Gernsbeck developed the idea of a teledactyl, an instrument for the tactile examination of patients from a distance using radio technology and a connected video feed. Although the invention could not be implemented at that time, it represents the origin of video-based remote medical services.

In the 1950s, X-ray images were first exchanged between two health centres in the USA using telephone technology and later developed into a teleradiology system. This early form of telemedicine was intended to compensate for the lack of medical facilities and specialists, especially in more rural areas. Soon, however, further potential was recognised, such as the simple exchange of patient data, test results or the general reduction of waiting times and travel distances. Since then, the technology has been further optimised and had its big breakthrough in 2020 with the onset of the pandemic.

The national market for digital health is growing rapidly. In 2020, a global turnover of 200 billion USD was generated and forecasts indicate that a turnover of around 979 billion USD will already be achieved in 2025. This rapid growth and the optimistic figures are due in no small part to the pandemic, which experts say has accelerated the introduction and establishment of digital health solutions by two years. While telemedicine applications were only offered sporadically in 2017, namely by around 2% of registered doctors, around 50% offered online consultations as of 2020.

In Europe, the market has been driven primarily by remote consultations and other telemedicine services since 2020. Forecasts from 2020 promised a global turnover of 80.5 billion USD for telemedicine based on demand in 2021. Experts even expect an increase to 218.5 billion USD by 2025.

Digital health applications are low-risk medical devices (I and IIa) that are based on a digital technology - namely apps or desktop/browser applications - and are CE certified. DiGAs do not have to be software-based either, but can also include additional devices, sensors, and other hardware such as wearables. In everyday use, health apps and DiGAs are often equated, but in reality this is strictly distinguishable. Unlike ordinary health apps, DiGAs are tested by the Federal Institute for Drugs and Medical Devices (BfArM), are to be prescribed by doctors and the costs are reimbursed by health insurance companies. Even though both app groups serve to support diseases, DiGAs are subject to much stricter regulations as well as testing procedures. Digital health apps support on the way to a self-determined health-promoting lifestyle through the detection and targeted treatment of diseases. DiGAs have to pass a 12 to 24-month trial period and are then included in the DiGA directory either permanently or temporarily based on available test evidence of positive care effects. With the help of ICD coding, indication groups can be defined by the manufacturers so that doctors and therapists can easily and efficiently find and prescribe suitable DiGAs for their patients.

DiGAs have been reimbursable since the end of 2020, but the digital trend has not yet fully established itself among the masses. In July 2021, only around 200,000 downloads were made. The most common areas of use so far are for chronic tinnitus and back pain, as well as obesity and migraine. The strongest user groups are currently patients between 50 and 59 years of age, followed by the 30 to 39-year-old patient group. However, the biggest challenge at present does not seem to be the openness of patients to new digital tools, but rather the acceptance and behaviour of doctors, who are still sceptical about DiGAs.

While technology has made significant progress in maintaining healthcare, especially in times of contact reduction, telemedicine and DiGAs are not a complete substitute for in-person doctor visits or other clinical services. As telemedicine applications and digital health apps rely only on verbal symptom descriptions or supporting facts through app evaluations, this cannot suffice for a definitive medical assessment, but further requires a face-to-face check-up where the doctor has the patient directly in front of him and can work on him. Nevertheless, telemedicine supports mainly short checks, initial diagnoses, prescriptions and sick notes.

Telemedicine and digital health applications can be divided into the following categories and areas of application:

CATEGORY	DESCRIPTION	FIELD OF APPLICATION
Interactive tele-medicine (real time)	The best-known form is real-time telemedicine, in which the patient and doctor/therapist communicate with each other via live video. As a rule, this is made possible by video conferencing software and a stable internet connection. In contrast to the other telemedicine categories, interactive telemedicine can often replace a face-to-face visit to the doctor, while the others are only a supplement. Since confidential and sensitive content is discussed in the digital consultation, telemedicine apps must meet significantly higher security requirements than conventional video apps.	<ul style="list-style-type: none"> • Primary and emergency care • Treatment of chronic or long-term illnesses • Follow-up meeting <p>Fields of application:</p> <ul style="list-style-type: none"> • Online consultation • Telecare • Teleneuropsychology • Telepharmacy
Asynchronous tele-medicine (Store-and-forward)	Asynchronous telemedicine is used to exchange patient information between healthcare professionals in different geographical locations. Due to the confidentiality of sensitive medical data, the strictest security checks apply. Through the collaboration of different specialists and the rapid exchange of information, diagnoses can be made faster and therapies can be set up more efficiently.	<p>Exchange of</p> <ul style="list-style-type: none"> • Relevant patient data and information • Imaging examinations and videos • Test results <p>Frequently used in radiology, ophthalmology, dermatology and pathology</p>
Tele-monitoring	Telemonitoring helps to monitor patients remotely using special devices. This self-monitoring allows healthcare professionals to remotely observe the health status of patients, document the progress and continuously adjust therapy. To ensure that the results collected from the patient are also highly accurate, it is important that telemedicine providers and healthcare providers provide clear instructions on how to perform telemonitoring.	<ul style="list-style-type: none"> • Chronic diseases e.g. diabetes, asthma, cardiovascular diseases
Digital health apps	DiGAs, as digital technologies, are intended to assist in the detection, monitoring, treatment or alleviation of disease. They are also used to treat, alleviate or compensate for injuries or disabilities.	<ul style="list-style-type: none"> • Mental/behavioural disorders • Nutrition/Metabolism • Nervous system • Musculoskeletal system

Current main trends in the health sector are:

1) Online consultation hours

The use of telemedicine applications has increased dramatically over the past two years. Looking at the European market, Great Britain leads the way with 54% of users, followed by 31% in the Netherlands and 28% in France. In Germany, the user figures are still very much expandable with 17 per cent, but here, too, enormous potential is seen in the trend. In addition to the obvious advantages such as the reduction of waiting time and the elimination of travel, digital video consultations are convincing with their easy integration into everyday life and the reduction of the risk of infection through the contactless service. Active users of online consultations state that they are very satisfied with their treatment and 78% of the respondents in the Capterra study also stated that their problem could be solved in the consultation. The conclusion is also clear: a full 91% of respondents want to continue using online consultations after the pandemic and 65% of those who have not yet used online consultations are open to them in the future. The Federal Ministry of Health has also paved the way for the trend by paving the legal ground for telemedicine services for years, for example through the Digital Care and Nursing Modernisation Act (DVPMG). The challenge with this trend is to actively motivate doctors and psychotherapists to use the offer, because so far only about 28% use it.

2) Networking the health care system through teleconsultation

The trend of teleconsultation holds enormous potential in that it links medical specialists globally and supports them especially in the exchange of information about special cases or rare diseases or treatment methods. Doctors from different disciplines have the opportunity to exchange professional information via video telephony or telemedical platforms and thus make an efficient diagnosis without any effort on the part of the patient. The consultation does not necessarily have to take place live, but can be viewed and evaluated by the respective doctors on the platforms regardless of location and time. In the area of teleconsultation, the legal framework was also adapted in 2017 through the introduction of the E-Health Act, so that remuneration and billing are also clearly regulated. The technical requirements include ensuring encrypted data transmission via a certified communication service. Furthermore, it requires a qualified electronic signature as well as the possession of an electronic health professional card of each participating doctor. Here, too, the figures still have a lot of room for improvement, because so far teleconsultation between medical specialists with the help of telemedical platforms is only used by about 17 percent in Germany. In contrast, the situation is different for hospitals, where more than 40 per cent of doctors use the offer for professional exchange with other clinics and doctors.

3) App on prescription

Since the introduction of the Digital Health Care Act in 2019, digital solutions can establish themselves more easily in the German health sector. This has now also led to the trend of „apps on prescription“, which makes it possible to have apps and web-based applications that have been tested and approved by the BfArM prescribed by a doctor. There are currently 28 DiGAs in the list of reimbursable health apps. According to a Bitkom survey, patients are showing increased interest in the digital health assistants. The study showed that around 60% of users over the age of 16 would use DiGAs in their everyday lives. Not only the app-savvy age group of the under-30s is in favour of the approach, but also one in two of the 65-plus generation sees potential in DiGAs and says they want to use them themselves in the future. It is now a matter of facilitating access to the right app and actively integrating DiGAs from doctors and health insurers into the therapy plan. A survey by EPatient Analytics revealed that around 66 per cent of patients are on their own when looking for their desired app, 18 per cent with the help of their health insurer and 12 per cent through advice from their doctor.



Gamechanger

The rapid development and rapid technological progress in the field of telemedicine requires dynamic adaptations to the requirements and needs of the market. Below you will find a list of national and international companies that have established themselves in the field of telemedicine and digital health applications in medical technology and/ or are continuously advancing innovative research approaches.

COMPANY	SUBJECT AREA	WEBSITE
CANKADO Service GmbH	• Digital health applications	https://diga.cankado.com/
Emperra GmbH E-Health Technologies	• Digital health applications	https://www.emperra.com/
GAIA AG	• Digital health applications	https://de.deprexis.com/
GET.ON Institut für Online Gesundheitstrainings GmbH	• Digital health applications	https://hellobetter.de/
mementor DE GmbH	• Digital health applications	https://www.mementor.de/
Mindable Health GmbH	• Digital health applications	https://www.mindable.health/
mynoise GmbH	• Digital health applications	https://www.kalmeda.de/
Newsenselab GmbH	• Digital health applications	https://www.m-sense.de/
Oviva AG	• Digital health applications	https://oviva.com/
Selfapy GmbH	• Digital health applications	https://www.selfapy.com/
Sonormed GmbH	• Digital health applications	https://www.sonormed.com/
Sympatient GmbH	• Digital health applications	https://sympatient.com/
Vivira Health Lab GmbH	• Digital health applications	https://www.vivira.com/
98point6 Inc	• Telemedicine	https://www.98point6.com/
Amazon	• Telemedicine	https://amazon.care/
Doctor on Demand Inc / Included Health	• Telemedicine	https://www.doctorondemand.com/
Health Bridge Medical Ltd (t/a Zava)	• Telemedicine	https://www.zavamed.com/de/
HealthHero Germany GmbH / MARCOL	• Telemedicine	https://www.fernarzt.com/
Kry International AB	• Telemedicine	https://www.kry.de/
m.Doc GmbH	• Telemedicine	https://www.mdoc.one/
Minxli Healthcare GmbH	• Telemedicine	https://minxli.com/
Navigating Cancer Inc	• Telemedicine	https://www.navigatingcancer.com/
Open Tele Health	• Telemedicine	https://www.oth.io/
Teladoc Health Inc	• Telemedicine	https://www.teladochealth.com/
Teleclinic GmbH	• Telemedicine	https://www.teleclinic.com/
Medlanes GmbH	• Telemedicine	https://medlanes.com/
MDLIVE Inc	• Telemedicine	https://mdlnext.mdlive.com/
MeMD Inc	• Telemedicine	https://www.memd.net/
icliniq	• Telemedicine	https://www.icliniq.com/
Virtuwell.com	• Telemedicine	https://www.virtuwell.com/
DocCIRRUS GmbH	• Telemedicine	https://www.doc-cirrus.com/
Eedoctors AG	• Telemedicine	https://eedoctors.ch/
Medgate	• Telemedicine	https://www.medgate.ch/
SHL Telemedizin GmbH	• Telemedicine	https://www.shl-telemedizin.de/

In the following, we would like to introduce you to some of the companies on the list. The selected companies are international big players in medical technology and each specialises in different medical fields. Years of experience, extensive expertise, visionary innovative thinking as well as the willingness to take risks and the desire to sustainably and continuously improve the healthcare system are what drive these companies:

GET.ON Institut für Online Gesundheitstrainings GmbH / Hello Better



Founding Year: 2011

Location: Hamburg, Germany

CEO: Hannes Klöpffer

Number of employees (worldwide): < 100

Medical expertise: Digital health applications

Products: HelloBetter Stress & Burnout/ HelloBetter Panik / HelloBetter Diabetes & Depression/ HelloBetter ratiopharm chronischer Schmerz/ HelloBetter Vaginismus Plus

GAIA AG



Founding year: 1997

Location: Hamburg, Germany

CEO: Mario Weiss

Number of employees (worldwide): ≈ 200

Medical expertise: Digital health applications

Product: Deprexis & Elevida & Velibra & Vorvida

Selfapy GmbH



Founding year: 2016

Location: Berlin, Germany

CEO: Katrin Bermbach & Nora Blum

Number of employees (worldwide): < 100

Medical expertise: Digital health applications

Product: Online course for coping with depression / anxiety disorders / panic disorders



HealthHero Germany GmbH



Founding year: 2017

Location: Berlin, Germany

CEO: Ranjan Singh

Number of employees (worldwide): ≈ 50

Medical expertise: Telemedicine

Product: Fernarzt

Kry International AB



Founding year: 2014

Location: Stockholm, Sweden

CEO: Johannes Schildt

Number of employees (worldwide): > 500

Medical expertise: Telemedicine

Product: Kry

Virtuwell



Founding year: 2010

Location: St. Paul, USA (MN)

CEO: Andrea Walsh

Number of employees (worldwide): > 50

Medical expertise: Telemedicine

Product: Virtuwell 24/7 online clinic

Eedoctors AG



Founding year: 2016

Location: Bern Liebefeld, Switzerland

CEO: Andrea Vincenzo Braga

Number of employees (worldwide): > 50

Medical expertise: Telemedicine

Product: Eedoctors virtual medical office App

Interview

With the intention of gaining deeper and more personal insights into what is happening in the industry, we have made it our task to exchange views with industry experts in order to find out their perspectives and thoughts on key innovations in medical technology and to explore the background. For the launch of the first arcoro innovations, we were able to win Dr. Matthias Kuss for an interview. Learn more about telemedicine platforms, online consultations, future prospects and challenges of the industry on the following pages.



Name: Dr. Matthias Kuss
Company: XPERTyme GmbH / MEDITyme
Field of expertise: Telemedicine platform
Job Position: CEO
Part of the company since: 2016

What is your vision for the TYME Group/MEDITyme?

At the Tyme Group, we aim to provide experts in various fields with all the necessary technologies to ensure a complete end-to-end video consultation. MEDITyme is a platform that focuses on the medical sector. We want to enable experts to get almost everything from search, booking and their own video tool with end-to-end encryption to complete billing and money collection from a single source. We want to avoid the need for many different tools and the experts having to coordinate everything individually. The challenge here is that not only the expert, but all parties involved must know who has spoken to whom and what agreements have been made. This is especially difficult in an area like telemedicine, where sensitive data is handled and exchanged. That's why we see it as our task to be able to offer these experts and, beyond that, entire expert networks this service end-to-end in encrypted form without media disruption.

How does MEDITyme work and what is your USP?

We are a technology platform that provides experts with two different models. One is MEDITyme as a platform for individual medical experts and the other is an individual white label solution for empowering entire networks. More than 5,000 medical experts have already registered with MEDITyme and use it for consulting purposes. The application is simple: one goes to the platform, registers and identifies oneself and can then either use it via a free account, which includes three free video consultations per month, or one uses the entire range. Among other things, you can integrate practice calendars, offer group courses in addition to individual consultations, conduct professional webinars with up to 5,000 participants or offer a video call centre including a call queue. This broad spectrum of application possibilities is also what makes us unique. In addition, it is also possible to access each individual function via API. This means that you don't have to take MEDITyme as a platform, but can easily integrate it into your own platform and environment via API. In addition, we are able to provide our customers with an individual white-label platform within one week, where we are no longer the operator, but the corresponding customer. This service is used by many customers who want to quickly and easily have their own end-to-end encrypted

video platform with all the relevant functions and at the same time have the certainty of data control and security. This is appreciated not least because we use a fully German infrastructure with full DSGVO compliance in the medical sector, whereas many competitors take a diversion via American service providers and are thus only DSGVO compliant to a limited extent.

In addition to the health sector, you also support various other consulting fields with your technology platforms. What are your origins and what factors led you to expand?

The origin of the idea came from the fact that I needed medical advice in my private environment, but it was not possible to show up on site myself at that time. In around 90% of medical cases, doctors are able to make a solid assessment of a situation based on patient statements, symptom descriptions and a look at the patient and make a recommendation. At that time, telemedicine did not yet play a role in Germany, so at that moment I was missing a quick, medical recommendation for action.

In 2016, we started with a simple expert platform. By 2018, we were able to raise the requirements to medical safety level and launch MEDITyme. In addition, the ban on remote treatment was also lifted during this period, which meant that the service was more widely accepted and we were able to expand our offering. In the beginning, however, it was a hard road and the health sector was only a relatively small part of our business. It was not until the pandemic and the associated rapid establishment of telemedicine that this business area became the dominant factor. In the end, Corona was the big booster for telemedicine matters, which now no longer only amount to digital prescription issuing, but are used in many medical fields. We were also one of the first to have a conference function certified, which also enabled us to win over many speech therapists and psychologists with regard to group therapies.

What opportunities does the use of MEDITyme and telemedicine applications offer the health sector?

There are several emergencies in the current health system. On the one hand, we are confronted with a shortage of doctors or an inept distribution of doctors. Especially in more rural regions, telemedicine can therefore help to better match supply and demand and compensate for bottlenecks. The potential is far from exhausted and should be used more in both medical counselling and care.

Furthermore, telemedicine as we know it today is in most cases very visual and relies on two or more people seeing and talking to each other via cameras on screens. In the future, however, it will be possible to easily integrate data from various wearables such as health trackers or ECGs. There are also already some initiatives working on projects such as „practice without a doctor“. The idea is to involve medical assistants who care for and treat patients in advance in a legally secure manner and only call in a doctor via telemedicine later on. I am sure that we will see such scenarios more often in the future.

All areas in which doctors are dependent on additional aids, such as ophthalmology, in which patients are examined with the help of various devices, also offer great opportunities for telemedicine. It is possible for patients to carry out the process themselves on the equipment and send the data to the relevant experts. Telemedicine is also already well established in radiology. Findings are viewed and evaluated by experts worldwide without them ever having seen the patient live. The

challenge in this context will be to network the necessary devices in such a way that the data can be brought together and analysed cleanly and securely.

What challenges does telemedicine face?

Here, too, there are various topics, but one is definitely the legal situation, as there is still no planning certainty here as to where the concrete journey will lead. The system is not yet fully developed and is in the discovery phase, which does not make it easy for telemedicine providers and requires quick adaptation reactions.

On the other hand, medicine is an industry in which many players, such as doctors, health insurers, insurance companies, etc., have to meet and cooperate with each other. If one party refuses to use telemedicine, this has far-reaching consequences for all other parties. So you have to find a way where all parties see a benefit for themselves.

Another hurdle is that many treatment pathways are very entrenched, which is not a negative thing, but it makes it difficult to integrate new possibilities into them. So you have to try to add value through integration without disrupting the existing workflow or creating additional work. Telemedicine providers should therefore focus either on easy and fast patient acquisition, on creating more efficient workflows in the respective health facilities or on the possibility of generating additional income for doctors. In this way, it would certainly be possible to win over even more doctors and therapists to use telemedicine applications in their everyday professional lives.

Telemedicine works with a lot of sensitive patient data. How do you ensure the protection of this data across your platforms?

I believe that we have a pioneering role in this context. So far, we have always been among the first two providers to be certified and accredited according to all new requirements of the Association of Statutory Health Insurance Physicians. Since we not only have our own MEDITyme platform, but also offer white-label solutions, we are also involved in the certification of customer platforms. For this reason, we also regularly receive feedback from the certifiers on the basis of pentests, which on the one hand represent a control and on the other hand enable a quick readjustment and optimisation. So far, we have not had any data varnish incidents and also no pentest that suggested a high vulnerability. Both our CTO and I come from large corporations and have set the highest standards for this topic from the very beginning. There are various options for the discussion between doctor and patient, but their procedure is strictly prescribed by the certification. Doctors can send their patients either a link or a tan and invite them into the virtual treatment room. The whole process is end-to-end encrypted and goes directly from browser to browser. In addition, we are one of the few that also have the entire data flow, including the transmission of files, encrypted end-to-end. Neither we nor any outsiders can get at that!

What other areas of application are there and how can they influence the medical future?

Another area of application is tele-surgery. This is easy to do with a platform like ours, if you also have, as you know from remote maintenance programmes, a responsible person on site who can intervene. The challenge here is also to connect the computers and devices in such a way that both real-time communication and a secure line are guaranteed. Nevertheless, it must always be ensured that someone on site can independently take over or bridge the gap, because in case of doubt, there can always be technical failures due to power outages, etc. The issue is not yet common practice, but it will be. This topic is not yet common practice, but it is already used occasionally and will certainly increase in the future.

However, there will also be many other areas of application and I think that it will become stronger especially in the fields of application in which integrated image recognition and automatic diagnosis play a role. I can imagine that other analyses such as facial expressions and voice colours will also take place during transmission and that these will be used additionally for findings, anamneses and diagnoses.

What measures would have to be taken to make telemedicine inevitable for doctors, therapists and patients?

I believe that we are still a long way from that. In order to make full use of all the video possibilities in practices and hospitals, we must first create the possibility for doctors and patients to network in a really simple and uncomplicated way. However, this also requires a general cultural change, in which first and foremost the assistant professions must be upgraded. If you take a doctor in a hospital, for example, he or she walks several kilometres from patient to patient every day. In the future, after a patient presses the bell, a tablet could start up and connect him or her with the nurse in charge, who would give his or her assessment and then individually connect with the doctor to describe the situation. Of course, this procedure would still mean a lot of work along the entire value chain. Nevertheless, it could enable doctors to work more location-independently and focus more on the essential part - namely the interpretation of data, diagnosis and treatment - based on machine-generated evaluations. This can change the doctor shortage we are heading towards now, rather than starting when the situation has already occurred.

What is the craziest use case you can imagine in connection with telemedicine in the future?

I think it is realistic that in about 10 years we will no longer have a doctor sitting in front of us, but a deep fake or an avatar. I can also imagine that chatbots will play a big role in this context, as we are already seeing with Ada Health or Infamedica. In addition, there will perhaps be a combination with voice and facial analyses, as well as the integration of additional image analyses. These will then initially ask the patient questions completely virtually, go through the medical history and make diagnoses with the help of various tools. We will then speak of „virtual doctor's assistants“ or similar, who will only selectively forward the data and information to real doctors. There will certainly be a lot more in store for us here.

Deep Dive

Innovations in medical technology in general are driven by technological advances. A dynamic market that determines people's health and lives requires continuous optimisations and making the impossible possible! In our „Deep Dive“ category, we focus on successful and innovative key technologies that are related to telemedicine and digital health applications. We offer you insights into different areas of application, explain how they work and refer to companies that use the technology. Are you familiar with the key technologies of telemedicine applications? Compact and aggregated. Learn more now and stay up-to-date.

1. Electronic patient record (ePR)

The introduction of the electronic patient file not only enables complete documentation of health treatment, but above all offers the advantage that independent specialists, therapists or pharmacists receive a holistic overview of the course of treatments carried out so far. In this way, individual therapy decisions can be made more quickly and efficiently. But what technology is the ePA based on and what other functions are hidden behind it?

The use of the ePA is voluntary and free of charge for insured persons. The documents stored on it are available 24/7 nationwide and can be easily exchanged between different medical facilities. To do this, insured persons only have to register with their statutory health insurers and download the health insurer-specific ePA app. Registration then takes place with the help of the electronic health card or two-factor authentication. It is then possible to view health-related data in the app or to upload or download doctor's reports or other medical documents.

The prerequisite for practices, pharmacies and other health care facilities to access the electronic health record is connection to a telematics infrastructure. This in turn requires that a PTV4 connector, an eHealth card reader incl. station and an SMC-B institutional card are available. The connector as a hardware component connects the service provider to the telematics infrastructure via a transport network. In this way, primary systems can securely access various smart cards of the telematics infrastructure via network-capable e-health card terminals. The connection between the connector and the eHealth card terminal is made via a LAN interface. Whenever the electronic health card is inserted, the master data of the insured person is compared and updated. If, for example, electronic medication plans or an emergency data record are to be created on the card, the primary system first requests PIN entries at the card terminal. With the help of a security module integrated in the card terminal, the data is encrypted via a TLS connection.

ePR as an innovative digital approach to healthcare

- **Provider:**
all health insurance funds (in Germany)
- **Technical requirements:**
PTV4 Connector,
eHealth card terminal,
Institution card SMC-B
- **Advantages:**
All relevant health data united in one place

Transparency

Security through TLS encryption
- **Document types:**
e.g. emergency record

electronic medication plan / doctor's letter / vaccination/maternity record / certificate of incapacity for work

Child examination booklet

Data from digital health applications

Telemedical monitoring

Primary systems such as hospital information and practice management systems must be equipped with a corresponding software update so that the data records on the ePA as well as other specialised applications (e.g. electronic prescription, medication plan, etc.) of the telematics infrastructure can be read and updated. Some documents, such as doctor's letters, additionally require a qualified electronic signature (QES) via electronic health professional card. This can be requested by the service providers from the respective card providers.

2. Telemonitoring via PA sensor

Telemonitoring is now increasingly used for remote monitoring of patients with heart failure. One possibility is the remote monitoring of blood pressure in the pulmonary artery. In the future, it is hoped that this will enable deterioration of the heart function to be detected at an early stage and thus enable a rapid medical response. But can telemonitoring establish itself as routine care for heart failure?

The answer is: YES! Patients suffering from heart failure must be monitored continuously. An increase in blood pressure in the pulmonary artery provides an indication of dangerous changes. Until now, these pressure values could only be determined by means of a heart catheter and thus in connection with a surgical intervention. A new sensor now promises a permanent and innovative solution.

Abbott Vascular developed the CardioMEMS implant, which is only a few millimetres in size and guarantees reliable, permanent and gentle monitoring of blood pressure values. For this purpose, the sensor is permanently placed in the distal pulmonary artery using a minimally invasive right heart catheter procedure in order to be able to continuously measure blood pressure. The data is read out via a specific pillow-shaped read-out device (CardioMEMS™ patient electronics system used) on which patients have to lie down for about 20 seconds every day. These patient-initiated readings are transmitted wirelessly and securely via the Internet to a website (Merlin.net™ Patient Care Network) that selected, specialised clinics and medical practices can access.

The platform integrates remote pulmonary artery pressure data with implantable electronic system diagnostics. Sensor readings (including AT/AF load, ventricular pacing (%), patient activity, day & night heart rate, VT/VF events with antitachycardia (ATP) and shock therapies) are then monitored by trained heart failure specialists and physicians, and therapy and medication are individually adjusted as needed.

INNOVATIVE APPROACH

- **Company:**
Abbott Laboratories AG
- **Product:**
CardioMEMS™HF system
- **Technological basis:** PA Sensor, Deliveryx catheter, Readout device, Merlin.Net
- **Field of application:**
Telemonitoring of patients with heart failure
- **Prerequisite:**
A lot of communication between patients and the care team in order to derive efficient and effective treatment recommendations in a timely manner, which are implemented by the patients.
- **Website:**
<https://www.de.abbott/>

Patients then receive customised messages about monitoring, medication adjustments or lifestyle change recommendations via the system's own myCardioMEMS app. In addition, the history of sensor readings and transmission status can be viewed in real time.

Continuous monitoring allows any increase in pressure in the pulmonary artery to be detected weeks before a complication occurs.

3. Telemedicine diagnostic points

Telemedicine services provide patients with a new opportunity to receive basic medical services. A modern technology that is also subordinated to telemedicine and contributes to the digitalisation of health concerns are diagnostic stations. In this way, patients are provided with medical devices that help them measure important vital parameters without having to visit a doctor or carry specific health wearables.

Diagnostic stations can be set up simply and easily accessible in a wide variety of locations and used by patients. The measurement results obtained in these stations are then transmitted to and discussed with medically trained professionals via a cloud-based telemedicine platform, if required.

Diagnostic stations contain a variety of different measuring devices as well as an integrated IT infrastructure, which in combination allow the measurement of basic vital parameters. Patients have access to an ECG event recorder, blood pressure and blood glucose meters, a pulse oximeter, thermometers and body scales, among other things. A stethoscope and otoscope can also be used. By providing special telemedical devices, patients can thus perform the measurements on their own, without first visiting a doctor's office or hospital and being exposed to long waiting times.

The diagnostic stations from Comarch are available in different versions: on the one hand as a stationary version that can be placed at airports, for example, a portable version in a portable case including measuring devices and tablet, and a third mobile version in the form of a trolley that is especially suitable for patients with mobility difficulties.

Generally, the stations are operated via a dedicated app on a tablet, which also simultaneously gives patients instructions on how to perform the individual measurement steps. In order to use the diagnostic station and start the vital sign measurement, patients must first create an account and fill out a medical history form. This medical history sheet is offered as both a simple and an extended version and requires a reliable and detailed listing of the individual's state of health, on the basis of which doctors can analyse the results and make diagnoses.

INNOVATIVE APPROACH

- **Company:**
Comarch SA
- **Product:**
Comarch Diagnostic Point + Comarch e-care
- **Field of application:**
independent measurement of vital parameters
- **Types:**
stationary version (box)/
portable version (suitcase)/
mobile version (cart)
- **Website**
<https://www.comarch.de/>

The user-friendly and intuitive application, with detailed instructions and visual processing of the individual steps in the procedure, reduces incorrect measurements and provides accurate measurement results, which are first transmitted to the application via Bluetooth and then transferred to the cloud-based platform Comarch e-care. The patient also receives these in the form of a report and has the option - if there is a direct connection to a telemedicine centre - to contact medical professionals via video consultation through the platform.

In addition, there is the option to create a user account in the associated online health diary Comarch HealthNote and to save the determined values, medical information and patient-related data in order to compare and check them in the further course.

Advantages

- Time saving by avoiding long waiting times for a doctor's appointment
- Immediate access to basic screening for health problems
- Raising health awareness
- Lower patient volume in medical facilities
- Greater comfort for patients and caregivers

Challenges & Prospects

„Healing at a distance“ - this is how the World Health Organisation (WHO) defines telemedicine, through which patients can claim health services around the clock and easily accessible. The increasing use of medical health apps also shows the change and progress of digitalisation in the health sector.

The benefits of telemedicine applications are clear to see. Especially in the last years of the pandemic, telemedicine helped to secure medical care. Vulnerable or mobility-impaired target groups are not exposed to any further risk or effort by visiting a doctor in person, including travel and long waiting times, but can attend consultations or therapy sessions remotely based on various communication technologies.

The legal foundations and legal frameworks in the national and international environment are also becoming increasingly cooperative for digital applications in the health sector. Germany is setting another milestone in this respect by being the first country worldwide to introduce systematic remuneration for health apps in primary care. Since 2019, the digital development process in the healthcare sector has been driven by a variety of new and modern laws.

Telemedicine and health apps open up new possibilities and help to compensate for staff shortages in the medical sector, which is particularly useful in rural areas. In addition, processes in medical practices can be made more efficient in this way, for example when several telemedicine systems are shared and seamlessly connected with each other so that synergies can be drawn from them.

Although the course has already been set correctly and the basic requirements for telemedical services have been met, the technology has not yet been used by the majority of patients and doctors/therapists. Surveys show that in Germany only about 20% of patients have used telemedical applications so far. In other European countries, the willingness to use the technology is already much more pronounced, which may also be due to the fact that until 2019 telemedicine was much less prominent and difficult to access for legal reasons.

In order for telemedicine and health apps to play a significant role in medical care in the future, it is first necessary to convince health insurance companies and doctors of the advantages. The trend can only become fully established if they support the technology and the various possible applications and use them in everyday life.

In addition, technical difficulties have to be solved and a stable and flawless internet connection - also in rural areas - has to be guaranteed. Another hurdle is to familiarise older people in particular with the technology, as they often do not have the technical prerequisites and know-how to use digital services. However, this target group in particular, which often has limited mobility or suffers from chronic diseases and thus requires continuous monitoring and a large number of doctor's appointments, has a high potential.

Telemedicine and health apps as a medical consultation service have become more present in the minds of patients in recent years. However, the technology is not yet able to completely replace a face-to-face doctor's visit, but only offers a supplement for routine visits or medical information discussions or data exchange. However, many diseases require a physical examination in order

to be correctly diagnosed and treated, which means that the traditional doctor's visit will remain irreplaceable in the coming years.

How long do you think it will take for telemedicine solutions and health apps to become established in the majority of everyday use by patients, doctors' practices, hospitals and therapy centres? One thing is certain: in the next few years, we will continue to be presented with innovative research approaches that continuously optimise the quality of medical care and revolutionise the healthcare system.

Market Insights

arcoro has set itself the task of actively shaping the future of medical technology by bringing together medtech companies and experts. Through our large network and personal exchange with industry experts in medical technology, we are able to deliver results that also offer you real added value and exciting insights into the current environment but also into the future. Thanks to surveys of specific target groups, the concentrated expertise of specialists and comprehensive research, you are close to the market thanks to us. The result: nationwide aggregated and detailed insider knowledge summarised compactly for you. Candidates gain the opportunity to share their own perspective and compare themselves with colleagues in the industry. Companies get an additional, independent source to gain valuable impressions of the medical technology market and to follow its development with regard to various areas of innovation.

Innovations in medical technology: Telemedicine & digital health applications

Survey background:

Period of the survey: 01.03.2022 to 22.04.2022

Number of participants: 56

Type of survey: Questionnaire (Focus on open questions)

Tool: Survey Monkey

Participant profile: International experts in telemedicine & digital health applications

1. Development of health care through telemedicine & digital health applications

- Increasingly individualized medical care (there is a suitable service for every illness)
- More needs-based care (rural areas, chronic patients)
- Improved interaction between patients and physicians at eye level
- Surgical support through the involvement of specialists
- Better assessment of own health condition
- Greater sense of responsibility for one's own lifestyle
- Video consultations
- Establishment of a comprehensive online medical coaching service
- Continuous data collection via health wearables
- Progress highly dependent on Bfarm regulations (regarding DiGAs) as hurdles are high and price negotiations tough.
- Telemedicine also operable by specialized providers with KV-approved physician call centers.
- Simple telemedical treatment of common illnesses (cold, cystitis, viral infections,...)
- Telemedical monitoring of chronically ill patients
- On-site care especially for severe diseases
- Opening of new efficient ways, which enable new manifold tasks in the care with less and less service providers (important is to pick up doctors and patients at an early stage and to get them used to it)
- Transition to predominantly virtual care (telemedicine consultations, remote patient monitoring, virtual wards, etc.)
- Increasing mergers/acquisitions as stand-alone solutions will have a hard time surviving
- Greater focus on health equity, as to date many health technologies have been available only to a limited socioeconomic group
- Greater government focus on health literacy - prevention and wellness must be integrated into education (schools, public awareness campaigns, etc.). In the long run, a reactionary focus on treating disease will be too expensive for the health care system.

2. Which solutions promise high success potential?

DiGAs for chronic diseases (e.g. diabetes)	★ ★ ★ ★
Telemonitoring (remote monitoring of vital data)	★ ★ ★ ★
Teletherapy	★ ★ ★ ★
DiGAs for mental illness	★ ★ ★ ★
Teleconsil (consultation from doctor to doctor)	★ ★ ★
ePA/E-Prescription/E-Sick note	★ ★ ★
Symptom checker	★ ★ ★
Online consultation hours	★ ★
Online appointment booking	★
Digital prevention and online courses	★

3. Gamechanger - who is shaping the market at national and international level?

GAMECHANGER		
FormelSkin	Withings	m.doc GmbH
Avi Medical	Telecor	Comarch SA
Doctor.se	Medgate	Doctor on Demand
HelloBetter	Caspar Health	Philips
Apple	ps Health Group	Virtuwell.com
Selfapy	Amazon Care	Kry International

4. Opportunities and risks of medical technology through the use of telemedicine

Opportunities



- Shortage of skilled workers (especially in more rural areas) can be
- be compensated
- Fast and flexible appointments (no waiting time, no travel)
- Mobility-impaired or elderly persons can keep appointments without
- without great effort
- Fast cross-sector
- Networking of specialists worldwide with teleconsultation
- More efficient processes in medical practices through additional telemedical services and networking with other digital solutions
- More frequent check-ups (e.g. routine examinations for chronic diseases) are performed due to less effort
- Reduction of costs due to lower time and
- bureaucratic effort
- Better and faster exchange of expert opinions

Risks



- Technical difficulties
- Older people have little experience in dealing with digital media
- Many diseases can only be diagnosed through physical contact
- Misdiagnoses based on
- Insufficient or too subjective information
- Data protection problems / slacks
- More frequent consultations lead to overload of medical capacities
- Lack of acceptance and commitment of physicians and therapists
- Incorrect aggregation and analysis of health data as a risk to individuals
- AI cannot show empathy. Automating healthcare with algorithms developed from a psychosocial perspective may actually reduce treatment effectiveness

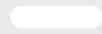
4. Opportunities and risks of medical technology through the use of DiGAs

Opportunities



- Early detection & treatment of diseases
- Continuous observation and control of the course /
-progress
- Active and self-determined participation of patients
- Improvement of the patients' quality of life by adapting their lifestyle based on assistance of DiGAs
- Access to underserved communities and thus
Improving health equity

Risks



- Technical prerequisite often not fulfilled especially for older people
- Lack of reliability
- Billing/reimbursement of services
- Data protection risk
- User-friendliness
- Legal basis and regulations (depending on country)
- Approval system as a DiGA and not only as a health app
- Question of acceptance of responsibility
- Skepticism of physicians leads to low number of „apps on prescription“

6. use cases that could be part of everyday life in the near future

A general prerequisite in the context of telemedicine and DiGAs will be that users learn how to use smartphones and that wifi is available to everyone everywhere:

- Telemedicine and bots / AI perform initial diagnosis before it is forwarded to doctor. The initial recommendation generated in this way can promote efficiency and avoid time delays in everyday practice.
- AI-driven symptom checkers replace medical history calls
- Chronic patients are tracked telemedically via wearables as standard and associated apps automatically transmit data to treating specialists (data collection of RR, oxygen, glucose, HF, ECG, medication intake)
- General self-evidence that patients share their data via a cloud. Fast communication channels and software-driven data analysis also give patients better insights into their own health.
- Telemedicine boxes in shopping malls, where all important vital data can be measured and checked
- can be measured and checked - freely accessible / in the event of problems, direct referral to a doctor (online appointment)
- Patient self-management for chronic diseases
- More opportunities for early diagnosis (skin cancer, eye diseases, etc.)
- Increased use of language patterns for diagnosis and management (e.g., Parkinson's, depression)
- Sentiment analysis including cultural nuances to reshape AI in conversations
- Ki-based medication recommendation, automated prescribing, and delivery ordering through combination of telemedicine & bots
- Telemedicine & virtual reality combined to gamify VR occupational therapy and physical therapy, for example, to provide exciting alternative therapies for patients (e.g., after strokes)

ABOUT arcoro

arcoro is a renowned, highly specialised HR services boutique with the visionary goal of „connecting MedTech companies of the future“. To this end, we offer flexible and diverse solutions for medical technology companies and medical technology experts. We see ourselves as a facilitator of expertise and years of experience of our industry experts in companies pursuing significant, innovative and exciting projects in the industry.

In doing so, we focus on different areas of expertise, covering Clinical Affairs, Regulatory Affairs, Research and Development as well as Production and Quality Management. We provide companies with access to more than 3000 medical technology experts from our database. We offer candidates new development opportunities and impulses through deployment in innovative projects of the future in a constantly growing environment of renowned companies with high innovative strength.

What drives us? Personal contact, years of expertise in the dynamic environment of the medical technology industry and the pursuit of innovation. Let's revolutionise medical technology together.

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