# Acceptance analysis of physicians in rural areas on the subject of technology-based care concepts in Lower Austria.

Master Thesis

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by
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# Declaration

I declare that I have developed and written the enclosed Master Thesis completely by myself, and have not used sources or means without declaration in the text. Any thoughts from others or literal quotations are clearly marked. This work was not used in the same or in a similar version to achieve an academic grading or is being published elsewhere.

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# Abstract

The Austrian healthcare system is facing various challenges as demographic change and increasing health costs occur, as well as changing and more complex demands arise. A too high frequency of hospital visits in cases that could often be treated by local general practitioners indicates that the Austrian basic healthcare system needs strengthening to meet these current and future trends and challenges. Even though telemedical services show the potential to improve the current situation and help serving these challenges, especially in rural areas, it is rarely adopted in Austria by now. Within this research a questionnaire, based on the UTAUT model for technology acceptance, was developed and distributed in the rural areas of Lower Austria in order to evaluate general practitioners' acceptance of telemedical applications. The primary goal was to verify if there is an acceptance problem and to identify possible acceptance problem areas.

# Kurzfassung

Das österreichische Gesundheitssystem sieht sich mit einer Anzahl von Herausforderungen konfrontiert. Der demographische Wandel, immer weiter steigende Kosten im Gesundheitssektor, wie auch sich verändernde und komplexere Bedürfnisse. Ein internationaler Vergleich zeigt eine zu hohe Frequenz an Spitalsbesuchen, sowie eine enorme Beanspruchung von Spitalsambulanzen. Die deutet darauf hin, dass die österreichische Grundversorgung einer Stärkung bedarf um den aktuellen Entwicklungen stand halten zu können. Obwohl sich telemedizinische Services als ein geeignetes Tool zeigen um die aktuelle Grundversorgung (vor allem auch im ländlichen Bereich) zu unterstützen, adaptiert sich die Telemedizin recht langsam in Österreich, auch im internationalen Vergleich. Im Rahmen dieser Arbeit wurde ein Fragebogen, auf der Basis des UTAUT Modelles, zur Evaluierung der Akzeptanz hinsichtlich telemedizinischer Anwendungen im ländlichen Raum Niederösterreich erstellt, verteilt und ausgewertet. Das Hauptziel der Arbeit war es zu verifizieren ob es tatsächlich Akzeptanzprobleme hinsichtlich telemedizinscher Anwendungen gibt und Problembereiche zu identifizieren.

# Table of Contents

# 1 Introduction

The current world is in the process of moving away from analog communications and towards a more effective and efficient digital communication. This change has also made its way into the healthcare sector, driven by tech enterprises equally as by users. Numerous health apps, virtual coaching programs, and smart wearables are available to help maintain health, prevent diseases, and accompany rehabilitation and therapy [1]. Telemedical services show great potential to serve existing and upcoming challenges of healthcare systems worldwide [6], [10].

*Problem*

Healthcare systems worldwide are facing various challenges, as is the Austrian healthcare system. Demographic change, increasing healthcare costs, as well as changing and more complex demands are causing the further development of existing healthcare concepts to be a necessity [6], [10]. An international comparison demonstrates a too high frequency of hospital visits and a limitless inlet to outpatient-departments in Austria indicating that strengthening the Austrian basic healthcare system is needed in order to meet current trends and future challenges [25]. Looking at the average age of physicians in Austria a clear increase is found. Numbers also indicate that working as a general practitioner has lost its appeal, the percentage of general practitioners among physicians has continuously decreased since 1997 [26], even though there is a great need for general practitioners [27]. An adaptation of the Austrian healthcare system to current and even more future trends, such as the increase of chronic and long-term diseases, the continuous technical innovation, the demographic change and an unbalanced work-life balance of health professions, is necessary [25]. Although telemedical services show great potential in serving existing challenges [6], [10], a study showed that from 31 countries measured for their use of telemedical services, Austria ended up being ranked 21, indicating that telemedicine is being adopted more slowly in Austria on a European scale [33].

## 1 Introduction

*Aim*

The objective of this current work is to review the state of the art of telemedicine in Austria and develop a questionnaire based on a review of the most popular theoretical models in the field of technology acceptance. Furthermore, it aims to identify if there are acceptance problems in the rural areas of Lower Austria and possible problem areas regarding physicians' acceptance.

*Structure*

Chapter 2 illuminates the theoretical background including worldwide digitalization in the healthcare sector, trends and challenges for the Austrian healthcare system, the current status of telemedicine in Austria, and technology acceptance. Chapter 3 describes the research model, questionnaire inventory, and survey methodology. All results are demonstrated in chapter 4 followed by the discussion in chapter 5.

# 2 Theoretical Background

This chapter discusses the theoretical background including worldwide digitalization in the healthcare sector, trends and challenges for the Austrian healthcare system, the current status of telemedicine in Austria, and technology acceptance.

In table 1 frequently used terms are specified for their meaning within the context of this research for clarification:

| term | definition |
|---|---|
| physician | also called doctor, professional who practices human medicine |
| general practitioner | physician who assumes responsibility for the provision of continuing and comprehensive medical care to communities, as it is usual in rural areas of Austria |
| specialist | physician who focuses his/her practice on certain disease categories, methods of treatment or types of patients |

Table 1: term specification within the context of this research

## 2.1 Digitalization in the health sector

The current process of moving away from analog communications and towards more digital communications, which the world is undergoing changes the way we live and communicate affecting all economic sectors. Digitalization in the sector of health is not only driven by tech enterprises, but also by users. Health apps, virtual coaching programs, and smart wearables are available and already well adopted with the purpose of staying and getting in shape, maintaining health and preventing diseases, as well as to accompany rehabilitation and therapy [1].

*Evolvement*

In retrospect, adding value to the health sector through digitalization has meant improving efficiency and effectiveness. Firstly, this has resulted in creating links for the transport and sharing of data, and secondly, all this collected data has had

to be used and analyzed within the healthcare sector. Electronic health (eHealth), mobile health (mHealth) and telemedicine are the result of these needs - technologies that allow the omnipresent collection and transport of healthcare data [1]. Due to the fast evolvement of digitalization in the healthcare in sector, clear term standardization has yet to be found. Terms such as eHealth, telemedicine, telehealth and mHealth are common classifications, but cannot be distinctly categorized. Telemedicine and mHealth, for example, are both branches of eHealth, however telemedical services however can also be carried out through smartphones, and therefore can be mHealth applications [2]–[4]. A description of eHealth, mHealth, telehealth and telemedicine can be found in the following chapters 2.1.1 – 2.1.3.

### 2.1.1 eHealth

*Definition*

eHealth, according to the World Health Organization (WHO), is defined as the use of information and communication technologies for health; including non-physician services as for example telepharmacy or telenursing [3], [5].

*Evolvement*

The accessibility of information and health data has always been a key criterion in the provision of medical care for patients. Terms such as telematics and telemedicine have been used since the 1970s. The term telematics is a combination of the terms telecommunication and informatics and initially denoted the interconnectedness of different information technology (IT) systems for the benefit of linking information from different sources. New terms describing the actual movement in this field develop equally as fast as the technical equipment does. The term eHealth was coined when the internet opened new possibilities of networking. Figure 1 demonstrates the historical evolution of popular terms in the field of eHealth, from telematics to digital health [1].

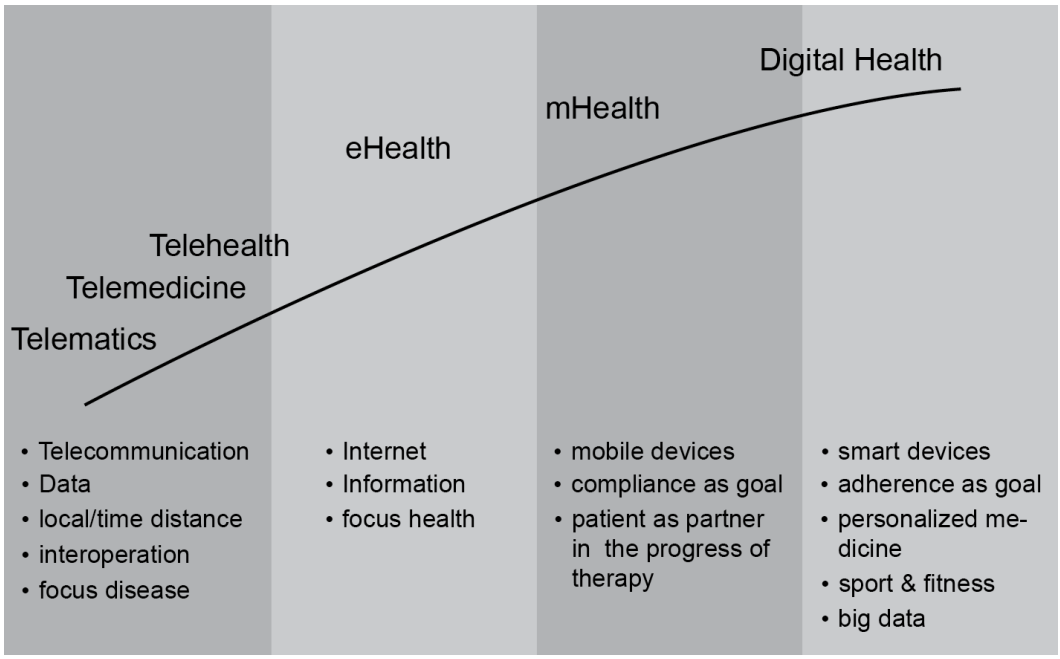


Figure 1: Historical evolution of terminology from telematics to digital health [1].

### 2.1.2 Telemedicine

*Definition*

According to WHO, telemedicine or telehealth is one area under the umbrella of eHealth and means the provision of healthcare services overcoming a physical distance between physicians and patients or between two physicians. telemedicine describes the use of information and communication technologies for the exchange of information for prevention, diagnosis and treatment of injuries and diseases, for research and evaluation, as well as for education purposes of healthcare providers [2].

*Evolvement*

In November 1879, about three years after the official invention of the telephone, the first known scientific documentation of a teleconsultation happened when *The Lancet* reported an incident where a physician diagnosed a baby after hearing it cough over the phone [6]. Although this first form of telemedicine has already existed since 1879, a broader field of telemedical applications only started to develop in the 1950s. Wittson et al. were the first to perform telepsychiatric consultations over a physical distance of 112 miles in 1959 in the US [7]. In the same year the first teleradiology tasks were performed when Jutra transmitted telefluoroscopic examinations over coaxial cable [7]. At this point telemedicine is a broad field containing numerous telemedical services, systems, and

applications used in numerous different medical fields [8]. telemedicine is classified in a variety of niche telemedicine application fields, such as teledermatology, teleradiology, telerehabilitation, telepsychiatry, teleoncology, etc. [9].

#### *2.1.2.1 Telemedical systems*

Giving systematic consideration, telemedical systems can be described by a layer model, where each of six layers provides specialized services or technical components for the layer above as described following [10]. As demonstrated in figure 2 hardware, such as sensors, sensor systems or medical devices, builds the base layer. The hardware layer is the source of the data, which is either further transmitted or analyzed. The second layer is the data layer, here the different forms of data (for example user data, therapy data, therapy content and therapy plans, etc.) are collected, integrated, and analyzed. The communication layer holds all the technical components for authorization, encryption, data transmission and network management, as well as the different communication channels such as telephone calls, text messages, etc. The services layer describes complex services, which are combinations of different components and modules out of the layers below. These services can be used in each of the applications in the application layer. Between the application layer and the services layer is the communication layer holding all types of input and output media. The communication layer supports the communication between users and the system, a functionality of this layer could be the visualization of therapy content or data. The top layer, as already mentioned above, is the application layer. This layer describes the concrete medical specialist field or indication, which the telemedical system is used for [10].

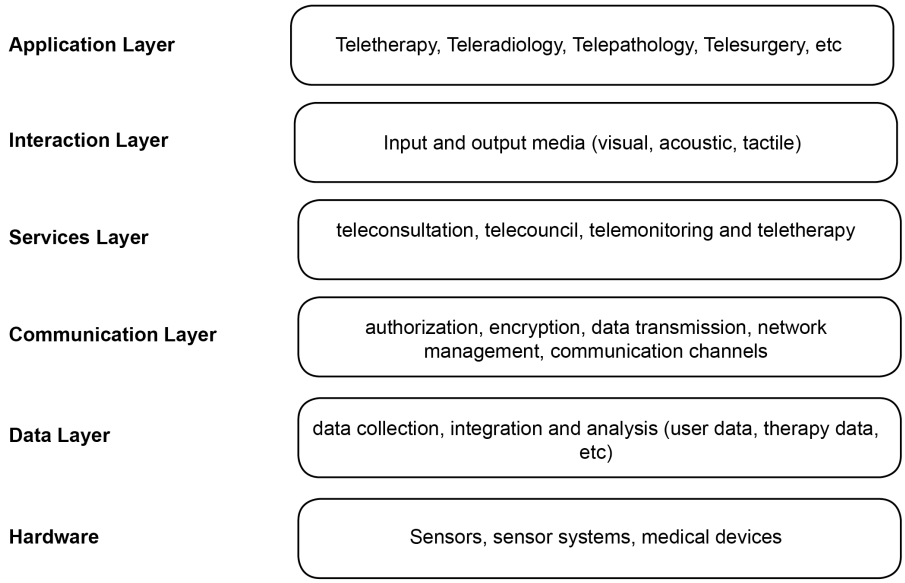


Figure 2: Telemedical systems can be described by a layer model, where each of the six layers provides specialized services or technical components for the layer above [10].

### *2.1.2.2 Telemedical services*

Telemedical services can be subdivided into teleconsultation, telecouncil, telemonitoring and teletherapy [6]. While telecouncil describes council between different physicians, teleconsultation, telemonitoring and teletherapy all have as a key factor the communication between physicians or other medical professionals and patients. Telemedical services can be provided through different media technologies [6].

*Telemonitoring*

Telemonitoring is defined as the remote monitoring of patients using telecommunication and electronic information processing technologies such as, for example, audio and video technologies. One fundamental function of telemonitoring is the transmission of physiological or biological data from a remote location to another location for the interpretation of the data and data-based decision making [11]. Telemonitoring is used for industrial medicine and prevention, as well as in the field of chronic disease management for the following medical indications [12]:

- diabetes mellitus
- congestive heart failure
- asthma
- COPD

- CHD
- depression

Literature shows chronic disease management to be the most promising field of telemonitoring applications. Telemonitoring can lead to a better follow-up for chronic disease patients and as a result reduce complications in chronic disease management [11], [13]. Kalter-Leibovici et al. in a countrywide study in Israel found that heart failure patients assigned to partly telemedical disease management, which included regular remote contact with nurses, had a lower depression score and a better health-related quality of life compared to patients assigned to traditional care, i.e., care without telemonitoring [14].

*Teleconsultation*

The most important form of telemedicine for basic care is Teleconsultation; the interaction between patients and physicians. In numerous countries teleconsultation is already an established and well integrated part of the medical care system. In countries such as Switzerland, Scandinavia, England and the Netherlands, teleconsultation was already established in the 1990s. Countries with a wide geographic extend, such as the United States and Australia, also implemented telemedical services early on [6], [15].

Teleconsultation includes the following services [6]:

- telemedical counseling in acute situations
- telemedical triage
- providing general medical information
- travel-medical counseling
- advice giving on medication including interaction check
- providing recommendations for self-treatment
- providing help in finding the appropriate medical institution for treatment
- guiding patients into next steps of treatment

### 2.1.3 mHealth

*Definition*

According to WHO, mHealth is a branch of eHealth and describes services for the provision of medical care, health prevention and healthcare supported by mobile communication devices, such as wireless patient monitoring devices, smartphones, personal digital assistants, and tablet computers. Functions used for these services can be text messages, GPS, Bluetooth and mobile web [4].

## 2 Theoretical Background

*Evolvement*

The creation of mobile and smart devices has changed the way of living, people are always accessible and information is constantly available everywhere. This major change in society, in combination with the preceding development of the eHealth sector, has opened up a new form of connection between healthcare and patients, as demonstrated in figure 3 [16].

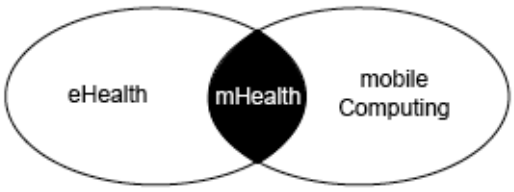


Figure 3: eHealth and mobile computing combined has led to a new form of connection and communication between patients and health providers [16].

With the invention of the first wireless devices using classic portable computers such as laptops, the first approaches to mHealth were established; ward trolleys were developed for the daily rounds of physicians in hospitals. Smartphones were the main catalyst for the transition to mHealth, but other wireless devices such as tablets have also been contributing factors. Through constant development more hybrid forms, such as wearables and convertibles, have been developed up until now. Wearables have been proven to be especially important for the mHealth sector, allowing the constant tracking of movement and vital parameters while worn. Notable examples of wearables are smartwatches and activity trackers [16], [17].

Due to the high market penetration of mobile devices amongst the population, the field of mHealth has begun to be established as a promising field of eHealth [17].

*mHealth systems*

mHealth systems can be classified in terms of technical functionality or field of application. Regarding technical functionality, applications can be clustered into native apps and web apps, with a third form being the mixture of both, i.e., the hybrid apps. The patient-orientated classification regarding field of application is not standardized, as a result of the rapid development in the app market a variety of different types of health apps can be found today [16]. In 2016, 3,2 billion health apps were downloaded worldwide [22].

## 2 Theoretical Background

In a study by FH St. Gallen on behalf of eHealth Suisse the following categorizations were determined: lifestyle and health apps, personal advisory or support apps, and wireless telemedical services. The data input can be done by patients manually and or some lifestyle and health apps can be combined with medical systems or sensors to measure vital parameters such as blood pressure, pulse and body temperature. Personal advisory or support apps are for example applications reminding patients to take medication, but also fitness and dieting applications belong in this category. Wireless telemedical services provide location independent support in acute care situations [23].

In modern care concepts a patient-centered approach has been established, therefore, as figure 4 demonstrates mHealth applications are further categorized into three sectors: citizen sector, patient sector and administration sector. The citizen sector describes mHealth applications, which are used by citizens of their own accord and mostly without an acute medical purpose, but with the purpose of self-optimization, wellness, etc., such as fitness apps, yoga apps, etc. Patient sector means apps for patients with acute or chronic diseases. MHealth applications in the patient sector are characterized by the fact that their use is based on a specific medical indication and recommended or prescribed by qualified medical staff. Applications within this sector need to follow significant higher quality and security standards. Applications in the administration sector serve the purpose to support the practice of medicine or hospital administration. Users of mHealth applications in this sector are patients, physicians and other medical staff; applications for mobile appointment or patient data administration, but also applications supporting patients in the control and monitoring of their individual therapy journey, belong into this category [23].

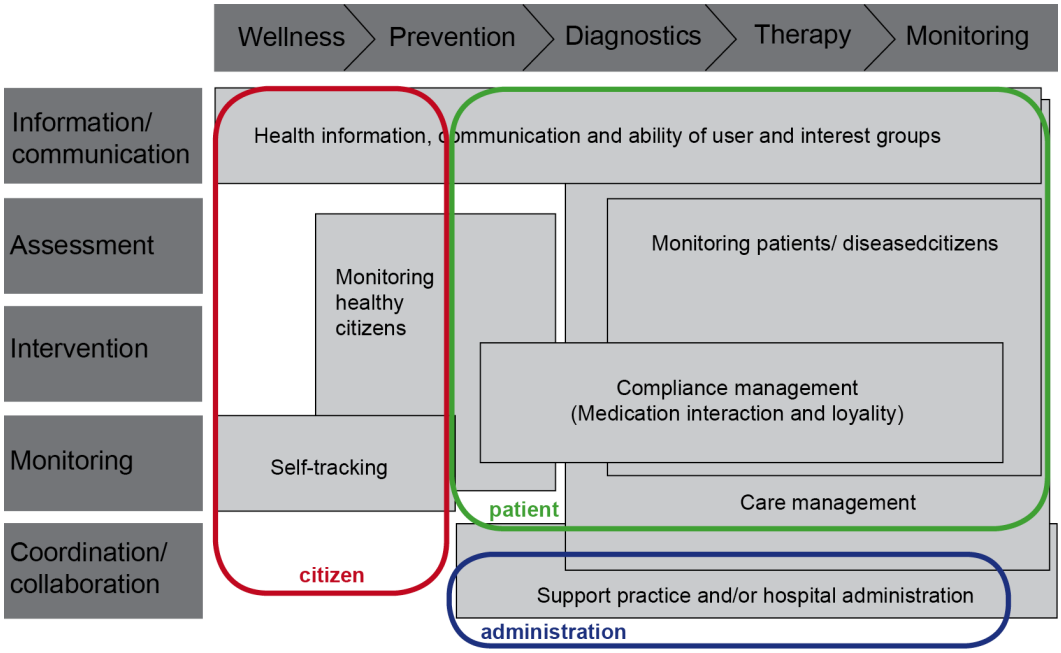


Figure 4: Classification of mHealth applications, a patient-centered approach [23].

### 2.1.4 Potentials for health sector through digitalization

In addition to telemedical services in countries which are densely populated and often have inadequate infrastructures, there are also various challenges for existing healthcare systems in western industrialized countries. Demographic change, increasing healthcare costs as well as changing, more complex demands cause the further development of existing healthcare concepts to be a necessity. The high standards of patient care must be maintained or even be improved. Within that objective it is of high priority to keep the offered services affordable. Telemedical services have great potential to serve existing and upcoming challenges [6], [10].

Challenges for modern health systems

Healthcare systems are challenged by **demographic change,** that is a continuously ageing population with increased life expectancies in combination with an increase in chronic diseases such as diabetes or cardiac diseases. These changes are accompanied by an increased demand for medical consultation and services. In addition, the population's standards are rising, people are exacting access to immediate healthcare services, while then again, a feeling of uncertainty as well as an insufficient health literacy can be observed among the population [6].

On the other hand, as demonstrated in figure 5 **healthcare costs are increasing, mostly out of proportion** compared to the GPD (gross domestic product), a measure of the market value of all services and goods produced in a country in a specific time period, in health systems worldwide [2], [24].

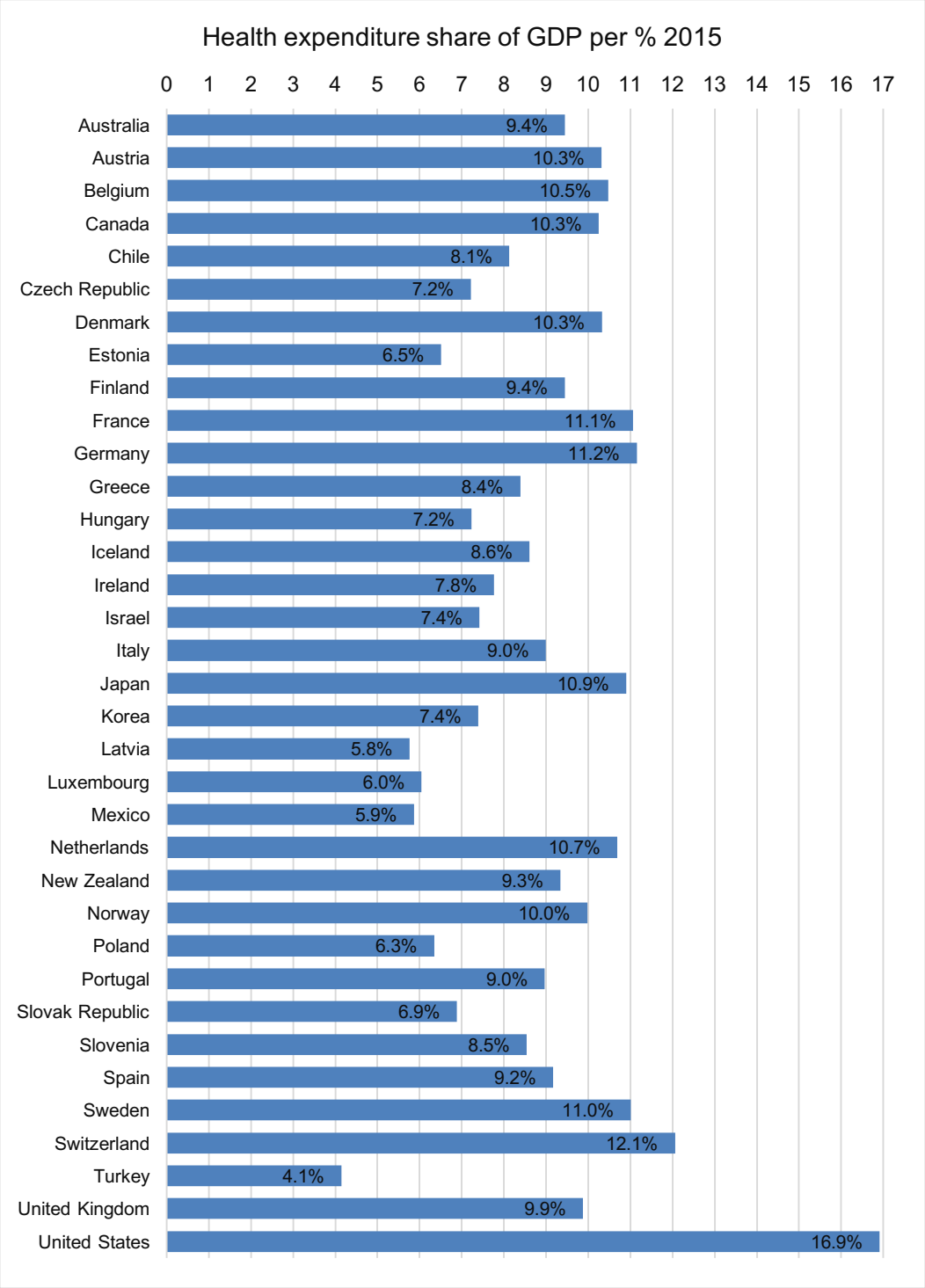


Figure 5: Healthcare expenditure share of GPD per percentage in 2016 [24].

Furthermore, health**care services have become more complex and highly fragmented**. Ambulant consultations in various disciplines are increasing in many European countries. High referral rates from general practitioners to specialists as well as disorientation regarding the selection of the adequate provider for medical care among population can be observed [6].

Several trends are pointing toward **accentuated problems in basic care**. Patients that should be treated in basic care increasingly use ambulant hospital care. The density of general practitioners is decreasing, especially in rural areas, due to a lack of successors. Capacity problems at universities lead to the education of too few physicians in order to provide the amount of medical care needed by the population in the long term. Additionally, the percentage of female doctors is rising, thus leading to a higher rate of doctors working part-time [6], [10].

## 2.2 Trends and challenges concerning the Austrian health system

The trends and challenges for healthcare systems worldwide, described in chapter 2.1.4, apply to the Austrian health system as well. This chapter describes problem areas, challenges, potentials and tendencies for the Austrian healthcare system, including facts and numbers from Austria regarding demographic change, healthcare costs and basic healthcare systems.

### 2.2.1 Demographic change

Increased life expectancy

Similar to a worldwide trend, the life expectancy in Austria is significant higher than it was twenty years ago. Figure 6 demonstrates that the life expectancy calculated for the total population increased from 76.8 years in 1995 to 81.3 years in 2015 [25].

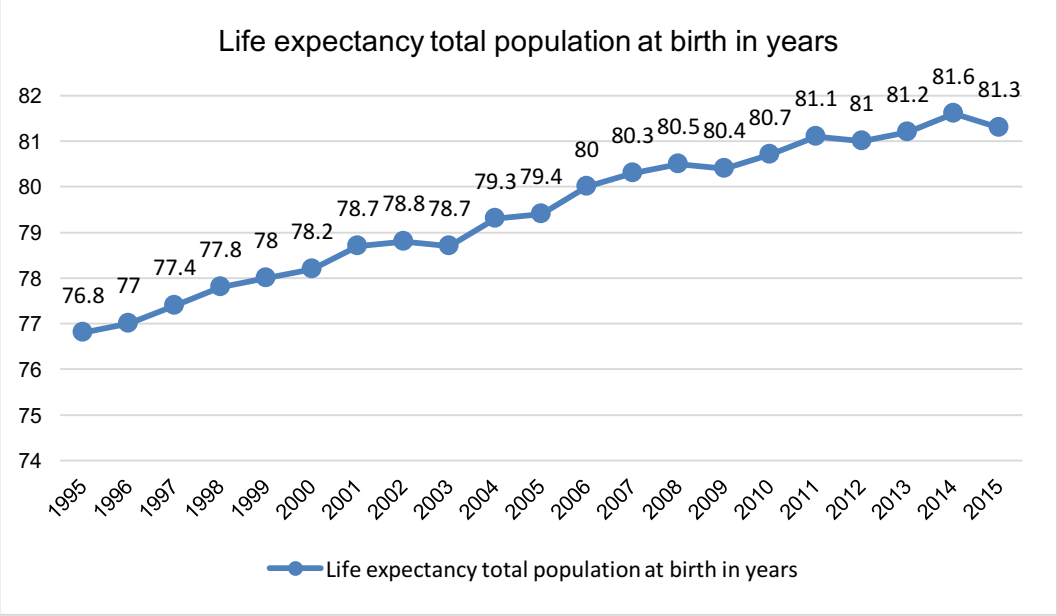


Figure 6: The life expectancy of the total Austrian population at birth between 1995 and 2015 [25].

Ageing population

The change in Austria's population age structure goes hand in hand with the general growth of the population, as well as with the rapid advancement in healthcare technology. While in 1995, 15.1% of the Austrian population was 65 years of age and over, figure 7 describes how this number increased to 18.3% by 2015. In that year Austria's population increased to 8,633,200 people, resulting in 1,583,900 people being 65 years of age and over, of whom 429,900 people were 80 years of age and over, as illustrated in figure 8 and figure 9 [21].

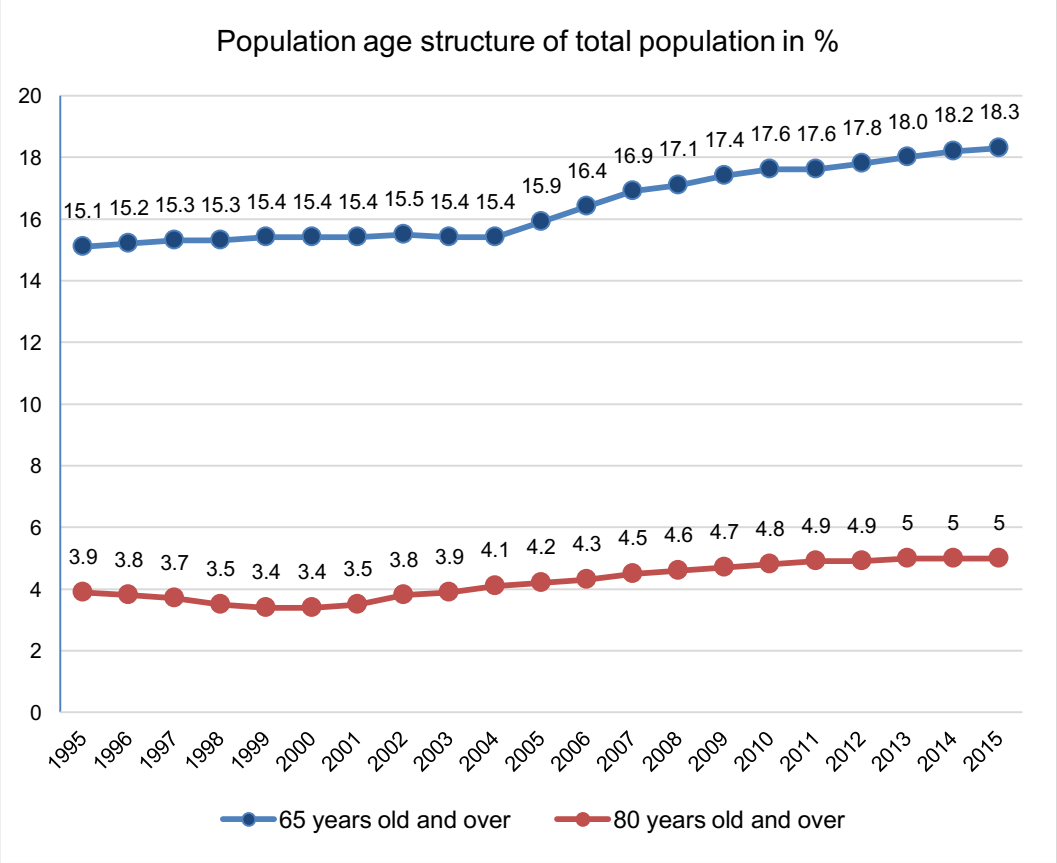


Figure 7: Population age structure from 1995 to 2015 in Austria [26].

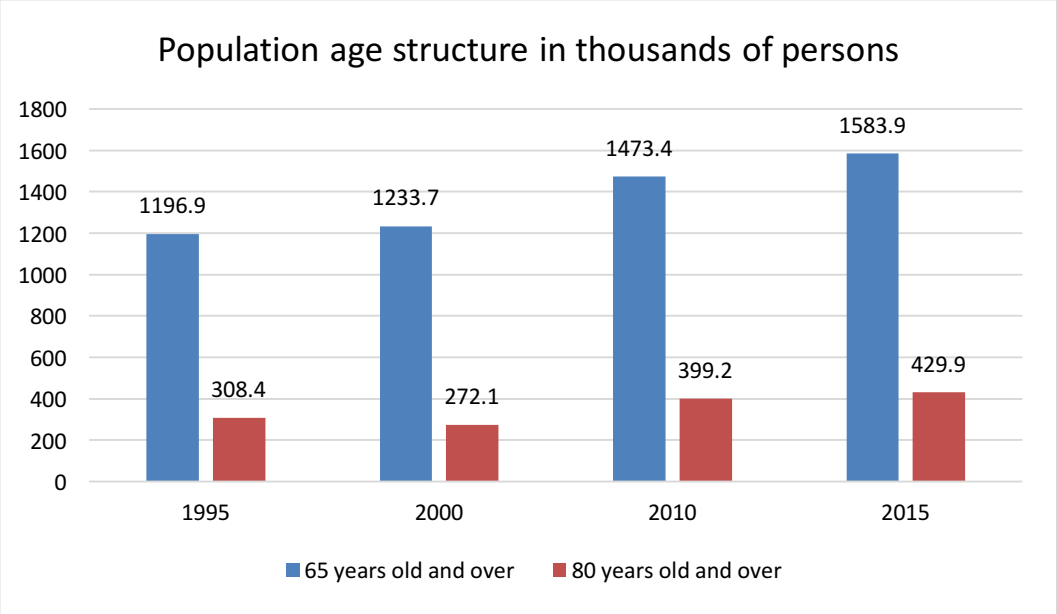


Figure 8: Population age structure in Austria in the years 1995, 2000, 2010 and 2015 [26].

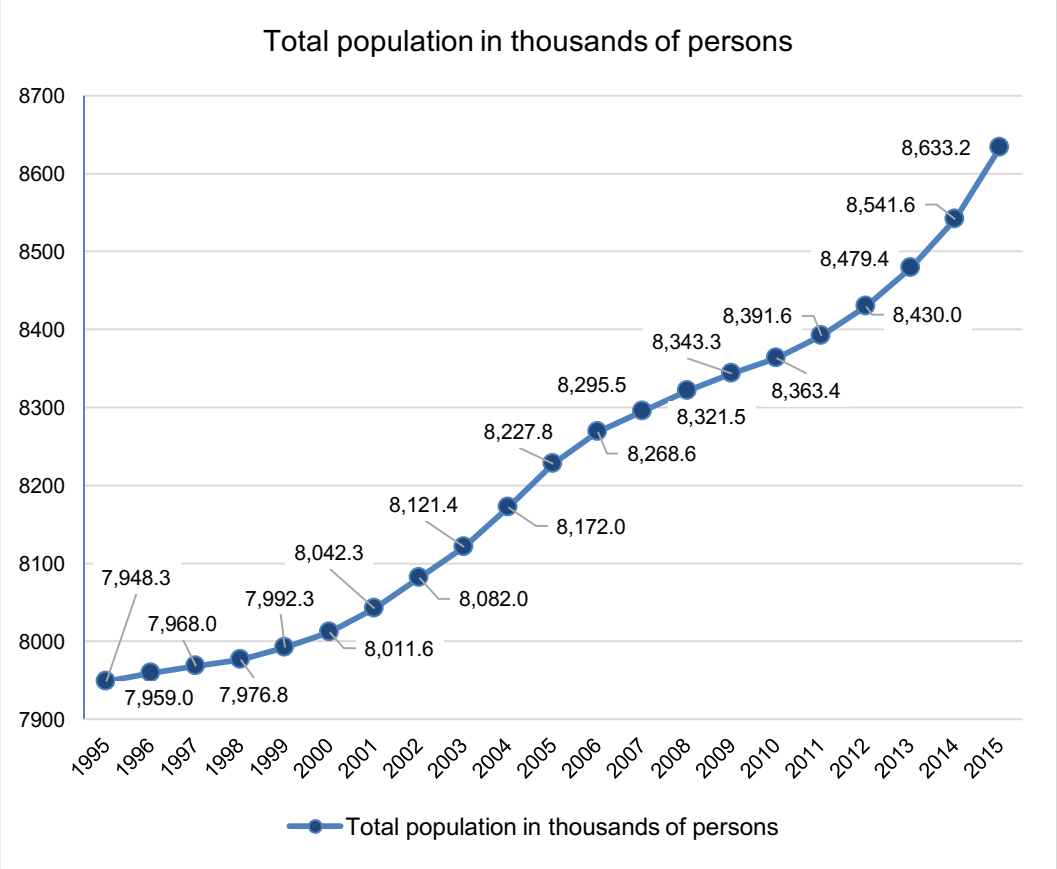


Figure 9: Total population of Austria between 1995 and 2015 [26].

Chronic diseases

As a result of the ageing population and higher life expectancy chronic diseases are a challenge to the Austrian healthcare system. In a 2014 survey 36% of Austrians questioned aged 15 years and older stated to have had at least one chronic disease [22]. Following the incidence of diabetes mellitus and cardiovascular diseases in Austria is described more detailed, for the reason that these areas were identified as the top two areas having potential for the implementation in the Austrian regular care system, as further described in chapter 2.3 [13].

Within a 2013 diabetes report, the Austrian Ministry of Health estimated the number of Austrian people to be affected by **diabetes mellitus** as being approximately 573,000 to 645,000. That is about eight to nine percent of the population, of which only about 6 percent have been diagnosed, while the rest remain undiagnosed. In 2011 diabetes was diagnosed as the reason for mortality in 2,900 deaths; the diabetes mortality rate is the highest in the states of Lower Austria and Burgenland. Diabetes mellitus is one of the most common reasons

for contacting a general practitioner for patients older than 65 and ranks second place among chronic diseases for patients contacting medical care [23].

According to an Austrian diagnosis and treatment documentation from 2014, 437,000 patients were diagnosed with **cardiovascular diseases**; mostly diagnosed were the following cardiovascular diseases: hypertension, ischemic heart disease, cardiac arrhythmia, congestive heart failure, cerebrovascular diseases and diseases of the arteries, arterioles and capillaries [24]. In 2011 cardiovascular diseases were diagnosed as the reason for mortality in about 32,000 deaths, the cardiovascular disease mortality is the highest in the states of Lower Austria and Burgenland [24].

### 2.2.2 Healthcare costs

As populations age and life expectancy increases significantly, figure 10 describes the resulting increased health expenditure share of the GPD. In Austria while the health expenditure share was 8.95 percent in 1995, it increased to 10.32 percent in 2015 in Austria [24].

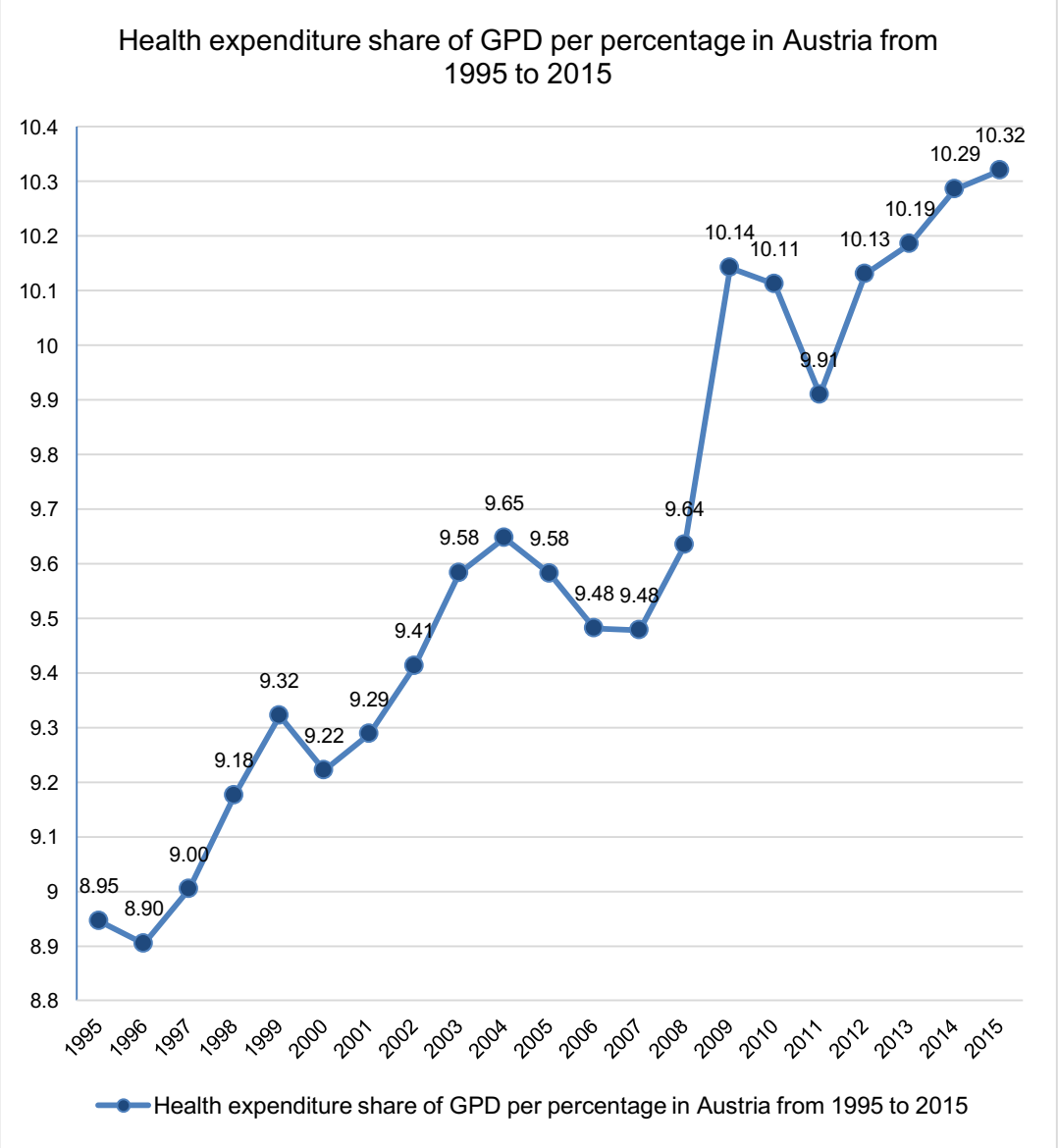


Figure 10: The health expenditure share of GPD in Austria increased from 8.95 percent to 10.32 by 2015 [24].

### 2.2.3 Basic healthcare

An international comparison shows a too high frequency of hospital visits and a limitless access to hospital outpatient services in Austria; that is too many patients are opting to use the hospital services instead of making an appointment and going to the doctor. This indicates that the Austrian basic healthcare system needs strengthening in order to meet current trends and future challenges [25].

## 2 Theoretical Background

*Density of practitioners*

In 2015, a headcount of 1.65 general practitioners per 1,000 people in Austria was observed. Although the overall number of general practitioners has increased from 10,032 in 1995 to 14,275 by 2015, the percentage of general practitioners among physicians has continuously decreased since 1997, as figure 11 demonstrates. These numbers indicate that working as a general practitioner has lost its appeal [26], even though there is a great need for general practitioners. In a 2014 survey 76.2% of Austrians stated to have seen a general practitioner within the last twelve months [27]. In Lower Austria, 79.4%, the highest percentage among all nine states, stated to have seen a general practitioner within the last twelve months [27].

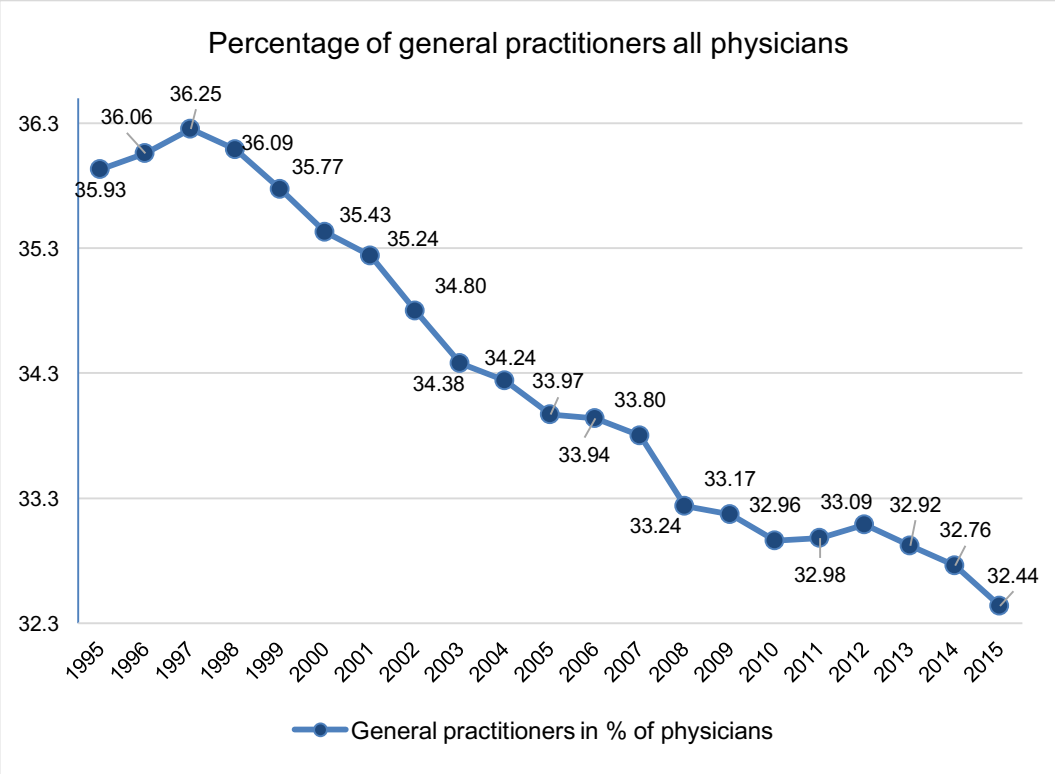


Figure 11: The percentage of general practitioners among physicians in Austria has continuously decreased to 32.44 percent by 2015 [26].

*Average Age of physicians*

Looking at the average age of physicians in Austria a clear increase is found. As demonstrated in figure 12, the percentages of total physicians who are in the older age groups of 65 to 74 years and 55 to 64 years have steadily increased from 2000 to 2015; age group 55 to 64 years being the highest to increase of all groups. By 2015, 540 physicians in Austria were 75 years old and older [26].

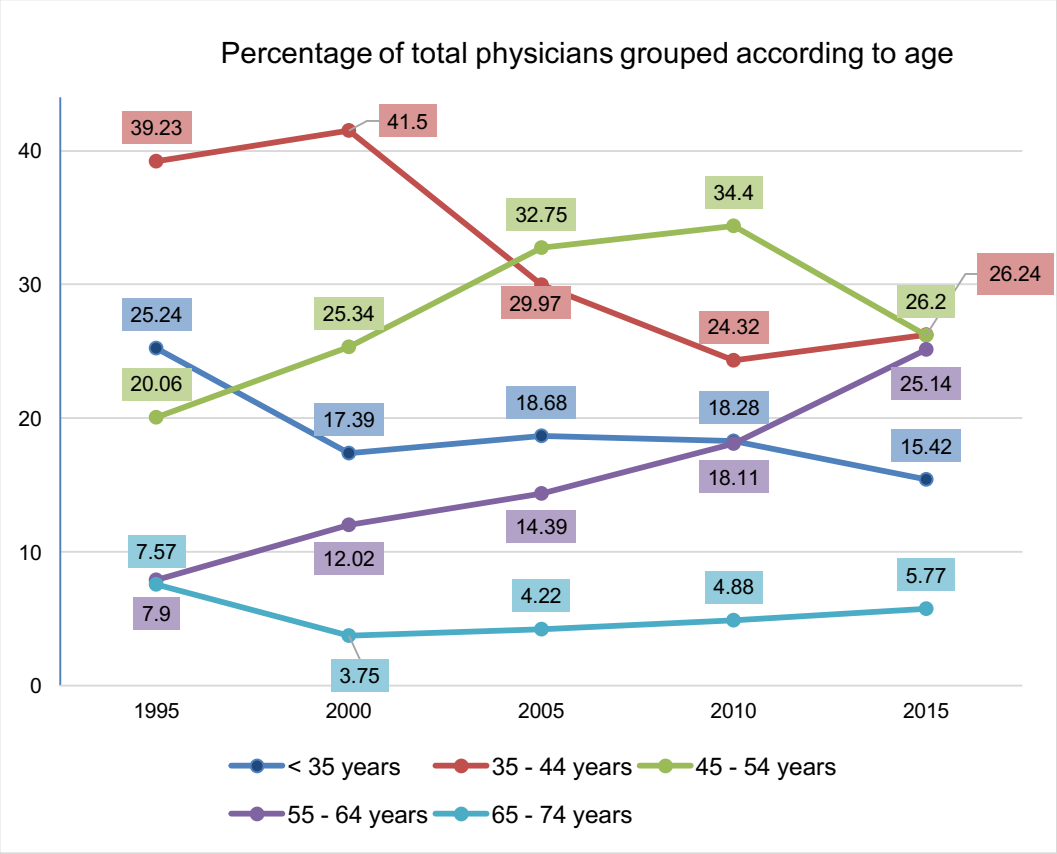


Figure 12: Percentage of total physicians in the age groups under 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years and 65 - 74 years in Austria from 1995 to 2015 [26].

A similar trend can be observed among general practitioners in Austria. As figure 13 illustrates the majority of general practitioners are in the age group of 50 years and older. In 2015 there were 1,205 general practitioners who were 70 years of age and older practicing in Austria. The situation in Lower Austria offers a very described in figure 14 [30].

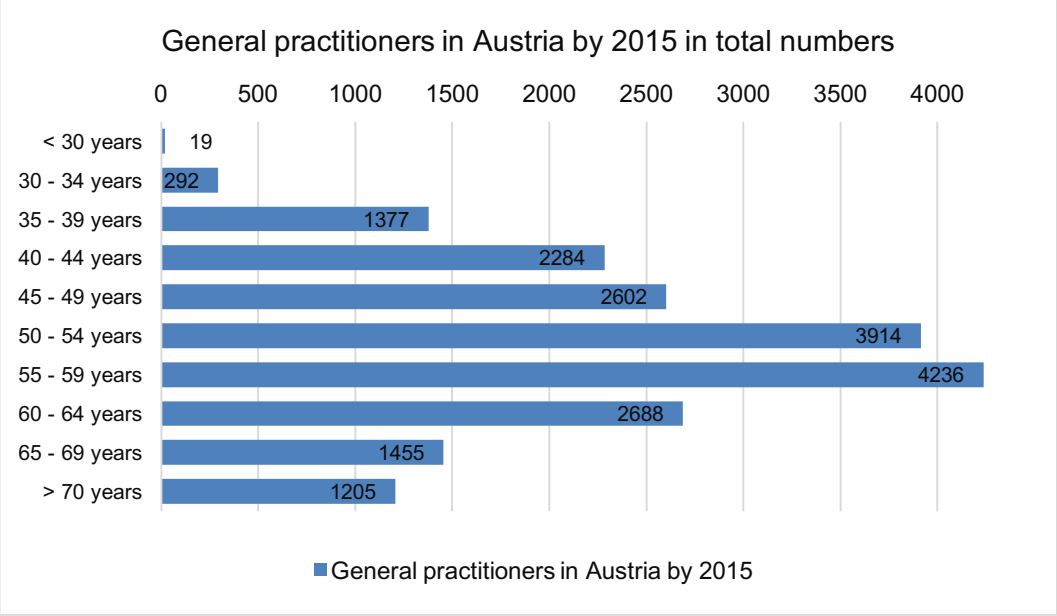


Figure 13: Absolut number of general practitioners by age groups in Austria by 2015 [30].

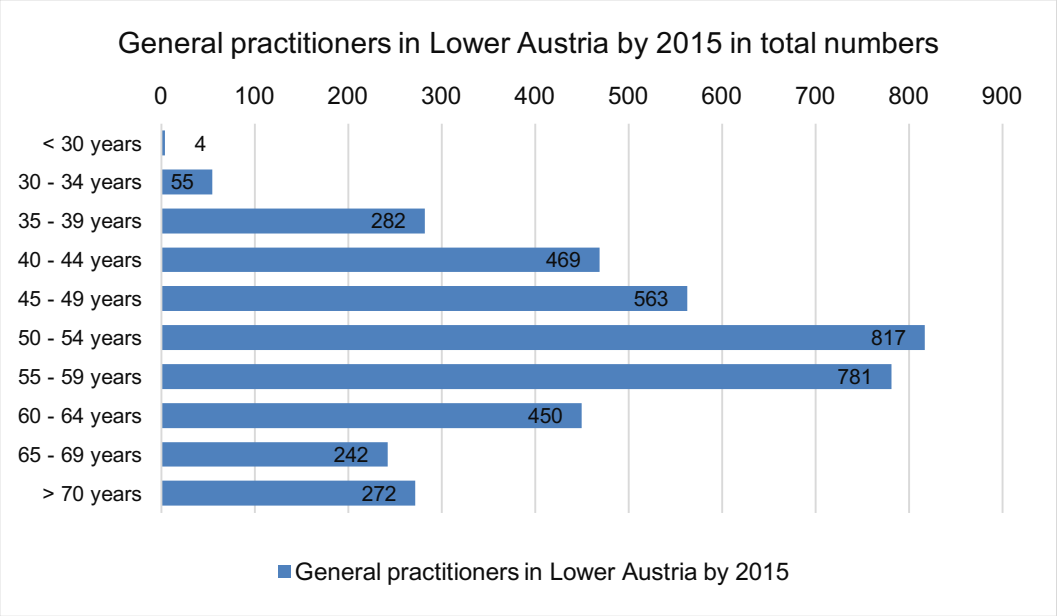


Figure 14: Absolut number of general practitioners by age groups in Lower Austria by 2015 [30].

*Higher rates of female physicians*

In 1995 33.34% of physicians were female, so 9,310 female physicians were practicing in Austria by then. As of 2015, 46.55% of physicians practicing in Austria were female, equivalent to 20,462 female physicians [26].

## 2.3 Telemedicine in Austria

The current challenges, described in chapter 2.2, are also being recognized by different organizations within the Austrian healthcare system. An adaptation of the Austrian healthcare system to current and even more future trends, such as the increase of chronic and long-term diseases, the continuous technical innovations, the demographic changes, and an unbalanced work-life balance of health professions, is necessary [25].

The **"Bundes-Zielsteuerungskommission"**, a nationwide target control commission for the healthcare sector, concluded a concept for multi-professional and interdisciplinary basic healthcare in Austria (2014). The main aims of this concept are to maintain the high degree of satisfaction concerning the healthcare system among the Austrian population in the future, and in addition to raise the attractiveness of basic healthcare for physicians and other healthcare professionals [25].

The **"Telegesundheitsdienste-Komission"** (following TGDK) is an advisory board which supports the Austrian Federal Ministry of Health in each steps of the implementation and use of telemedical applications in Austria. In 2014, the commission concluded and presented their recommendations for the implementation of telemedical applications in Austria [17], [31]. The implementation of telemedical applications were mainly in two areas of chronic disease:

- Cardiovascular diseases (congestive heart failure, implant aftercare in cardiology)
- diabetes

Concrete projects for the different indications have been identified to have the highest potential for implementation in regular medical care in Austria [13].

For the indication **congestive heart failure** TMScardio, a telemonitoring System for congestive heart failure, was highlighted to have a high potential for the implementation in Austria's regular care [13].

For **implant aftercare in cardiology** five projects were highlighted to have great potential [13]:

- CareLinkTM Service
- Home MonitoringTM Service
- Merlin.netTM Service
- LatitudeTM Service

- SmartviewTM Service

For indication **diabetes mellitus** the following three projects have been highlighted [13]:

- „Gesundheitsdialog Diabetes mellitus“ - a feasibility study done by the Austrian insurance industry for railroad and mining. The technology used in this project was DiabMemory, a diabetes telemonitoring System developed by the AIT Austrian Institute of Technology GmbH.
- „Renewing Health – REgioNs of Europe WorkINg toGether for HEALTH“ - a project co-financed by the European Union at the LKH Klagenfurt, LKH Laas and LKH Villach.
- “Disease Management Programm (DMP) Therapie Aktiv – Diabetes im Griff” – a program developed by the Styrian “Gebietskrankenkasse” (regional health insurance provider).

The TGDK also states that for the implementation of the named telemonitoring applications, technology platforms in form of information and communication tools for patients as well as for healthcare providers, must be created. As figure 15 demonstrates, the TGDK highlights the importance of the interoperability of these platforms with ELGA (electronic health record), especially with its key components regarding identification and the HL7 CDA/IHE standardization. Ideally the TGDK recommends one modular telemedicine platform for the support of all chronic diseases, which can be expanded to support more diseases over time [13].

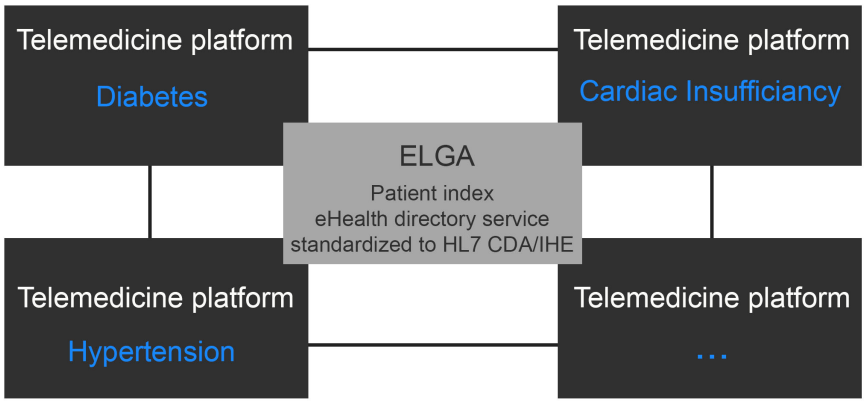


Figure 15: Telemedicine platforms must be interoperable with ELGA, especially with its key components regarding identification (patient index and eHealth directory service) and the HL7 CDA/IHE standardization [13].

Well-structured technical as well as medical training for patients and healthcare providers is a crucial success factor of telemedical solutions and thus a substantial component of a Disease Management program (DMP). Therefore the commission recommends the development of a DMP 2.0, using the group training concept from “DMP – Therapie Aktiv”, but as distinct from DMP also integrating telemedical care [13].

Progress within the area of **teleconsultation in Austria** has been made with **“TEWEB 1450”**. “TEWEB 1450” is a project for the conception and implementation of a web- and telephone-based service for first contact and consultation. The implementation of this for Austria’s new service will take place in Vienna, Lower Austria, and Vorarlberg as pilot states. “TEWEB 1450” will be carried out by the Austrian federation, the pilot states and the main association of the national insurances. In December 2016, medical experts from different areas started to implement the expert system to adjust to the local Austrian needs [32], in April 2017 “TEWEB 1450” went live and should now be tested in the pilot states until December 2018 [33].

#### *2.3.1.1 Actual use of telemedical applications in Austria*

A 2013 study regarding the use and availability of e-Health in hospitals showed that on a European level Austria ranks the center at 12 on a scale from 1 to 30 reflected countries (EU plus Iceland and Norway) [34]. In the extramural sector the implementation of telemedicine was not as far advanced in Europe by 2013. A study showed very little availability and very little use in the EU countries. Altogether 31 countries were evaluated within the same study, Austria ended up on rank 21, indicating that telemedicine is being adopted more slowly in Austria on a European level [33].

The in table 2 listed aftercare and monitoring systems were being used in the field cardiology in Austria by the year 2013. Table 2 contains the number of patients treated by these systems by 2013 as well as the number of general practitioners and hospital outpatient services which offered the systems. In total about 3,000 patients received aftercare and monitoring by telemedical systems in 2013 [35].

| | Patients | General practitioners | Outpatient-departments |
|---|---|---|---|
| **Biotronik – Home-Monitoring ®** | 1,626 | 2 | 52 |
| **Medtronic – CareLink ®** | 895 | 4 | 25 |
| **Boston Scientific – Latitude ®** | 280 | 2 | 10 |
| **St.Jude Medical – Merlin.net TM** | 150 | 0 | 13 |

Table 2: Aftercare and monitoring systems used in the field of cardiology in Austria by 2013 [36].

## 2.4 Technology Acceptance

In order to evaluate the acceptance of telemedical services in the rural areas of Lower Austria the measuring of acceptance and especially technological acceptance needed to be investigated. Therefore, within this chapter several theoretical models for explaining and assessing end users' acceptance behavior towards information and communication technology were examined. The most popular models which have been verified in numerous scientific papers were identified and used as a fundamental basis for the development of the questionnaire. The first model used is the Technology Acceptance Model (TAM), developed in 1985 by Davis [37].

### 2.4.1 Technology Acceptance Model (TAM)

In 1985 Fred D. Davis Jr. submitted his dissertation „A Technology Acceptance Model for Empirically Testing New End-User Information Systems" to the M.I.T. Sloan School of Management. Within this dissertation he developed the first version of TAM in order to discover the variables that are needed to predict, explain, and presumably control end-users' acceptance of technologies [37].

As graphically depicted in figure 16, three variables were identified and used in the first version of TAM: *Perceived Usefulness*, *Perceived Ease of Use* and *Attitude*. According to Davis, attitude, as well as perceived usefulness directly affect users' behavioral intention to use a technology, and have been identified as the most reliable predictors for the actual use of a technology. Attitude itself has two determinants, *Perceived Usefulness* and *Perceived Ease of Use*, second of which is also a determinant for *Perceived Usefulness* [37].

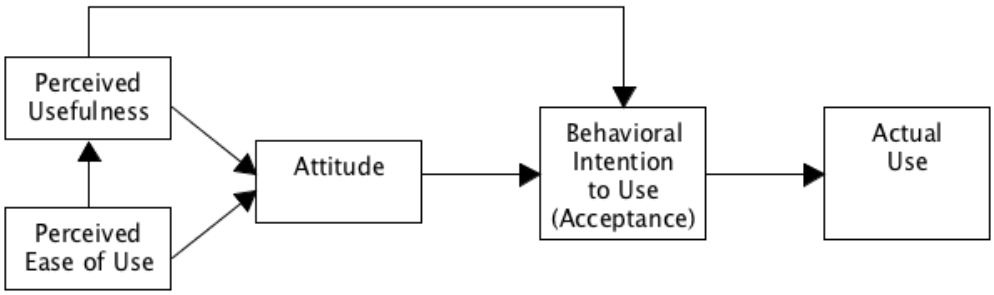


Figure 16: The first TAM model as described by Davis [37].

Throughout the years, TAM has undergone several changes, adaptions and the development of numerous extensions have been developed. TAM is clearly one of the most popular models in the research field of technology acceptance and the basis for numerous developments, including the following two described technology acceptance models [38], [39].

### 2.4.2 Technology Acceptance Model 2 (TAM2)

As previously mentioned, before TAM has undergone some changes over the years. The Technology Acceptance Model 2, as indicated by its name, is an update of the original TAM, published by Venkatesh and Davis in 2000 [40].

Demonstrated in figure 17, within TAM2 *Attitude* was removed as a component of the model. Additionally, the impact of three interrelated social forces, namely *Subjective Norm*, *Voluntariness* and *Image*, were brought into the model. *Subjective Norm* was added as a variable to capture the social influence which drives users to more readily accept telecommunication technologies. TAM2 also describes three more cognitive determinants than the original TAM. In addition to *Perceived Ease of Use*, the cognitive determinants *Job Relevance*, *Output Quality* and *Result Demonstrability* were also brought into the model. Furthermore, the theory of Hartwick and Barki was taken into consideration; that is the direct effect of *Subjective Norm* on end-users' intentions may be reduced over time with increased *System Experience* [40].

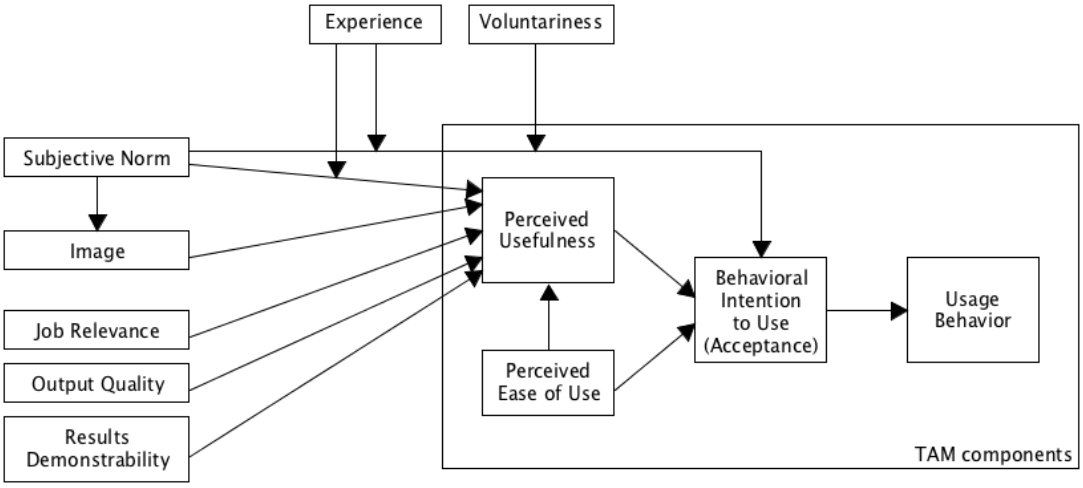


Figure 17: TAM 2 as proposed by Venkatesh and Davis [40].

### 2.4.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

In 2003, Venkatesh et al. reviewed user acceptance literature to compare eight different prominent models and extensions of models in order to develop a unified model which integrates components out of all eight models. Figure 18 demonstrates the proposed UTAUT model. This model describes four constructs to be significant determinants for *Behavioral Intention* and *Usage Behavior*: *Performance Expectancy*, *Effort Expectancy*, *Social Influence* and *Facilitating Conditions*. The model also includes *Gender*, *Age*, *Experience* and *the Voluntariness of Use* as factors influencing the direct effect of the determinants on the behavioral intention to use an information technology system [41].

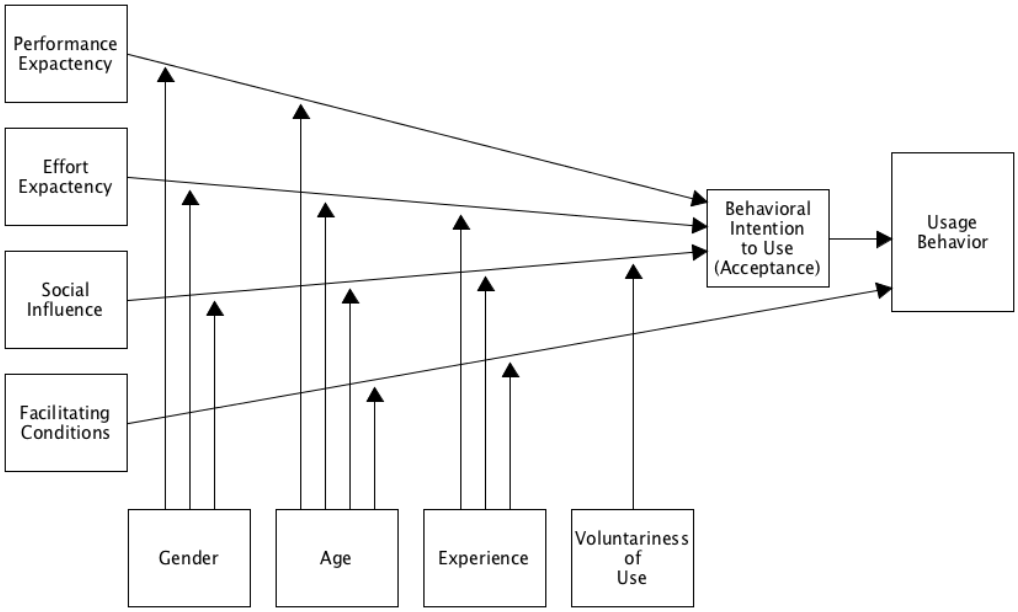


Figure 18: UTAUT as proposed by Venkatesh et al. [41].

In „User Acceptance of Information Technology: Toward a Unified View“ the UTAUT model was not only developed, but was also empirically validated to be successful. In empirical tests it outperformed all of the eight models which have been reviewed and partially brought into the new model [41].

As a result of the fact that UTAUT has increasingly become a very popular model, more testing and validation has been done by other researchers. Oshlyansky et al. validated the UTAUT model cross-culturally by testing it in nine culturally-diverse countries. Therefore, the model was translated into six languages: Czech, Arabic (Saudi Arabian), Dutch, Greek, Malay and French. The results showed that UTAUT is a tool robust enough to withstand translation and therefore to be used cross-culturally [42]. Göğüş et al. validated UTAUT to be functional for the Turkish language [43] and also applications of UTAUT translated into German language were found [44].

*UTAUT in healthcare*

The UTAUT model has proven to be a reliable survey instrument for specific applications within the healthcare sector. Since its introduction by Venkatesh et al. numerous studies, done all over the world, have used UTAUT to evaluate the acceptance of information technology in the healthcare sector proving its popularity in this specific sector [45]–[47]. Vanneste et al., for example, tested and used it to evaluate a web-based system enabling person-centered recording and data sharing across healthcare settings with interRAI instruments called

BelRAI, in Belgium [46]. Seok et al. used a modified UTAUT to evaluate healthcare professionals' acceptance of a mobile electronic medical record after a seven month period of use in South Korea [45]. UTAUT has also been used to determine information technology acceptance in the healthcare sector in rural areas. Phichitchaisopa and Naenna for example applied and tested the UTAUT model to examine the factors influencing the acceptance of information technology in rural areas in Thailand [47].

These have only been a few examples, numerous more applications of UTAUT in the healthcare sector as in a broad range of other sectors can be found in literature. It can be concluded that UTAUT is not only a reliable method for the evaluation of users' technology acceptance in the health sector, but a popular, well tested one [45]–[47].

# 3 Methodology

## 3.1 Research Model

For this research, a quantitative approach was chosen. A questionnaire based on existing technology acceptance models was developed and sent out to physicians within the target group. Following in this chapter the questionnaire inventory and survey methodology are described.

## 3.2 Questionnaire Inventory

The questionnaire was built upon the reviewed technology acceptance models which were discussed in chapter 2.4. The UTAUT model influenced the questionnaire considerably. The basic structure of UTAUT, as described in figure 18, was implemented, but the actual items were changed to better fit the purpose and context of this research. All items used are described in chapter 3.2.3.

### 3.2.1 Questionnaire structure

The questionnaire focuses on two applications, which are telemonitoring and teleconsultation. As described in chapter 2.3, the “Telegesundheitsdienste-Komission”, a commission for telemedical applications in Austria, evaluated application areas of the telemedicine field and formulated a prioritization for future telemedical applications to be used in Austria. Within this prioritization a decision was made to recommend the use of telemonitoring in the field of diabetes and cardiovascular diseases [13].

For both application fields the same sets of items have been used, although some items within the sets differ for telemonitoring according to the topic specific needs for evaluating the same significance.

### 3.2.2 Rating scale

The majority of items were rated on a Likert-type scale, with the exception being the item *Experience*, which had checkboxes to select from. In addition, the participants were given the opportunity to write in item suggestions, which were also rated on the Likert-type scale.

The Likert-type scale which was used is a rating scale from one to five, i.e. “very much” to “not at all”. The scale which was written in the original German language as well as an English translation, are described in the following table 3.

| Scale | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **English translation** | Not at all true | Not really true | Partially true | Somewhat true | Very much true |
| **German original** | Trifft nicht zu | Trifft eher nicht zu | Teils-teils | Trifft eher zu | Trifft zu |

Table 3: The Likert-type scale as used in the original German language & English translation.

### 3.2.3 Items used in questionnaire

Most sets were taken from the UTAUT model. The items classified into these sets were changed for the purpose of this study to evaluate the acceptance of telemonitoring and teleconsultation applications. As demonstrated in figure 19, the sets taken from the UTAUT model are *Performance Expectancy (PE)*, *Effort Expectancy (EE)*, *Social Influence (SI)*, *Behavioral Intention (BI)* and *Facilitating Conditions (FC)* as direct determinants. Also taken in from the UTAUT model were *Gender, Age,* and *Experience* as influencers of with direct effect on *Behavioral Intention* and *Usage Behavior*. As in UTAUT, *Gender, Age* and *Experience* were collected as demographic data. *Experience* was additionally tested for one item (table 14 and table 15).

In contrast to UTAUT, *Behavioral Intention (BI)* was reduced to one question. This decision was made due to the fact that no specific technology was tested during this research considering the broad field of applications telemedicine includes, so therefore asking about the intention to use in such detail would not have been relevant. In addition, the *Voluntariness of Use* was not taken into consideration because at this point in time in the rural areas of Austria the use of telemedical applications concerning this research is 100% voluntary. Furthermore, the UTAUT format was extended by one item regarding possible *Motivators (MOT)* for the use of telemedical applications on the part of physicians in order to evaluate H4.

## 3 Methodology

All items were used in the German language. An English translation of all items is stated below for international accountability of this research only.

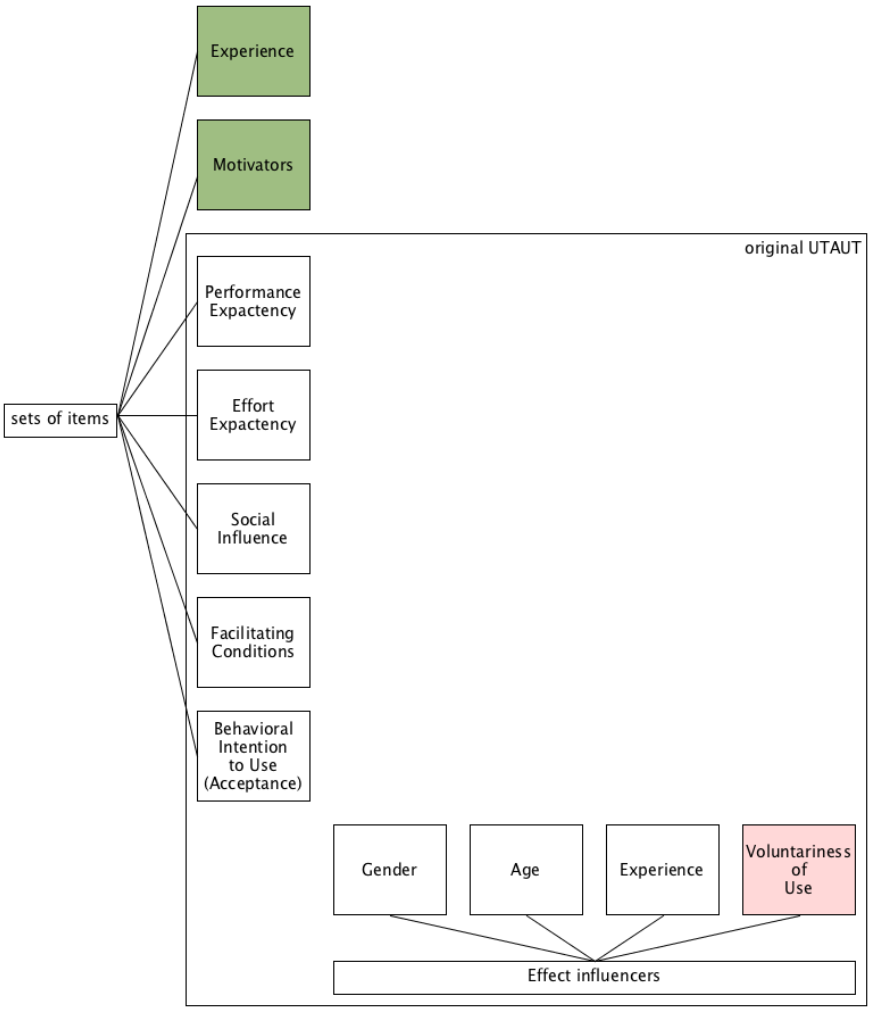


Figure 19: The adjusted version of UTAUT used in this study.

*Performance Expectancy (PE)*

To evaluate *Performance Expectancy,* three items were used for telemonitoring, while two items were used for teleconsultation. The reason for this was that telemonitoring for this item was divided into disease management and disease prevention in order to get a more detailed picture of whether physicians would accept one of these areas better than the other. Every area was rated on a Likert-type scale.

Table 4 contains the original items used in the German language, while the English translation can be seen in table 5.

| Performance Expectancy (PE) | |
|---|---|
| **Telemonitoring** | |
| PE1 | Telemonitoring könnte in meinem Arbeitsalltag ein nützliches Mittel zur Betreuung meiner Patienten/ Patientinnen im Bereich Disease Management sein…<br>… bei Diabetes mellitus<br>… bei Herzinsuffizienz<br>… bei Asthma<br>… bei COPD<br>… bei KHK<br>… bei Depression<br>… Sonstiges (bitte spezifizieren Sie): |
| PE1a | Telemonitoring könnte in meinem Arbeitsalltag ein nützliches Mittel zur Betreuung meiner Patienten / Patientinnen im Bereich Prävention sein…<br>… bei Diabetes mellitus<br>… bei Herzinsuffizienz<br>… bei Asthma<br>… bei COPD<br>… bei KHK<br>… bei Depression<br>… Sonstiges (bitte spezifizieren Sie): |
| PE2 | Ich denke, die Verwendung von Telemonitoring-Systemen könnte meine Produktivität in der Betreuung meiner Patienten / Patientinnen steigern. |
| **Teleconsultation** | |
| PE1 | Das Mittel der Telekonsultation könnte in meinem Beruf eine nützliche Ergänzung zu persönlichen Terminen sein…<br>… für telemedizinische Beratung in der Akutsituation<br>… für die telemedizinische Triage<br>… für die Bereitstellung von allgemeinen medizinischen Informationen<br>… für reisemedizinische Beratung<br>… für Beratung zu Medikamenten inklusive Interaktions-Check<br>… zur Gabe von Empfehlungen für die Selbstbehandlung<br>… zur Unterstützung von Patienten / Patientinnen bei der Suche und Empfehlungen zur geeigneten medizinischen Institution<br>… für das Führen von Patienten / Patientinnen in die nächsten Behandlungsschritte<br>… Sonstiges (bitte spezifizieren Sie): |
| PE2 | Die Verwendung von Telekonsultation-Systemen könnte meine Produktivität in der Betreuung meiner Patienten / Patientinnen steigern |

Table 4: Items used to evaluate *Performance Expectancy* in the original German language.

| Performance Expectancy (PE) | |
|---|---|
| **Telemonitoring** | |
| PE1 | Telemonitoring could be a useful disease management tool for the care and treatment of my patients…<br>… with diabetes mellitus<br>… with congestive heart failure<br>… with asthma<br>… with COPD<br>… with CHD<br>… with depression<br>… other (please specify): |
| PE1a | Telemonitoring could be a useful tool in disease prevention for the care and treatment of my patients…<br>… with diabetes mellitus<br>… with congestive heart failure<br>… with asthma<br>… with COPD<br>… with CHD<br>… with depression<br>… other (please specify): |
| PE2 | I think, the use of telemonitoring systems could aid in increasing the productive care and treatment of my patients. |
| **Teleconsultation** | |
| PE1 | Teleconsultation as a tool could be a useful supplement to in-person appointments in my job…<br>… for telemedical counseling in acute situations<br>… for telemedical triage<br>… for providing general medical information<br>… for travel-medical counseling<br>… for advice on medication including interaction check<br>… to provide recommendations for self-treatment<br>… to provide help in finding suitable medical institutions for treatment<br>… for guiding patients into the next steps of treatment<br>… other (please specify): |
| PE2 | I think, the use of teleconsultation could aid in increasing the productive care and treatment of my patients. |

Table 5: Item used to evaluate *Performance Expectancy* translated from the original German language into English.

*Effort Expectancy (EE)*

To evaluate *Effort Expectancy,* two items were used per category. As shown in table 6 (German) and table 7 (English) in this category telemonitoring and teleconsultation slightly differ, i.e., teleconsultation is broken down into various communication technologies, in order to determine whether a specific communication technology makes a difference in physicians' acceptance.

| **Effort Expectancy (EE)** |
|---|
| **Telemonitoring** |
| EE1 Ich denke, die Bedienung eines Telemonitoring-Systems (beispielsweise Einsicht in ein digitales Diabetestagebuch und Kontrolle der darin übermittelten Daten) wäre leicht zu lernen für mich. |
| EE2 Ich bin der Meinung, dass die Verwendung von einem Telemonitoring-System (beispielsweise Einsicht in ein digitales Diabetestagebuch und Kontrolle der darin übermittelten Daten) nicht mit übermäßigem zusätzlichem Aufwand verbunden wäre. |
| **Teleconsultation** |
| EE1 Ich denke, die Bedienung eines Telekonsultation-Systems wäre leicht für mich zu lernen, bei Konsultation über folgende mediale Anwendungen (in der Annahme eingehaltener Datenschutzrichtlinien)<br>… Telefonat<br>… Videokonferenz<br>… Webportal (Bsp.: webbasierter Austausch von Nachrichten)<br>… App (Bsp.: Nachrichtenaustausch mittels Smartphone App) |
| EE2 Ich denke, die Bedienung von einem System für Telekonsultation wäre mit geringem zusätzlichen Aufwand umzusetzen, bei Konsultation über folgende mediale Anwendungen… (in der Annahme eingehaltener Datenschutzrichtlinien)<br>… Telefonat<br>… Videokonferenz<br>… Webportal (Bsp.: webbasierter Austausch von Nachrichten)<br>… App (Bsp.: Nachrichtenaustausch mittels Smartphone App) |

Table 6: Items used to evaluate *Effort Expectancy* in the original German language.

| Effort Expectancy (EE) |
|---|
| **Telemonitoring** |
| EE1 I think, that I could easily learn the operation of a telemonitoring system (for example to monitor the data submitted from patients within a digital diabetes diary) easily. |
| EE2 I think, the use of a telemonitoring system would not involve excessive additional effort (for example to monitor the data submitted from patients within a digital diabetes diary). |
| **Teleconsultation** |
| EE1 I think the operation of a teleconsultation system would be easy for me to learn when consulting using the following media applications (assuming compliance with privacy guidelines)<br>… telephone calls<br>… video conferences<br>… web portal (for example web based message exchange)<br>… app (message exchange via smartphone app) |
| EE2 I think, the use of a teleconsultation system would not involve excessive additional effort, when the consultation was made via (assuming the data protection is not an issue)<br>… telephone calls<br>… video conferences<br>… web portal (for example web based message exchange)<br>… app (message exchange via smartphone app) |

Table 7: Items used to evaluate *Effort Expectancy* translated from the original German language into English.

*Social Influence (SI)*

For the evaluation of *Social Influence*, the same items, only differing in the given application example, have been used. Table 8 includes the items used in their original German language, while table 9 includes the items translated into the English language.

| Social Influence (SI) | |
|---|---|
| **Telemonitoring** | |
| SI1 | Die meisten meiner Patienten / Patientinnen würden es begrüßen, wenn ich Telemonitoring (beispielsweise zur Kontrolle von regelmäßig zu überprüfenden Vitalwerten) anbiete. |
| SI2 | Andere Gesundheitsexperten und ExpertInnen würden es begrüßen, wenn ich Telemonitoring (beispielsweise zur Kontrolle von regelmäßig zu überprüfenden Vitalwerten von chronisch kranken Patienten / Patientinnen) anbiete. |
| **Teleconsultation** | |
| SI1 | Die meisten meiner Patienten / Patientinnen würden es begrüßen, wenn ich Telekonsultation (beispielsweise um allgemeine medizinische Informationen zu geben oder um bei der Suche der geeigneten medizinischen Institutionen bei speziellen Beschwerden zu unterstützen) anbiete. |
| SI2 | Andere Gesundheitsexperten und ExpertInnen würden es begrüßen, wenn ich Telekonsultation (beispielsweise um allgemeine medizinische Informationen zu geben oder um bei der Suche der geeigneten medizinischen Institutionen bei speziellen Beschwerden zu unterstützen) anbiete. |

Table 8: Items used to evaluate *Social Influence* in the original German language.

| Social Influence (SI) | |
|---|---|
| **Telemonitoring** | |
| SI1 | Most of my patients would welcome me offering telemonitoring (for example to monitor patients' vital signs regularly). |
| SI2 | Other health professionals would welcome, me offering telemonitoring (for example to monitor patients' vital signs regularly). |
| **Teleconsultation** | |
| SI1 | Most of my patients would welcome me offering teleconsultation (for example, to provide general medical information or to assist in the search for suitable medical institutions for specific complaints). |
| SI2 | Other health professionals would welcome, me offering teleconsultation (for example, to provide general medical information or to assist in the search for suitable medical institutions for specific complaints). |

Table 9: Items used to evaluate *Social Influence* translated from the original German language into English.

*Behavioral Intention (BI)*

As mentioned, this set was also in the original UTAUT. It was reduced to only one item. Table 10 contains the German version of the item used in the questionnaire, an English translation for in paper use only is shown in table 11.

| **Behavioral Intention (BI)** | |
|---|---|
| BI1 | Ich beabsichtige in den nächsten 5 Jahren telemedizinische Systeme für die Betreuung meiner Patienten / Patientinnen zu nutzen, in den Bereichen…<br>… Telemonitoring (beispielsweise Überwachung der Messwerte von Diabetes Patienten / Patientinnen mittels digitalem Diabetikertagebuch, Kontrolle der von Patienten / Patientinnen selbst erhobenen und übermittelten Vitalparameter bei Herzinsuffizienz)<br>… Telekonsultation (beispielsweise Beratung zu Medikamenteninteraktionen, Hilfe beim Finden geeigneter medizinischer Institutionen, Ausstellen von Überweisungen, etc.)<br>… Sonstige (bitte spezifizieren Sie) _____ |

Table 10: Items used to evaluate *Behavioral Intention* in the original German language.

| **Behavioral Intention (BI)** | |
|---|---|
| BI1 | Within the next 5 years I intend to use the following type(s) of telemedical applications to care for my patients …<br>… telemonitoring (for example to monitor diabetes patients via a digital diabetes diary or to monitor congestive heart failure patients' vital signs)<br>… teleconsultation (for example for advice on medication interactions, to provide help in finding suitable medical institutions for further treatment, issuing referral forms, etc.)<br>… Other (please specify): _____ |

Table 11: Items used to evaluate *Behavioral Intention* translated from the original German language into English.

*Facilitating Conditions (FC)*

The items in this set again slightly differ for **telemonitoring** and **teleconsultation**. The teleconsultation items are broken down into communication technologies in order to find out whether a specific communication technology makes a difference in physicians' acceptance. Table 12 shows the items used in the original German language, while the English translation of the items can be seen in table 13.

| **Facilitating Conditions (FC)** |
|---|
| **Telemonitoring** |
| FC1 Ich hätte die Ressourcen und Infrastruktur um Telemonitoring (beispielsweise mit einem digitalen Diabetestagebuch) anzubieten. |
| FC2 Die Nutzung von Telemonitoring-Systemen (beispielsweise zu Kontrolle von regelmäßig zu überprüfenden Vitalwerten von chronisch kranken Patienten / Patientinnen) wäre mit meiner derzeitigen Arbeitsweise kompatibel. |
| **Teleconsultation** |
| FC1 Ich denke, dass ich die Ressourcen und Infrastruktur hätte um Telekonsultation anzubieten in Form von<br>… Telefonaten<br>… Videokonferenz<br>… Webportal (Bsp.: webbasierter Austausch von Nachrichten)<br>… App (Bsp.: Nachrichtenaustausch mittels Smartphone App) |
| FC2 Meinen Patienten / Patientinnen die Nutzung von Telekonsultation anzubieten wäre mit meiner derzeitigen Arbeitsweise kompatibel in Form von<br>… Telefonaten<br>… Videokonferenz<br>… Webportal (Bsp.: webbasierter Austausch von Nachrichten)<br>… App (Bsp.: Nachrichtenaustausch mittels Smartphone App) |

Table 12: Original items used to evaluate *Facilitating Conditions* in the German language.

| Facilitating Conditions (FC) | |
|---|---|
| **Telemonitoring** | |
| FC1 | I would have the resources and infrastructure to offer telemonitoring (for example to monitor diabetes patients via a digital diabetes diary). |
| FC2 | The use of telemonitoring systems would be compatible with my working routine (for example to monitor vital signs of chronic disease patients). |
| **Teleconsultation** | |
| FC1 | I think, I would have the resources and infrastructure to offer telemonitoring in the form of<br>… telephone calls<br>… video conferences<br>… web portal (for example web based message exchange)<br>… app (message exchange via smartphone app) |
| FC2 | Offering my patients the use of teleconsultation systems would be compatible with my working routine in the form of<br>… telephone calls<br>… video conferences<br>… web portal (for example web based message exchange)<br>… app (message exchange via smartphone app) |

Table 13: Items used to evaluate *Facilitating Conditions* translated from the original German language into English.

*Experience (EXP)*

As mentioned, this set was not in the original UTAUT, but was added with one item to measure previous experience with such systems in more detail. This set is more of a general approach and therefore not categorized into telemonitoring and teleconsultation as the previous sets. In table 14 the items used in the original German language can be found, and an English translation is shown in table 15.

| **Experience (EXP)** | |
|---|---|
| EXP1 | Ich habe bereits telemedizinische Systeme für die Betreuung meiner Patienten / Patientinnen genutzt im Bereich:<br>☐ Telemonitoring (beispielsweise Überwachung der Messwerte von Diabetes Patienten / Patientinnen mittels digitalem Diabetikertagebuch, Kontrolle der von Patienten / Patientinnen selbst erhobenen und übermittelten Vitalparametern bei Herzinsuffizienz)<br>☐ Telekonsultation (beispielsweise Beratung zu Medikamenteninteraktionen, Hilfe beim Finden geeigneter medizinischer Institutionen, Ausstellen von Überweisungen, etc.)<br>☐ Sonstige (bitte spezifizieren Sie): _____<br>☐ Ich habe noch keine telemedizinischen Systeme für die Betreuung meiner Patienten verwendet. |

Table 14: Items used to evaluate *Experience* in the original German language.

| **Experience (EXP)** | |
|---|---|
| EXP1 | I have already used the following type(s) of telemedical systems for the treatment of my patients:<br>☐ Telemonitoring (for example to monitor diabetes patients via a digital diabetes diary, or to monitor congestive heart failure patients' vital signs)<br>☐ Teleconsultation (for example for advice on medication interactions, to provide help in finding suitable medical institutions for further treatment, issuing referral forms, etc.)<br>☐ Other (please specify): _____<br>☐ I haven't used any type of telemedical systems for the treatment of my patients. |

Table 15: Items used to evaluate *Experience* translated from the original German language into English.

*Motivators (MOT)*

The set *Motivators* with one item was added to the questionnaire to identify motivators for the use of telemedical applications on the part of physicians. Table 16 shows the items used in the original German language, and the English translation can be found in table 17.

| **Motivators (MOT)** | |
|---|---|
| MOT1 | Die folgenden Effekte würde ich bei Einführung von telemedizinischen Dienstleistungen wie z.B. Telemonitoring und Telekonsultation in meiner Praxis als Vorteil empfinden<br>… Weniger überfüllte Warteräume<br>… Regelmäßiger durchgeführte Kontrollen von chronisch kranken Patienten / Patientinnen<br>… Weniger durchzuführende Hausbesuche<br>… Kürzere Wartezeit für Patienten / Patientinnen im Wartezimmer<br>… Ersparnis einer weiten Anreise für Patienten / Patientinnen<br>… Ersparnis der Anreise für Patienten / Patientinnen mit eingeschränkter Mobilität<br>… Optimierung der Versorgungswege im ländlichen Raum<br>… Verbesserung der Lebensqualität von chronisch kranken Patienten / Patientinnen |

Table 16: Items used to evaluate *Motivators* in the original German language.

| **Motivators (MOT)** | |
|---|---|
| MOT1 | In my practice I would identify the following outcomes as advantages of the implementation of telemedical applications, i.e., telemonitoring and teleconsultation.<br>… less crowded waiting rooms<br>… more regularly performed checkups for chronic disease patients<br>… fewer house calls<br>… shorter waiting times for patients in the waiting room<br>… sparing patients long journeys to the doctor's office<br>… sparing patients with limited mobility journeys to the doctor's office<br>… optimization of treatment processes in rural areas<br>… improving the quality of life for chronic disease patients |

Table 17: Items used to evaluate *Motivators* translated from the original German language into English.

## 3.3 Survey methodology

An online survey was created using Unipark software [48]. To distribute the survey a link was sent out via email to only general practitioners working in doctor's practices in rural areas in the province of Lower Austria. The survey was carried out over a five-month period, beginning on May 28th, 2017 and ending on October 31st, 2017.

*Definition of rural*

There are various definitions for the term rural. For the purpose of this study the definition written by the OECD (Organization for Economic Co-operation and Development) is used [49]. This definition classifies areas as rural in two steps based on their population density. In the first step "local units" are classified as rural if the population is below 150 inhabitants per square kilometer. In the second step these areas are further broken down into the following categories [50]:

- Predominantly Urban (share of population living in rural local units < 15%)
- Intermediate (share of population living in rural local units 15% - 50%)
- Predominantly Rural (share of population living in rural local units > 50%)

In addition, the USDA, Economic Research Service, published an article about "Defining the "Rural" in Rural America". Within this article one of the outcomes for defining rural was, that the choice of definition for rural depends and should be based on the context / purpose of the activity [51].

Taking in this point into consideration for the purpose of this research rural was further defined on the terms of whether medical facilities exist in an area; only physicians in cities and towns in Lower Austria having no hospital were included in the definition of rural.

*Data analysis*

For all evaluation, n = 20. The calculations were done using SPSS data analysis tool (https://www.ibm.com/analytics/data-science/predictive-analytics/spss-statistical-software). The items which were not included in the sets were the items that were only supposed to give additional information (other, please specify), these items were not mandatory and therefore include more missing values than values and were therefore were dropped from the sets for the following calculations.

## 3 Methodology

*Descriptive statistics*

In table 18 and 19 the general survey statistics can be found. The survey was sent to about 150 practitioners fitting the target group. It was opened by 60 people, which of whom 25 people began to answer the survey, and among those 20 people actually completed the survey, i.e. about 13.33% completed the survey. On average 12 minutes and 49 seconds were needed to complete the survey.

| | **Started** | **Drop out** | **Completed** | **Completed with breaks** |
|---|---|---|---|---|
| **Persons** | 60 | 40 | 18 | 2 |
| **% (rounded)** | 100 | 66 | 30 | 3 |

Table 18: Field report completion statistics in absolute numbers and percentage.

| | **Median** | **Arithmetical mean** | **Max. duration** | **Min. duration** | **Page Nr. with most drop outs** |
|---|---|---|---|---|---|
| **Completion time** | 11.48 min | 12.49 min | 27.97 min | 5 min | 1 |

Table 19.: Field report: completion duration statistics.

# 4 Results

## 4.1 Measurement model evaluation

**Reliability** is reported as a quality criteria in order to assess the reflective measurement model. The reliability was calculated using Cronbach's alpha value of the sets. Cronbach's Alpha is based on the average correlation between all items of the set [52]. Ideally the reliability should contain a value above 0.8. According to Bortz & Döring a value of 0.9 and higher marks a high reliability [53]. Reliability values under 0.7 need a revision of the respective set [52]. All evaluated sets had reliability values higher than 0.7 (table 20).

| Set | Cronbach's alpha | Number of items |
|---|---|---|
| PE | 0.951 | 22 |
| EE | 0.780 | 10 |
| SI | 0.718 | 4 |
| FC | 0.782 | 10 |
| EXP | 0.683 | 3 |
| MOT | 0.932 | 7 |

Table 20: Cronbach's Alpha values of the sets.

**Correlation Analysis**

The results of a Pearson correlation analysis (table 21) show no significant correlation between *Social Influence* (SI), *Facilitating Conditions* (FC), *Effort Expectancy* (EE) and *Behavioral Intention* (BI). For a sample of the size n = 20 a correlation can be considered significant at the 0.01 level of significance when r (correlation) > 0.534 and at the 0.05 level of significance when r > 0.377 [54].

| | SI | FC | PE | EE | BI |
|---|---|---|---|---|---|
| SI | 1 | 0.613** | 0.709** | 0.223 | 0.206 |
| FC | | 1 | 0.305 | 0.581** | -0.106 |
| PE | | | 1 | 0.149 | 0.491* |
| EE | | | | 1 | -0.053 |
| BI | | | | | 1 |

Table 21: Pearson correlation between the measures scales.

**. Correlation is significant at the 0.01 level of significance.

*. Correlation is significant at the 0.05 level of significance.

## 4.2 Demographic data

This chapter contains all the demographic data of the participants: gender, age, number of years practicing, and additional fields of specialization (figures 20 – 24). Regarding gender, 80% of the participants were male. The largest age groups were 40 – 49 years of age and 50 – 59 years of age. In addition, no participant was under 30 and 15% were over 59 years of age. At the time of the evaluation 60% of participants had been practicing medicine for 20 years or more. Furthermore, 60% of the participating general practitioners had no additional field of specialization.

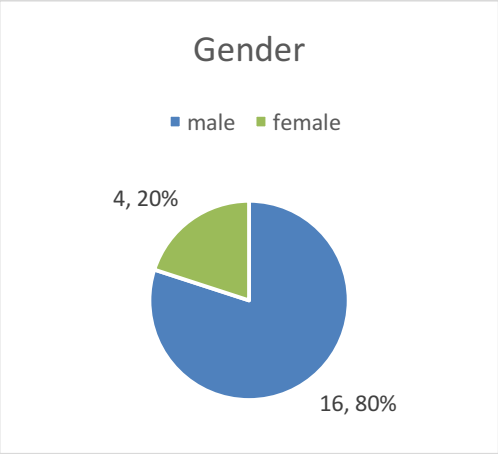


Figure 20: Participants' gender.

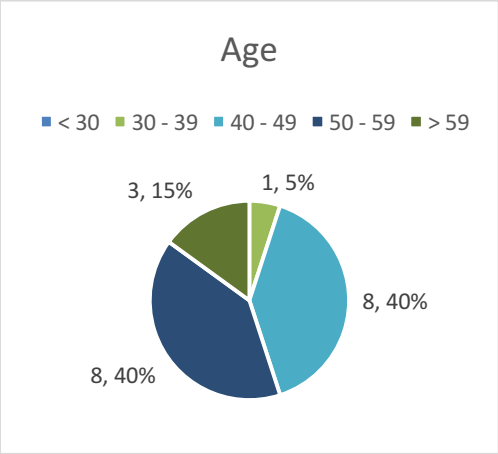


Figure 21: Participants' age.

## 4 Results

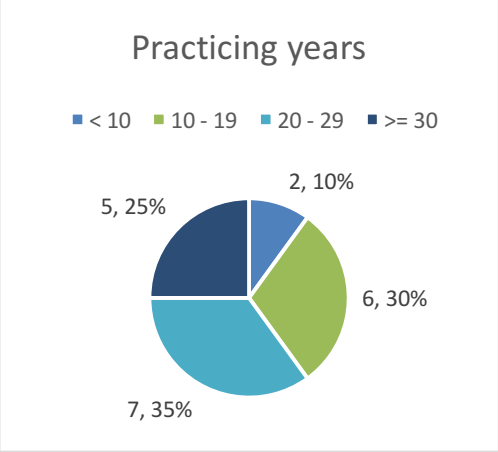


Figure 23: Participants' years of practicing.

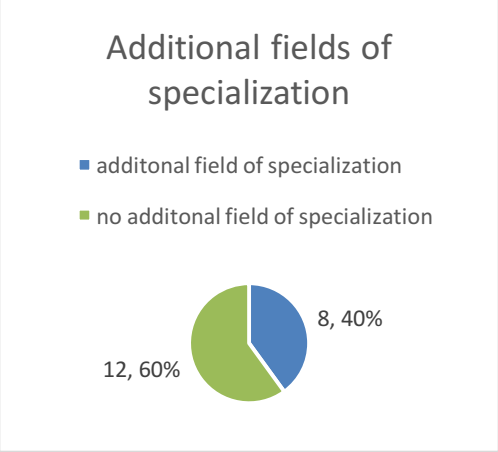


Figure 22: Participants' specialization: GP vs. GP plus additional field(s) of specialization

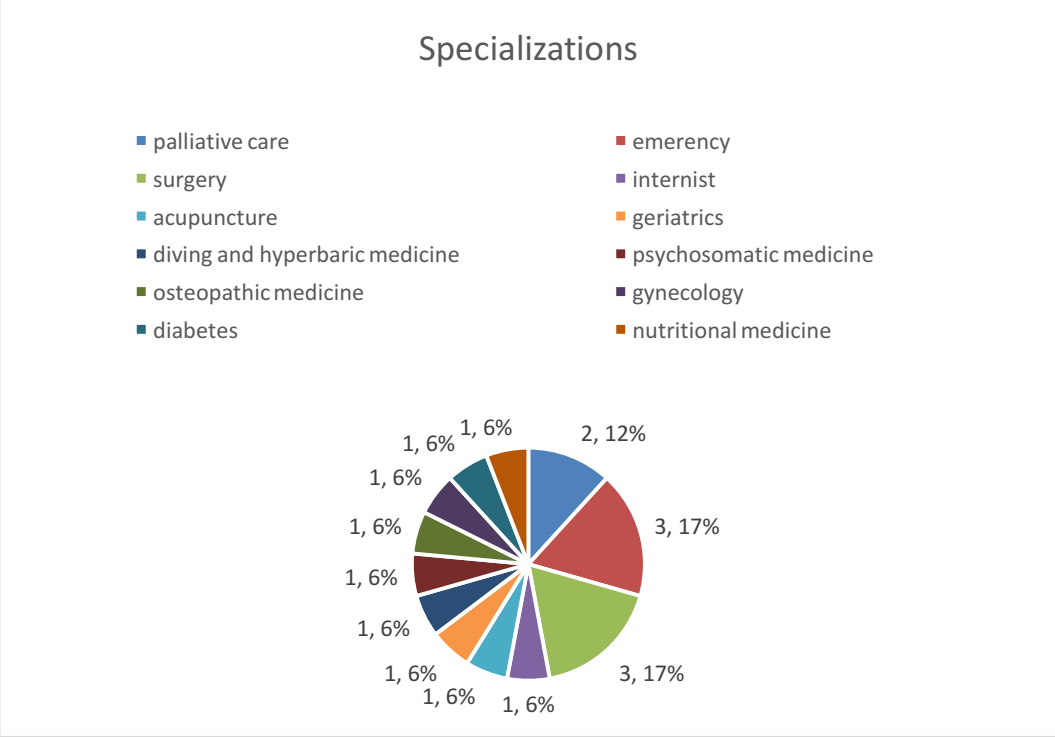


Figure 24: Additional specializations of the participants.

# 4.3 Questionnaire results

The overall *Behavioral Intention* (BI) to use technology-based care concepts of 2.89 indicates the existence of an acceptance problem in the rural areas of Lower Austria (table 22). The highest set index among all sets had *Effort Expectancy (EE)*. The overall *Motivation (MOT)* was 2.96, the overall *Social Influence (SI)* 3.01, the set *Facilitating Conditions (FC)* was measured with 3.12 and the overall *Performance Expectancy (PE)* was 3.17. The overall *Effort Expectancy* was 3.31, which means that *Effort Expectancy* is the smallest issue regarding the acceptance problem, yet all set indices, including *Effort Expectancy*, indicate an acceptance problem. The rating scale ranged from 1 to 5, where 1 was indicating zero acceptance, 3 was a neutral result and 5 would be the best result, indicating full acceptance, i.e. no acceptance problem.

| Set | **PE** | **EE** | **SI** | **BI** | **FC** | **MOT** |
|---|---|---|---|---|---|---|
| Set index | 3.17 | 3.31 | 3.01 | 2.89 | 3.12 | 2.96 |

Table 22: Results - set indexes.

The individual results for the items within the sets are described in the chapters following from 4.3.1 to 4.3.7.

### 4.3.1 Performance Expectancy (PE)

*PE1 - Telemonitoring*

Within the set of *Performance Expectancy* three statements regarding **telemonitoring** were rated. The first statement block was **"**Telemonitoring could be a useful disease management tool for the care and treatment of my patients…

… with diabetes mellitus
… with congestive heart failure
… with asthma
… with COPD
… with CHD
… with depression
… other (please specify)"

As figure 25 describes participants identified Diabetes mellitus to be the field of application with the highest potential for disease management through telemonitoring (overall score 3.9), followed by CHD (overall score 3.25) and congestive heart failure (overall score 3.2).

Among the participants 50% agreed and 30% strongly agreed with this statement

regarding diabetes mellitus, i.e. 80% of all participants agreed that telemonitoring could be a useful tool for disease management for patients with diabetes mellitus (figure 26). For cases of congestive heart failure 50% of all participants agreed (15% strongly agreed, 35% agreed). In addition, 20% of participants stated that telemonitoring could be a useful tool for disease management for patients with other/not listed diseases; mentioned were hypertension (three times), after a stroke (once), dementia (once) and arrhythmia (once).

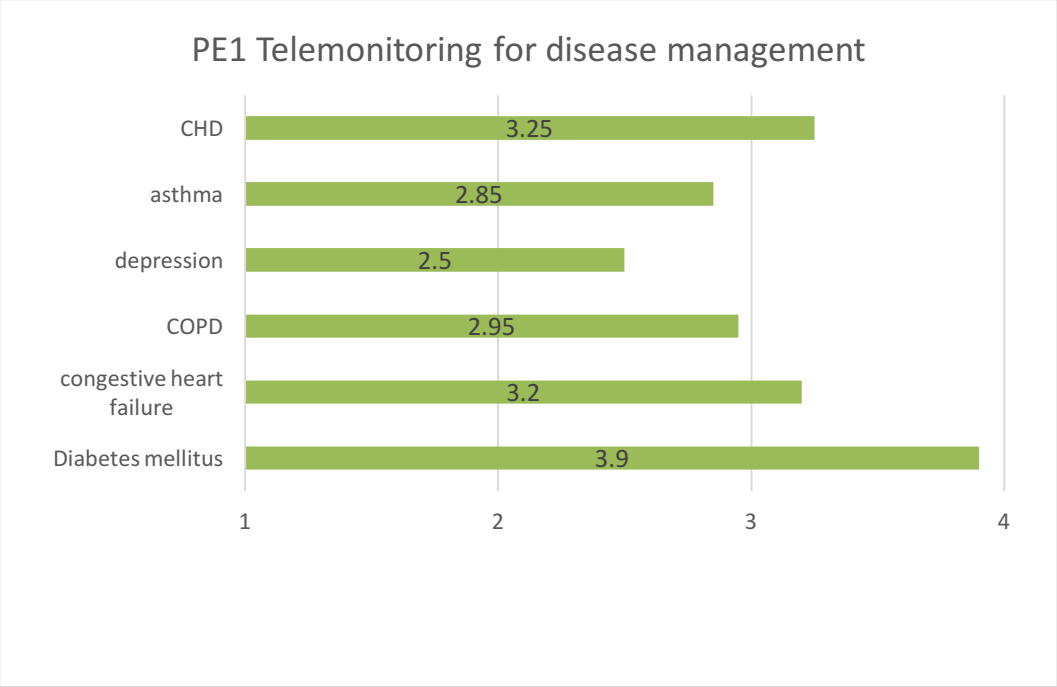


Figure 25: Evaluation of *Performance Expectancy* regarding telemonitoring for disease management.

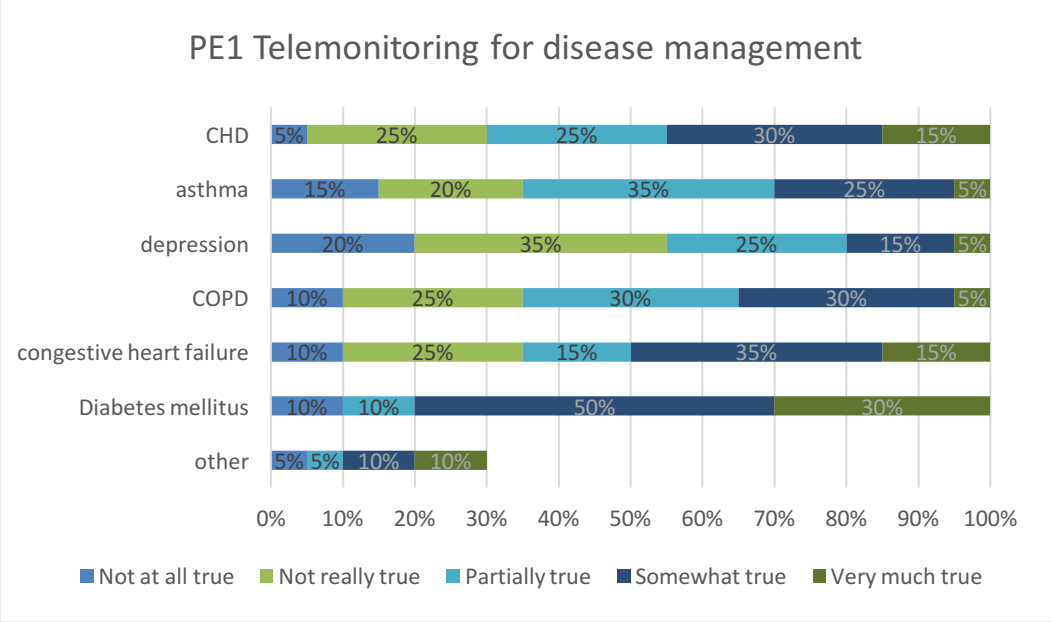


Figure 26: Detailed evaluation of participants' answers on the usefulness of telemonitoring as a tool for disease management.

*PE1a - Telemonitoring*

The second statement block **"**Telemonitoring could be a useful tool in disease prevention for the care and treatment of my patients…

… with diabetes mellitus
… with congestive heart failure
… with asthma
… with COPD
… with CHD
… with depression
… other (please specify)".

Participants identified Diabetes mellitus to be the field of application with the highest potential for the use of telemonitoring in the area of disease prevention (overall score 3.75), as described in figure 27.

Among the participants 65% found telemonitoring a useful tool for the treatment of patients with diabetes mellitus (45% agreed, 20% strongly agreed; figure 28), while 15% (strongly agree 10%, agree 5%) of participants stated that telemonitoring could be a useful tool for the prevention of other not listed diseases; mentioned were hypertension (twice) and after a stroke (once). For depression, the participants disagreed to telemonitoring being a potential prevention tool (30% strongly disagreed, 35% disagreed).

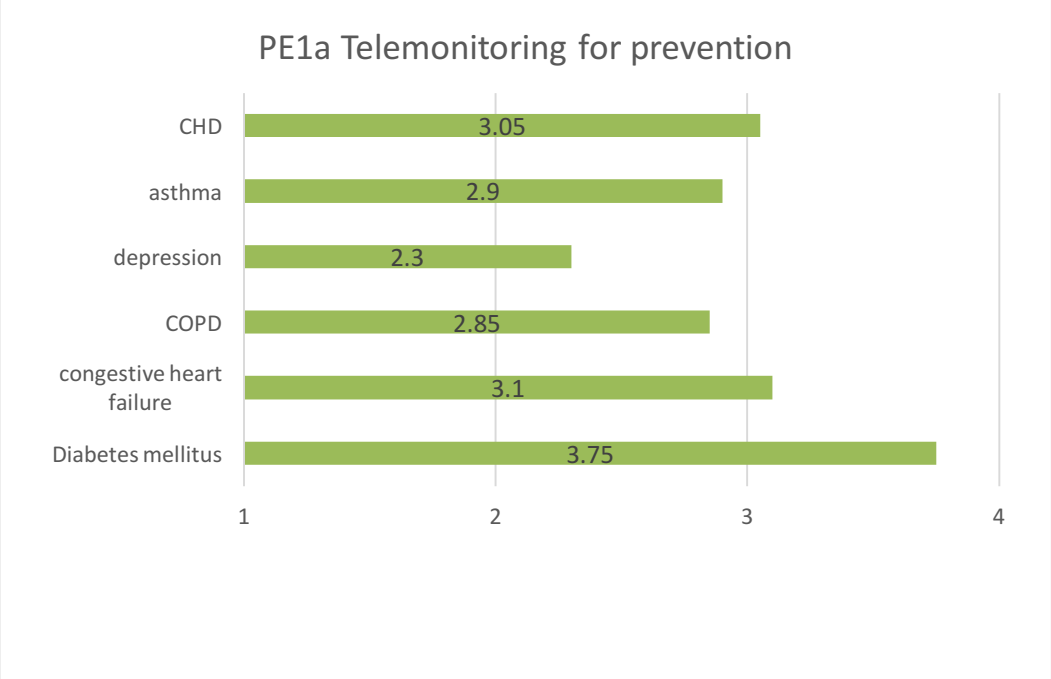


Figure 27: Evaluation of *Performance Expectancy* regarding telemonitoring as a tool for disease prevention.

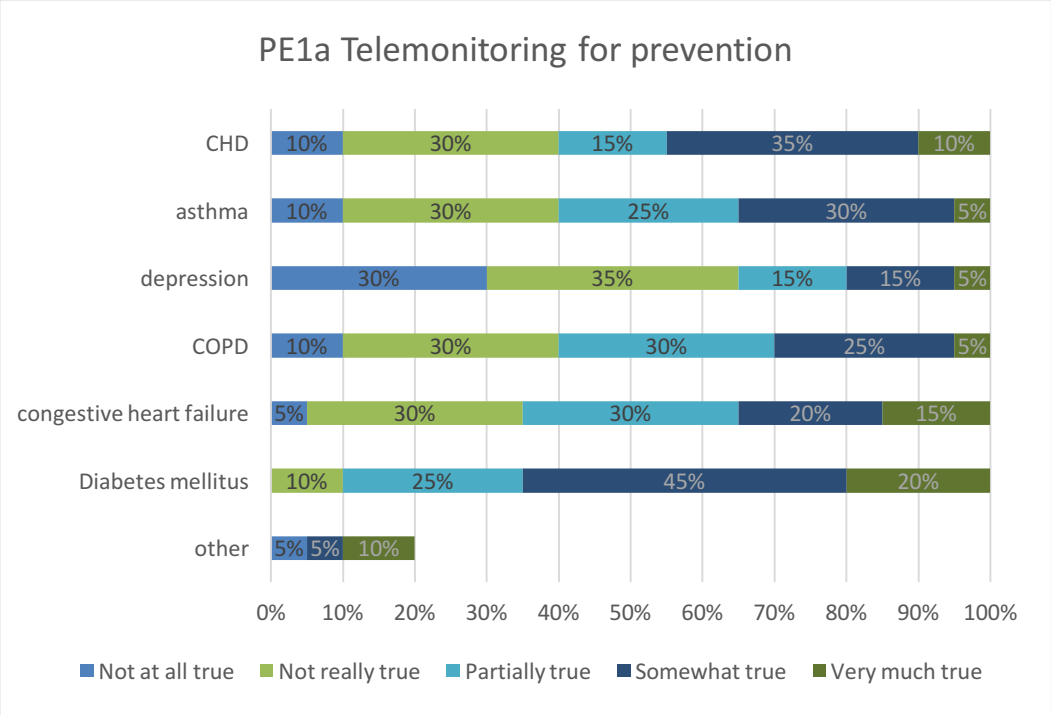


Figure 28: Detailed evaluation of participants' answers on the usefulness of telemonitoring as a tool for the prevention of diseases.

*PE2 – Telemonitoring*

The result of PE2 “I think, the use of telemonitoring could aid in increasing the productive care and treatment of my patients” can be seen in figure 29. The overall score of item PE2 for telemonitoring was 3.0. Among the participants 45% agreed partially that telemonitoring could enhance their productivity, and 20% agreed.

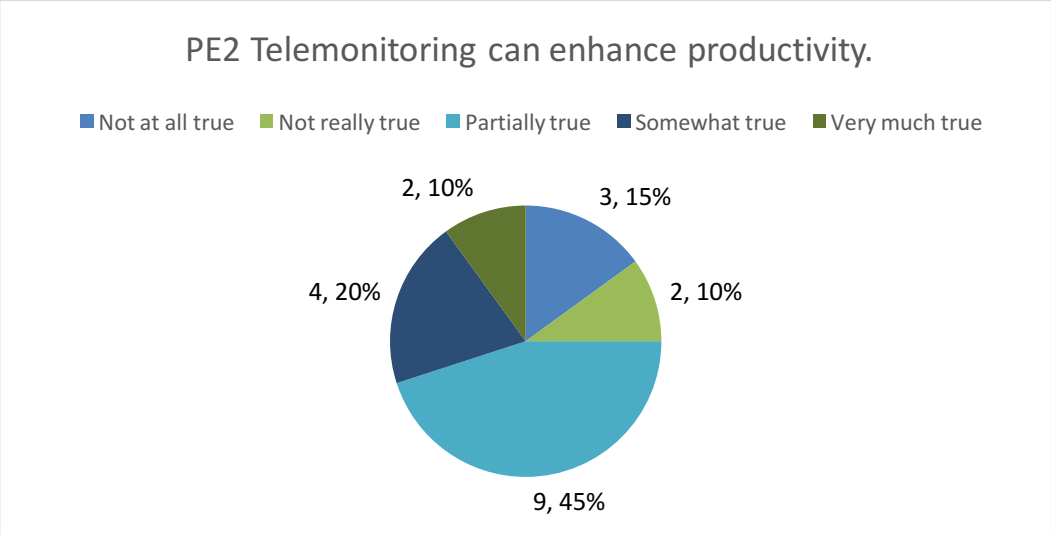


Figure 29: Evaluation of *Performance Expectancy* regarding telemonitoring as an enhancer of productivity.

*PE1 – Teleconsultation*

Within the set of *Performance Expectancy* two statements regarding **teleconsultation** were rated. The first statement block was “Teleconsultation as a tool could be a useful supplement to in-person appointments in my job…

… for telemedical counseling in acute situations
… for telemedical triage
… for providing general medical information
… for travel-medical counseling
… for advice on medication including interaction check
… to provide recommendations for self-treatment
… to provide help in finding suitable medical institutions for treatment
… for guiding patients into the next steps of treatment
… other (please specify)”.

The overall scores in figure 30 indicate that teleconsultation is seen as the most useful tool in the case of providing help in finding suitable medical institutions for

treatment (overall score 3.75), followed by providing general medical information (overall score 3.65) and travel-medical counseling (overall score 3.55). Telemedical counseling in acute situations has the lowest overall score, as figure 31, which contains the detailed results of this item, visualizes 30% of participants strongly disagreed and 5% more disagreed that teleconsultation could be useful for telemedical counseling in acute situations.

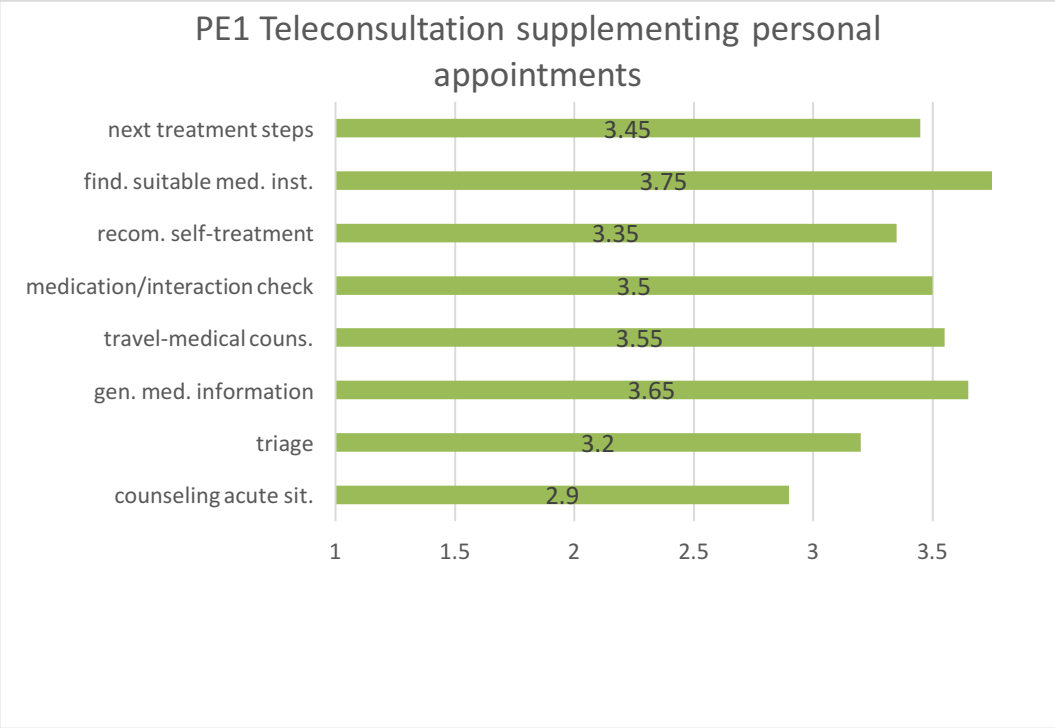


Figure 30: Evaluation of *Performance Expectancy* regarding teleconsultation as a useful supplement to in-person appointments.

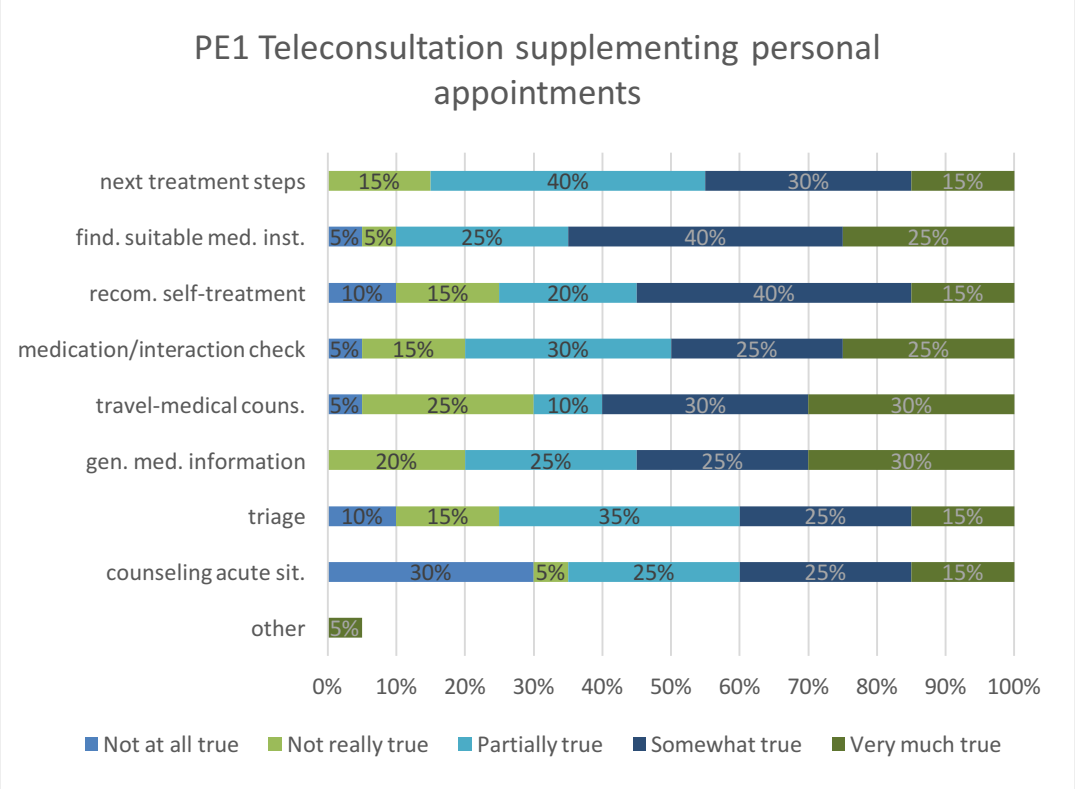


Figure 31: Detailed evaluation of *Performance Expectancy* regarding teleconsultation as a useful supplement to in-person appointments.

*PE 2 - Teleconsultation*

The results of the second item of *Performance Expectancy* regarding teleconsultation "I think, the use of teleconsultation could aid in increasing the productive care and treatment of my patients" show an overall score of 2.75, which indicates a very slight tendency towards a positive attitude regarding teleconsultation as a productivity enhancer.

35% of participants partly agree, while only 5% (1 person) strongly agreed and 20% agreed. In addition, 25% of the participants disagreed and 15% strongly disagreed to the statement (figure 32).

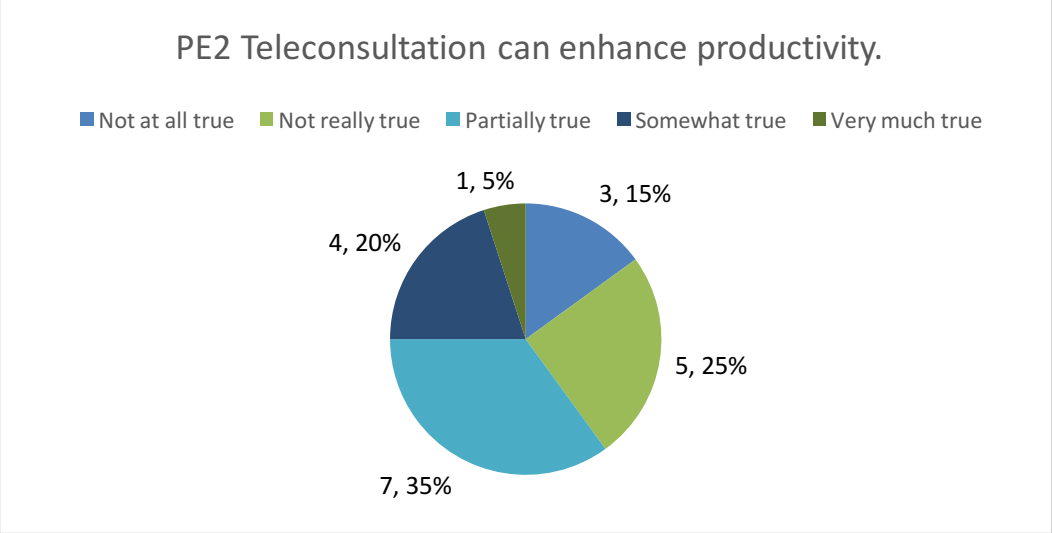


Figure 32: Evaluation of *Performance Expectancy* regarding teleconsultation as an enhancer of productivity.

### 4.3.2 Effort Expectancy (EE)

*EE1 – Telemonitoring*

The detailed results of the item “I think, that I could easily learn the operation of a telemonitoring system (for example to monitor the data submitted from patients within a digital diabetes diary) easily.” are shown in figure 33. All participants found it either partially true (15%), somewhat true (30%) or very much true (55%) that they could easily learn such a system.

The compared to other items fairly high overall score of 4.4 suggests a high acceptance of telemonitoring regarding the expected learning effort.

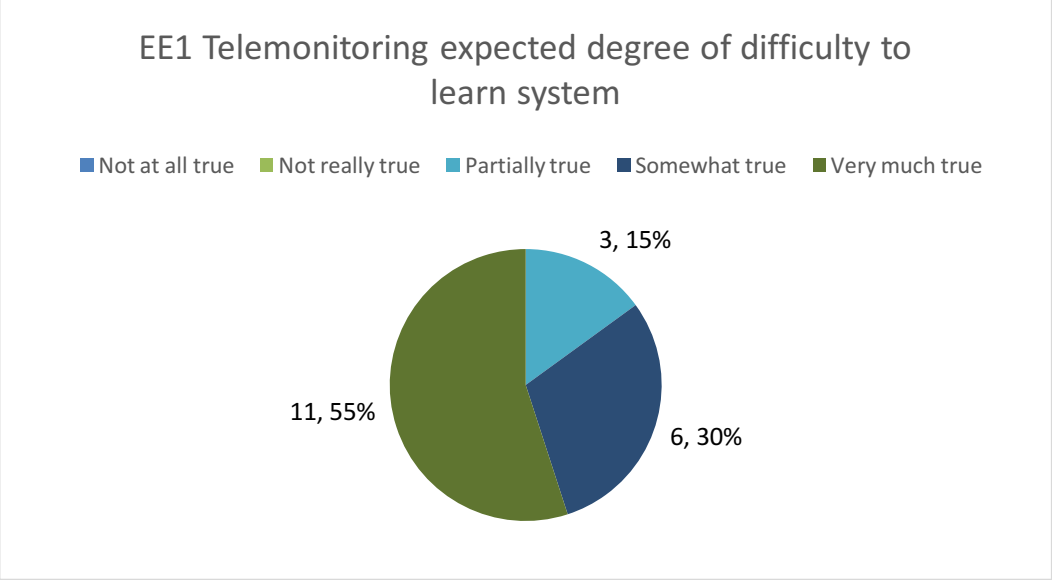


Figure 33: Evaluation of the *Effort Expectancy* when learning to use a telemonitoring system.

*EE2 – Telemonitoring*

In difference to the high overall score regarding the expected effort for learning a telemonitoring system, the use of such a system landed a low overall score of 2.4.

Figure 34 shows the detailed results of the second item regarding the *Effort Expectancy* when using telemonitoring system "I think, the use of a telemonitoring system would not involve excessive additional effort (for example to monitor the data submitted from patients within a digital diabetes diary)." A majority of participants expect excessive additional effort when using a telemonitoring system.

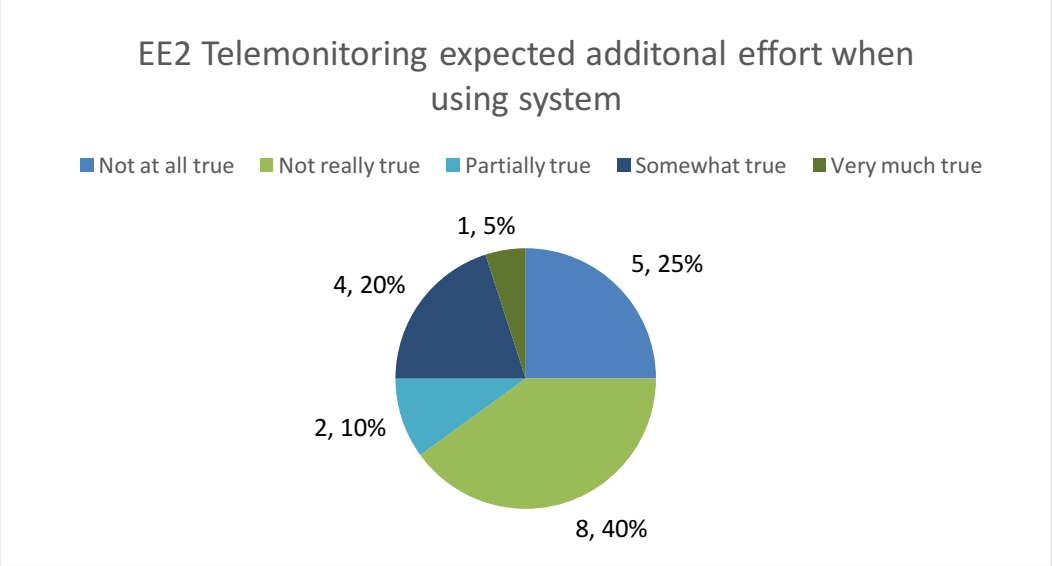


Figure 34: Evaluation of *Effort Expectancy regarding the* expected additional effort when using a telemonitoring system.

*EE1 - Teleconsultation*

Regarding the *Effort Expectancy* of Teleconsultation systems different types of media (telephone calls, video conferences, web portal, app) were evaluated. The results of item one "I think the operation of a teleconsultation system would be easy for me to learn when consulting using the following media applications (assuming compliance with privacy guidelines)

… telephone calls
… video conferences
… web portal (for example web based message exchange)
… app (message exchange via smartphone app)"

are depicted in figure 35 and figure 36.

For every type of media over 50% of participants stated that it would be easy to learn the system (agreed and strongly agreed). Worthy of notice, teleconsultation via telephone call is expected to be the easiest form of teleconsultation with an overall score of 3.95, 55% rated the statement as very much true and another 20% as somewhat true. Teleconsultation via app is the only form of teleconsultation, in which no participant completely disagreed that it would be easy to learn. The lowest overall score had teleconsultation via a web portal (3.35).

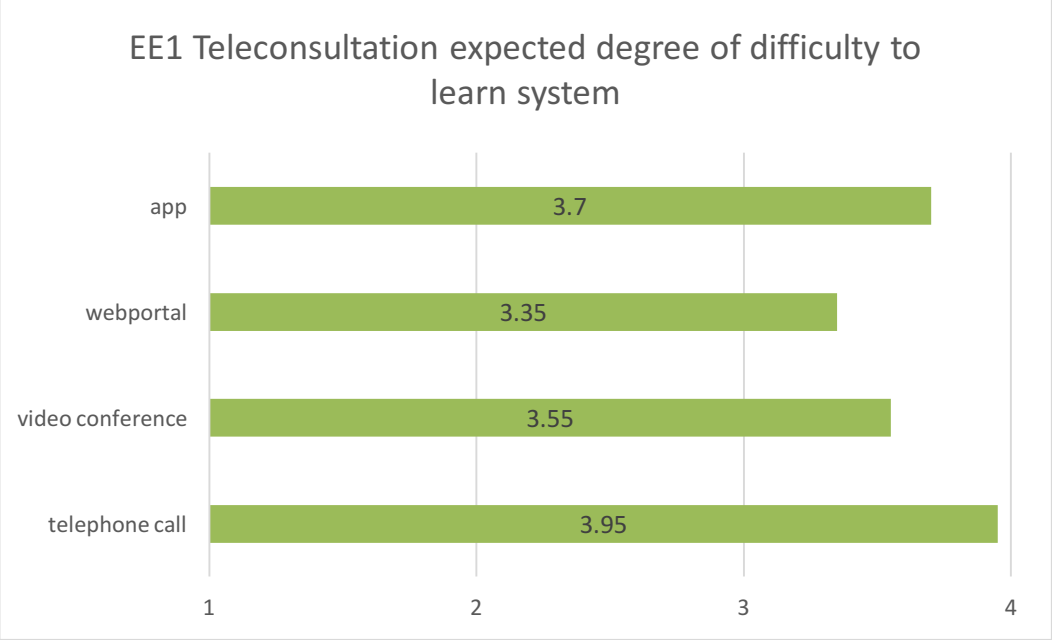


Figure 35: Evaluation of *Effort Expectancy regarding* the expected difficulty to learn a teleconsultation system in various types of media.

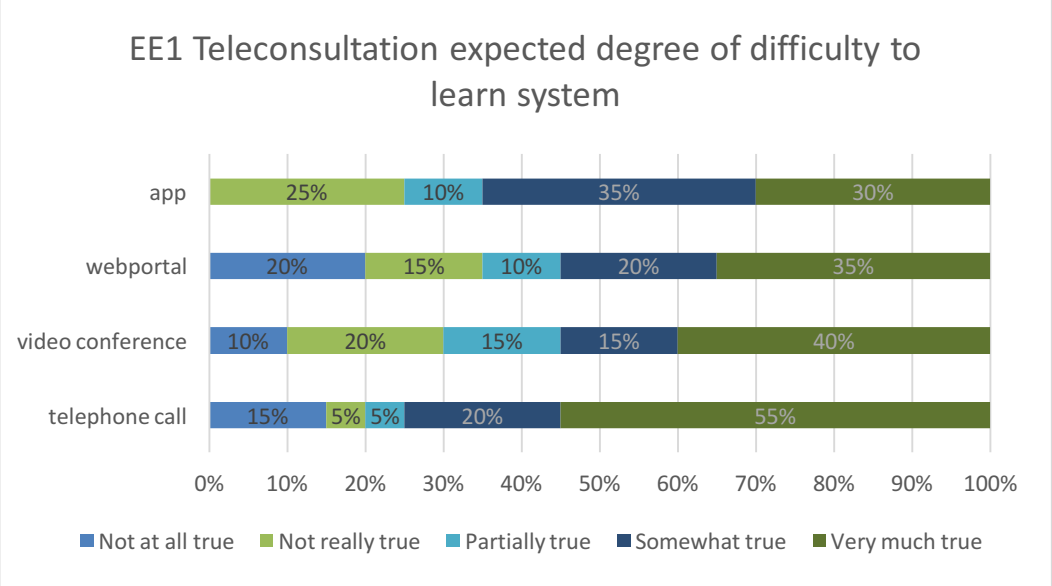


Figure 36: Detailed evaluation of *Effort Expectancy regarding* the expected difficulty to learn a teleconsultation system in various types of media.

## 4 Results

*EE2 - Teleconsultation*

Figure 37 and figure 38 contain the results of item two regarding *Effort Expectancy* of teleconsultation systems “I think, the use of a teleconsultation system would not involve excessive additional effort, when the consultation was made via (assuming the data protection is not an issue)

… telephone calls
… video conferences
… web portal (for example web based message exchange)
… app (message exchange via smartphone app)”.

Participants stated that teleconsultation via telephone call and app are less likely to cause excessive additional effort than a web portal or video conference (figure 37 - 38. As figure 38 shows, among participants 50% agreed, i.e. agreed (20%) and strongly agreed (30%), that teleconsultation via telephone call would not cause excessive additional effort, for teleconsultation via app 40% agreed and 15% strongly agreed. Participants expect that using video conference as a tool for telecommunication would entail the most additional effort, i.e. disagreed (35%) and strongly disagreed (30%).

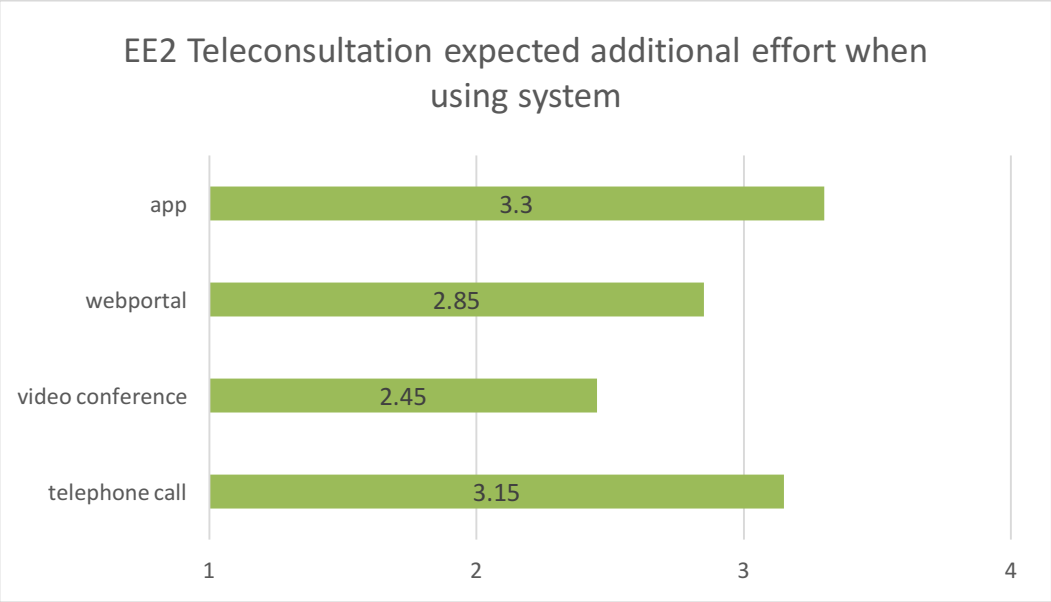


Figure 37: Evaluation of the expected additional effort entailed with the use of different media systems for teleconsultation.

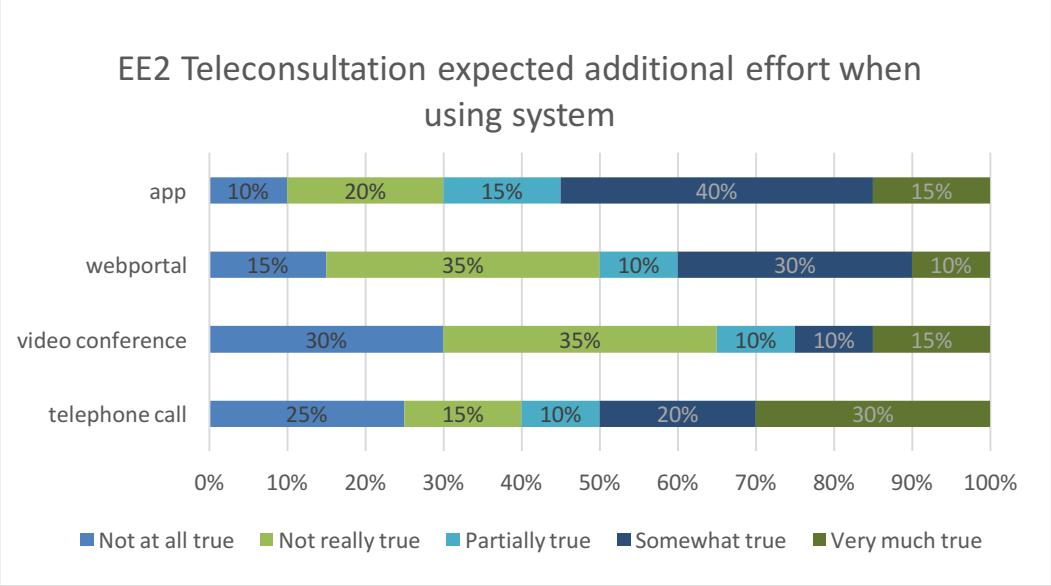


Figure 38: Detailed evaluation of the expected additional effort entailed with the use of different media systems for teleconsultation.

### 4.3.3 Social Influence (SI)

*SI1 - Telemonitoring*

Item one regarding telemonitoring "Most of my patients would welcome me offering telemonitoring (for example to monitor patients' vital signs regularly)." was to measure the social influence of the patients' opinion about the use of telemonitoring. The overall score for this item was 2.75. Among participants 35% think that their patients would not really welcome the use of telemonitoring, while 30% think they partially would and 20% think that they somewhat would (figure 39).

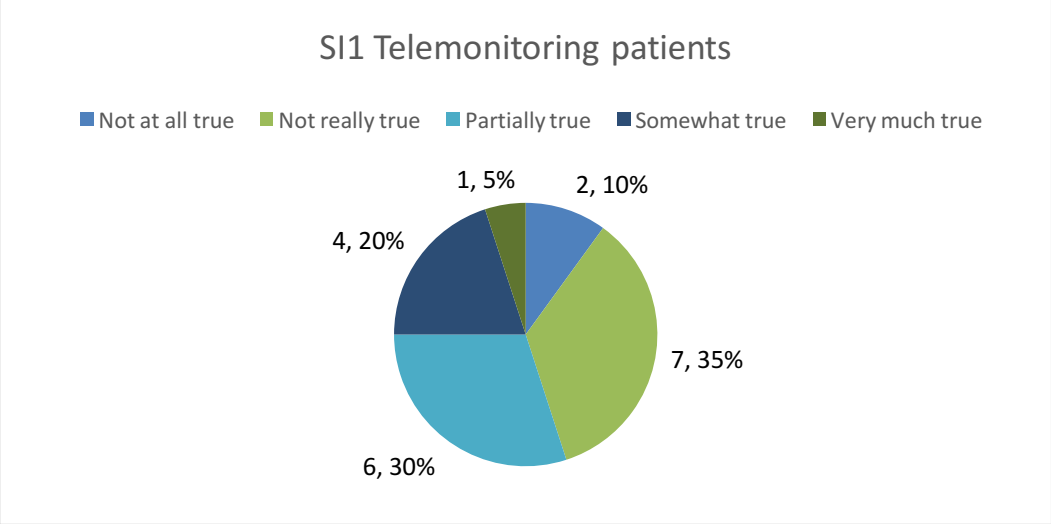


Figure 39: Evaluation of *Social Influence* regarding patients' views of telemonitoring.

*SI2 - Telemonitoring*

The detailed results of the second item of social influence regarding other professionals' views, "Other health professionals would welcome, me offering telemonitoring (for example to monitor patients' vital signs regularly)" are shown in figure 40. Among participants 45% think that colleagues would welcome them offering telemonitoring services (30% somewhat true, 15% very much true), 40% think they would not welcome them offering telemonitoring services (15% not at all true, 25% not really true) and 15% are indecisive.

The overall score for this item of 3.05 indicates that participants overall were indecisive.

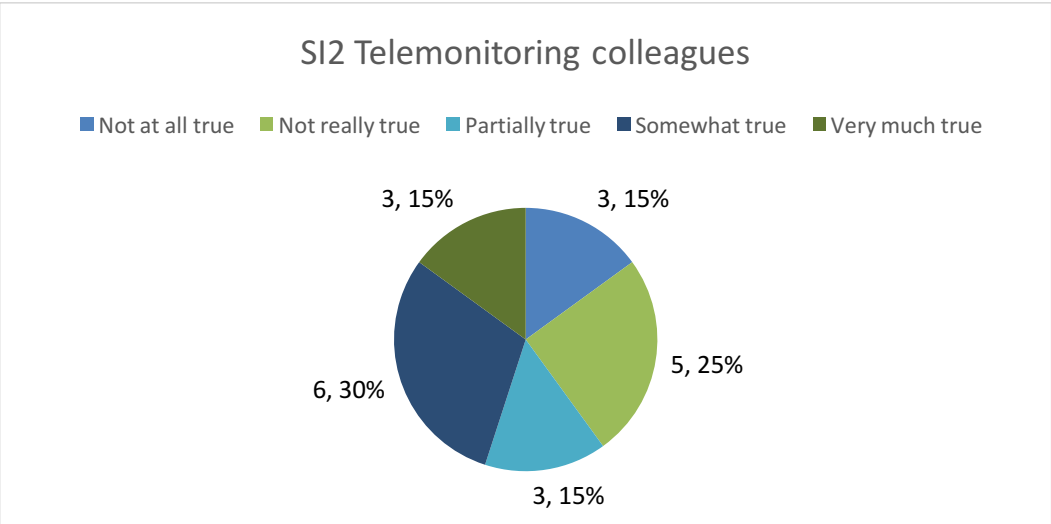


Figure 40: Evaluation of *Social Influence* regarding colleagues' views of telemonitoring.

## 4 Results

*SI1 - Teleconsultation*

Figure 41 shows the detailed results of item one for *Social Influence* regarding teleconsultation “Most of my patients would welcome me offering teleconsultation (for example, to provide general medical information or to assist in the search for suitable medical institutions for specific complaints).” Among the participants 35% think that their patients would not really welcome the offer of teleconsultation, 30% think they partially would and 20% think that they somewhat would. The overall score for this item was 2.95.

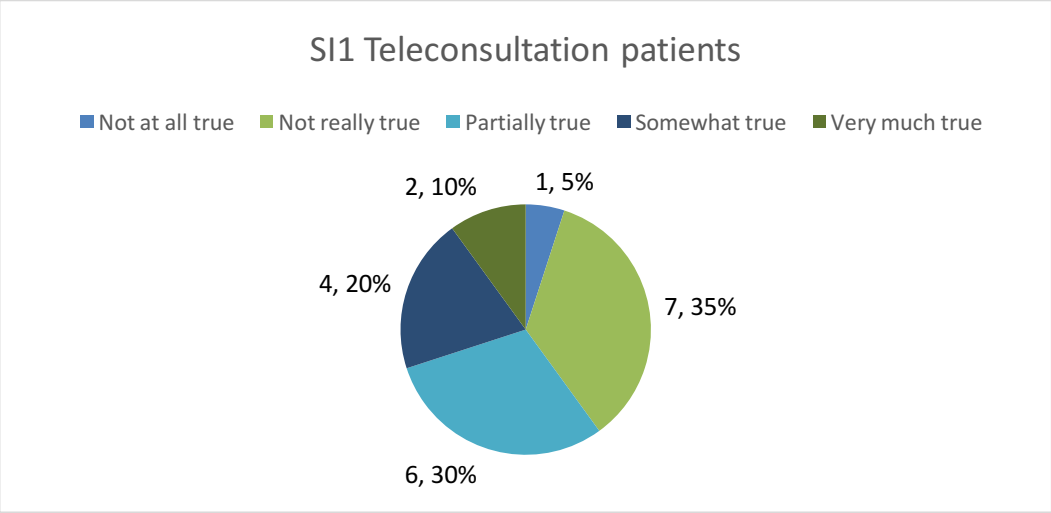


Figure 41: Evaluation of *Social Influence* regarding patients’ views of teleconsultation.

*SI2 - Teleconsultation*

The results of “Other health professionals would welcome, me offering teleconsultation (for example, to provide general medical information or to assist in the search for suitable medical institutions for specific complaints).” are indicate that participants thought other health specialists would rather welcome them offering teleconsultation than patients. The overall score for this item was 3.3. As figure 42 depicts among the participants 45% think that other colleagues would welcome it, if they offered teleconsultation services (30% somewhat true, 15% very much true), while 25% think that other colleagues would not welcome them offering such services (20% not really true, 5% not at all true). In addition, 30% of the participants were indecisive.

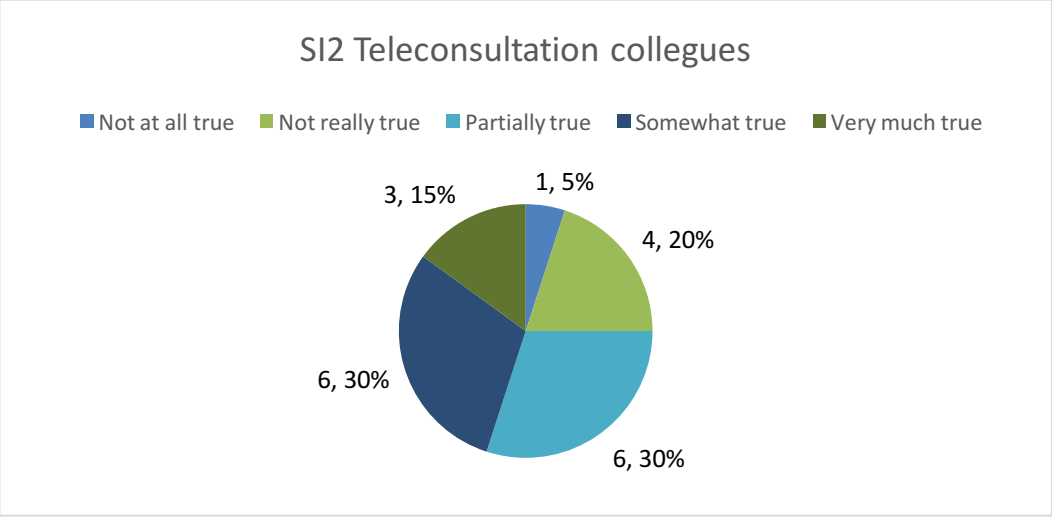


Figure 42: Evaluation of *Social Influence* regarding colleagues' views of teleconsultation.

### 4.3.4 Behavioral Intention (BI)

To measure *Behavioral Intention* the following statement was used: "Within the next 5 years I intend to use the following type(s) of telemedical applications to care for my patients … telemonitoring (for example to monitor diabetes patients via a digital diabetes diary or to monitor congestive heart failure patients' vital signs) … teleconsultation (for example for advice on medication interactions, to provide help in finding suitable medical institutions for further treatment, issuing referral forms, etc.) … Other (please specify)". As figure 43 demonstrates more participants are planning on using teleconsultation within the next 5 years than telemonitoring. As depicted in figure 44, among the participants 15% stated that they have the intention to use other telemonitoring systems in the future; mentioned were telephone calls and emails with caretakers such as relatives, blood measure monitoring, referral systems for long-term ECG, pacemaker/defi/loop monitoring, general medical information and triage in acute situations. Telephone calls and emails with caring relatives, as well as general medical information and triage in acute situations are a form of teleconsultation; blood measure monitoring and pacemaker/defi/loop monitoring are forms of telemonitoring; this suggests that some participants might not have understood either the full concept of telemonitoring and teleconsultation in general or in the setting of this questionnaire.

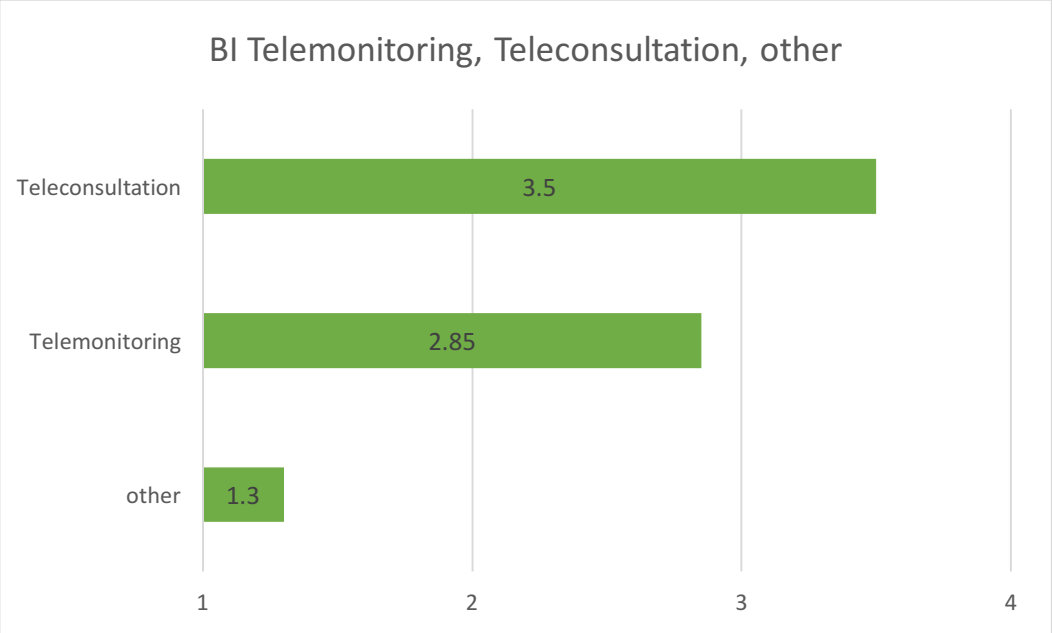


Figure 43: Evaluation of the *Behavioral Intention* to use telemedical systems in the future.

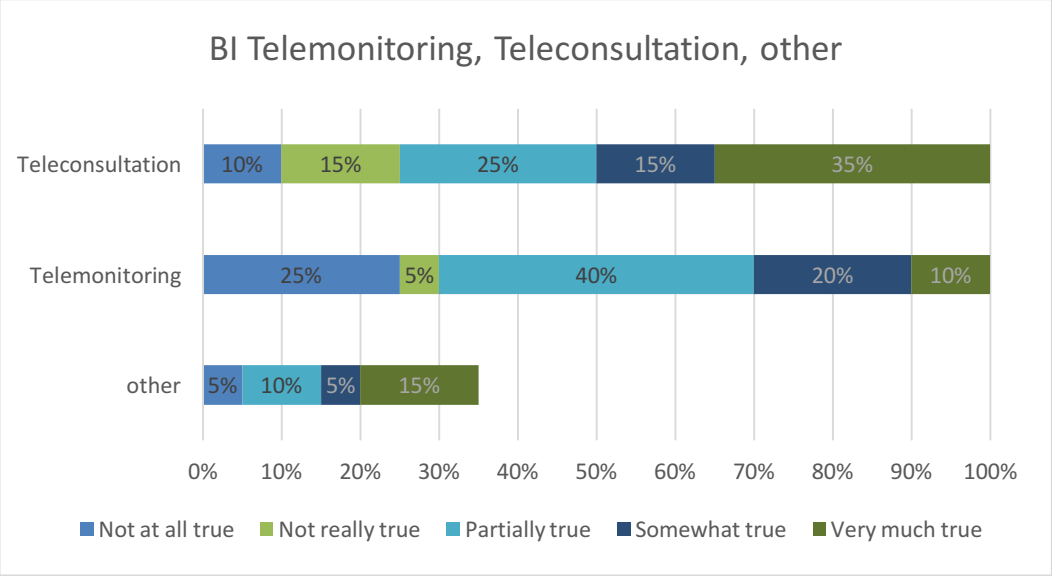


Figure 44: Detailed evaluation of the *Behavioral Intention* to use telemedical systems in the future.

### 4.3.5 Facilitating Conditions (FC)

*FC1 - Telemonitoring*

As depicted in figure 45 the result of item one regarding telemonitoring “I would have the resources and infrastructure to offer telemonitoring (for example to monitor diabetes patients via a digital diabetes diary).” show that 30% of the participants did not think they had the necessary infrastructure to offer telemonitoring (30% not really true, 10% not at all true), while 35% thought they had the infrastructure (20% somewhat true, 15% very much true). Furthermore, 25% of participants where indecisive. The overall score for this item was 3.0.

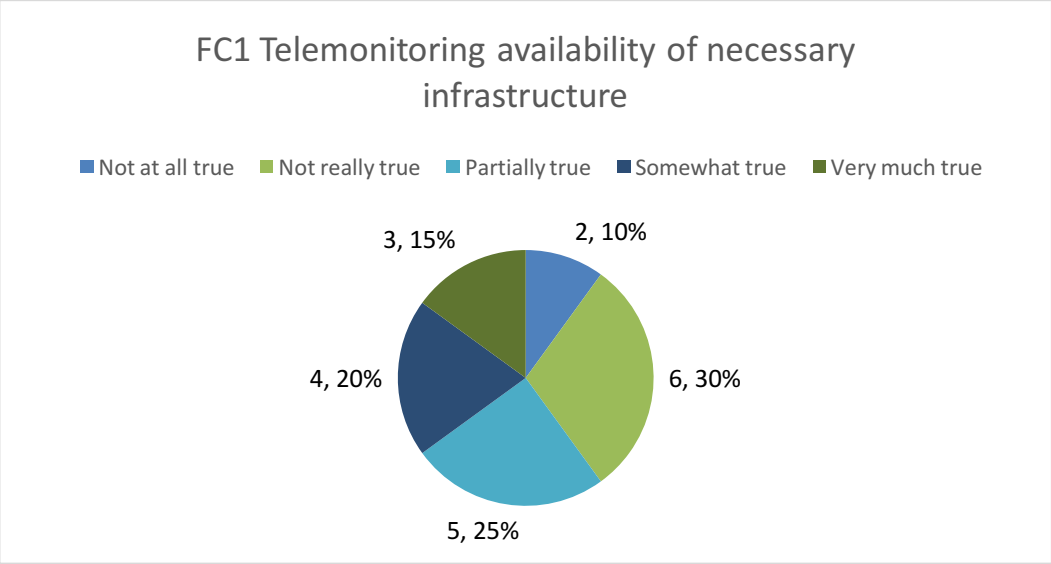


Figure 45: Evaluation of *Facilitating Conditions* regarding the perceived availability of the necessary infrastructure to offer telemonitoring.

*FC2 - Telemonitoring*

Figure 46 demonstrates the detailed results of item 2 regarding *Facilitating Conditions* for telemonitoring “The use of telemonitoring systems would be compatible with my working routine (for example to monitor vital signs of chronic disease patients).” Among the participants 35% found that offering telemonitoring is not really compatible with their ways of working, 10% found it not at all true, although 30% found the statement to be somewhat true and 15% very much true. The overall score of 3.3 indicates that participants thought the use of a telemonitoring system is better compatible with their current ways of working than with their current facilitating conditions.

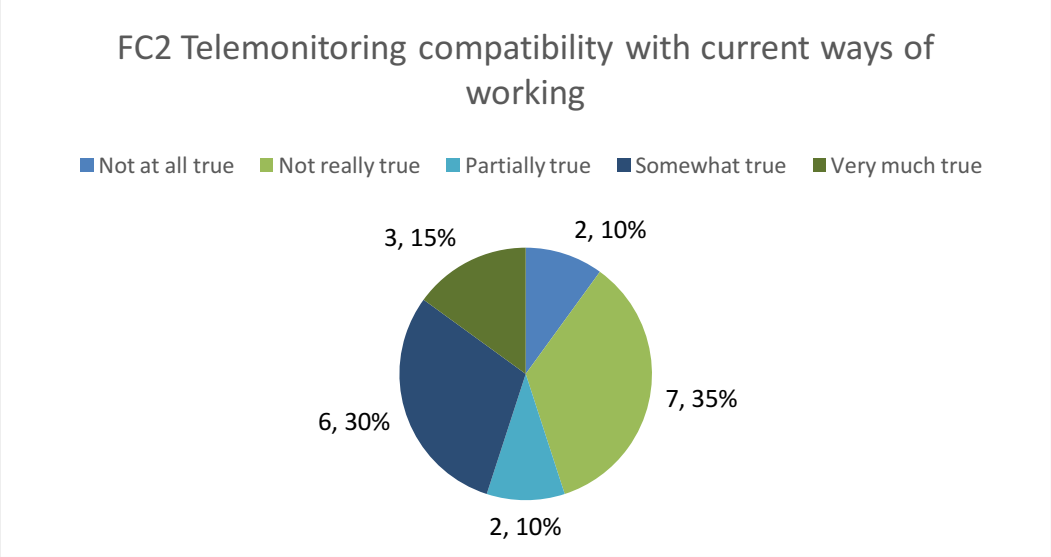


Figure 46: Evaluation of *Facilitating Conditions regarding* the expected compatibility of telemonitoring systems with current ways of working.

*FC1 - Teleconsultation*

The items regarding *Facilitating Conditions* where once again asked separately for different types of media systems. “I think, I would have the resources and infrastructure to offer telemonitoring in the form of

… telephone calls
… video conferences
… web portal (for example web based message exchange)
… app (message exchange via smartphone app)”.

With an overall score of 3.75 telephone calls are the media system were participants most likely thought they had the needed facilitating conditions, followed by web portals and apps (figure 47).

The detailed results in figure 48 show that among the participants 50% think they absolutely have the infrastructure for telephone calls, an additional 10% stated they somewhat have the infrastructure. In contrast 15% think they do not have the infrastructure for teleconsultation via telephone calls at all. Among the participants 55% (35% very much true, 20% somewhat true) think they have the infrastructure for teleconsultation via web portal and 50% (30% very much true, 20% somewhat true) for teleconsultation via app. The results for teleconsultation via video conference show that it is the media system in which the least number of participants think they have the suitable infrastructure (25% very much true, 10% somewhat true) Therefore, most of the participants think they do not have

the suitable infrastructure for video conferencing (30% not at all true, 15% not really true).

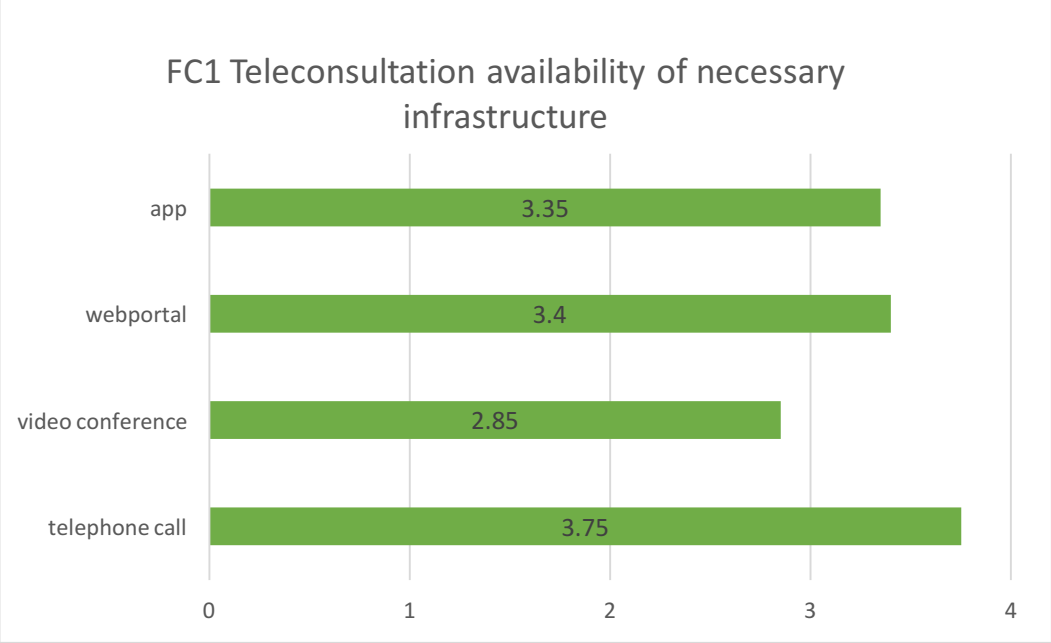


Figure 47: Evaluation of *Facilitating Conditions* regarding the perceived availability of the necessary infrastructure to offer teleconsultation.

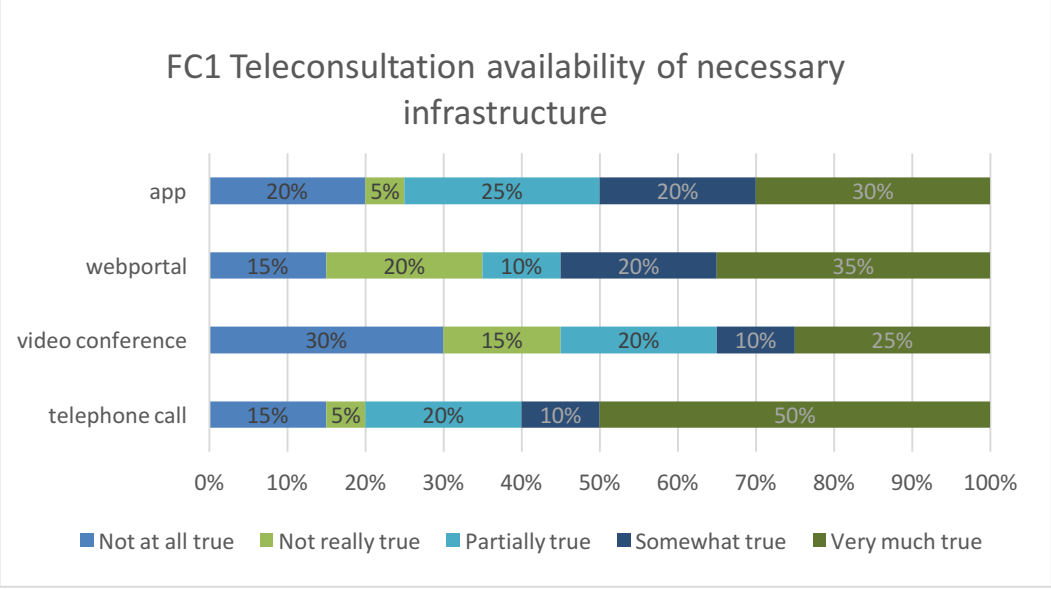


Figure 48: Detailed evaluation of *Facilitating Conditions* regarding the perceived availability of the necessary infrastructure to offer teleconsultation.

*FC2 - Teleconsultation*

“Offering my patients the use of teleconsultation systems would be compatible with my working routine in the form of

… telephone calls
… video conferences
… web portal (for example web based message exchange)
… app (message exchange via smartphone app)”.

Noteworthy is that the same number of participants stated that telephone calls and web portals are compatible with their current working routines (25% very much true), anyhow the overall score for telephone calls is higher (3.3) than for web portals (3.0), as depicted in figure 49. Figure 50 shows that 20% said that teleconsultation via app is compatible. Video conference is the form of teleconsultation in which most participants think that it is not compatible with their currant ways of working (40% not at all true, 25% not true).

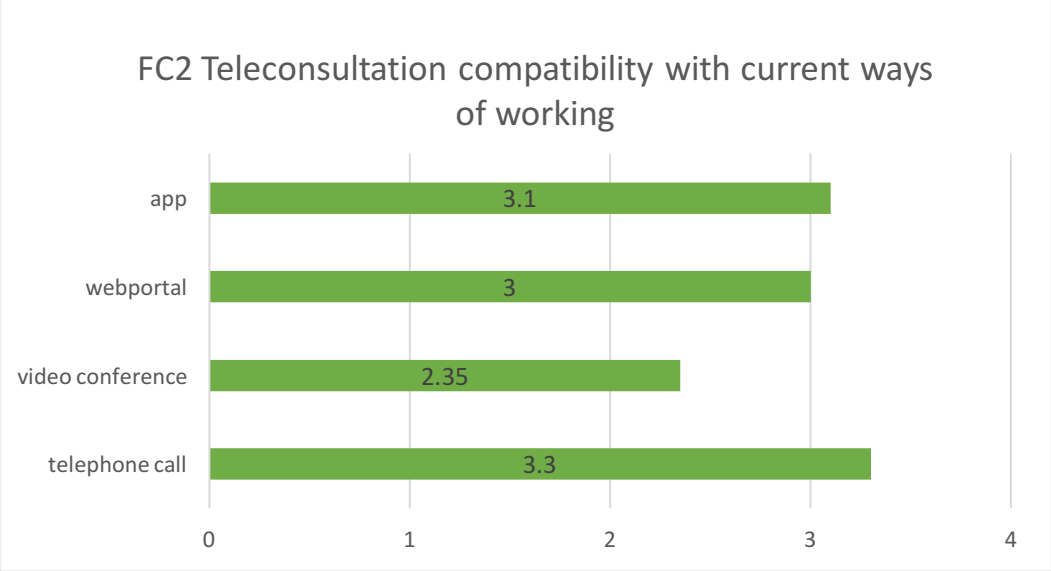


Figure 49: Evaluation of *Facilitating Conditions* regarding the expected compatibility of teleconsultation via different media systems with current working routines.

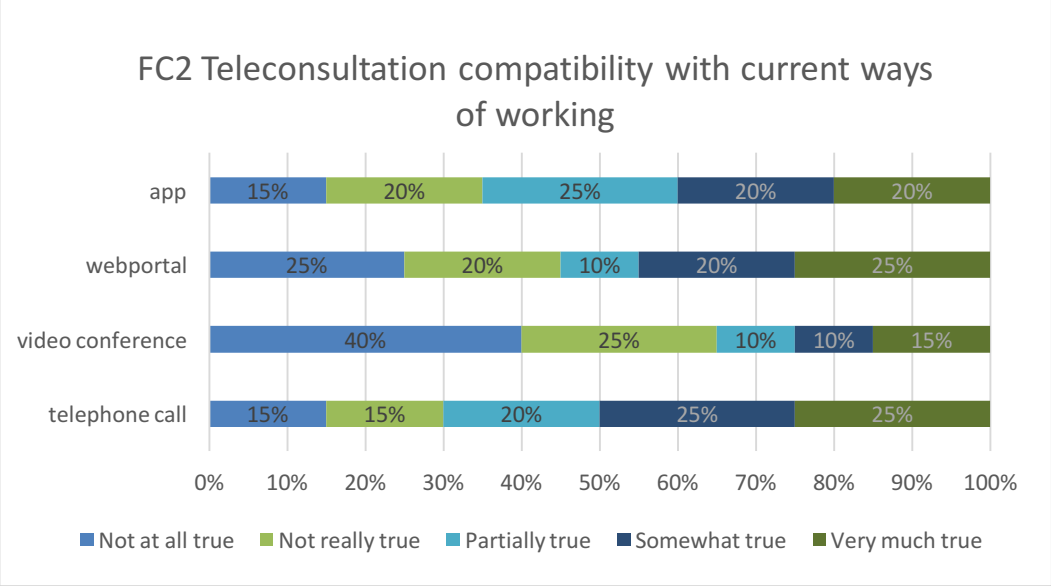


Figure 50: Detailed evaluation of *Facilitating Conditions* regarding the expected compatibility of teleconsultation via different media systems with current working routines.

### 4.3.6 Experience (EXP)

"I have already used the following type(s) of telemedical systems for the treatment of my patients:

☐ Telemonitoring (for example to monitor diabetes patients via a digital diabetes diary, or to monitor congestive heart failure patients' vital signs)
☐ Teleconsultation (for example for advice on medication interactions, to provide help in finding suitable medical institutions for further treatment, issuing referral forms, etc.)
☐ Other (please specify): _____
☐ I haven't used any type of telemedical systems for the treatment of my patients."

As depicted in figure 51, 27% of participants had never used any form of telemedical systems for the treatment of patients. On the other hand 73% had already used some form of telemedical system; 19% of participants stated to have had experience with telemonitoring, 42% with teleconsultation and 12% with other telemedical systems, e.g. direct consultation, telephone calls, video conferences, WhatsApp, call center work for medical service 141, and apps for antibiotics. Telephone calls and video conferences can be included in teleconsultation indicating that some participants might not have understood either the full concept of telemonitoring and teleconsultation in general or in the setting of this questionnaire.

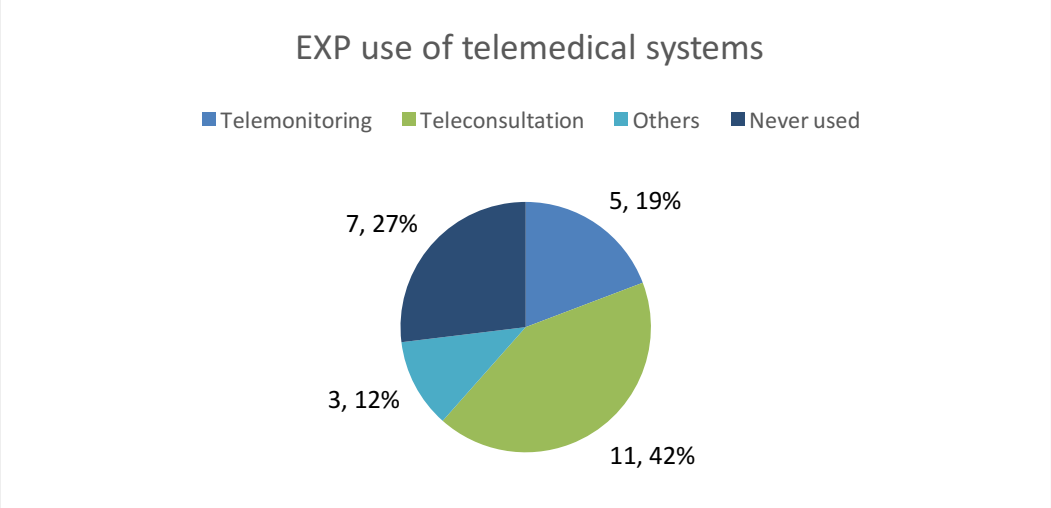


Figure 51: Evaluation of *Experience* regarding previous use of telemedical systems.

### 4.3.7 Motivators (MOT)

"In my practice I would identify the following outcomes as advantages of the implementation of telemedical applications, i.e., telemonitoring and teleconsultation.

… less crowded waiting rooms
… more regularly performed checkups for chronic disease patients
… fewer house calls
… shorter waiting times for patients in the waiting room
… sparing patients long journeys to the doctor's office
… sparing patients with limited mobility journeys to the doctor's office
… optimization of treatment processes in rural areas"

The results are visualized in figure 52 and figure 53. Sparing patients with limited mobility a trip to the doctor's office, with the highest overall score of 3.45 (35% very much true, 10% somewhat true), is seen as the most advantageous motivator for implementing telemedical applications, followed by the optimization of treatment processes in rural areas. Less crowded waiting rooms are not rated as an advantage by the participants with a low score of 2.35 (figure 52), as figure 53 states 35% stated "not at all true".

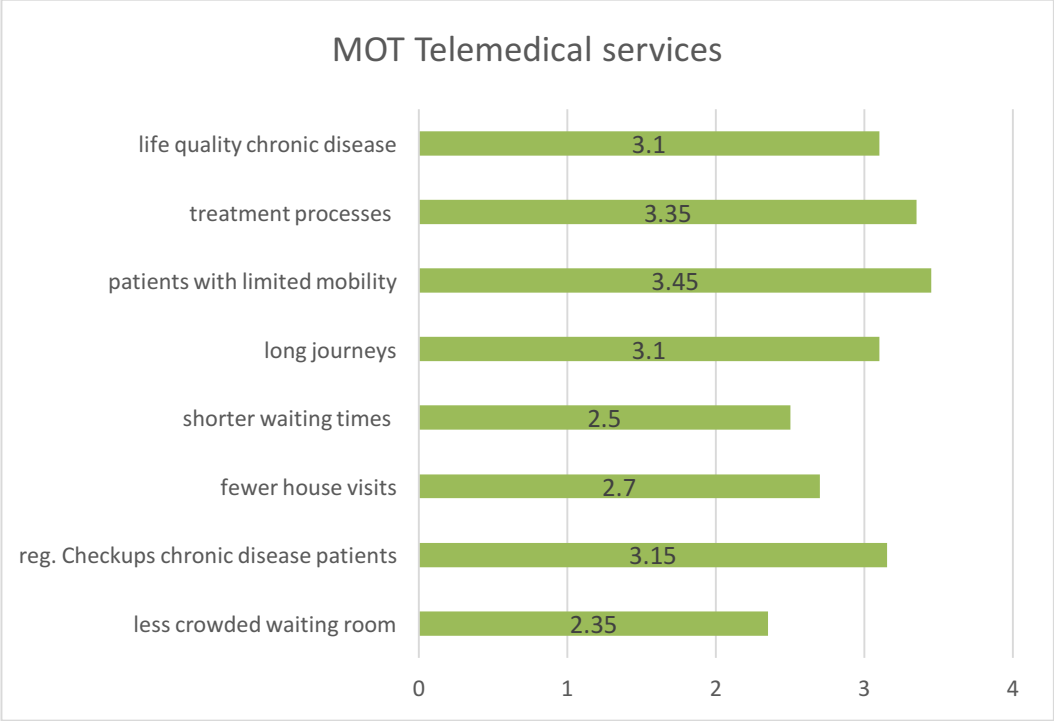


Figure 52: Evaluation of *Motivation* regarding potential motivators for the use of telemedical systems.

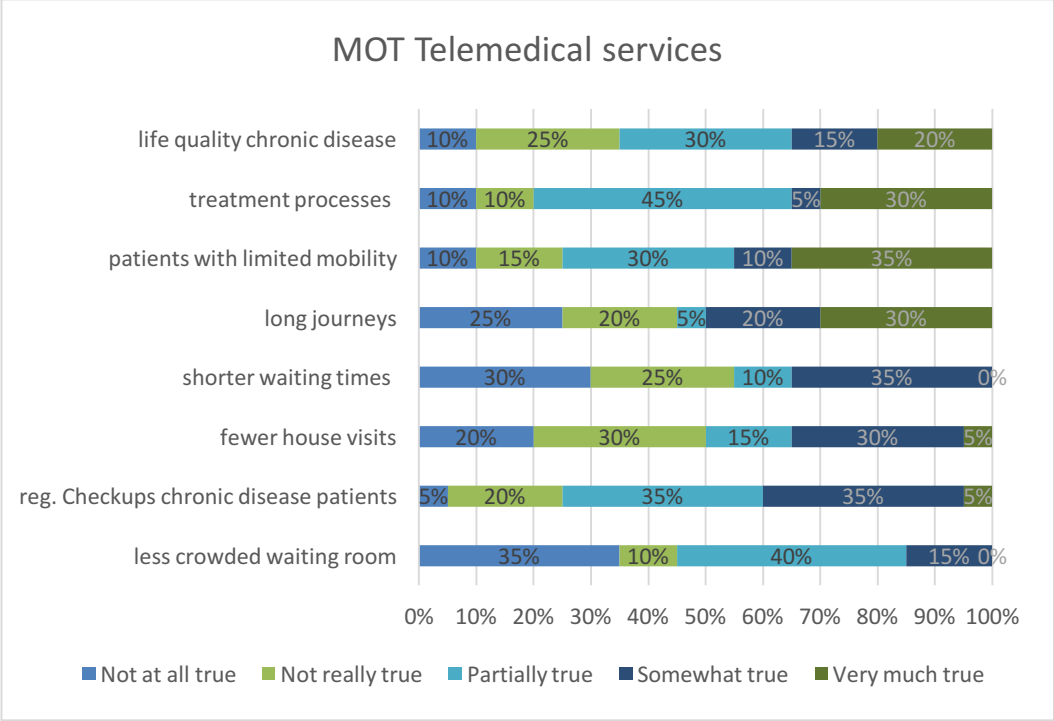


Figure 53: Detailed evaluation of *Motivation* regarding potential motivators for the use of telemedical systems.

### *4.3.8* Influence of experience on *Behavioral Intention*

Participants who stated to have experience with telemonitoring had higher mean values for *Behavioral Intention* to use telemonitoring, as well as teleconsultation in the future. Similar results are found for participants who had previous experience with teleconsultation. Participants who stated to have experience with both show the highest *Behavioral Intention* to use teleconsultation, higher than participants who only stated to have used teleconsultation (tables 23 - 25).

*Telemonitoring*

| Telmonitoring experience | Mean (BI telemonitoring) | Mean (BI teleconsultation) |
|---|---|---|
| not quoted (15) | 2 | 2 |
| quoted (5) | 4 | 3.8 |

Table 23: Mean calculation of *Behavioral Intention* to use a system depending on existing /non-existing previous experience with telemonitoring

*Teleconsultation*

| Teleconsultation experience | Mean (BI telemonitoring) | Mean (BI teleconsultation) |
|---|---|---|
| not quoted (9) | 2 | 2 |
| quoted (11) | 2.5 | 3.5 |

Table 24: Mean calculation of *Behavioral Intention* to use a system depending on existing /non-existing previous experience with teleconsultation

*Telemonitoring + Teleconsultation*

| Experience in telemonitorin and teleconsultation | Mean (BI telemonitoring) | Mean (BI teleconsultation) |
|---|---|---|
| not quoted | 2 | 2 |
| quoted | 4 | 4 |

Table 25: Mean calculation of *Behavioral Intention* to use a system depending on existing /non-existing previous experience with both, telemonitoring and teleconsultation.

# 5 Discussion

*Results*

For most of the questionnaire items participants' answers are either polarized or spread over the scale, resulting in scale indices between 2.89 (*Behavioural Intention*) and 3.31 (*Effort Expectancy*), where 3 is a neutral result. Therefore, the results are not highly distinctive and depend upon interpretation. A problem with the acceptance of the technology can definitely be seen in the results of *Behavioural Intention.* The wide variation between answers suggests no clear direction which can be generalized for physicians in the rural areas of Austria. Possible problem areas regarding physicians' acceptance cannot be determined on the basis of these results. The results indicate that physicians have very strong opinions regarding telemedical services which seem to be either positive or negative, and which have resulted in polarized answers; in some cases this even suggests that the participants did not fully understand the concepts of telemonitoring and teleconsultation. The fact that 15% of participants strongly disagreed to having the infrastructure to offer teleconsultation via telephone calls shows that further education needs to be done in this field in order to promote the use of telemedical services in the rural areas of Austria.

*Hypotheses verification*

**H1 – supported: An acceptance problem visible through a low *Behavioral Intention* to use technology-based care concepts in the rural areas of Lower Austria.**

Acceptance is measured by *Behavioral Intention*. *Behavioral Intention* for the use of telemonitoring was measured at 2.85 on a scale from 1 to 5. Since this value is under 3 which represents "partially true" for having an intention to use the system, it can be interpreted that acceptance is low in this case. The *Behavioral Intention* to use teleconsultation was higher measuring at 3.5, a value between "3 partially true" and "4 somewhat true". The overall *Behavioral Intention* of 2.89 shows that acceptance is on a low level slightly under neutral, therefore the hypothesis is supported.

**H2 - supported: Physicians with experience have more intention to use the system in the future, than physicians with no previous experience.**

Results show that participants who stated to have experience with telemonitoring are more likely to have the *Behavioral Intention* to use telemonitoring, as well as teleconsultation, in the future. Similar results are found for participants who had already had previous experience with teleconsultation. Participants who stated to have had experience with both demonstrate the highest *Behavioral Intention* to use teleconsultation, that is, higher than participants who only stated to have used teleconsultation.

**H3 – not supported: Effort expectancy has a high influence on the *Behavioral Intention* to use a telemedical system in the future.**

No significant correlation between effort expectancy and behavioral intention was found in this research.

**H4 – partially supported: Less crowded waiting rooms and sparing patients with limited mobility the journey are strong motivators for the use of telemedical system in rural areas of Lower Austria**

Less crowded waiting rooms are not seen as a big motivator on the physicians' side, no participants fully agreed to that statement, 15% agreed, while 35% strongly disagreed. Less crowded waiting rooms had the lowest overall score of 2.35. In contrast sparing patients with limited mobility a trip to the doctor's office was evaluated as the biggest motivator with an overall score of 3.45; 35% of participating physicians stated it to be very true and only 10% found it not at all true.

**H5 – not verifiable: Age influences the *Behavioral Intention* to use telemedical services in the future, physicians over 50 years in age are less likely to accept the technology.**

This item could not be measured accurately due to the fact that 80% of the participants were in two age groups, which were 40 – 49 years of age and 50 – 59 years of age. For teleconsultation, the age group of 40 – 49 shows a slightly higher *Behavioral Intention*, for telemonitoring the age group of 50 – 59 shows slightly more *Behavioral Intention*, the results are not significant, therefore the hypothesis is not verifiable.

## 5 Discussion

*Limitations*

In this chapter limitations and negative aspects of this research are discussed.

A major drawback in this research is the very limited target group "general practitioners in rural areas of Lower Austria". The compliance of the target group was extremely low, for a number of possible reasons:

1. General practitioners are quite busy and always have a waiting room full of patients.
2. General practitioners get numerous requests to answer surveys; mostly from students. The answer given most often when calling to ask for permission to send this survey was that the practitioner refuses to do any surveys on principle.
3. There is no advantage for the physician. Students might be motivated by handing out coupons, but busy general practitioners are not that easy to motivate and eager to participate.
4. There seemed to be a trust factor which had to do with providing survey information to an unknown person. Initially, detailed information about the survey needed to be verified per telephone, i.e what the survey was for, who the author was, where the author was from, and additional personal details about the author. These details given per telephone then needed to be sent by mail (requested by physicians) in order to create a chance of physicians participating in the survey.

The survey even had extremely low participating rates when the survey was distributed through personal connections (through other physicians).

Another limitation was the risk of physicians with no interest in the topic, e.g. a lack of interest in the topic resulted in not participating in the survey.

In total only 20 persons completed the survey, which is not a representative number of participants for general practitioners in the rural areas of Lower Austria.

As mentioned in chapter 4.3.4 and 4.3.6 some answers within the survey suggested that some participants might not have fully understood the concepts of telemonitoring and teleconsultation. It can also be seen that the answers of specific items have no clear outcome, which might also be due to the small number of participants.

## 5 Discussion

**Due to the above-mentioned limitations, it needs to be added, the results of this research should be taken with caution.**

*Recommendations for Future Research*

Recommendations for future research work and the development of telemedical tools for use in rural areas of Lower Austria and a prospect for future complementing research are discussed here. It can be recommended that the length of the survey time be extended and a fundamental motivation model must be developed in order to motivate more physicians to participate in the survey. Due to the fact that it is unclear if the participants understood the full concept of the described telemedical services, a better alternative to the online survey might be personal interviews providing the opportunity to explain the concept to the necessary extent required for the individual needs of the respective physicians.

For a broader implementation of telemedical services in the rural areas of Lower Austria a broader education among physicians needs to occur. The results of this survey suggest that no explicit media system is clearly preferred, so when developing systems for this sector different types of media must be developed to choose from in order to reach the different consumer groups.

*Prospects*

A prospect for future research can be an acceptance analysis of potential patients in the rural areas of lower Austria. For the development of telemedical tools that will be used it is not only important to know what physicians think and require, but also what is needed so potential patients will adapt to the technologies. In order for telemedical services to be adapted in regular healthcare, there must not only be the supply, but also the demand.

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# Appendix

# A. Questionnaire

## Herzlich Willkommen zur Umfrage zum Thema Telemedizin!

Mein Name ist Anita Angerer, ich studiere Digital Healthcare an der FH St. Pölten und arbeite aktuell an meiner Masterarbeit. Im Rahmen dieser befasse ich mich mit möglichen telemedizinischen Anwendungen für die Kommunikation zwischen Mediziner / Medizinerin und Patient / Patientin im ländlichen Raum Niederösterreich. Ziel ist es, mittels Ihrer Meinung als Experte / Expertin das mögliche Potential von telemedizinischen Dienstleistungen wie z.B. Telemonitoring oder Telekonsultation im niedergelassenen Bereich in Niederösterreich zu evaluieren.

Allgemeiner Hinweis: Meine Arbeit beschränkt sich dabei rein auf das Potential der Technik aus Sicht von Gesundheitsexperten / Gesundheitsexpertinnen, gehen Sie also bitte bei der Beantwortung der Fragen von der Annahme aus, dass telemedizinische Gesundheitsleistungen im selben Rahmen vergütet würden wie klassische Gesundheitsleistungen.

Datenschutz-Hinweis: Die im Fragebogen gewonnenen Daten werden nach den gesetzlichen Datenschutzbestimmungen erfasst, absolut vertraulich behandelt und ausschließlich im Rahmen dieser wissenschaftlichen Arbeit verwendet. Einzeldaten werden nur in statistisch zusammengefasster Form dargestellt. Die Befragung ist anonym.

Die Ergebnisse der Arbeit können auf Wunsch an der FH St. Pölten öffentlich eingesehen werden. Gerne stehe ich auch für Fragen zu Verfügung.

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Durch die Beantwortung der Fragen erklären Sie sich mit der Verwendung der von Ihnen angegebenen Daten im Rahmen dieser Masterarbeit einverstanden.

## Begriffsdefinition

Telemedizin involviert die Nutzung von Telekommunikationstechnologien für eine Palette von medizinischen Dienstleistungen unter der Überwindung von Distanz. Zu diesen Dienstleistungen zählen unter anderem das Telemonitoring sowie die Telekonsultation.

Telemonitoring dient der medizinischen Überwachung von Patienten / Patientinnen, wobei diese von zu Hause aus die relevanten Messdaten an gesundheitliche Kompetenzzentren oder den/die behandelnden Mediziner / Medizinerin zur Kontrolle übermittelt. Diese Übermittlung kann manuell von den Patienten / Patientinnen (beispielsweise durch Eintragung in ein digitales Tagebuch) oder automatisch durch das Messgerät erfolgen.

Telekonsultation im Bereich der Kommunikation zwischen Patient / Patientin und Mediziner / Medizinerin beinhaltet folgende Dienstleistungen, abgehalten bei nicht Anwesenheit von Patient / Patientin und Mediziner / Medizinerin am selben Ort:

1) Telemedizinische Beratung in der Akutsituation
2) Telemedizinische Triage
3) Allgemeine medizinische Informationen
4) Reisemedizinische Beratung
5) Beratung zu Medikamenten inklusive Interaktions-Check
6) Empfehlungen für die Selbstbehandlung
7) Suche und Empfehlungen zur geeigneten medizinischen Institution

## Zeitaufwand und Beantwortungsschema

Die Beantwortung des Fragebogens wird ungefähr 10 Minuten in Anspruch nehmen.

Bitte bewerten sie im folgenden Aussagen auf ihr Zutreffen auf einer Skala von 1-5, wobei 1 für „trifft nicht zu “, 2 für „trifft eher nicht zu “, 3 für „teils-teils “, 4 für „trifft eher zu “ und 5 für „trifft zu “ steht. Bitte beantworten Sie die Fragen so offen wie möglich, Ihre ehrliche Sicht der Dinge liefert wertvollen Input für die Beleuchtung des Themas.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Geschlecht:** | ○ | männlich | ○ | weiblich | | | | | | |
| **Alter:** | ○ | < 30 | ○ | 30 - 39 | ○ | 40 - 49 | ○ | 50 - 59 | ○ | > 59 |

## Ich habe bereits telemedizinische Systeme für die Betreuung meiner Patienten / Patientinnen genutzt im Bereich: (Mehrfachauswahl möglich)

- ☐ Telemonitoring (beispielsweise Überwachung der Messwerte von Diabetes Patienten / Patientinnen mittels digitalem Diabetikertagebuch, Kontrolle der von Patienten / Patientinnen selbst erhobenen und übermittelten Vitalparamtern bei Herzinsuffizienz)
- ☐ Telekonsultation (beispielsweise Beratung zu Medikamenteninteraktionen, Hilfe beim Finden geeigneter medizinischer Institutionen, Ausstellen von Überweisungen, etc.)
- ☐ Sonstige (bitte spezifizieren Sie):
- ☐ Ich habe noch keine telemedizinischen Systeme für die Betreuung meiner Patienten verwendet.

## Die folgenden Effekte würde ich bei Einführung von telemedizinischen Dienstleistungen wie z.B. Telemonitoring und Telekonsultation in meiner Praxis als Vorteil empfinden

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Weniger überfüllte Warteräume | ○ | ○ | ○ | ○ | ○ |
| Regelmäßiger durchgeführte Kontrollen von chronisch Kranken Patienten / Patientinnen | ○ | ○ | ○ | ○ | ○ |
| Weniger durchzuführende Hausbesuche | ○ | ○ | ○ | ○ | ○ |
| Kürzere Wartezeit für Patienten / Patientinnen im Wartezimmer | ○ | ○ | ○ | ○ | ○ |
| Ersparnis einer weiten Anreise für Patienten / Patientinnen | ○ | ○ | ○ | ○ | ○ |
| Ersparnis der Anreise für Patienten / Patientinnen mit eingeschränkter Mobilität | ○ | ○ | ○ | ○ | ○ |
| Optimierung der Versorgungswege im ländlichen Raum | ○ | ○ | ○ | ○ | ○ |
| Verbesserung der Lebensqualität von chronisch kranken Patienten / Patientinnen | ○ | ○ | ○ | ○ | ○ |

## Ich beabsichtige in den nächsten 5 Jahren telemedizinische Systeme für die Betreuung meiner Patienten / Patientinnen zu nutzen, in den Bereichen:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Telemonitoring (beispielsweise Überwachung der Messwerte von Diabetes Patienten / Patientinnen mittels digitalem Diabetikertagebuch, Kontrolle der von Patienten / Patientinnen selbst erhobenen und übermittelten Vitalparametern bei Herzinsuffizienz) | ○ | ○ | ○ | ○ | ○ |
| Telekonsultation (beispielsweise Beratung zu Medikamenteninteraktionen, Hilfe beim Finden geeigneter medizinischer Institutionen, Ausstellen von Überweisungen, etc.) | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| Sonstige (bitte spezifizieren Sie): | ○ | ○ | ○ | ○ | ○ |

## Telemonitoring

Telemonitoring dient der medizinischen Überwachung von Patienten / Patientinnen, wobei diese von zu Hause aus die relevanten Messdaten an gesundheitliche Kompetenzzentren oder den/die behandelnden Mediziner / Medizinerin zur Kontrolle übermittelt. Diese Übermittlung kann manuell von den Patienten / Patientinnen (beispielsweise durch Eintragung in ein digitales Tagebuch) oder automatisch durch das Messgerät erfolgen.

Hinweis: Alle beschriebenen Telemonitoring Maßnahmen sind nicht als Ersatz, sondern lediglich als Unterstützung und Ergänzung zu den klassischen Wegen der Betreuung Ihrer Patienten und Patientinnen gedacht.

**Telemonitoring könnte in meinem Arbeitsalltag ein nützliches Mittel zur Betreuung meiner Patienten/ Patientinnen im Bereich Disease Management sein…**

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| … bei Diabetes mellitus | ○ | ○ | ○ | ○ | ○ |
| … bei Herzinsuffizienz | ○ | ○ | ○ | ○ | ○ |
| … bei COPD | ○ | ○ | ○ | ○ | ○ |
| … bei Depression | ○ | ○ | ○ | ○ | ○ |
| … bei Asthma | ○ | ○ | ○ | ○ | ○ |
| … bei KHK | ○ | ○ | ○ | ○ | ○ |
| Sonstige (bitte spezifizieren Sie): | ○ | ○ | ○ | ○ | ○ |

**Telemonitoring könnte in meinem Arbeitsalltag ein nützliches Mittel zur Betreuung meiner Patienten / Patientinnen im Bereich Prävention sein…**

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| … bei Diabetes mellitus | ○ | ○ | ○ | ○ | ○ |
| … bei Herzinsuffizienz | ○ | ○ | ○ | ○ | ○ |
| … bei COPD | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| ⋯ bei Depression | ○ | ○ | ○ | ○ | ○ |
| ⋯ bei Asthma | ○ | ○ | ○ | ○ | ○ |
| ⋯ bei KHK | ○ | ○ | ○ | ○ | ○ |
| Sonstige (bitte spezifizieren Sie): | ○ | ○ | ○ | ○ | ○ |

## Telemonitoring II

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Ich bin der Meinung, dass die Verwendung von einem Telemonitoring-System (beispielsweise Einsicht in ein digitales Diabetestagebuch und Kontrolle der darin übermittelten Daten) nicht mit übermäßigem zusätzlichem Aufwand verbunden wäre. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Andere Gesundheitsexperten und ExpertInnen würden es begrüßen, wenn ich Telemonitoring (beispielsweise zur Kontrolle von regelmäßig zu überprüfenden Vitalwerten von chronisch kranken Patienten / Patientinnen) anbiete. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Die Nutzung von Telemonitoring-Systemen (beispielsweise zu Kontrolle von regelmäßig zu überprüfenden Vitalwerten von chronisch kranken Patienten / Patientinnen) wäre mit meiner derzeitigen Arbeitsweise kompatibel. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Ich denke, die Verwendung von Telemonitoring-Systemen könnte meine Produktivität in der Betreuung meiner Patienten / Patientinnen steigern. | ○ | ○ | ○ | ○ | ○ |

## Telemonitoring III

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Ich denke, die Bedienung eines Telemonitoring-Systems (beispielsweise Einsicht in ein digitales Diabetestagebuch und Kontrolle der darin übermittelten Daten) wäre leicht zu lernen für mich. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Ich hätte die Ressourcen und Infrastruktur um Telemonitoring (beispielsweise mit einem digitalen Diabetestagebuch) anzubieten. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Die meisten meiner Patienten / Patientinnen würden es begrüßen, wenn ich Telemonitoring (beispielsweise zur Kontrolle von regelmäßig zu überprüfenden Vitalwerten) anbiete. | ○ | ○ | ○ | ○ | ○ |

## Telekonsultation

Telekonsultation im Bereich der Kommunikation zwischen Patient / Patientin und Mediziner / Medizinerin beinhaltet unter anderem folgende Dienstleistungen, abgehalten bei nicht Anwesenheit von Patient / Patientin und Mediziner / Medizinerin am selben Ort:

1) Telemedizinische Beratung in der Akutsituation
2) Telemedizinische Triage
3) Allgemeine medizinische Informationen
4) Reisemedizinische Beratung
5) Beratung zu Medikamenten inklusive Interaktions-Check
6) Empfehlungen für die Selbstbehandlung
7) Suche und Empfehlungen zur geeigneten medizinischen Institution

Hinweis: Alle beschriebenen Formen der Telekonsultation sind nicht als Ersatz, sondern lediglich als Unterstützung und Ergänzung zur klassischen persönlichen Konsultation gedacht.

### Ich denke, die Bedienung eines Telekonsultation-Systems wäre leicht für mich zu lernen, bei Konsultation über folgende mediale Anwendungen (in der Annahme eingehaltener Datenschutzrichtlinien)

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| ⋯ Telefonat | ○ | ○ | ○ | ○ | ○ |
| ⋯ Videokonferenz | ○ | ○ | ○ | ○ | ○ |
| ⋯ Webportal (Bsp.: webbasierter Austausch von Nachrichten) | ○ | ○ | ○ | ○ | ○ |
| ⋯ App (Bsp.: Nachrichtenaustausch mittels Smartphone App) | ○ | ○ | ○ | ○ | ○ |

### Meinen Patienten / Patientinnen die Nutzung von Telekonsultation anzubieten wäre mit meiner derzeitigen Arbeitsweise kompatibel in Form von

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| ⋯ Telefonat | ○ | ○ | ○ | ○ | ○ |
| ⋯ Videokonferenz | ○ | ○ | ○ | ○ | ○ |
| ⋯ Webportal (Bsp.: webbasierter Austausch von Nachrichten) | ○ | ○ | ○ | ○ | ○ |
| ⋯ App (Bsp.: Nachrichtenaustausch mittels Smartphone App) | ○ | ○ | ○ | ○ | ○ |

## Telekonsultation II

**Das Mittel der Telekonsultation könnte in meinem Beruf eine nützliche Ergänzung zu persönlichen Terminen sein⋯**

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| ⋯ für telemedizinische Beratung in der Akutsituation | ○ | ○ | ○ | ○ | ○ |
| ⋯ für die telemedizinische Triage | ○ | ○ | ○ | ○ | ○ |
| ⋯ für die Bereitstellung von allgemeinen medizinischen Informationen | ○ | ○ | ○ | ○ | ○ |
| ⋯ für reisemedizinische Beratung | ○ | ○ | ○ | ○ | ○ |
| ⋯ für Beratung zu Medikamenten inklusive Interaktions-Check | ○ | ○ | ○ | ○ | ○ |
| ⋯ zur Gabe von Empfehlungen für die Selbstbehandlung | ○ | ○ | ○ | ○ | ○ |
| ⋯ zur Unterstützung von Patienten / Patientinnen bei der Suche und Empfehlungen zur geeigneten medizinischen Institution | ○ | ○ | ○ | ○ | ○ |
| ⋯ für das Führen von Patienten / Patientinnen in die nächsten Behandlungsschritte | ○ | ○ | ○ | ○ | ○ |
| Sonstige (bitte spezifizieren Sie): | ○ | ○ | ○ | ○ | ○ |

**Ich denke, die Bedienung von einem System für Telekonsultation wäre mit geringem zusätzlichen Aufwand umzusetzen, bei Konsultation über folgende mediale Anwendungen⋯ (in der Annahme eingehaltener Datenschutzrichtlinien)**

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| ⋯ Telefonat | ○ | ○ | ○ | ○ | ○ |
| ⋯ Videokonferenz | ○ | ○ | ○ | ○ | ○ |
| ⋯ Webportal (Bsp.: webbasierter Austausch von Nachrichten) | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| ··· App (Bsp.: Nachrichtenaustausch mittels Smartphone App) | ○ | ○ | ○ | ○ | ○ |

**Ich denke, dass ich die Ressourcen und Infrastruktur hätte um Telekonsultation anzubieten in Form von**

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| ··· Telefonat | ○ | ○ | ○ | ○ | ○ |
| ··· Videokonferenz | ○ | ○ | ○ | ○ | ○ |
| ··· Webportal (Bsp.: webbasierter Austausch von Nachrichten) | ○ | ○ | ○ | ○ | ○ |
| ··· App (Bsp.: Nachrichtenaustausch mittels Smartphone App) | ○ | ○ | ○ | ○ | ○ |

## Telekonsultation III

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Andere Gesundheitsexperten und ExpertInnen würden es begrüßen, wenn ich Telekonsultation (beispielsweise um allgemeine medizinische Informationen zu geben oder um bei der Suche der geeigneten medizinischen Institutionen bei speziellen Beschwerden zu unterstützen) anbiete. | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Die Verwendung von Telekonsultation-Systemen könnte meine Produktivität in der Betreuung meiner Patienten / Patientinnen steigern | ○ | ○ | ○ | ○ | ○ |

| | trifft nicht zu 1 | trifft eher nicht zu 2 | teils-teils 3 | trifft eher zu 4 | trifft zu 5 |
|---|---|---|---|---|---|
| Die meisten meiner Patienten / Patientinnen würden es begrüßen, wenn ich Telekonsultation (beispielsweise um allgemeine medizinische Informationen zu geben oder um bei der Suche der geeigneten medizinischen Institutionen bei speziellen Beschwerden zu unterstützen) anbiete. | ○ | ○ | ○ | ○ | ○ |

Ich danke Ihnen sehr für die ehrliche Beantwortung des Fragebogens. Ihre ehrliche Meinung stellt einen wertvollen Beitrag zur Beleuchtung des Themas dar.

**Haben Sie noch weitere Anmerkungen?**

Vielen Dank!

Für Fragen stehe ich gerne zu Verfügung.
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