Digital Transformation in the German healthcare industry: An analysis of the video consultation (teledoctor) and how it can shape the German healthcare industry

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ABSTRACT

Title: Digital Transformation in the German healthcare industry: An analysis of the video consultation (teledoctor) and how it can shape the German healthcare industry

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The healthcare industry is currently undergoing a digital transformation. Thereby, efficiency and accessibility between physicians and patients shall be improved by innovative care and treatment concepts. One of these innovative concepts is the telemedicine and in particular the video consultation which enables a location independent treatment of patients through information and communication technology. However, this kind of digital medical treatment is currently not properly available in Germany. Therefore, this exploratory study deals with the current status and potential of video consultation in Germany, the challenges and derives potential impacts of the video consultation. The findings reveal that the legal framework of the video consultation, inappropriate reimbursement, acceptance within patients and physicians and no adequate expanded telematic infrastructure are the main challenges that hinder the further development of the video consultation. At the same time, an educated guess showed that a potential size of video consultation based on physicians and patient's acceptance exists. The video consultation and its connected features will shift the physical based healthcare system to a more online focused and patient centered system which in return will affect all involved stakeholder. Patients will have better access to medical care and physicians will have more efficient practice processes and more flexible working models. In order to adapt to the digital change of society, physicians should provide VC and healthcare insurance companies should support it.

Key words: Telemedicine, Video Consultation, Digitization, Teledoctor

ABSTRACTO

Título: Transformação digital na indústria alemã de saúde: Uma análise do vídeo de consulta (teledoutor) e como ele pode moldar a indústria alemã de saúde

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A indústria da saúde está, atualmente, a passar por uma transformação digital. Deste modo, a eficiência e a acessibilidade entre médicos e pacientes serão melhoradas através de conceitos inovadores de cuidados e tratamentos. Um destes conceitos inovadores é a telemedicina e, em particular, a videoconferência, que permite um tratamento independente da localização dos doentes através das tecnologias da informação e da comunicação. No entanto, este tipo de tratamento médico digital não está actualmente disponível de forma adequada na Alemanha. Portanto, este estudo exploratório lida com a situação atual e o potencial da consulta por vídeo na Alemanha, os desafios e os potenciais impactos da consulta por vídeo. Os resultados revelam que a estrutura legal da consulta em vídeo, o reembolso inadequado, a aceitação pelos pacientes e médicos e a falta de infraestrutura telemática expandida adequada são os principais desafios que dificultam o desenvolvimento futuro da consulta em vídeo. Ao mesmo tempo, uma suposição esclarecida mostrou que existe um tamanho potencial de consulta por vídeo baseado na aceitação dos médicos e pacientes. A consulta em vídeo e os recursos conectados mudam o sistema de saúde com base física para um sistema mais focado online e centrado no paciente, o que afetará todas as partes interessadas envolvidas. Os pacientes terão melhor acesso aos cuidados médicos e os médicos terão processos práticos mais eficientes e modelos de trabalho mais flexíveis. A fim de se adaptar à mudança digital da sociedade, os médicos devem fornecer VC e as companhias de seguros de saúde devem apoiá-la.

Palavras-chave: Telemedicina, Vídeo Consulta, Digitalização, Teledoutor

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GLOSSARY

Doc-2-doc	-	Doctor-to-Doctor
Doc-2-pat	-	Doctor-to-Patient
GP	-	General Practitioner
ICT	-	Information and Communication Technology
MA	-	Medical Assistant
VC	-	Video Consultation

1. Introduction

1.1 Background

„The world has become digital“ (Popkova and Ostrovskaya, 2018). Internet of things, social media, artificial intelligence, and the fast increase of technology have fundamentally changed society's private and professional life. In the course of digital transformation, the people's expectations and communication habits are continuously changing which forces companies to adapt existing processes and replace them with more efficient, digital processes (Berman, 2012). These digital developments are reflected in all industries across all countries. However, "some industries have seen faster transformation, whereas the healthcare sector only recently came into focus" (Eysenbach, 2018), especially in Germany. Digital transformation and disruption in the healthcare industry focus on enhancing efficiency, accessibility, and communication between physicians and patients in order to enable innovative care and treatment concepts (Bain & Company, 2017).

The new generation of patients relying on Dr. Google, wearables, healthcare apps and the arrangement of an online appointment at clinics is already part of the digital healthcare system (Waack, 2017). Nevertheless, the question remains how the digital transformation influences the doctor's visit? At this point eHealth, telemedicine and particularly video consultation (VC) plays a role in a patient's journey and physician's processes. So far, medical competence has been tied to the location of the doctor. But telemedicine is not bound to any location as it uses information and communication technologies (ICT) which help doctors to treat their patients at any distance in space and time (Johansson et al, 2014). Instead of waiting at a doctor's clinic, a patient can be consulted online and, if necessary be issued a prescription or sickness certification online via an App. Hence, patients mainly need to visit a doctor's practice if physical examination is required. This implies a restructuring of the doctor's clinic and creates a new channel for patients to reach their doctor (Thranberend et al., 2015).

Especially against the background that Germany faces the problem of a declining number of physicians in the upcoming years, telemedicine reflects a good supplement to the traditional doctor's visit. By the year 2030 a shortage of more than 100,000 doctors, in particular in rural areas, is estimated (Mühlner, 2017). Moreover, Germany has a rapidly growing proportion of

older citizens, overcrowded emergency rooms and an increase in chronic illnesses which require an improvement in healthcare resources. The mentioned factors lead to rising costs and increasing pressure on the already strained healthcare systems (Sträve, 2018). A study of McKinsey showed that the state could have saved up to € 34 billion in 2018 if the German healthcare system had already been more digitized (Mc Kinsey, 2018).

Despite these factors, patients have adjusted their expectations, thinking and engagement to the digital change. They obtain information about diseases or diagnosis through the internet and prefer to self-manage their health and wellbeing (Deloitte, 2017).

These are only a few examples where digital innovations as the VC might assure a better medical care in Germany in the future. Additionally, it may reduce travel time, costs and offers further advantages over traditional methods of treatment (Sträve, 2018). But, an exclusively remote treatment via VC with the opportunity to issue prescriptions or sickness notification is currently only within pilot projects available in Germany. However, other countries like Switzerland and Sweden have already implemented first approaches of the VC and show that this is a realistic approach of the doctor's visit in the future (Jünger, 2016). Hence, this thesis analyze the current state of VC in Germany and deals with the question of "How can the video consultation shape the German healthcare system".

1.2 Relevance and problem statement

This thesis deals with the telemedical service within the German healthcare industry. Telemedicine and especially the field of video consultation (teleconsultation) experienced an enormous dynamic in the past few years. The use of ICT within healthcare has received social and health policy attention (Bundesärztekammer (a), 2018). Since 2017, physicians are financially supported by health insurance companies (HICs) when conducting VC for certain doctor groups and indications. Furthermore, the ban on remote treatment was lifted in some federal states in Germany in order to offer physicians more flexibility for VC by the end of 2018. Thus, VC will have a big impact on the German healthcare system in short-term (Lux, 2017). For those reasons, the focus is set on the VC and disregards other fields of telemedicine within the frame of this thesis since it would exceed the capacity of this research. Due to the current legislative changes and renewals in terms of VC in Germany in 2018, it is interesting how this development will continue and shape the healthcare system.

Hence, this thesis explores the following research question:

“How can the video consultation (teledoctor) shape the German healthcare system?”

In order to analyze this question, the literature review provides a first overview about the dynamics and country specific regulations of the VC in Germany. In the beginning, the healthcare system and telemedicine in Germany is introduced. Furthermore, chapter 2.3 addresses the concept of the VC by describing the legal framework, requirements and fields of application as it currently exists in Germany. In chapter 2.4 a global outlook of telemedical consultation is described to represent the development and success factors of other countries. Furthermore, the methodology explains the procedure of the expert interviews and based on these an estimation of the potential size of VC is presented. Chapter 4. provides the findings and analysis of this thesis. At the beginning the patients and physicians acceptance based on secondary literature and two pilot projects are discussed. Based on pilot projects, the overview of other countries and insights from the experts, the challenges and further development steps of VC will be identified. This enables me to perform an educated guess about the estimation of the potential market size of the VC and to derive first impacts on the stakeholders of the German healthcare industry. Lastly, the key findings are summarized in a conclusion and the limitation of the work is pointed out.

With regard to the scope of the analysis, this thesis is limited to research and analysis within the healthcare industry in Germany. The research of the VC is focused on the outpatient care since the consideration of inpatient care would exceed the frame of this thesis. Furthermore, the VC is mainly discussed in terms of doctor-to-patient (doc-2-pat) relationship and less the doctor-to-doctor (doc-2-doc) relationship.

2. Literature Review

2.1 Introduction into the German healthcare system

The healthcare system in Germany is organized on three basic principles. Firstly, compulsory insurance obliges all citizens to insure themselves statutory or private. Secondly, the healthcare

is financed predominantly by contributions of the health insured citizens and the employers. This differs from other international systems such as in United Kingdom or Sweden, which use state health systems and operate with tax revenues. Thirdly, the solidarity principle measures the amount of the health insurance contribution by the insured person's income. All members pay the same fixed percentage of their income into the health fund and receive the same benefits in return (IQWiG, 2018).

Furthermore, a distinction is made between two insurance systems, namely the statutory health insurance and the private health insurance. Employees with an annual gross income above € 59,400 are statutory health insured, self-employed or employees over this income limit can choose between a statutory or private health insurance (Blümel and Busse, 2018). The medical services which are reimbursed for the statutory health insured people are specified jointly by the statutory HICs. Privately insured persons can select their benefits individually on the basis of a benefit catalogue (IQEH, 2018; Panea, 2018).

Moreover, the German healthcare can be divided into outpatient care and inpatient care. Outpatient care in Germany is mainly provided by established independent doctors, dentists, psychotherapists and specialties. Inpatient care refers to the stay and treatment in a hospital (Bundesärztekammer (b), 2018).

2.2 Definition and application fields of telemedicine

Telemedicine describes the interaction between patients and practitioner or between physicians in the event of a physical and temporal discrepancy by using ICT (WHO, 1997). This includes all medical services of healthcare in the area of diagnostics, medical decision advice, therapy and rehabilitation (AG Telemedizin, 2015). A further definition of the term telemedicine also includes a multitude of different techniques and applications. These includes the improvement of communication between medical service providers and the electronic documentation of findings with location-independent data access, such as electronic patient file. Additionally, the monitoring of vital parameters, e.g. blood pressure by using telemonitoring procedures and the teleconsultation such as the medical consultation, advice or therapy recommendations through VC (GKV-Spitzenverband, 2016).[1]

[1] Definitions of the terms eHealth, Telematics Infrastructure and electronic patient file can be find in Appendix-1.

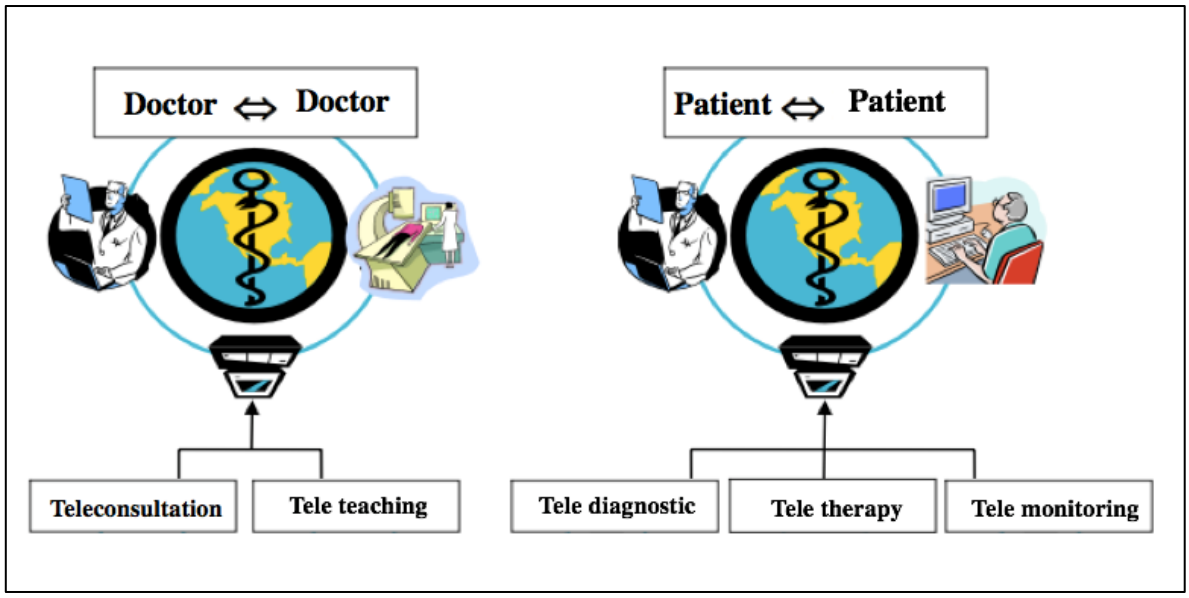


Figure 1. Application fields of telemedicine (Duftschmid et al., 2005).

According to the figure 1 above, telemedicine can be divided into five basic application fields.[2] Tele diagnosis and tele therapy can be performed between doc-2-pat in form of a VC. The teledoctor provides a medical diagnosis or therapy to the patient at a physical distance through a real-time conversation by ICT (Reiter et al., 2011). The teleconsultation between two physicians (doc-2-doc) is an evaluation of patient data from a teledoctor (physical separated from patient) requested by a presence doctor (physical at the patient) through ICT. (Duftschmid et al., 2005; Whitten, 2006). All the three mentioned applications fields can be performed within a VC.

2.3 Concept of Video Consultation (doc-2-pat) in Germany

2.3.1 Legal framework of the Video Consultation

Since April 2017, the VC can be carried out and billed by doctors in accordance with the E-Health Act (Kassenärztliche-Bundesvereinigung (a), 2018). However, in most federal states in Germany a pure remote treatment via VC is not possible due to the ban on remote which determines strict regulations for the procedure and reimbursement of the VC.

[2] Within this thesis, only the fields of teleconsultation, tele diagnostic and tele therapy will be considered and explained.

The ban of remote treatment is an integral part of the medical professional regulations. According to paragraph § 7 of the “professional regulations for physicians”, doctors are not allowed to carry out individual treatments and especially consultations exclusively via communication technologies" (Bundesärztekammer (b), 2018) . This regulation is referred as a “ban on remote treatment”. However, remote treatment is not prohibited in general, but only “exclusive” remote treatment is prohibited under professional law. Thus, only patients who have already had “initial contact” with the doctor within the last two quarters are allowed to be treated through VC in regard of certain indications (Chapter 2.3.4).

Exceptions within the ban on remote treatment have been created for two pilot projects in the federal state of Baden-Württemberg in 2017 where they are allowed to conduct an exclusively remote treatment (VC without initial personal contact). The medical association of Baden-Württemberg has amended its professional regulations and added some phrases to the above-mentioned regulation:

> *"[...] pilot projects, in which medical treatments are carried out exclusively via communication networks, require the approval of the medical association of the responsible federal state and are particularly used for research and need to be evaluated” (Hartmannbund, 2018).*

This means, remote treatment, without visiting the doctor once before, can be done in case of a pilot project and shall be evaluated for further medical research.

Against this background, the ban on remote treatment was redefined in general at the German Doctors’ Congress in May 2018, which is set out below:

> *"Doctors may advise and treat patients in personal contact. Besides, they can use communication media to support this. Exclusive consultation or treatment via communication media is permitted in individual cases if this is medically justifiable and the necessary medical care is maintained […].” (Bundesärztekammer (c), 2018).*

This has created an initial legal basis, but the federal states are not forced to accept the refinement since it is up to each individual federal state of how the legal regulations will be adapted, redefined or if they maintain the ban on remote treatment (Hahn, 2018). The federal

states of Baden-Württemberg, Schleswig-Holstein, Sachsen and Nordrhein-Westfalen support the new regulation and do not want to restrict it only to "individual cases". These states want to use it for a broader range of cases to provide more legal capacity for physicians (Kassenärztliche-Vereinigung Baden-Württemberg (a), 2018). Baden-Württemberg was the initiator and first state which adapted its regulations. The other three federal states only adapted their legal regulations end of 2018 and have not implemented any project yet (Henke, 2018; Krüger-Brand, 2018).

Although the German Doctors' Congress has proposed a relaxation of the ban on remote treatment, there are still no guidelines in regard how the VC without initial contact should be carried out or reimbursed in the future. For this reason, in November 2018 the federal cabinet decided to create a new law, the so-called “Nursing Staff Strengthening Act”. This law shall provide regulations for the use, application fields, medical indications and reimbursement of the VC without initial personal contact. It is expected to come into force in 2019 (Federal ministry of health (b), 2018).

Hence, in the future, doctors may treat patients remotely on an expanded legal basis, but there are still further obstacles that limit the full range of services via VC. This includes the issuance of a prescriptions and a sickness certification. In principle, the prescription of a drug without "obvious" doctor-patient contact is prohibited. However, a deviation in the law allows to issue a prescription in "justified exceptional cases" (Kassenärztliche-Vereinigung Baden-Württemberg (a), 2018). Hence, prescriptions could be issued during a remote treatment, but it refers only to the federal state of Baden-Württemberg yet. With regard to the declaration of incapacity for work, the law stipulates that an incapacity for work and its probable duration may only be issued with a prior medical examination (Krüger-Brand, 2018).

2.3.2 Reimbursement of the Video Consultation

In 2017, the VC became part of the uniform evaluation scale of HICs in order to reimburse the physicians by the statutory health insurance funds. This means, doctors are able to treat patients with certain clinical pictures online (chapter 2.3.4) and can submit this consultation as an invoice to the HIC (Kassenärztliche-Bundesvereinigung and GKV-Spitzenverband, 2017).

The VC conducted by physicians is reimbursed with an amount of € 9.27 per patient contact. This only applies if no patient contact took place in the same quarter and if the patient visited the practice at least one time in the two previous quarters. If these requirements are met, a physician can submit an invoice of the VC to the HIC. In case the patient has to be send to a local practice since the VC was not sufficient and a physical check-up is required, the teledoctor will not be reimbursed for the VC although his provided service (Kassenärztliche-Vereinigung Baden-Württemberg (a), 2018). Furthermore, the VC can only be reimbursed for certain medical specialties and selected indications which are listed in chapter 2.3.4.

2.3.3 Definition and Procedure of the Video Consultation

The VC, based on the ban on remote treatment, is defined in Germany as a ″synchronous communication between a physician and a patient known to him if necessary, with assistance of an online video consultation in real time" (Kassenärztliche-Vereinigung Berlin, 2017).

The process of a VC, as it may currently be used in Germany on a legal basis, can proceed as follows: Firstly, Physicians must create an account with an appropriate telemedicine provider (Kassenärztliche-Bundesvereinigung (a), 2018). The appointments for the VC can be arranged personally during a doctor’s visit, by telephone or online. Before the first online consultation can take place, the doctor must obtain the patient's written consent and informs him about the dial-in code which is required for the login of the VC. In the next step, the telemedicine provider connects the parties and ensures that their connection is shielded from other parties (Wilms, 2017). In the following, it depends on the physician whether he can accomplish the VC under the existing conditions e.g. enough light, good camera quality. In case of bad conditions, e.g. poor quality of the camera, the VC should be interrupted and rescheduled or alternatively a personal face-to-face appointment has to be arranged (Kassenärztliche-Bundesvereinigung (a), 2018).

2.3.4 Fields of application of the Video Consultation

The VC may only be used and billed by certain groups of physicians and is only intended for suitable indications due to the ban on remote treatment (Kassenärztliche-Bundesvereinigung and GKV-Spitzenverband, 2017).

Suitable groups of doctors include:
Family doctors, pediatricians, anesthetists, ophthalmologists, surgeons, ear, nose and throat surgeons, oral and maxillofacial surgeons, neurologists, nerve surgeons and neurosurgeons, orthopedists, gynecologists, dermatologists, specialists in internal medicine, psychiatrists, urologists, specialists in physical and rehabilitative medicine and radiation therapists (Kassenärztliche-Bundesvereinigung (a), 2018).

Indications and clinical pictures, which are allowed for the VC due to the ban on remote treatment include: (Kassenärztliche-Bundesvereinigung and GKV-Spitzenverband, 2017) :

- Visual postoperative follow-up of an operation wound
- Visual follow-up of dermatosis, after radio therapeutic treatment
- Visual monitoring of the progress of acute, chronic and open wounds
- Visual assessment of movement restrictions/disorders of the musculoskeletal system, as a follow-up check.
- Assessment of the voice, speaking and language as a follow-up check
- Anesthesiologic, post-operative follow-up

2.4 Global outlook in terms of telemedical consultation

2.4.1 Overview and success factors of other countries

A study of the Bertelsmann Institute compared seventeen different countries in terms of success factors and indicators like telemedical and eHealth implementations (online Prescription, digital patient file, video consultations etc.), telematic infrastructure and eHealth strategies. It has showed that Great Britain, Scandinavian countries, Canada and Switzerland are particularly well advanced in the field of telemedicine and digitalization of the healthcare system (Jünger, 2016; Kostera and Thranberend, 2018).

Furthermore, the international comparison presented some success factors of the pioneer countries which helped them to develop and introduce digitization and telemedicine technologies within their healthcare system. In almost all countries, the politicians defined a

clear framework, ensure acceptance and has driven the development of medical technologies forward. Those frameworks are mainly in form of digital eHealth strategies which are implemented on a national level and present clear target visions and solutions. Furthermore, except of Spain and Germany, all other countries have competence centers or "agencies for digital health" (Kostera and Thranberend, 2018). These agencies consist of different stakeholders within the healthcare system and are politically anchored authorities. They act as advisors, coordinators and can also actively intervened in the development process through binding regulations and standards. However, the pioneer countries also face the problem of physicians and patients reservation against digitalization and telemedical technologies and therefore see the promotion of acceptance as a strategic task. For instance, Canada and the Netherland introduced special communications campaign and “info offices” to inform about the telemedical services (Kostera and Thranberend, 2018). Additionally, those countries recognized the importance of involving the end user, patients and doctors, when creating new telemedical services. In the Scandinavian countries, focus groups and surveys were conducted in several hospitals and practices in order to find out the needs and ideas of patients, physicians and further medical employees and to increase their acceptance (Kostera and Thranberend, 2018). In addition, it has been shown that a centralized, nationwide or state-funded structure is more likely to have a beneficial effect on the early implementation of telemedicine. For instance, in 2017 Sweden´s health authorities agreed to compensate telemedicine providers for the VC with public funds (Ram, 2018). Some examples regarding VC are presented below.

Sweden’s healthcare system e.g. has an electronic patient file, which was already implemented nationwide in 2017 (GTAI, 2017). Additionally, 95% of all prescriptions are already issued electronically and are either sent directly to the pharmacy or stored in central databases for retrieval (GTAI, 2017). Moreover, the Swedish telemedicine provider “KRY” may advise patients on all health pictures where no physical contact is required and may issue online prescriptions (KRY, 2018; Pracht, 2018). The company was founded in 2017 and currently more than 2% (European Observatory on Health Systems and Policies, 2017) of all primary healthcare consultancies in Sweden are covered by the service of KRY. In addition, the VC is charged in the same way as a personal consultation and is partly financed by two Swedish state-funded treatment centers (Neubert, 2018). Since 2017, a total amount of 250,000 treatments were already carried out by “KRY” doctors through VC (Weißling, 2018).

Finland has also established several telemedicine centers within the last years. In 2016, about 900,000 citizens were treated online by psychologists via VC. Furthermore, Helsinki's biggest eHealth center consists of 1,500 employees and treats 20,000 elderly people online via VC every month (Feely, 2017).

Another example is the British platform Dr.Ed, the telemedicine provider may advise patients for approximately 35 clinical pictures via VC (Dr.Ed, 2018) and is able to give concrete therapy recommendations and issue prescriptions (Jünger, 2016). Regarding costs, the attendance and diagnosis are free of charge for patients, only treatments e.g. prescribing medication or laboratory tests has to be paid privately by patients (Riedler, 2016). Additionally, issued prescription will be delivered directly to the patient's home. (Dr.Ed, 2018).

2.4.2 Best practice example of Switzerland

In Switzerland, remote treatment and diagnosis have been used by Swiss doctors for over ten years, as there exist no ban on remote treatment such as in Germany. The digitization and telemedicine have led HICs to develop completely new insurance models in Switzerland (Jahns, 2017). Additionally, the professional regulations for physicians have been adapted to support them on a legal basis and they are also financially supported by the state (Riedler, 2016). Hence, the telemedical counselling has quickly gained acceptance among doctors in Switzerland (Rychlik, 2018).

In Switzerland, two telemedical concepts can be distinguished. On the one hand, the regional and publicly financed services of doctors' associations and hospitals exist. Those represent a platform where patients can ask questions about specific health problems. But within this concept no diagnosis or issuance of prescriptions is possible. On the other hand, there are telemedical services offered by telemedicine providers which are allowed conduct the full range of services within a treatment and are also integrated in the insurance models of the HICs (Fares and Bernstein, 2016). This concept is presented in the example of "Medgate", which is the largest telemedicine provider in Switzerland (Riedler, 2016).

The Medgate's treatment procedure works as follows:
Patients can contact Medgate via telephone, Internet or via an App. In the first step, personal data, symptoms of the illness and the urgency of the treatment are recorded by a MA (Medical

Assistant). For patients who call for the first time, a "Patient File", will be created where they can upload photos e.g. of skin irritations or injuries. Within 15 minutes the physicians recalls the patient and proceed with the treatment. The physicians of Medgate are allowed to issue prescriptions which can sent online directly to a nearby pharmacy (Gossler and Klauser, 2017). In approximately the half of Medgate's cases, the teledoctor can treat his patient in a way that no further visits to a stationary doctor is necessary. If a personal examination of a physician is required, the teledoctor refer the patient to a so called “Polyclinic”. In this case, a letter of referral with all gathered data and diagnosis of the patient is created and send to the statutory Polyclinic (Gossler and Klauser, 2017).

The Polyclinics provide GPs (General Practitioner) and further medical specialties at various locations in Switzerland. Another Medgate service are the so-called 'Mini Clinics'. These are equipped with MAs and offer various examination options such as blood tests or laboratory tests. If required, a teledoctor can be connected to the Mini Clinic via video chat (Medgate, 2018).

Moreover, the physicians at Medgate have to undergo a training for telemedical consultation lasting several months, which is concluded with an examination. If the examination is passed, the doctors receive a license for telemedical consultation, which will be reviewed and renewed annually (Medgate, 2018).

In terms of health insurance models, Switzerland is dominated by three different insurance models, which are the standard model, the family doctor model and the telemedicine model. The telemedicine model requires a call to a teledoctor or consultation center before further medical treatment is initiated. Hence, a kind of "triage" may take place in order to better classify the concerns of the patients and to assess whether a doctor visit is necessary. Other insurance models also include telemedicine consultation, but patients may freely choose between a teledoctor or presence physician (Fares and Bernstein, 2016). Therefore, HICs that have incorporated Medgate into their insurance models were able to save between 12% and 17% on outpatient treatment costs (Till, 2018).

3. Methodology

This dissertation applies a qualitative method in order to find out how the teledoctor technology can shape the healthcare industry in Germany. The exploratory study focuses on the analysis of the current state of VC and the associated challenges to derive further development steps and impacts of the teledoctor (VC) within the German healthcare industry.

In order to draw a holistic picture of the VC and to gain insights of involved parties, the selected data collection technique included in-depth interviews with stakeholders of the teledoctor technology within the German healthcare system. In-depth interviews are particularly suitable to uncover attitudes, estimations, beliefs as well as assessments of the objects under investigation (Harris, 1996). The interviewees are experts in this field of physicians, managers of insurance companies, CEO of a telemedicine provider and managers of German medical associations (Appendix 3).

Regarding the measurement of this study, a semi-structured guideline is used in order to conduct the in-depth interviews. Hence, the questions can be adapted according to the course of the conversation and the resulting answers which provides space for discussions with interviewees and raises the flexibility of the interview. The questions are mostly open-ended such as ‘what’ or ‘why‘ questions to encourage interviewees to present subjective experiences and opinions (Saunders et al., 2008).

Three different interview guidelines were created for the several stakeholders due to professional different backgrounds and knowledge. The interview guidelines were distinguished in a guideline for physicians, a guideline for HIC and the medical association and a guideline for the telemedicine provider. However, all three questionnaires pursued the same main aspects, including the following:

- Insights of currently implemented pilot projects with VC
- Challenges and further development steps
- Future perspective

Furthermore, the interviews were conducted in German via skype calls. Subsequently, the key insights from the interviews were translated in English for documentation purposes. In order to

evaluate the interviews in a meaningful way, a summarizing qualitative content analysis was used, which aims to capture a subjective view of individuals on a certain question in order to derive interpretations and action orientations (Mayring, 2015).

To provide an overview what the market potential of VC would be without a ban on remote treatment and with the current acceptance of doctors and patients, a market estimation is made for the present time (Jan. 2019) and a future forecast for 2024 is performed (five years in the future). This calculation is done through a top-down approach, by taking the number of inhabitants with internet access in Germany into account and multiplying this number with the average of doctor´s visits per year. Afterwards the derived number of doctor´s consultations was multiplied with the acceptance of VCs within patients and physicians. Furthermore, only medical specialties that are suitable for VC were considered. The experts were presented a list of seventeen different medical specialties and had to choose which were best suited for the VC. The seventeen different medical specialties presented, are currently reimbursed by the HIC for a VC. Furthermore, the selected medical specialties of the experts were compared with specialties of secondary literature that represents the patient perspective and consistencies were determined (Chapter 4.1.3).

In the next step, this number was multiplied with each percentage of indications that can be performed via VC. Since only a few indications and services are suitable for VC, the interviewed physicians were ask how many percentage of the patients requests can be covered by VC. For instance, 10% of the consultations at a GP can be done online (Appendix 8).

Due to the fact that the ban on remote treatment was changed at the time of this thesis in some parts of Germany, only the four federal states without the ban (VC without initial contact) were taken into account.

In order to present a prognosis for 2024 an educated estimation based on interviews and secondary literature is performed. Hence, scenarios of a possible increase of acceptance towards the VC are drawn, which are also based on the expert interviews and secondary literature. Summarized it can be said that the projections serve as a basis to provide the reader with a first overview of how many consultations could be conducted online today and, in the future, based on acceptance and legal basis.

4. Findings and Analysis

4.1 Acceptance of video consultation

4.1.1 Definition of acceptance

“The rapid growth of investment in information technology (IT) by organizations worldwide has made user acceptance an increasingly critical technology implementation and management issue” (Hu et al., 2015). This also applies to the healthcare system as the success or failure of medical services is determined by patients and physicians. Hence, the acceptance of doctors and patients is a critical success factor in establishing telemedical innovations such as the VC.

The acceptance in this context is defined as “an individual's psychological state with regard to his or her voluntary or intended use of a particular technology” (Hendrick and Brown, 1987). Thereby, the recognition of the value and utility of the new technology is an important aspect that influences acceptance. In terms of the VC, physicians and patients are reactively willing to use the VC by finding out their added value through this ICT. In this context “reactively” willing means that they are willing to use the VC when it is offered to them (Meskó et al., 2017).

In the following chapters, four different secondary studies were summarized, in which the acceptance and attitudes of physicians and patients towards VC are represented. These studies were selected due to the fact that they depict the most current figures and associated justifications concerning the acceptance of VC in Germany and were also conducted by renowned companies. Furthermore, statements of the interviewed experts support those study´s findings.

4.1.2 Doctor acceptance

In the survey of Coliquio, Germany's largest physicians' platform, 386 doctors were asked about their acceptance of VC. The definition of acceptance in this study is coherent with the definition in the chapter above. It was found out that 57% of the surveyed doctors are willing to offer VC. Furthermore 72% of physicians believe that telemedicine will be an integral part of their healthcare system by 2022 (Coliquio, 2018).

The interviewed physicians define the main advantages of the VC as the simplification of procedures within the treatment of patients, more regular consultations of patients who live further away and saving time through fewer home visits (Interviewee-A-B). These statements comply with the study of Coliquio. For example, 38% of the respondents assume that they will have more regular consultations especially with immobile patients or those living in rural areas. Other reasons to offer VC are meeting the expectations of patients, adapting digital models to the competitive situation and increasing the quality of care (Coliquio, 2018). Moreover, the interviewee C states that "doctors who have already tried the VC also recognize an added value and would continue to use it".

With regard to possible indications for the VC, the interviewed experts mentioned general consultation, control appointments, the treatment of simple diseases such as a cold or the discussion of laboratory test. Moreover, physicians would prefer to have the possibility to treat a patient without initial first contact and less indication restrictions (Interviewee-A-B).

According to the study of the Bertelsmann institute, the reasons for the rejection of VC by the doctors are the fear of a misdiagnosis via VC, worsening of doctor-patient relationship and the technical effort (Thranberend et al., 2015). These statements resemble the arguments of the interviewed experts. Chapter 4.3. will discuss the reasons in more detail.

4.1.3 Patient acceptance

The survey of a German HIC with 1000 interviewed patients shows that in average 34% of the participants would use a VC. The acceptance among respondents, aged between 35 and 54, were higher with 39%. Moreover, the patients do not mind whether they are familiar with the doctor or not (Schwenninger, 2017). The definition of this study is coherent with the definition of chapter 4.1.1. Additionally, 82% of Germans believe that online communication in doctors' practices will be commonplace in ten years (TK, 2016).

Respondents of a study of TelemedAllianz mentioned the ease and fast access to physicians as well as saving the waiting time in the practice as benefits of the VC. The avoidance of an infection and less travel costs through the VC are further arguments (TelemedAllianz, 2017). The interviewed experts also see the advantage in more teleconsultations between GPs and

medical specialties and thus patients do not need to visit several physicians to obtain diagnosis regarding special medical problems (Appendix 4, 5).

With regard to possible indications, the respondents of the Bertelsmann study stated that patients would use the VC for cases such as general consultations, discussion of laboratory results and x-rays, control appointments, obtaining a second medical opinion or for minor diseases such as flu or skin rash. Additionally, patients would use the VC particularly to clarify first questions and to find out whether a doctor's visit is necessary. These cases are independent of whether the patient has already had an initial personal contact with the physician or not (Thranberend et al., 2015).

Furthermore, a survey conducted by "TK" insurance company revealed that 42% would like to have their prescriptions issued online. The proportion of internet savvy people was even higher with 90%. Additionally, on average 33% and 75% of internet savvy people would like to receive a sickness notification online (TK, 2017).

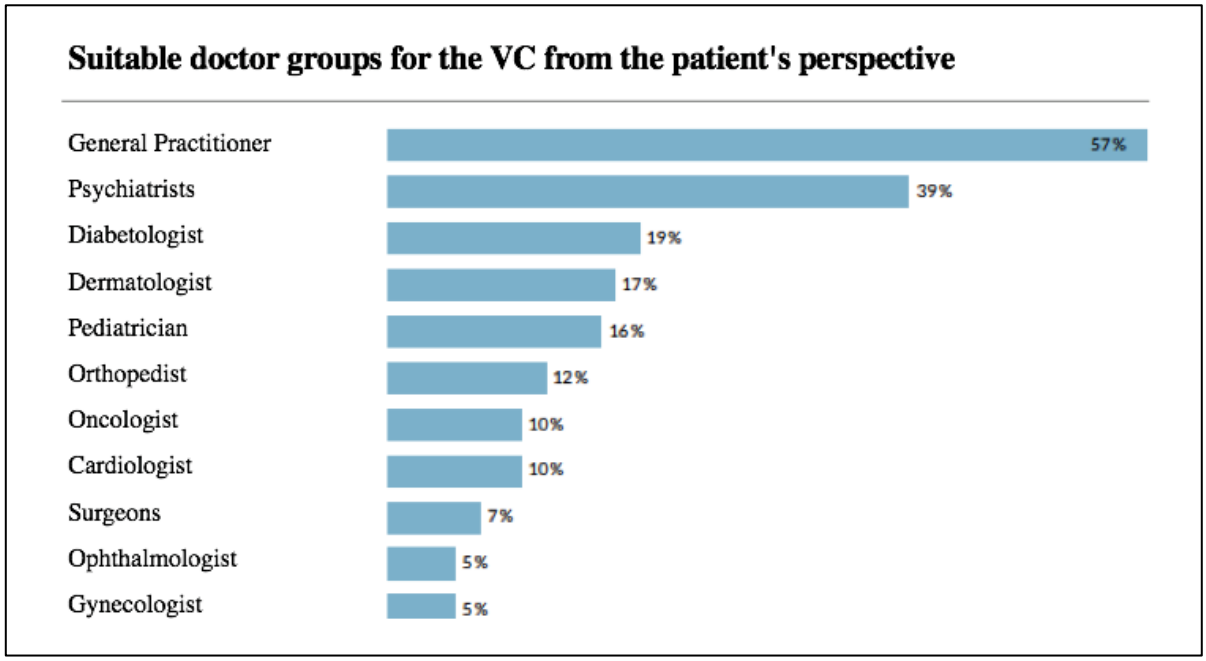


Figure 2. Suitable doctor groups for VC from the patient´s perspective (Thranberend et al., 2015).

According to the figure above, the respondents are most likely to use a VC with general practitioners (57%), followed by psychologists (39%), endocrinologists with 18% and the dermatologist (16%).

Patients arguments against a video consultation include the fear that the doctor might overlook something important via VC, the doctor-patient relationship is worsening, that direct physical examinations are not possible, concerns about data fraud and that VC will replace the doctor (Thranberend et al., 2015).

4.2 Pilot Projects in Germany

4.2.1 Introduction of the pilot project

Chapter 2.3.1 have already described the form in which the VC may be carried out based on German law (with initial personal contact). According to the statements of the Interviewees D and C, the VC with initial personal contact are only rarely offered by the physicians and thus not used by the patients. This is in line with the secondary literature (Aerzteblatt, 2017). The interviewee C states that the VC with initial contact was only reimbursed twice within the year 2017. Of course, this does not apply to all 110 health insurance companies in Germany, but already provides a first overview of the usage of the VC in Germany. Furthermore, the interviewee C assumes that the VC was used more often than the two times it had been reimbursed.

In the following chapters, two pilot projects are presented. The special feature of those projects is the fact that no "personal initial contact" is required between doctor and patient (Telemed, 2018). This was not permitted due to legal reasons in Germany until 2018. However, some legal exceptions were made for pilot projects in the federal state of Baden-Württemberg. Those legal exceptions were adopted by three further federal states by the end of 2018. But information regarding the usage of VC with the new legislation in these federal states are not published yet (Chapter 2.3.1).

The aim of the two pilot projects in Baden-Württemberg is to find out in which medical fields and indications an exclusive medical consultation via VC is compatible with patient safety. Furthermore, it is to be tested whether the use of telemedical technologies in outpatient healthcare may meaningfully supplement the increasingly scarce resource of physicians. On the healthcare system side, the aim is to relieve the burden on the emergency departments of hospitals and to support outpatient medical care by reducing the number of "minor" medical cases (Telemed, 2018).

Since no guideline or reimbursement for a VC without initial contact exist, some guidelines and a reimbursement scale were defined specifically for the pilot projects by the "Association of Statutory Health Insurance of registered Physicians" (ASHIP) of Baden-Württemberg (Interviewee-F).

4.2.2 Pilot project: “docdirekt”

The pilot project "docdirekt" was launched in April 2018 by the ASHIP of Baden-Württemberg. Within the project, patients receive competent medical advice from physicians through VC. Currently, only patients with statutory HIC can participate in the online consultation (Kassenärztliche-Vereinigung Baden-Württemberg, 2018).

At the moment, around 40 doctors participate in this pilot project (Interviewee-D). The VC at docdirekt was described by the two involved physicians as follows: Patients who are urgently ill and cannot reach their treating GP can contact the docdirekt call center of the ASHIP of Baden-Württemberg either by telephone, chat or video via an App. The MA answers the calls on weekdays, from 9 a.m. until 7 p.m. (docdirekt, 2018), and record the personal details and symptoms of the Patients´ illness in a digital patient file. In the next step, the MA forwards the patient to a suitable physician. The teledoctor then uses the patient's medical history and makes a diagnosis (Interviewee-B). At the end of the treatment, a PDF is created which includes health data of the patient, such as “[…] findings, diagnosis and a summary for the patient that can be received via the APP” (Interviewee-B). Currently, physicians within the project are not allowed to issue sickness certifications, prescriptions or referrals (Interview-A).

In regard of reimbursement and costs, the VC is free of charge for patients who are statutory insured while living in the selected area of the project. The teledoctor will be reimbursed by the HIC and receive 25€ per VC (Interviewee-D).

Concerning the technology, the telemedicine provider “TeleClinic” offers the technical infrastructure for the project docdirekt, which includes the software, database and the corresponding app (docdirekt, 2018). The app can be used by patients in order to upload personal information such as weight, chronic disease, allergies, photos or X-rays (Appendix 4).

A first feedback, from the patients treated so far is that they are very satisfied and most could be treated online in a way that no further visit at a local practice was necessary (Appendix 4). In addition, the service was used by various age groups, including a number of older patients. “However, it can already be noted that the new contact channel is used in particular by men with an average age of 45 years which represent 70% of the contact seekers” (Interviewee-D). Furthermore, the inquiries do not differ initially from those which are usually placed in physician´s practices. Those include complaints such as abdominal pain, skin diseases or flu infections. Overall the demand of patients who used the VC within the pilot project was low. The interviewee D states that from April to October only 60 patient´s inquiries were received. For further results concerning potential and relief of the emergency department, it is currently too early and demand is too low for any kind of evaluation (Appendix 4).

In terms of feedback from HIC side, the interviewee D mentioned the problem of patient verification. Patients data will be queried by the MA but there is no identification whether those data really belong to the person who is calling. According to interviewee D, this was no obstacle to cancel the pilot project. Regarding future plans of the project, the VC will be expanded by 2019 that doctors can issue prescriptions online within the project (Appendix 4).

4.2.3 Pilot project “TeleClinic”

The idea of the project “TeleClinic” is explained by the interviewee F as follows:

> *“Teleclinic is about making it easier and faster for patients to talk to doctors. This means, if a patient has a medical problem, he can talk to a doctor quickly. For example, as fast as if one would enter a question at google, but at the same time it should also be an individual and competent help […] from a real doctor”.*

The difference between the projects are that Teleclinic works almost exclusively with private HICs and has recently started to cooperate with three statutory HICs. Hence, the VC of TeleClinic is only limited to patients who are insured at one of the cooperating HICs. All other patients who want to use the VC have to pay it privately. Currently, TeleClinic is cooperating with 10 out of 110 Germany HICs (TeleClinic, 2018).

The TeleClinic comprises a pool of around 150 physicians. The service of the telemedicine provider can also be expanded to patients who are currently located abroad e.g. on vacation or

business trip, as long as they are insured at one of the cooperating HICs. Concerning the patients' demand, clear differences compared to docdirekt can be identified. According to interviewee F, the pilot project was very well accepted by doctors and patients after implementation. "At present, more than 10,000 people are registered at the TeleClinic" (Interviewee-F), but withholds how many of them are meanwhile actively using the service. Concerning the type of patient's requests, the most frequent patients' concerns are colds and coughs in pediatrics or questions in the field of gynecology. Dermatology and orthopedics are also frequent areas which are requested by patients (Interviewee-F). In addition, Teleclinic received permission from the German Medical Association to issue prescriptions online on a legal basis. This leads to the fact that in 50% (Interviewee-F) of all VC by TeleClinic doctors, the treatment can be completed in a way that the patient does not have to visit a stationary GP afterwards. However, for legal reasons, online prescriptions may currently be issued only to privately insured patients and only to those who are located within the area of Baden-Württemberg (TeleClinic, 2018).

Moreover, most inquiries are received during weekends or outside the opening hours of a GP. This can be related to the fact that those are typical times when patients would go to the emergency department since they can´t reach their GP. Additionally, this can be also a decisive factor why the TeleClinic project has a higher demand than the docdirekt project since they provide different opening hours (Appendix 4).

Furthermore, TeleClinic does not only treat new patients without previous contact compared to docdirekt. They also offer a combination of both since customers who have been treated because of an urgently problem, can later contact the doctor online for aftercare, consultation or other concerns. This is very well received by the patients (Appendix 4).

4.3 Challenges of the Video Consultation

The following chapters describe challenges, further development steps and impacts of the VC in regard to the involved stakeholders. The subsequent parties were named by all interviewees as the most important stakeholders of the VC (Appendix 5):

- Physicians
- Patients

- Ministry of Health
- Cost bearers such as the insurance companies and the Association of statutory Health Insurance of Physicians (ASHIP)
- Medical associations of each federal state
- Telemedicine providers which include tech departments

In order to analyze more precisely why the VC in Germany is mainly used within pilot projects and not on a national level, the interviewees were asked what are the current challenges that hinder the further development of the VC. Thereby, four main challenges could be identified.

First, the legal framework of VC is one of the main challenges which was stated by all interviewed experts. As mentioned in chapter 2.3.1, the old professionals regulation of physicians is seen as a ban of remote treatment since it prohibits an exclusively remote treatment (without previous first contact). Four out of sixteen federal states already adopted their legal regulations in order to enable doctors a more flexibility in their work. However, at the moment no uniform and nationwide regulation for VC exist which unsettle and hinder the physicians to provide the VC (Appendix 5).

Alongside, the reimbursement of the VC represents a barrier (Appendix 5). The VC, how it is currently allowed in Germany since 2017, will be reimbursed with € 9.27 per consultation and also has strict regulations e.g. physicians can make this valid only once within a month even if the patient called every week (Interviewee-E). For comparison, a physical consultation is reimbursed with € 15.34 (EBM, 2018). Furthermore, the VC with the new adapted professional regulation (VC without first contact), how it is currently aligned in four federal states, does not have a new reimbursement standard yet. Therefore, the VCs must be also reimbursed with the old measurement scale of € 9.27 (Interviewee-F). This represents a constraint for physicians and the less profitability might explain the reason why VC is offered rarely in Germany.

Besides, the acceptance of patients and physicians were mentioned by all interviewees as a challenge. The patients' acceptance was justified by the fact that they are not sufficiently informed about the VC. The interviewed physicians stated that the patients do not even know about the existence of a VC due to a low promotion. Additionally, the service via VC is still

limited e.g. patients would be advised online but have to pick up their prescription at the local practice (Appendix 5).

Regarding doctors acceptance, the experts stated that the physicians do not perceive enough added value through the VC yet. The low reimbursement does not represent an incentive for them to provide the VC. They miss the opportunity to issue prescriptions, referrals, or sickness notifications to conduct an adequate treatment (Interviewee-C). Furthermore, the doctors are still restricted in the medical indications[3] and the way the VC is performed, which also leads to uncertainty and the fear of making a false diagnosis (Interviewee-B). Moreover, all interviewees agreed that the digital transformation is a general issue for physicians since outpatient practices are not prepared for the VC due to less digital processes. In particular, the older generation of physicians has not addressed the possibilities through new technologies yet. The interviewee B emphasizes

> *"The younger generation of doctors grew up with computers and the internet. The older ones are from a different generation and are less concerned with technology and digitization".*

In general, it is proven that the willingness to use new technology decreases in old age (Heinze, 2018). These claims might explain why some physicians are still reserved with regard to VC. Nevertheless, all interviewees are convinced that a greater added value will increase the acceptance (Appendix 5).

The last challenge was also mentioned by all interviewees. It relates to the telematic infrastructure, which is the basis for all telemedical applications. Interviewee E argues that

> *"[…] the connection of electronic applications is necessary in general. This means if an online consultation is held, the teledoctor must document the treatment and then the patient and doctor must have the opportunity to share this data with other parties in the healthcare system" (Interviewee-E).*

[3] See medical services in chapter 2.3.4

But according to the experts, the telematic infrastructure is not adequately expanded in all areas of Germany in order to conduct a proper VC and to share data within the parties of the healthcare system. Additionally, not all software required for the VC are compatible with other programs within doctor's offices. Hence, the required interoperability within the different programs is still limited (Appendix 5).

The Interviewees E, D and C also considers the structure of the healthcare system and the federalism in Germany as factors that decelerates the development of the VC. Germany is a big country consisting of sixteen federal states and each is allowed to make decisions and regulations independently. Thus, legislative regulations are not always made on a nationwide level (Interviewee-D). Additionally, the German healthcare system is highly structured and comprises many actors with different interests (Interviewee-C). For those reasons, examples such as the Swiss system cannot be applied to Germany. The interviewee E emphasizes that

> *"There are great examples abroad. However, we always have to pay attention to what kind of healthcare system is used in these countries. Most of them have a national health and insurance system […]".*

Thus, a takeover of a system like Medgate is providing cannot simply be implemented in Germany.

4.4 Further development steps

According to the experts, the first step should be made by politics in order to define a clear framework for the VC. They must act more agile, decisive and faster in respect that a uniform guideline for VC and its reimbursement will be created (Interviewee-C). Furthermore, digital change in the healthcare sector must be actively managed. The acceptance and a broadly shared vision for the goals need to be communicated to citizens, doctors, and other health professions. The implementations and success factors from other countries in which VC is further developed, can be seen as best practice examples (Chapter 2.4). For instance, Germany could also introduce a department on national level that combines all relevant stakeholders in order to define a uniform frame. A first step towards a new legislation was taken in November 2018 with the enactment of the Nursing Staff Strengthening Act. This law come into force on the 1th

January 2019 and defines a new guideline for VC and exclusive remote treatment (Interviewee-E).

Furthermore, the promotion of acceptance can be seen as a strategic task to advance the development of VC. For instance, communication campaigns for patients can be initiated by ministry of health and doctors association as it was done in Canada (Chapter 2.4). Additionally, telemedicine providers and HICs may take the usage of educative advertisement to raise the level of knowledge within patients. Digital transformation is not only about implementing new technologies, it is also about a change in the mindset of involved parties. In this respect, trust in the technology must be established by informing patients about the ease use and its advantages (Appendix 5). In addition, the end users, patients and physicians, should be better involved in the development to decrease their reservation as it is already practiced in some Scandinavian countries.

Moreover, telemedicine and VC are not yet sufficiently integrated into the education and training of medical and therapeutic providers (Interviewee-D-E). Doctors and nurses must be familiarized with the possibilities of digital care to use it in a meaningful and planned manner. This might also reduce physicians' fears of misdiagnosis.

However, further incentives of the VC for patients and physicians must be developed. The interviewee E confirms that first plans are in progress e.g. the electronic prescription, sick report and the medication plan are already in the planning stage. When introducing such services, it is important that they are compatible with each other and with the software systems of the doctor´s practices (Appendix 5). Overall, VC must be integrated into established technical systems, such as practice management, in order to simplify the application. In this context, a possibility for the patient identification must also be created.

Beyond that, an incentive must be created through a new reimbursement regulations that the VC treatment is at least as profitable as a personal treatment at a located practice. The currently existing reimbursement standard is not used by physicians due to bad conditions and restrictions. Only some isolated solutions exist which only apply for pilot projects (Appendix 5). For this reason, the HICs must jointly define a uniform, appropriate and simplified reimbursement standard

The telematics infrastructure also plays an important role in further development steps. Politics must increase pressure on Gematik (the institute responsible for telematics infrastructure) to further expand the infrastructure (Interviewee-C).

4.5 Future perspective regarding potential of the video consultation

Since the subject of VC is quite new and no official figures regarding the amount of VCs exist yet, an educated estimation is performed to quantify the potential size of VC that may take place at the current time (Jan. 2019) based on the adapted legal situation (Appendix 9). Additionally, a possible projection how it can develop until 2024 based on acceptance is also performed. In this context, the estimation deals with the VC without the ban of remote treatment (Chapter 2.3) i.e. doctors are allowed to treat patients online without personal first contact and may issue prescriptions. This is currently possible in four federal states in Germany (Chapter 2.3.1). The estimation follows a top-down approach and is explained in three basic steps, as depicted in figure 3.

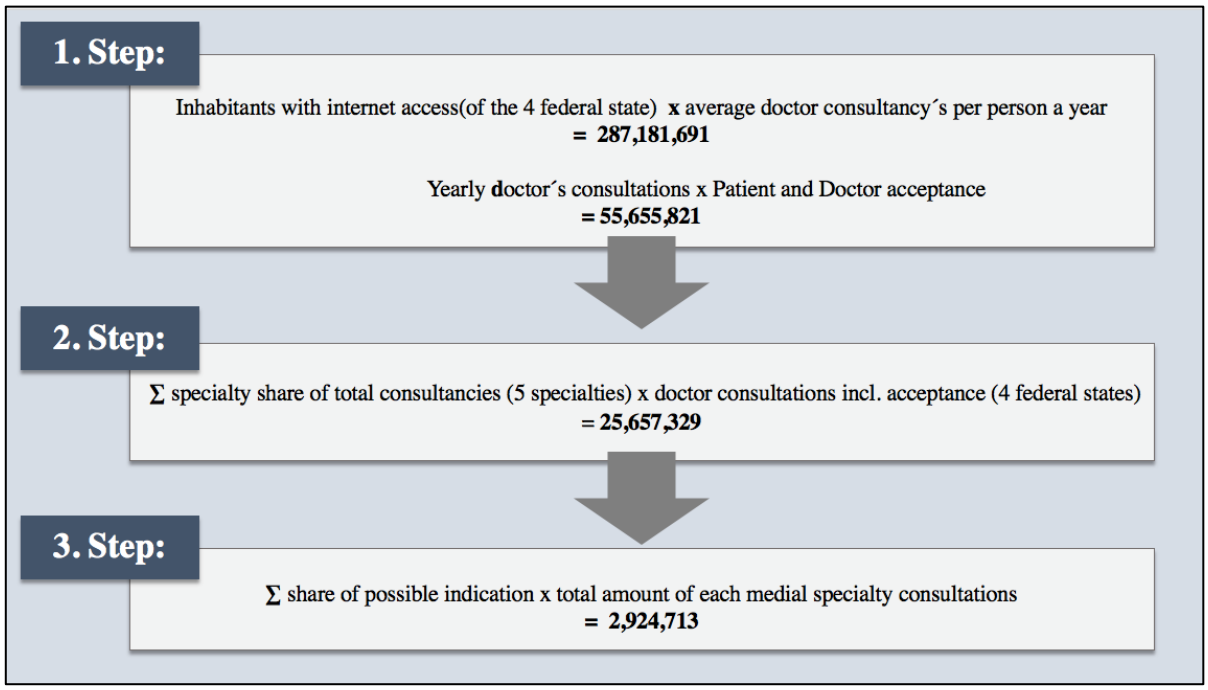


Figure 3. Estimation of the size of VC in steps

In the first step the total number of doctor consultancy´s were derived by multiplying the inhabitants with internet access of the four federal states (Federal Statistical Office Germany, 2017) by the average doctor consultancy´s per person a year (Barmer, 2018). This number was

further multiplied by patient (34%) and doctor (57%) acceptance. After considering these factors a number of 55,655,812 interactions between physicians and patients, based on acceptance, was computed.

In the second step, the annual potential interactions between physicians and patients within the five most suitable medical specialties were calculated. Based on expert interviews and secondary data, five out of seventeen medical specialties were anticipated to be suitable for VC (Appendix 7). To compute the total doctor consultancies within those five specialties, the share of all doctor visits per specialties was taken and multiplied by the total interactions. The sum of all multiplications resulted in 25,657,329 doctor consultancies within those five specialties.

In the third step, total interactions within each specialty were multiplied by the percentage of indications that can be performed online according to the two interviewed physicians (Appendix 8). By multiplying each of those percentages with the five chosen specialty consultancies, a number of 2,924,713 was derived. This implies that 11.40% of the consultations within the five chosen medical specialties can be performed online at the current state of acceptance and legal regulations. Hence, a potential of VC based on acceptance is assumed to already exist.

To project the future potential of VCs in Germany until 2024, several scenarios for doctor and patient acceptance were identified. For the current state of a 57% doctor acceptancy and 34% patient acceptancy, a sensitivity analysis was performed which accounts for increasing acceptances.

Different assumptions were made based on the expert´s expectations (Appendix 6). According to the experts, it can be assumed that the legal regulations of each federal state will be adapted to provide a properly and exclusively remote treatment via VC (diagnosis can be made online without initial contact) within the next five years. Moreover, physicians will be equipped with an app or platform where they may issue a prescription online, sickness notification, referral and share data through electronic patient file, as it is partly possible in the two described pilot projects (Chapter 4.2). If such assumptions are met, the acceptance will rise due to a greater added value for patients and physicians. The increase of acceptance can be supported by a study from previous years which showed that the acceptance of patients and physicians consistently increased (Stiftung-Gesundheit, 2017). Moreover, at the point of the analysis the acceptance of

physicians was already higher than those of patients. Thus it can be assumed that acceptance of physicians will rise slightly less than patient's acceptance in the future.

		Doctor Acceptance					
		57%	60%	63%	66%	69%	72%
Patient Acceptance	34%	6,743,698	7,098,629	7,453,561	7,808,492	8,163,424	8,518,355
	38%	7,537,074	7,933,762	8,330,450	8,727,138	9,123,827	9,520,515
	42%	8,330,450	8,768,895	9,207,340	9,645,785	10,084,229	10,522,674
	46%	9,123,827	9,604,028	10,084,229	10,564,431	11,044,632	11,524,834
	50%	9,917,203	10,439,161	10,961,119	11,483,077	12,005,035	12,526,993
	55%	10,908,923	11,483,077	12,057,231	12,631,385	13,205,538	13,779,692

Table 1. Sensitivity analysis

By stepwise increasing both acceptance, a range between 6,743,698 and 13,779,692 VC could be conducted. This implies 11.40% to 23.29% of VCs within the five specialties (Appendix 10) and 5.26% to 10.54% of VCs within the total market of doctor´s consultations (Appendix 11). These percentage terms imply that increasing acceptances would almost double the overall market in the future by holding all other assumed factors.

Those assumed calculations show that a potential for the VC may exists and demonstrate that patients and physicians are ready for the visualization of doctor´s visit, but still lack some incentives due to current challenges. Hence, if the challenges can be reduced in the future, the patients and physicians will have a greater added value and are better informed. This, in return, will lead to an increase in their acceptance. It can be assumed that when physician´s acceptance increase in general, it will result in a greater number of specialties beyond the five selected.

Besides knowing that acceptance might increase in the future, it would be valuable for the involved stakeholders to know whether the patients or doctors acceptance are the main drivers of the VC. The Interviewee E considers the patients to be the key driver. She believes that if more patients demand VC, the pressure on the doctors will automatically increase and they will more often provide VC. On the opposite, Interviewee D states that if physicians are convinced about VC, they will actively prescribe the VC to patients. Considering all arguments for and against both drivers, patient acceptance is figured out to be the key driver. Reasons for that are the current lower patient acceptance and the higher doctor´s dependence on patients since those

cannot offer their service without the patients demand. Although patients are also dependent on doctors, doctors can regulate their offer by promoting VCs or not. For instance, in the case of a low reimbursement, doctors will consequently lower advertising VCs but in the same time HICs will increase their advertisement due to cost savings which in total invalidates the power of doctors.

In summary, the doctor's visit in the future could be shaped in such a way that certain fields can be covered online by the VC and its connected features. In particular, informational consultations or minor injuries can be clarified online. However, this picture and figures of the VC are only based on assumptions from expert interviews and secondary literature. Thus, the forecast serves only as a purpose to provide a first impression of how many consultations could be conducted online in the future by increasing acceptance and when legal issues are solved.

4.6 Impact of the video consultation on the Stakeholders within the German healthcare industry

The digital transformation through the VC will have many different impacts on the German healthcare industry. In the following, the impacts in relation to patients, physicians, HICs, telemedicine providers (including a tech department) and the Ministry of Health will be described. First, the short-term effects within the next five years are described. Long-term effects are discussed at the end of this chapter.

The VC and the related technological introductions such as electronic prescription and sick certification imply a digital restructuring that will lead to a change of the medical society. Thereby, today´s dynamics within the medical care will be changed fundamentally in a way that the healthcare system will be more patient centered. Through a better connection of the stakeholders in the healthcare sector, the patient will have the opportunity to save time and costs due to less travel distances and waiting times. Especially simple requests such as referrals, follow-up prescriptions or minor injuries do not necessarily require a doctor's visit and can be covered through the VC. This allows patients and physicians an easier handling. The VC will enable patients a faster access to their physicians which leads to faster diagnosis and treatment processes (Appendix 6). Additionally, patients gain better access to numerous doctors of several medical specialties across the country via VC. However, the better access to physicians would

also shift the demand and supply relationship and thus influences the price of VC.[4] Furthermore, a negative side effect of VC might be a worsening of the doctor-patient relationship since it becomes more impersonal as patients increasingly seek out doctors online that they do not know. Moreover, the connection and transparency of patients´ data can lead to less confidentiality and security of sensitive medical information.

With regard of impacts on physicians, the VC represents a new business model for them, through which they can offer their patients a further range of care. Moreover, physicians can better control their patients by offering them VCs for certain occasions such as chronically ill or immobile patients. The effort and the time for the consultation remain the same, but the doctor saves himself travel time and might structure practice's processes more efficient. This means less crowded waiting rooms and consequently more regular control appointment and spontaneous consultations (Appendix 4, 6).

Furthermore, the VC would have an impact on the professional field of the physician, as the teledoctor presents a new profession (Interviewee-E). Thus, in the future physicians will obtain qualifications to become teledoctors by learn the suitable indications for VC and how to communicate with a patient at a distance. This also affects the study plan of medicine students, e.g. the University of Mainz is the first one which adapted telemedicine to its curriculum (University of Mainz, 2017). Additionally, the VC will affect physician´s working models. Mothers can return earlier from parental protection and work part-time as teledoctors. The same refers to the older generation of physicians or pensioners, who can retire earlier and work as teledoctor (Appendix 6). Overall, it might provide a better and more flexible work-life-balance.

However, especially at the beginning when implementing the VC into doctor´s practices, it will cost time, effort and money. Additionally, the risk for physicians in terms of misdiagnosis may occur due to insufficient information, poor video quality or lack of information. Beyond that, the VC and a connected digital patient file provide more transparency within doctors and patient´s data. Doctors may see what kind of treatment or medication was prescribed for a patient by a previous doctor, and thus double or wrong treatments and prescriptions can be avoided.

[4] This is described more detailed at the end of the chapter in regard of long-term implications

Concerning implications for HICs, they can provide better medical services for patients and doctors while expanding their concept by the VC. Processes can be structured more efficiently through better communication. For instance, sickness certifications issued during a VC can be directly send to the HIC and to patients which simplifies this process.

With regard to new insurance models as already in place in Switzerland, this is not feasible for German HICs due to the unique solidarity principle. This states that patients have the guarantee of the same health benefits regardless their contribution level or medical condition. Hence, HICs cannot provide different insurance models to different people e.g. depending on medical condition. However, they can expand their service by the offering VC and might even prefer contracts with physicians who are willing to use the VC. Besides, they can provide private supplementary health insurances for people who are insured at a HIC which does not provide VC. Consequently, the competition within the HICs will further increase. HICs, which have not focused on digitalization, telemedicine, and the VC yet, will sooner or later be left behind by the others as patients will choose the HIC with the best and most services (Interviewee-E). This may result in possible mergers between HICs in order to maintain success. Another further negative effect might be an insurance fraud, e.g. patients cannot be identified within the pilot project “docdirekt” yet. This implies patients who have a HIC that does not offer the VC, can still use it with the identity of someone else because there is no verification so far. The same refers to physicians or telemedicine providers, who can charge for treatments they have not done.

In terms of consequences for telemedicine providers, many foreign providers have already announced their intention to expand into the German healthcare market (Interviewee-E). Hence, German providers will face more pressure from foreign and more experienced competition. This further affects the German health ministry since the money of German HICs would consequently be allocated to providers abroad.

However, the VC also has positive effects on the ministry of health. Germany struggles with the problem of overcrowded emergency rooms especially due to patients with minor injuries or bad accessibility to medical care on weekends. Such cases do not necessarily require physical treatment in an emergency room and can be prevented by a so-called "triage". A “triage” can take place in form of extra provided teams with teledoctors who can be reached 24/7 and cover

such minor injuries or patient's questions. Additionally, the outpatient medical practices could also cover some of these cases by offering VC on weekends.

Furthermore, the VC affects the medical associations and the ministry of health regarding new occupational fields. For example, the MA may take over some home visits of the doctors. They could visit the older or immobile patients and record their vital parameters, forward these to the doctor and then discuss the findings with the patient and doctor via VC. Hence, the medical association and ministry of health need to develop trainings for the new service field of MAs.

In terms of cost savings, the HICs and ministry of health could save money by having less travelling costs for physicians and avoidance of double treatment and medication. However, a nationwide introduction of VC is also associated with investment costs such as technical equipment and employee training. In particular, the reimbursement of the VC should be as high as a personal doctor´s visit, especially in the beginning during the implementation to provide an incentive for physicians to use it.

Those mentioned short-term impacts above are mainly related to dynamics in the next five years but it can be assumed that the VC will gain fundamental ground in Germany in the long-term over the next ten years. Such long-term impacts might be that telemedicine providers will increase the pressure and competition on small outpatient practices (Interviewee-E). Large telemedicine providers such as TeleClinic are privatized companies that have a large pool of different medical specialties and also includes a specialized tech department. These may take over patients from the small practices since patients will choose clinics which have the most services. Currently the telemedicine providers are limited to online consultation but best practice examples of Switzerland have shown that such providers expand their spectrum with local polyclinics.

Moreover, a trend could be developed in the direction that less doctors will have their own outpatient practices because they can perform VC from home or work for large polyclinics. Alternatively, more joint practices will be established where different doctors share the facilities in the future. Hence, HICs and the ministry of health could continue to save costs by reducing the expenses of equipment for practices and facilities in case more polyclinics and joint practices will exist. In this context, it is up to the ministry of health to what extent such telemedicine providers from abroad and also from Germany will be restricted or which

strategies and cooperations can be introduced that the small medical practices are not left behind.

Concerning the workload of physicians, they might have more time due to less travels and better patient coordination but in return might also have more consultations per day. Especially against the background that patients will have better access to physicians across the country, the demand for online consultations might increase. This implies that doctors have more work and perhaps less income from consultations since through the VC some other subsidies from HICs and the Ministry of health might be cut (Interviewee-E).

Moreover, in the long-run the currently physical based doctor society will experience a shift from a fragmented supply of teledoctors to a more online based system in which doctors with good ratings will dominate. Hence, better patient´s access to medical care implies also more access for doctors to potential patients. Therefore, competition among the doctors will be higher and they must better differentiate themselves from each other e.g. by providing good quality and gather positive reviews on their VC. This distorts the image of the doctor towards the direction of a service provider for medical services who is being more active in commercial seeking of "clients".

Furthermore, the recommendation for the current low reimbursement of doctors was given by providing teledoctors with a minimum price which should be equal to the reimbursement of a physical doctor's consultation. However, economically seen in the long-run, the higher supply of teledoctors will inevitably lead to a drop in prices of VCs. Since, the supply of teledoctors is further increased by part-time mothers, pensioners and physicians who do not have a practice or a German medical certificate that will be able to also provide VCs. Summarized, the change to a focused online based system will imply a better access and higher service quality for patients but at the same time might lead to a drop in reimbursement prices due to the increasing supply of teledoctors in the market.

5. Conclusion

5.1 Limitations and future implications

Several limitations regarding expert interviews as the most important data source can be explained. A major limitation is the lack of representativeness due to the small sample size (n=6) of interviewed experts, which makes it difficult to generalize the results. Furthermore, it cannot be ruled out that the experts may take a positive or negative view due to their attachment to the topic. Besides, the experts do not only present facts but also their own perceptions and interpretations, which may bias the results.

In some cases, the experts were not allowed to disclose information for reasons of data protection and secrecy or do not have the required background to answer all questions e.g. the physicians were not able to answer all economical questions. Furthermore, certain questions could not be answered due to the fact that the topic is still very new in Germany and no evaluations or figures (e.g. data of the current number of VC in Germany) exist yet. It is also worth mentioning that the conducted interviews followed a specific guideline. Hence interviewees might be influenced by the interviewer which may result biased answers. In addition, since three different questionnaires were designed for the respective stakeholders, not all answers could be compared with each other to identify similarities or discrepancies. Furthermore, in the selection process, different stakeholders should be consulted in order to gain a holistic understanding of the VC in Germany, but this was not possible due to limited accessibility to the experts. Furthermore, the perspective and acceptance of the patients and physicians are mainly based on secondary studies since a primary survey within this limited frame and time was not possible. However, the aim of this work was to present a holistic picture of the VC in Germany by showing all aspects e.g. current status, possible problems and impacts of the VC and not only limit it to the acceptance of patients or physicians.

Regarding the estimation of potential size of VC in Germany, following limitations were set. The numbers researched for the calculation, such as inhabitants, annual visits and the percentages of acceptance were obtained from various sources and might influence the results in a way that the figures do not correspond to the reality. In addition, assumptions of the physicians regarding the chosen medical specialties and indications, which were based on the individual opinions and pure assumptions of the interviewed physicians, cannot be generalized

for the VC. Furthermore, the secondary studies that were used to reflect patient and physician acceptance have been published only a few information about their approach and methodology. Consequently, the study results cannot be directly compared and thus the most important facts from each study were summarized.

In addition, external factors such as the age of the population or population growth were excluded from the calculation since this would have led to a complication of the estimation. Therefore, only the two main factors acceptance and legal legislation within the several federal states were considered in order to show the impact and importance of these factors on the development of the VC. These limitations might lead to a non-comparability with real results but even though represent a first possible future prognosis of the potential size of VC. All other findings, which are also mainly based on expert assumptions can be distorted as well. However, the derived results should serve to present a first overview of the current status of VC to uncover challenges and to derive first possible impacts of the VC in the future.

Since this thesis is narrowed to the development of VC in outpatient care it might be interesting in regard to future research how the VC will affect the inpatient care. Furthermore, the above mentioned limitations of this work could be resolved by a future research e.g. increase the sample size of expert interviews and collecting primary data regarding patient perspective in order to further extend this industry analysis.

5.2 Conclusion and managerial implications

The aim of this thesis has been to analyze the VC in Germany, identify the country specific challenges, show the potential size of VC and to derive implications how the VC can shape the German healthcare system.

The pilot project “TeleClinic” showed that the VC can be a valuable supplement to the original doctor’s visit. By integrating features such as ePrescription into the VC system, an adequate treatment can be carried out. Additionally, the willingness to use and offer the VC is at least partially present within the patients and physicians. More than one of three (34%) Germans are willing to use VC and more than half of the physicians (57%) in Germany are currently willing to offer VC. However, some barriers have to be overcome in Germany to further develop the VC and to conduct it adequately at least in the form of the described pilot projects on a national

level. These main challenges were identified as the legal framework of the VC, no uniform and appropriate reimbursement, acceptance within patients and physicians and lastly no adequate expanded telematic infrastructure. In particular, acceptance from both sides, care provider and patients, is required to advance the digital change through the VC. Therefore, initiative from side of ministry of health, medical association and HICs need to be taken to encourage the acceptance. Moreover, changes have to be done with regard to the legal framework and reimbursement since the added value for doctors is currently too small and thus influences their acceptance. The acceptance of the patients should not be neglected since without the patient's demand the VC will not be used.

Despite these challenges, a first prognosis regarding the current potential size of VC was estimated based on assumptions and current changes in the legislation. This resulted that 2,924,713 (11.4%) of the consultations within the five chosen medical specialties can be performed with VC based on the current state of acceptance. By assuming that the legal basis will change throughout Germany and acceptance within physicians and patients will continue to rise over the next five years, the potential of VC can be estimated between 6,743,698 to 13,779,692 VC by 2024.

In order to answer the questions "How can the video consultation shape the German healthcare system?", one can say that the classic doctor's visits as it is known will no longer be the same after properly implementing the online consultation. The VC and associated features enable a better digital connection between physician, patient and associated data. Hence, processes in the healthcare system will become more simple and efficient. The VC will not only have an impact on the doctor's visit, but also on the doctor's professional field and working models. Through VC new professional trainings and working models for doctors and MAs will be introduced. Moreover, HICs and the Ministry of Health might save costs through avoidance of double treatments and medication and through more transparency and more efficient processes.

If the development of VC is considered in the long term, it could lead to a redistribution of doctors and an increased pressure on small outpatient practices through telemedicine providers. Those providers might take over patients from small practice since they can provide more medical specialties. Furthermore, it may also lead to the trend that more physicians give up their practice and work for policlinics or joint practices. Whereas, HIC and the ministry of health could continue to save costs by reducing the expenses of equipment for practices and facilities.

At this point, it is the responsibility of the ministry of health to what extent these impacts will arise or which strategies and cooperations will be introduced to guide this trend in a right direction. Overall, the change through the VC lead to a shift from a physical based healthcare system to a more online focused system which leads to better access of medical care for patients. At the same time, physicians will have more flexible working models but also higher competition where doctors with high quality and good reviews will prevail.

With regard to managerial implications, this thesis helps to better understand that the VC represents a new business model for physicians. In order to adapt to the digital change of society and to remain competitive against the competition, doctors should digitally restructure their practices and implement a VC. HICs should also follow the digital trend to stay competitive. Especially during implementation phase of VC, HICs with focus on digitization might have an advantage by offering supplementary contracts over HICs that do not offer VC. Concerning telemedicine provider, the implementation of the VC in Germany enables a new market entry.

REFERENCE LIST

Aerzteblatt (2018), *Telemedicine and Video consultation rarely used*, [Online], at:https://www.aerzteblatt.de/nachrichten/99632, [Accessed 25.12.2018].

AG Telemedizin (2015). *Telemedical Methods in the Patient care – conceptual positioning* [Online], at: http://www.bundesaerztekammer.de/fileadmin/user_upload/downloads/pdf-Ordner/Telemedizin_Telematik/Telemedizin/Telemedizinische_Methoden_in_der_Patientenversorgung_Begriffliche_Verortung.pdf, [Accessed 13.10.2018].

Bain & Company (2017). *Insurers Hold the Key to Healthcare's Digital Future*, [Online], at: http://www.bain.de/Images/Bainbrief_end_of_healthcare.pdf, [Accessed 24.12.2018].

Barmer Health Insurance Company (2018). *Physician Report 2018*, [Online], at: https://www.barmer.de/blob/144354/4b9c44d83dc8e307aef527d981a4beeb/data/dl-pressemappe-barmer-arztreport2018.pdf, [Accessed 13.12.2018].

Berman, S. (2018). *Digital transformation: opportunities to create new business models*, Strategy & Leadership, 40 (2).

Blümel, M., Busse, R. (2018). *The German Healthcare System*, [Online], at: https://international.commonwealthfund.org/countries/germany/, [Accessed 07.12.2018].

Bundesärztekammer (2017). *Telemedical methods in patient care*, [Online], at: http://www.bundesaerztekammer.de/aerzte/telematiktelemedizin/telemedizin/, [Accessed 06.11.2018].

Bundesärztekammer (a) (2018). *The use of telematics and telemedicine in health care from the point of view of the medical profession*, [Online], at: https://www.bundesaerztekammer.de/fileadmin/user_upload/downloads/pdf-Ordner/Telemedizin_Telematik/Telemedizin/eHealth_Bericht_kurz_final_1_.pdf, [Accessed 26.12.2018].

Bundesärztekammer (b) (2018). *The German Healthcare System*, [Online], at: http://www.bundesaerztekammer.de/weitere-sprachen/english/healthcare-system/, [Accessed 07.12.2018].

Bundesärztekammer (c) (2018). *Professional conduct according to § 7 Absatz 4 der Berufsordnung*, [Online], at: http://www.bundesaerztekammer.de/presse/pressemitteilungen/news-detail/121-deutscher-aerztetag-ebnet-den-weg-fuer-ausschliessliche-fernbehandlung/, [Accessed 06.11.2018].

Bower, M. (2018) *Most practices in England do not want to provide online consultation*, [Online], at: https://www.gponline.com/practices-england-not-want-provide-online-consultations/article/1454320 [Accessed 02.11.2018].

Brauns, HJ. & Loos, W. Bundesgesundheitsbl. (2015). *Telemedicine in Germany*, [Online], at: https://doi.org/10.1007/s00103-015-2223-5, [Accessed 06.10.2017].

Coliquio (2018). *Insights of a doctor´s clinic*, [Online], at: https://www.coliquio-insights.de/wie-bereit-sind-die-aerzte-fuer-videosprechstunden-umfrage/, [Accessed 26.12.2018].

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Research design Qualitative quantitative and mixed methods approaches, 1th Ed., S. Publications. https://doi.org/10.1007/s13398-014-0173-7.2

Deloitte (2017). *Connected health: How digital technology is transforming health and social care*, [Online], at: https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-connected-health.pdf, [Accessed 25.12.2018].

Docdirekt (2018). *Technology partner*, [Online], at: https://www.docdirekt.de/start/, [Accessed 23.11.2018].

Dr.Ed (2018), *Homepage of Online Doctor*, [Online], at: https://www.dred.com/de/ [Accessed 31 October 2018].

Dr.Ed (2018). *Exclusively remote treatment*, [Online], at: https://www.zm-online.de/news/praxis/ausschliessliche-aerztliche-fernbehandlung/ , [Accessed 30.11.2018]

Duftschmid, G., Binder, M., Werba, T., Dorda, W., Pehamberger, H. (2005). *Guidelines in order to plan and realize telemedical application*, Wiener Klinische Wochenschrift, 117 (19-20), pp. 672 – 683.

EBM (2018). *Basic lump sum of medical consultation*, [Online], at: http://www.kbv.de/tools/ebm/html/08211_2902686340260671970624.html, [Accessed 29.12.2018].

European Observatory on Health Systems and Policies (2017). *Sweden: Country Health Pro le 2017*, [Online], at: http://dx.doi.org/10.1787/9789264283572-en, [Accessed 21.12.2018].

Eysenbach, G. (2018), *Digital Transformation and Disruption of the Health Care Sector: Internet-Based Observational Study*, in: Journal of Medical Internet Research, 20(3).

Eysenbach, G. (2001). *What is eHealth*, in Journal of medical Internet Research, at: https://www.jmir.org/2001/2/e20/, [Accessed 08.10.2018].

Fares, A. & Bernstein, D.N. (2016). *Organization of the Swiss model of primary care telemedicine: Is adoption by the French health system possible?*, European Research in Telemedicine, 5, pp. 3-8.

Federal Statistical Office Germany (2017). *Federal states with capitals by area, population and population density*, [Online], at: https://webcache.googleusercontent.com/search?q=cache:DchGCvchf8MJ:https://www.destatis.de/DE/ZahlenFakten/LaenderRegionen/Regionales/Gemeindeverzeichnis/Administrativ/Aktuell/02Bundeslaender.xlsx%3F__blob%3DpublicationFile+&cd=2&hl=de&ct=clnk&gl=pt&client=safari , [Accessed 13.12.2018].

Federal Ministry of Health (a), 2018. *Definition of eHealth*, [Online], at: https://www.bundesgesundheitsministerium.de/service/begriffe-von-a-z/e/e-health.html, [Accessed 08.10.2018].

Federal Ministry of Health (b) (2018). *Draft law on the strengthening of the training personnel*, [Online], at: https://www.bundesgesundheitsministerium.de/sofortprogramm-pege.html#c13528, [Accessed 07.11.2018].

Feely, P. (2017). *Finland leads in healthcare technology*, [Online|, at: https://gulfnews.com/travel/destinations/finland-leads-in-healthcare-technology-1.2138649, [Accessed 21.12.2018].

Fischer, F., Aust, V. (2016). *eHealth: Background and Definition of terms*, 1st ed., Springer Verlag, p. 10.

Gematik, (2018). *Definition: Telematic infrastructure*, [Online], at: https://www.gematik.de/telematikinfrastruktur/, [Accessed 10.11.2018].

GKV-Spitzenverband (2016). *o.V. Telemedicine contract for the healthcare*, [Online], at: https://www.gkv-spitzenverband.de/media/dokumente/presse/publikationen/Positionspapier_Telemedizin_03-2016.pdf, [Accessed 02.11.2018].

Gossler, C., Klause, C. (2017). *Telemedicine in Switzerland – The example of Medgate*, [Online], at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-111357?lang=en, [Accessed 26.12.2018].

GTAI German Trade and Investments (2017), *eHealth Trends*, [Online], at: http://www.gtai.de/GTAI/Navigation/DE/Trade/Maerkte/Dossiers/Trends/Digitalisierung/Thema-EHealth/e-health.html#1358956, [Accessed 02.11.2018].

Haas, P. (2016). *Electronic patient files: Cross-institutional electronic patient files as a basis for integrated patient-centered treatment management platforms*, [Online], https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/VV_eEPA_Expertise_final.pdf, [Accessed 10.11.2018].

Hahn, E. (2018). *Telemedicine and a ban on remote treatment - An inventory of current developments*, Medical law journal, 36.

Hanke, G. (2018). *The ePrescription Project Gerda*, [Online], https://www.apotheke-adhoc.de/index.php?id=65&type=98&L=0%3Ft&tx_aponews_newsdetail%5BnewsItem%5D=48568&tx_aponews_newsdetail%5Bnewscategory%5D=10&cHash=a8611d232e9c6e746bc3c6d84983dd15, [Accessed 15.11.2018].

Häckle, D. (2011). *Medizinisch-technischer Fortschritt*, e-Health und Telemedizin, 1st ed., Gabler Verlag.

Harris, L. M. (1996). *Expanding horizons*, Marketing Research: A magazine of management and application, 8 (2), p.12.

Hartmannbund Institute (2018). *White paper: Ban of remote treatment*, [Online], at: https://www.hartmannbund.de/fileadmin/user_upload/Downloads/Umfragen/Fernbehandlungsverbot/Kurzinfo_Fernbehandlungsverbot.pdf [Accessed 19 October 2018]

Heinze, R. (2018.) *Age and Technology - Social Economic Findings and Perspectives*, 1th ed., Springer Link Puublisher, https://doi.org/10.1007/978-3-658-21054-0_2.

Hendrick, H., and Brown, O. (1987) . *Human factors in organizational design*. 1th ed., The Elsevier Netherlands, pp. 395–403.

Henke, R. (2018). *Nordrhein-Westfalen say "yes" for the new regulation*, [Online], at: https://www.aerztezeitung.de/praxis_wirtschaft/e-health/article/976770/online-videosprechstunde-nordrhein-sagt-ja-neuen-fernbehandlung.html, [Accessed 16.12.2018].

Hu, P., Chau, O., Liu Sheng, O., Yan Tam, K. (2015). *Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology*, Journal of Management Information Systems, 16(2).

IQEH (Institute for Quality and Efficiency in Health Care) (2018). *Healthcare in Germany*, [Online], at: https://www.gesundheitsinformation.de/das-deutsche-gesundheitssystem.2698.de.html?part=einleitung-co, [Accessed 07.12.2018].

IQWiG (2018). *Informed Health Online*, [Online], at: https://www.ncbi.nlm.nih.gov/books/NBK298834/, [Accessed 26.12.2018].

Jahns, R. (2017). *European countries are behind the USA in regards to telemedicine maturity but they're beginning to catch up*, [Online], at: https://research2guidance.com/european-countries-are-behind-the-usa-in-regards-to-telemedicine-maturity-but-theyre-beginning-to-catch-up/ [Accessed 02.11.2018].

Johansson, A., Lindberg, I., Söderberg, S. (2014). *Patients' Experiences with Specialist Care via Video Consultation in Primary Healthcare in Rural Areas*, International Journal of Telemedicine and Applications, 143824.

Jünger, K. (2016). *Guest Contribution: Telemedicine: Germany in an international Comparison*, [Online], at: https://www.pkv.de/service/pkv_publik/archiv/2016/pkv-publik-nr-10-2016/telemedizin-deutschland-im-internationalen-vergleich/ [Accessed 31 October 2018]

Kassenärztliche-Bundesvereinigung (2017). *Online into the practice: Contract doctors have been able to offer their patients video consultation hours since April*, [Online], at: https://www.kbv.de/media/sp/Praxisinformation_Videosprechstunde.pdf, [Accessed 31.12.2018].

Kassenärztliche-Bundesvereinigung (a) (2018). *Video Consultation*, [Online], at: http://www.kbv.de/html/videosprechstunde.php, [Accessed 25.12.2018].

Kassenärztliche-Bundesvereinigung (b) (2018). *Telematic infrastructure*, [Online], at: http://www.kbv.de/html/telematikinfrastruktur.php, [Accessed 10.11.2018].

Kassenärztliche-Bundesvereinigung and GKV-Spitzenverband (2017). *Arrangement on the requirements for the technical procedures for video consulting hours according to § 291g Absatz 4 SGB* , [Online], at: http://www.kbv.de/media/sp/Anlage_31b_Videosprechstunde.pdf, [Accessed 02.11.2018].

Kassenärztliche-Vereinigung Baden-Württemberg (a) (2018). *Q&A: Ban of remote treatment*, [Online], at: https://www.kvbawue.de/praxis/neue-versorgungsmodelle/docdirekt/faq-docdirekt/#c913, [Accessed 02.11.2018].

Kassenärztliche-Vereinigung Baden-Württemberg (b) (2018). *KVBW starting pilot project docdirekt*, [Online], at: https://www.kvbawue.de/praxis/aktuelles/nachrichten-zum-praxisalltag/news-artikel/news/smart-zum-arzt-kvbw-startet-telemedizin-projekt-docdirekt/, [Accessed 13.11.2018].

Kassenärztliche-Vereinigung Baden-Württemberg (c) (2018). *Docdirekt: FAQ*, [Online], at: https://www.kvbawue.de/praxis/neue-versorgungsmodelle/docdirekt/faq-docdirekt/#c913 [Accessed 13.11.2018].

Kassenärztlich-Vereinigung (c), (2018). *Electronic Patient File*, [Online], at: http://www.kbv.de/html/epa.php, [Accessed 05.12.2018|.

Kostera, T., Thranberend, T. (2018). *#SmartHealthSystems - Digitization needs effective strategy, political leadership and a coordinating national institution*, [Online], at: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/VV_SG_SHS_dt.pdf, [Accessed 21.12.2018].

Kassenärztliche-Vereinigung Berlin (2017). Topic: Telemedicine – Video consultation, [Online], at: https://www.kvberlin.de/20praxis/20qualitaet/10qsleistung/leistungen_ueberblick/videosprechstunden/praxisinfo_videosprechstunde.pdf, [Accessed 31.12.2018].

Krüger-Brand (2018*). Fernbehandlung: Weg frei für die Telemedizin*, [Online], at: https://www.aerzteblatt.de/archiv/198076/Fernbehandlung-Weg-frei-fuer-die-Telemedizin [Accessed 19 October 2018].

KRY (2018). *Symptoms*, [Online], at: https://support.kry.se/hc/en-us [Accessed 02.11.2018].

Leonadri, F. (2018). *The Definition of Health: Towards New Perspectives,* International Journal of Health Services, 48 (4).

Lux, T. (2017). *Digitalization in the healthcare sector - between data protection and modern medical care*, [Online], at: https://archiv.wirtschaftsdienst.eu/jahr/2017/10/digitalisierung-im-gesundheitswesen-zwischen-datenschutz-und-moderner-medizinversorgung/, [Accessed 02.01.2019].

Mahadevan, S., Muralidhar, K., Shetty,D. (2012). *Tele-Education Service Using Telemedicine Network in Healthcare Industry*, Telemedicine and e-Health, 18 (9).

Maillet, E., Mathieu, L., Sicotte, C. (2015). *Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT*, International Journal of Medical Informatics, 84 (1).

Mayring; P. (2015). In-depth Interviews, Qualitative content analysis: Basics and techniques, 12th ed., Beltz.

Mc Kinsey (2018). *Digitization Healthcare – Opportunities in Germany*, [Online], at: https://www.mckinsey.de/~/media/mckinsey/locations/europe%20and%20middle%20east/deutschland/news/presse/2018/2018-09-25-digitalisierung%20im%20gesundheitswesen/mckinsey92018digitalisierung%20im%20gesundheitswesendownload.ashx, [Accessed 25.12.2018].

Medgate (2018). *Procedure of the treatment at Medgate*, [Online], at: https://www.medgate.ch/de-ch/unser-angebot/tele-clinic, [Accessed 18.12.2018].

Meier, R. (2018). *Smart to the physician: KVBW starts telemedicine project docdirekt and start-up TeleClinic from Munich is technology partner*, [Online], at: https://bkk-sbh.de/wp-content/uploads/2018/04/20180416-docdirekt-Pressemitteilung.pdf, [Accessed 20.12.2018].

Meskó, B., Drobni, Z., Bényei, E., Gergely, B., Györffr, Z. (2017). *Digital health is a cultural transformation of traditional healthcare*, mHealth Journal, 3 (8), p.38.

Ministry for social work and integration (2018). *Online consultation hour docdirekt is offered immediately country widely*, [Online], at https://sozialministerium.baden-wuerttemberg.de/de/service/presse/pressemitteilung/pid/online-sprechstunde-docdirekt-wird-ab-sofort-landesweit-angeboten/, [Accessed 15.11.2018].

Mühlner, J. (2017). *Intelligent connection of Germany*, [Online], at: https://deutschland-intelligent-vernetzt.org/app/uploads/2017/06/DIV_Report_Spezial_Gesundheit2017.pdf, [Accessed 25.12.2018].

Müller, R. (2018). *ePrescription is coming*, [Online], at: https://www.aerztezeitung.de/praxis_wirtschaft/rezepte/article/973997/digitalisierung-e-rezept-kommt-frueher-erwartet.html, [Accessed 05.12.2018].

Obermann, K. (2016). *Doctors in the healthcare market 2016 - Digitization of physicians*, [Online], at: https://www.stiftung-gesundheit.de/pdf/studien/Aerzte_im_Zukunftsmarkt_Gesundheit_2016.pdf, [Accessed 09.12.2018].

Neuber,H. (2018) *Online consultation*, [Online], at: https://www.heise.de/tr/artikel/Der-Arzt-aus-dem-Smartphone-4150605.html [Accessed 02.11.2018].

Panea, R. (2018). *Structure of Germany Healthcare system*, [Online], at: https://viamedici.thieme.de/lernmodule/psychologie+und+soziologie/strukturen+des+deutschen+gesundheitssystems#_7BD7848B_4912_4D78_A8DE_EDE4B6C06B32, [Accessed 07.12.2018].

Popkova, E., Ostrovskaya, V. (2018). *Perspective of the use of new Information and communications technology (ICT) in the modern economy*, 1th ed., Springer.

Pracht, J. (2018). *Doctor 4.0 – What about the online consultation*, [Online], at: https://erfolgreicher-arzt.de/2018/04/12/arzt-4-0-was-bringt-die-online-sprechstunde/, [Accessed 20.12.2018].

Ram, A., (2018), *The doctor will see you on – on smartphone*, [Online], at: https://www.ft.com/content/6e5f28ae-2948-11e8-9274-2b13fccdc744 [Accessed 02.11.2018].

Raposo, V. L. (2016). *Telemedicine: The legal framework (or the lack of it) in Europe*, Journal of GMS Health Technology Assessment, 12, p. 3.

Reischmann,A. (2018). *„Ban of remote treatment",* [Online], At: https://www.medical-tribune.de/praxis-und-wirtschaft/ehealth/artikel/fernbehandlungsverbot-der-weg-ist-frei/ [Accessed 19.10.2018[

Reiter et al. (2011). *Telemedicine: A commodity of the future in healthcare*, [Online], At: https://e-health-com.de/fileadmin/user_upload/dateien/Downloads/C_A_P_Analyse_1-2011_Telemedizin.pdf [Accesses 06.11.2018].

Riedler, K. (2016). *Focus: Telemedicine*, [Online], at: http://www.lig-gesundheit.at/documents/3466927/21700976/ZGP+03_2016+Telemedizin.pdf/8f427343-bcd6-4c20-b429-d75a98554d0b?t=1490255133000, [Accessed 28.12.2018].

Rychlick, R. (2018). *Interview with Dr. med. Andy Fischer, CEO von Medgate – Telemedizin stellt in der Schweiz keine Konkurrenz zu den Hausärzten dar, sondern ist eine sinnvolle Ergänzung*, Journal of Gesundheitsökonomie & Qualitätsmanagement, 23 (04).

Saunders, M., Lewis, P., & Thornhill, A. (2008). *Research Methods for Business Students*, 5th ed., Harlow: Pearson Education Limited.

Schmidt-Kaehler, S. (2018). *Patient´s perspective concerning die video consultation*, [Online], at: http://www.kbv.de/media/sp/KBV_Patientenperspektiven_2018_qualitative_Studie.pdf, [Accessed 06.12.2018].

Schwenniger Health Insurance Company (2017). *www instead of waiting room - How digital will our healthcare be?,* [Online], at: http://presse.die-schwenninger.de/fileadmin/presse/user_upload/Studien/Umfrage_www_statt_Wartezimmer_Schwenninger_Krankenkasse.pdf, [Accessed 09.12.2018].

Stiftung-Gesundheit, (2017). *Doctors in the healthcare market 2016: Digitization of the medical profession*, [Online], at: https://www.stiftung-gesundheit.de/pdf/studien/Aerzte_im_Zukunftsmarkt_Gesundheit_2016.pdf, [Accessed 28.12.2018].

Sträve, T. (2018). *Healthcare in Germany – Digital First?*, [Online], at: https://blog.esmt.org/dsi/general/the-german-health-care-system-digital-first/, [Accessed 25.12.2018].

TeleClinic (2018). *Homepage: Cooperation with Pharmacies*, [Online], at: https://www.teleclinic.com/kooperationen/apotheken-apotheken-de, [Accessed 19.11.2018].

Telemed (2018). *Target of the telemedical pilot project*, [Online], at: https://www.telemedbw.de/de/projekte/modellprojekt-zur-fernbehandlung/, [Accessed 31.12.2018].

Telemed Allianz Bayer (2017), *Health 4.0*, [Online], at: https://www.bitkom.org/sites/default/files/pdf/Presse/Anhaenge-an-PIs/2017/03-Maerz/Verbraucherstudie-Telemedizin-2017-170327.pdf, [Accessed 28.12.2018].

Thranberend, T., Hartge, F., Fink, C. (2015). *Video Consultation – A useful tool within the out-patient care*, [Online], at: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/SpotGes_VideoSprechstunde_dt_final_web.pdf, [Accessed 29.12.2018].

Till, U. (2018) *Online consultation is now available*, [Online], at: https://www.swr.de/wissen/telemedizin-fernbehandlung-in-deutschland/-/id=253126/did=21626768/nid=253126/1208hor/index.html , [Accessed 30.11.2018].

TK, (2018). *Report about patient´s opinion in regard of the health system*, [Online], at: https://www.tk.de/centaurus/servlet/contentblob/946092/Datei/65921/TK-Meinungspuls-Gesundheit-2017-Studienband.pdf, [Accessed 16.12.2018].

University of Mainz (2017). *Press release: Telemedicince werde adapted to the curriculum*, [Online], at: https://hochschulforumdigitalisierung.de/de/news/universitaet-mainz-digitale-medizin-haelt-einzug-medizinstudium, [Accessed 06.12.2018].

Waack, J. (2018). *The current trend in the field of eHealth*, [Online], at: https://blog.ec4u.com/trends-e-health-wearables-self-service/, [Accessed 25.12.2018].

Walther, J. (2018). *Insurance company TK started pilot project for sickness certification*, [Online|, at https://www.tk.de/tk/digitale-gesundheit/digitale-angebote/elektronische-arbeitsunfaehigkeitsbescheinigung-eau/985952, [Accessed 05.12.2018].

Weißling, A. (2018). *New model projects for remote treatment in Baden-Württemberg approved*, [Online], at: https://www.esanum.de/today/posts/neue-modellprojekte-zur-fernbehandlung , [Accessed 30.11.2018].

Whitten, P., Davenport Sypher, B. (2006). *Evolution of Telemedicine from an Applied Communication Perspective in the United States*, Journal of Telemedicine and eHealth, 12(5).

Wilms, A. (2017). *Requirements for video consultation*, [Online], at: https://www.allgemeinarzt-online.de/home/a/endlich-verstaendlich-anforderungen-an-die-videosprechstunde-1854020, [Accessed 06.11.2018].

World Health Organisation (WHO) (2018). *"Definition of eHealth"*, [Online], at: http://www.who.int/ehealth/en/, [Accessed 08 October 2018].

World Health Organisation (WHO) (2005). Definition of eHealth, [Online], at: ://apps.who.int/iris/bitstream/handle/10665/20378/WHA58_28-en.pdf;jsessionid=3443DBD5B6B33A248E2E1622BADBD2D5?sequence=1, [Accessed 08.10. 2018].

World Health Organisation (WHO) (1997). *Telemedicine* [Online], at: http://apps.who.int/iris/bitstream/10665/63857/1/WHO_DGO_98.1.pdf, [Accessed 13.10.2018].

Zimmermann, G. (2018*). Recording of the video consultation in EBM favors "industrial" suppliers*, [Online], at: https://www.medical-tribune.de/praxis-und-wirtschaft/ehealth/artikel/aufnahme-der-videosprechstunde-in-ebm-beguenstigt-industrielle-anbieter/, [Accessed 02.11.2018].

APPENDICES

Appendix 1 - Definitions

eHealth

To date, there is no uniform definition for the term "eHealth", as it is often used as a synonym for similar terms such as Telemedicine or Telematics (Häckle, 2011). In addition, the current definition is already under discussion whether it is still adequate in relation to the new challenges of the healthcare system (Leonadri, 2018). In general, the term covers applications that use cost-effective and secure ICT for the treatment and care of patients (WHO, 2005). This concerns, for example, the communication of medical data made available with the electronic health card, such as emergency data or the medication plan, the electronic patient file, and also telemedicine applications. The instruments of eHealth include the Internet, the electronic patient file or the electronic health card. Those sensitive health information will be communicated via the telematics infrastructure (Federal Ministry of Health (a), 2018).

Telematics Infrastructure

Telematics refers to the networking of different IT systems and the possibility of linking information from different sources (Gematik, 2018). The telematics infrastructure networks all parties in the health care system and ensures the cross-sector, cross-system and secure exchange of information. It is a closed network to which only registered users with an electronic health professional and practice card have access (Gematik, 2018).

Electronic Patient File

The electronic patient file is a digital patient book that can be used by both doctors and patients themselves. It should be used as the central basis for digital treatment management and support existing documentation and communication channels. The electronic patient file stores all data information about the patient, such as allergies, incompatibilities, blood values and previous treatments with their history (Haas, 2016).

Appendix 2 – Interview Guideline

Interview Questionnaire:
Depending on the course of the conversation and the given answers, the questions will be adapted.

Introduction about the Pilot project

1. Please, briefly describe the procedure of a video consultation as it is currently being conducted in the pilot project xy?

2. What is the current acceptance of the video consultation from the side of doctors and patients?

3. Which problems or challenges can you currently identify during the video consultation?

4. Could be first results in terms of the potential of the video consultation already determined?

Stakeholder, Challenges and Chances of the video consultation

5. Where do you see in general chances by the offering of the video consultation ?

6. What are the main Stakeholders of telemedicine, especially video consultation, in Germany?

7. What is currently stopping the development of the video consultation? Which challenges arise?

8. How could the emerging problems be solved in the future? what further development steps to promote video consulting in Germany?

Future perspectives

9. In your opinion, what effects does the online consultation have on the German healthcare system?

10. What new features/services could be integrated into a video consultation app in the future?

11. How long do you think it will take for the video consultation to be introduced throughout Germany? When could services such as ePrescription, sick leave be introduced?

12. What are the most suitable specialties for the video consultation?

13. What percentage of the daily requests at a doctor's practice can be covered by the VC? Please state it for each of the previous suitable specialties.

Appendix 3 - Description of Experts

Abbreviation	Interviewee´s name	Position
Interviewee-A	Sven Supper	Physician of the pilot project "docdirekt" with specialty in pediatrics and youth medicine
Interviewee-B	Biljana Stojkovic	Physician of the pilot project "docdirekt" with specialty in pediatrics and youth medicine
Interviewee-C	Natascha Steinmann	Manager in the Digitalization department for care management at AOK Berlin insurance company
Interviewee-D	Carmen Gaa	eHealth manager and responsible project leader for the pilot project “docdirekt” at the insurance company AOK Baden-Württemberg
Interviewee-E	Jenny Hansen	Manager for eHealth at the medical association of Schleswig-Holstein
Interviewee-F	Katharina Jünger	CEO and Co-Founder of the Telemedicine provider “TeleClinic”

Appendix 4 – Expert Interviews Part 1: Introduction of the pilot project

Q1 (a) : Please, briefly describe the video consultation as it is currently being conducted in the pilot project “docdirekt”?	
Category	**Quotation**
General Information about the VC	“In 2017, video consultation (with initial contact) was allowed to be billed according to GOP 01439 for the first time. Since then, doctors have been allowed to offer a VC and are also reimbursed by health insurance companies for this”. (E) “I extra checked how often the VC were paid by our health insurance to the doctors. I was only reimbursed twice in year 2017. But this applies only for our insurance company, I do not know how often it was reimbursed at the others. I do not think a lot more. But I can imagine that assumes the VC was used more often than the two times it had been reimbursed. (C) “However I believe doctors offered the VC but did not submit it for reimbursement.” (C) “VC with initial personal contact is almost not used […]” (D)

Formal information about the pilot project	"The Project was launched in April 2018 […] currently about 40 physicians are registered. They are mainly GPs or pediatrician." (D) "For patients, the treatment is free […] physicians are paid by the insurance company, 25€ per consultation" (D)
Procedure of VC within the pilot project "docdirekt"	"Patients first contact MA. They collect patient data." (B) "Then we discuss the problem and I give some recommendations and make the diagnosis. At the end of the treatment we also write a summary for patients and they receive it as a PDF via the App. Alternatively if it is an emergency and we cannot advise by phone then we report this to the team of the MA and they search as soon as possible a practice that is ready to admit the patient[…]." (B) "[…] this contains normal health insurance data from the patient, such as […] findings, diagnosis and a summary for the patient that can be received via the APP." (B) "Patients can upload pictures via the app. Things like a x-ray or picture of a rash." (A) "[…]we are not allowed to issue a prescription yet" (A)
Issuance of prescription	"No the physicians are not allowed to issue notifications of illness, prescriptions or referrals yet. But I hope it will come soon."
Q2 : **What is the current acceptance of the video consultation from the side of doctors and patients?**	
Physician's acceptance	"I think it will be a while before many doctors offer the video consultation. I have the feeling that younger doctors have a rather technical affinity and for this reason would rather offer a video consultation than older doctors" (B) "[…] questions rises like "Do I really need this at the moment? Do I earn enough with it? As long as my colleagues don't offer it, I don't need it either." The doctors who are currently participating in the project are doing it mainly out of interest." (B) „I believe the low acceptance also results from the fact that doctors are afraid to make false diagnoses, because patients have not provided all the necessary information, e.g. that medication is already being taken. But something like this can happen to a doctor in the practice too, it's not due to the video consultation" (B) "Some doctors have already registered for the docdirekt project, but the acceptance of doctors in Germany as a whole is still low, I believe. The physicians see currently the same effort for the video consulting hour as if the patient comes into the practice. In addition the physician is still limited over the video consulting in its application possibilities." (D)

	"[…] namely the acceptance of doctors and patients. This plays a very important role in the entire development of the video consultation" (E) "I also believe that more doctors will join the video consultation when they see their colleagues join in." (E) "I think as soon as new services like the electronic prescription or the electronic certificate of incapacity for work are possible and the video office are better reimbursed then the doctors see a greater added value in it and the acceptance will probably increase." (E) "[…] I think the problem with acceptance has something to do with the fact that it all going a bit too fast for the doctors . We have a lot of older doctors, who will retire soon, who have experienced the health care or the doctor's visit during a completely different generation and who are not yet ready to accept the current development." (E) "I would rate the acceptance within my colleagues balanced. Digitization has not yet reached the doctors. And as long as they don't get any pressure they won't introduce the video consultation." (A) "[…] the physicians at TeleClinic accept the VC quite well […] I can't speak for the physicians in general […] there are always the ones who adapt it faster and the ones who adapt it slower." (F) "In the pilot projects it has been shown that doctors who have already tried the VC also recognize an added value and would continue to use it." (C) "The problem with acceptance is that most doctors haven't dealt with it or let's say informed about it yet. They need a boost." (C)
Patient's acceptance	"[…] that patients are not informed about the offer of the video consultation." (B) "I can imagine that patients would use it more often but currently the supple from doctor's side is too low." (D) "But I believe the more widespread the offer is, the higher the acceptance will be within the patients. I can also imagine that it will be demanded by the patients. For this reason I also believe that the patient […] is a drive" (E) "This means that broadband expansion is not yet very advanced in some regions of Germany. As a result, the acceptance of patients and doctors is also poor, as they simply cannot establish a good Internet connection for the video consultation." (E) "But once these next steps have been taken, the whole thing will establish itself very quickly and also find a high level of acceptance, I think. But at the moment it is still difficult and very bumpy." (E)

	"So there are always the total proponents and then the absolute opposite the opponents. I think it's still pretty balanced at the moment, so 50% supporters as well as opponents. Many are not sure yet or have not really dealt with the topic yet. But I think that once everything works, the acceptance will increase quickly. I think a big problem is just that the use of the video consultation is not yet recognized because some applications are not realizable yet such as a online prescription." (E) "I also think a very important fact is the doctor in the practice. He should explain to the patient exactly how a video consultation can be carried out and then it will be even more accepted by the patients. " (E) "I can't say much about the patient's acceptance in general but the patients who called at docdirekt were very satisfied and would use it always again." (A) "I don't know the statistics but I would say patient acceptance is higher than doctor acceptance. However, patients have the problem that they are not familiar with telemedicine or video consulting hours and do not know that this offer exists." (C)
Q3 (a) : Which problems or challenges can you currently identify during the video consultation?	
Physicians are satisfied	-"So far everything is working quite good. I always could help the patient. Of course, at the first call it was really new for me to treat a patient online, but from patient to patient I became more confident and better knew what I have to ask the patient." (B) "I had not so many patients yet. But the video consultation I had were good. At the beginning I was really curious about making a diagnosis online, but it is not very different from a usual consultation in a practices." (A) "It is always important to make notes about the treatment then you are on the save side." (B)
Verification of patients	"[…] one can be said, we have a problem with the identification or more verifications of the patients. Of course, at the beginning of the call the MA receive their contact data and number of their insurance card but we cannot verify the person […] e.g. through any code or tan. This is not possible at the moment. But it was also not a reason the cancel the project." (D)
No technical issues	"I would not have expect that it is working so well, especially from the technical side" (B) "I had always good connection and thus good quality […] I never had to cancel the video consultation due to technical problems" (A)
Q4 (a) : Could be first results in terms of the potential of the video consultation already determined?	
Patients requests	"Patients are very satisfied with the online treatment, I always ask them if they liked it. […] The consultant was always successful that the patient had not go to a local practice anymore." (B) "[…] but actually all indications that do not require a physical examination can be done online. […] like check-up appointment, discussion of

	laboratory test or x-rays, an informal consultation or just such minor injuries e.g. a cold." (B) "The patient´s request were similar to those in the practice, for example abdominal pain, skin diseases or flu infections" (D) "In pediatrics it is often the case that the parents just call because they are uncertain, mostly nothing bad happen" (A) "[…] definitely check-up or consultations, where I don´t need to see the patient physically, can be done via video consultation." (A)
Varies age groups	"by different age groups, also older patients. However, it can be already noted that the new contact channel is used in particular by men at an average age of 45 years. These represent 70% of the contact seekers" (D)
Less inquiries	"Usually I have to be online at a certain time during day, like a shift. But currently I am all day online because not so many people are calling. I had only 7 – 10 patients so far" (B) "[…] maybe I had 5 patients since I am registered. Not a lot. […] I have the feeling that patients do not know about this pilot project and the video consultation without first initial contact. They have no clue that it exists. […] due to the fact that health insurance companies do no promote it yet. People cannot know about it." (A) "I cannot say a lot about the feedback, from April to October we only received 60 inquiries from patients. […] the demand is too low and it is too early for any evaluation. We cannot say anything about the relief of the emergency department or any further potential" (D)
Digital prescription is coming	" in 2019 we try to offer an electronic prescription within the pilot project" (D)
Q1 (b) : Please, briefly describe the video consultation as it is currently being conducted in the pilot project <u>"TeleClinic"?</u>	
General information of the project	"[…] we work together with approximately 150 physicians" (F) "At present, more than 10,000 people are registered at the TeleClinic." (F)
Procedure and aim of the VC	"Teleclinic is about making it easier and faster for patients to talk to doctors. This means, if a patient has a medical problem, he can talk to a doctor quickly. For example, as fast as if one would enter a question at google, but at the same time it should also be an individual and competent help, not as with Google from a layman, but a competent opinion from a real doctor." (F)
Mainly private insured people	"[…] as you said we started only with private patients but started also to acquire statutory health insurance companies" (F)
Treat patients abroad	"Patients who are insured at one of our cooperating health insurance companies can be also treated when they are on vacation or for instance on a business trip" (F)

Main patient´s requests	"the most frequent patients' concerns are for example colds and coughs in the field of pediatrics or informative questions in the field of gynecology. Dermatology and orthopedics are also often requested specialties" (F) "Dermatology or orthopedics are very suitable areas since patients can upload pictures or x-rays […] show their problem on the screen" (F) "in the orthopedic field the doctors can also describe their patients very well which movements they have to make in order to find out the problem." (F)
Electronic prescription	"If the doctor can clearly determine a diagnosis by VC, the doctor is allowed to issue a prescription to the patient digitally"(F) "Due to legal reasons only for private insured people at the moment" (F) "[…] only within the pilot project in Baden-Württemberg" (F)
Q3 (b) : Which problems or challenges can you currently identify during the video consultation?	
Restrictions though legal regulations	"Our physicians can only issue prescription to private insured patients." (F)
Broadband expansion	"Broadband is still not expanded enough […] sometimes patients have problems with the internet connection." (F)
Q4 (b): Could be first results in terms of the potential of the video consultation already determined?	
Patients are satisfied	"Patients who used our service are very satisfied" (F) "Through the opportunity to issue prescriptions, 50% of our physicians can treat the patient in an adequate way that no further physical examination or visit to a local practice is necessary" (F)
Not only initial contact	"At the beginning we mainly had patients who called without initial contact […] after a while patients used the service regularly […] they were always treated from the same doctor" (F)
Service is mainly used during weekends	"Patients often call on weekends or later in the evening […] when the usual opening hours are over." (F)
Additional service through the treatment of known patients	"Furthermore, TeleClinic does not only treat new patients without previous contact compared to docdirekt. They also offer a combination of both since customers who have been treated because of an urgently problem, can later contact the doctor online for aftercare, consultation or other concerns. This is very well received by the patients "We made the experience that people who called us as a first contact, would like to have the opportunity to be treated further by our physicians […]." "Right, it was demanded by the patients […]" (F)
Q5: Where do you see in general chances by offering a video consultation ?	

Simplification of procedures within the treatment	"chronical patients who have to visit the practice every week or once a month for a backup can avoid this through the VC and e.g. come only once in the quarter." (A) "[…] minor injuries can be discussed via VC, those personal visits are not always necessary and make the handling for patient and physician easier." (B)
More regular consultations	"[…] patients come less since they want to avoid the travel, VC provides more comfort […] people would talk more often to doctors if the access to them would be easier." (B) "Patients become better access to physicians or medical care in general." (A)
Time saving	"Physicians could reduce the amount of home visits through the VC." (C) "Coordination of the appointments might be more structured and thus I can save time." (C) "Save time, especially for patients who frequently go to the doctor. For the physician it is naturally also in such a way that he saves also travel times, thus can save home visits." (D)
Better access to medical care	"If I have a patient with a special problem where I cannot help out I would refer him to a medical specialty. But with VC I could conduct a conference with the specialty and the patient for a first opinion. So the patient does not have to go necessarily to a specialty and can avoid long distances." (A) "If the VC is connected with a digital patient file where all physicians have access to it, double treatments can be avoided or double medication […] patient`s data can be shared among the physicians. […] at the moment I don´t have access to diagnosis from different doctors or any other documents related to the patient. Only the patients brings it to an appointment." (B) "The VC solves the problem of distances between patients and physicians, especially in rural areas where not many physicians and particularly medical specialties exist." (E) "Especially the people on the countryside, for whom a video consultation or telemedicine promises a great benefit" (E) "[…] better access to specialties, especially for a first consultation in order to gain an opinion."(C)

Appendix 5 - Expert Interviews Part 2: Stakeholder, Challenges and Chances of the Video Consultation

Q6: What are the main stakeholders of the video consultation in Germany?

Five main stakeholders	"Of course patients and physicians as they are the end user of the VC." (E) "Medical association plays an important role as they represent the physicians on a regional level […] the medical association of each federal state" (A) "The health insurance company plays an important role in the development of the video consultation. Together with other health insurance companies, the AOK has committed itself to developing a digital network that focuses on the patient" (D) "In the first place Ministry of health […]."(C) "Cost bearers e.g. health insurance companies since they provide the financial support and remunerate the physicians" (E) "yes sure, we (telemedicine provider) also play an important role as we provide the technology […]"(F) "In any case the politicians but also the cost bearers, that is the health insurances and the associations of health insurance physicians." (B)
Q7: What is currently stopping the development of the video consultation? Which challenges arise?	
Legal Framework	"Reimbursement and a new regulation, both are the next important points" (E) "[…] we only work with individual solutions or isolated solutions and pilot projects." (E) "The ban on remote treatment includes a strict limitation which unsettles the doctors" (B) "[…] the doctors are limited to several indications" (C) "[…] this law has so many restrictions for the indication and reimbursement of our work that it does not make sense to offer the VC at the moment" (A) "the way in which we are allowed to conduct the VC and how we are reimbursed are very limited and as long as there is no change the VC will not be offered by the doctors […] currently it only make sense within the pilot project" (A) "Yes, I've been told that the ban on remote presents a lot restrictions for the physicians" (D) "[…] definitely new guideline in form of a law must be defined to provide an adequate VC" (C)

	"[…] a refinement of the remote treatment would definitely encourage the development of the VC" (F) "an initial personal contact with the patient if mandatory to provide VC […] this is not the concept of telemedicine provider abroad thus they have not entered the market yet" (F) "[…] if the VC shall be implemented on a national level the physicians must be able to treat patients without previous first contact […] otherwise it does not make sense and will not reach the maximum potential of the VC" (B)
Inappropriate Reimbursement	"Reimbursement is the first priority here […] The VC without first personal contact does not even have a specific reimbursement standard so far and a VC with known patients is only very badly reimbursed." (C) "I extra checked the price for an VC […] it is only € 9.27 per consultation but physicians cannot always make this valid. It is only once within a month possible even if the patient has called every week. Hence, it is comprehensible if the physicians do not offer it." (E) "For the VC without previous does no reimbursement standard exist […] thus we actually have to use the old measurement scale GOP 01439 for statutory insured patients which is the same lump sum as for VC with initial contact […]" (F) "[…] but prices per consultation within pilot projects differ from the usual reimbursement […] in order to implement the VC on a national level a uniform reimbursement scale shall be defined" (F) "The doctors in the project are paid well, but apart from the pilot project the remuneration is not enough that doctors would take the initiative and offer VC" (B) "I cannot complain about the VC but we (teledoctors within the pilot project) receive a different reimbursement than usual reimbursement lump sum […] I think it is about 25€ for a consultation at docdirekt" (B) "[…] physicians within pilot projects receive a different reimbursement standard […] but I know that the reimbursement for a VC as it is legally defined in Germany is not high […] it is definitely lower than a face-to-face consultation" (A) " right, as you said the reimbursement for VC is lower as for a face-to-face consultation […] might be a reason why physicians are not demanding the VC" (D)
Acceptance of patients	"I have the feeling that the VC is not even promote it from health insurance company's side[…] a lot of my patients have no idea of the concept of the VC […] for which indications it can be used […] it is comprehensible why their acceptance is lower" (B)

	" […] patients should definitely detailed informed about the VC" (A) "[…]right, it is still not enough which results in low acceptance from both sides […] but patients just not good enough informed" (F) "acceptance from both sides definitely plays an important role in here (challenges)" (C) "acceptance of the end user, so physicians and patients, is still not enough for us in order to provide more initiatives" (D) "we know about the problem of the low patients acceptance and thus already have some plans in progress" (E) "But I think that once everything works, the acceptance will increase quickly. I think a big problem is just that the use of the video consultation is not yet recognized because some applications are not realizable yet such as a online prescription" (E) "I can imagine that it comes here naturally to a certain acceptance from the patients. But I believe the more widespread the offer is, the higher the acceptance will be with the patients. I also believe that more doctors will join the video consultation when they see their colleagues join in. I can also imagine that it will be demanded by the patients. For this reason I also believe that the patient is a driver" (E) "We are also aware that patients currently do not see the added value of consultation hours when no prescriptions may be issued. But we are currently working on that" (E)
Acceptance of physicians	"However, the problem here is that no prescription such as a sick certification or medication prescription may be issued. This is currently not possible. In this sense, the video consultation does not help me much when I have to pick up a prescription in practice." (E) "namely the acceptance of doctors and patients. This plays a very important role in the entire development of the video consultation." (E) "So there are always the total proponents and then the absolute opposite the opponents. […] Many are not sure yet or have not really dealt with the topic yet" (E) "Because most costs must then be covered by the doctor. I think as soon as new services like the electronic prescription or the electronic certificate of incapacity for work are possible and the video office hours are better reimbursed then the doctors see a greater added value in it and the acceptance will probably increase." (E) "the large majority who are still undecided and wait to see how it works with others until they jump up." (E)

	"I think it will be a while before many doctors offer the video consultation. I have the feeling that younger doctors have a rather technical affinity and for this reason would rather offer a video consultation than older doctors. The young doctors grew up with computers and the Internet. The older doctors are from a different generation, they are less concerned with technology and digitization. However, I have the feeling that younger doctors don't trust themselves to offer video consultation because they don't have enough experience. I think they are afraid of making mistakes that they might overlook something and make a false diagnosis." (B) "I believe the low acceptance also results from the fact that doctors are afraid to make false diagnoses, because patients have not provided all the necessary information, e.g. that medication is already being taken. But something like this can happen to a doctor in the practice, it's not due to the video consultation. I think it is in particular important for the doctors to build up a good trust with the patient so that he says all the necessary information and even more important that the doctor carefully documents everything he does. Then this cannot lead to problems later. (B) "The older doctors are more confident about this, but they don't really see the benefits and added value behind it yet. Questions arise such as "Do I really need this at the moment? Do I earn enough with it? As long as my colleagues don't offer it, I don't need it either." (A) "the physicians do not see the advantage in the VC yet […] they do not demand it" (D) "The physicians see currently the same effort for the video consulting hour as if the patient comes into the practice. In addition the physician is still limited over the VC in its application possibilities. It must be tested for what exactly the VC makes sense at all, for which applications and which areas. But this will probably be seen in the near future when the first results of the model project are evaluated and available." (D) "They are missing important feature as the online prescription or certification of sickness" (C) "the reimbursement for the VC must be higher to create an incentive. Then the acceptance will automatically increase." (C) "Doctors are still afraid that the relationship between doctor and patient will change" (C)
Digitalization in healthcare is not advanced enough	"Germany is a bit slow regarding this situation. In general, medical practices in Germany are not very digitally equipped. Within the last 8 years I have changed my practice to digital documents. I think that has less to do with Germany being slow, it´s just a generation change and that takes time. Doctors used to work differently, without computers […] (B)

	"So basically everything about digitization is a social change. This creates completely new tasks for the Federal Ministry, the Medical Association and the medical profession, which have to be taken into account." (E) "[…] digitalization is in general a big problem in the doctor´s practices." (A) "Since many things have not yet been digitally converted by the older generations" (C) "In general, digital transformation in healthcare is difficult as is now the case with the ePrescription" (D) "Some have also not yet suitable structures and systems for a video consultation hour" (D)
No appropriate expanded telematic infrastructure	"The infrastructure still plays an important role. This means that broadband expansion is not yet very advanced in some regions of Germany. As a result, the acceptance of patients and doctors is also poor, as they simply cannot establish a good Internet connection for the video consultation." (E) "[…] the connection of electronic applications is necessary in general. This means if an online consultation is held, the teledoctor must document the treatment and then the patient and doctor must have the opportunity to share this data with other parties in the healthcare system" (E) "the telematics infrastructure already exists and more and more doctors are joining in. Hopefully it will not take too long until this works across the board and the glass fibers are expanded. I suspect that things will go faster now than in the last few years and that in 5 years we will be able to use such a system, i.e. the video consultation hour and the associated electronic prescriptions, sickness reports and a networked patient file." (E) "[…] the telematics infrastructure exists but is still not expanded enough" (B) "However, I see the telematics infrastructure as a major challenge, as it has not yet been set up in such a way as to link all the service providers that are involved in healthcare and the video consultation" (D) "from the technical conditions so infrastructure we are not ready" (C) "the digital infrastructure is the basis for all telemedical applications." (E) "in order for this data to be integrated into the digital network, a functional infrastructure must be established first. At the moment, however, data has not really been entered or is this only in the form of identification digits or codes which the patient cannot read." (D)

	"[…] is not properly expanded […] we do not have the chance to share the data with our colleagues […] each doctor has his own patient file, medication plan etc." (A)
Interoperability of the digital devices is required	"It could also be the case that the patient has everything nicely in an app and the doctor cannot use it due to incompatibility. Such data cannot be used at the moment, everything would have to be compatible with each other. This means that the basis of all medical applications is this infrastructure and then of course the common interfaces, it won't work without that." (E) "Keyword is "interoperability" which means that the systems can talk to each other." (E) "every provider offer a different software or app and all are not compatible with each other" (D) "some software for the VC are not even compatible with certain software programs of physicians' practices" (D)
Patient identification	"I see patient identification during the video consultation as a problem as well as the patient's access rights. Solutions have to be found how the patient is identified before a video consultation and then it has to be defined which data the patient has access to." (D) "Germany is not yet so far with that, we are still lagging behind other countries such as Denmark or other Scandinavian countries" (D)
Structure of the German healthcare system and Federalism	"In addition, there are 16 different federal states in Germany and some also have different regulations and can therefore react faster or slower to this change. It is difficult to introduce the video office hours from one day to the next nationwide, because every single federal state has to agree. The systems abroad work on a national level which can also be a reason why it was implemented faster in Switzerland and Denmark. Moreover, Germany is much bigger which also makes the whole introduction more difficult." (E) "There are great examples abroad. However, we always have to pay attention to what kind of health care system is used in these countries. Most of them have a national health system and insurance system. Federalism once again plays a major role in ensuring that these countries can handle the country-specific situation differently from Germany. This means that a takeover of such a system as Medgate cannot simply be applied to Germany. But of course we can take some of the things that work very well in Switzerland. But such a scenario is not feasible in Germany." (E) "Germany is a big country. Small countries with fewer doctors can of course act faster. On top of that, we can't decide everything at a nationwide level, it is depending on the individual federal states. And unfortunately every federal state decides differently and independent from each other at the moment." (D)

	"The development of the electronic prescription has been delayed for so long for political reasons." (D) "The health care system is very hierarchical and therefore everything goes a little slower." (C) "many different parties are involved in the development of the VC and each of them want to represent its own opinion" (C)
Q8 : How could the emerging problems be solved in the future? what further development steps to promote video consulting in Germany?	
New legislative framework	"Legal situation must be changed in order to create a uniform guideline for the video consultation hour" (C) "The law definitely need to be relaxed to provide more flexibility for the physicians" (F) "The new law determines which doctors and indications are suitable for the video consultation in the future, in particular without the first contact" (E) "the nursing care strengthening law will come into effect on January 1, 2019" (E)
More initiative from the politicians	"Ministry of Health must develop a uniform strategy whereby all actors must be represented with their interests and that also not all federal states have their own regulations but are traded on a national level." (C) "[…] it must become more agile with regard to legislation and these must be adapted more quickly." (C) "So the first step would be on the part of politics as long as nothing is decided there is no incentive for all other involved parties to set anything in motion. But this happened with the enactment of the nursing care strengthening law on January 1, 2019. As next it would be important if the cost carriers agree on how the new kind of the video consulting hour is reimbursed. This includes cash-medical associations and the health insurance companies. These must discuss which model can be provided and thereby it would be also important to ask the physicians." (E) "The next step has to come from politicians side […]" (B)
New reimbursement standard	"There should be an incentive in the reimbursement, so that doctors have no losses through the VC" (C) "[…] reimbursement. At the moment, the current reimbursement lump sum is very limited, but this is to be changed. The new law will determined which doctors and indications may take place during a VC without initial contact in the future " (E) "HICs need to jointly define a new reimbursement scale[…]." (F)

Pressure on the Gematik	"Politics must put more pressure on Gematik" (C) "This means that the basis of all medical applications is this infrastructure and then of course the common interfaces, it won't work without that." (E)
Further incentives of the VC need to be provided	"The electronic prescription and sick report, but also, the medication plan are already in the planning stage, but we don't yet know how long it will take before they can actually be used. Among other things, this also involves data transfer from the patient himself. So that the patient uploads or takes pictures. (E) "There simply has to be a greater benefit from the video consultation and this includes the integration of electronic prescriptions, a sick report, a digital medication plan and above all the electronic patient file." (D) "But I think that once everything works, the acceptance will increase quickly. I think a big problem is just that the use of the video consultation is not yet recognized because some applications are not realizable yet such as a online prescription. It's got to give the doctors a benefit, otherwise they won´t use it." (E) "[…] Outpatient practices must think economically when a patient comes to the practice then the doctor can bill for various services where physicians make profit. However, if he only charges for the video consultation then he cannot charge for any other services because by video the physician can make also less, e.g. laboratory test etc. cannot be accounted. At this moment he can only charge for the consultation. From a medical point of view, this is of course rather negative and the willingness to offer a video consultation is correspondingly low." (C)
Inform patients and physicians about the VC to increase acceptance	"[…] informing people is currently very important for the introduction of telemedicine and especially video consultation […]" (E) "I also think a very important fact is the doctor in the practice. He should explain to the patient exactly how a video consultation can be carried out and then it will be even more accepted by the patients […]" (E) "Patients and doctors need to be better informed. The German Medical Association also sees itself as one of those responsible parties […]" (E) "Physicians need proactively prescribe the VC to the patients and inform them […]the acceptance will also increase through the education" (D) "End users need to be better familiarized with the technology" (C) "I see the patient as the main driver to further develop the VC […] if they are demanding the VC at their doctors' practices, the pressure on the doctors will increase […]" (E)

	"I also think a very important fact is the doctor in the practice. He should explain to the patient exactly how a video consultation can be carried out and then it will be even more accepted by the patients […]" (E)
Offer of trainings	"Offer training and further education. In Sweden, for example, there are proper training courses for telemedicine" (C) "the teledoctor presents a new professional field for physicians and thus trainings need to be provided" (E) "[…] education is currently very important for the introduction of telemedicine and especially video consultation." (E)
Better promotion of the VC	"The HICs and medical association need to better advertise the VC […] maybe information flyer or seminars […] anything that inform patients that VC exists in Germany and what kind of medical services are possible through the VC." (B)
Better organization for the introduction of VC	"I think the further introduction of the video consultation hour associated with the electronic patient record or a prescription is dependent on organizational reasons such as the legal situation, administration etc." (B) "I think the need a team or department to be defined which organize everything around the VC" (B) "it´s necessary that a team of physicians exist who only take care of those video consultation. A general doctor cannot handle this next to his daily business in the practice. Or at least can only do it some hours on certain days in a week. There are already too few doctors for this reason it must be clearly defined when and who is responsible for such video consultation hours" (B)

Appendix 6 - Expert Interviews Part 3: Future perspective and impacts

Q9 : In your opinion, what effects does the online consultation have on the German healthcare system?	
Better access to medical care	"I cannot speak now for all health insurance companies but the AOK sees the chance of the video office hours in the teleconsile so between two doctors to enable the patient a better and faster diagnosis. Therefore we have also implemented a project in the field of dermatology. The doctors have digital telescope which takes a photo of the image at the same time. The family doctor can forward the photo of his patient to a dermatologist, who diagnoses the findings and reports it back to the family doctor, who can then pass it on to his patient. Such teleconsile could also be applied to other areas except of dermatology. Through the teleconsile also the patients have advantages since they do not have to take any longer ways to a specialties. In addition, there are too few specialties in Germany, so this problem could be better counteracted." (D)

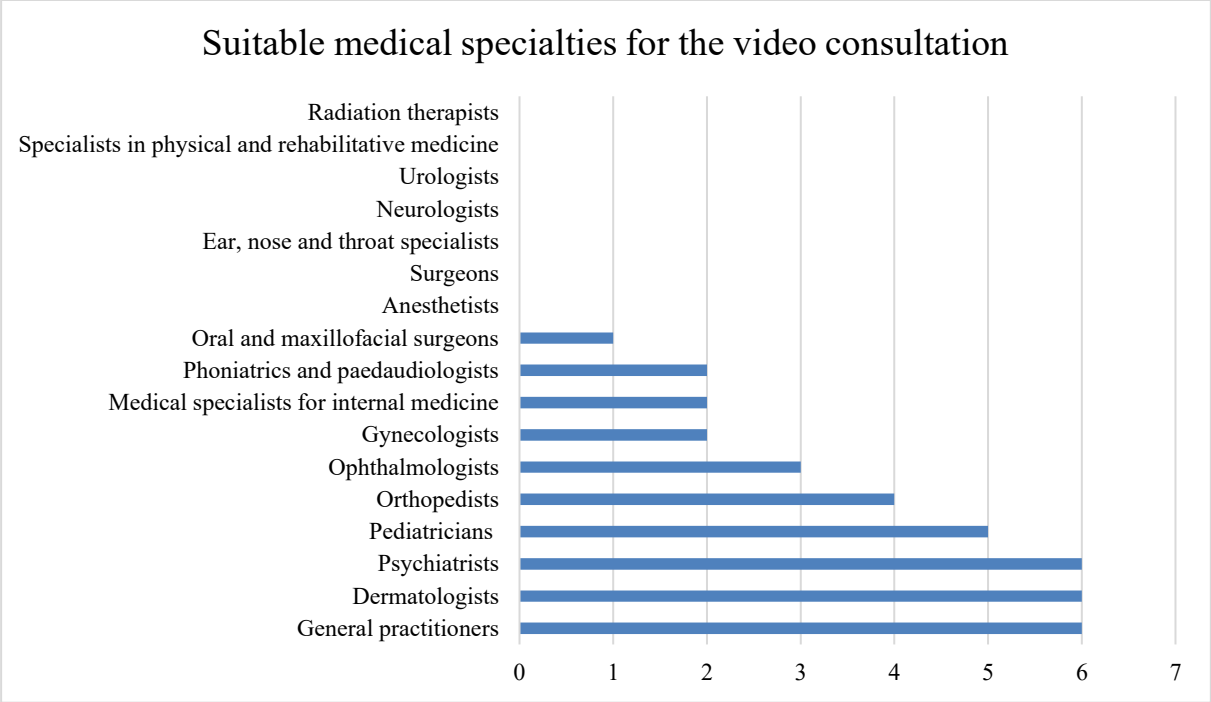
	"Especially the people on the countryside, for whom a video consultation or telemedicine promises a great benefit, are very interested in it and pass on the information." (B) "The patient is the focus of a team of different doctors. This means that the patient would not have to fill out a new medical history form or other documents every time. Patient access rights are an important aspect at this point. Through this access rights, the patient can then decide which data is accessible to whom. This provides the opportunity to share all data in a way that everything is connected with each other." (E) "Basically there will be a big change in society, especially in the health sector. Because the old image of the doctor-patient relationship will change. Patients could have the opportunity not only to be treated by one doctor, but also to have another opinion from another doctor, without having to travel long distances or incur high costs." (E) "[…] the care will change fundamentally […]" (E) "There is a good saying "Move the data not the patient That means you should set up the whole system more patients centered in a way that the patient will not be sent from A to B, but the doctors are well connected with each other. This brings us back to the topic of electronic health records." (E) "[…] and it will make life easier for the patients and the healthcare system will be able to deal better with doctors as a resource." (E)
Triage through VC to relief emergency department	"A kind of triage through the video consultation would make sense in any case" (D) "[…] the acute online consultation hours can of course also relieve the workload of the emergency rooms."(B)
New and more flexible working models	"I can well imagine that e.g. women or mothers working part-time could carry out this offer of the video consultation hour. Another possibility are retired doctors who are still interested in one or two days a week patients online to advise and treat. I can imagine this very well for the future." (B) "I can imagine that in the long run the online consultation will relieve the burden on the practices so that doctors don't have to do so much overtime anymore […]" (B) "New business models e.g. mothers or pensioners or doctors are restructuring their daily lives better." (C)
Less travel time and costs for patients	"For patients I see the advantages that they don't have to travel and wait so long […]" (B)

Avoidance of double treatments	"But also the fact that physicians can better talk to each other and thus the patient no longer has to visit so many different physicians to get a diagnosis. If the doctors can better communicate or exchange data better with each other, double treatments could be also avoided." (E)
Higher competition within the HICs	"Competition among the health insurance funds is being increased. Each health insurance company will focus on other specialties. Health insurance companies that do not focus on telemedicine will be left behind […]" (C)
More efficient processes at a doctor´s clinic	"Patients can be managed or better controlled […]."(C)
More transparency within the doctors	"[…] doctors trust each other more and not only their own findings but also those of my colleagues […]"(C)
Saving time	"Home visits can be saved and done by video consultation hour […]"(C)
More pressure for outpatient practices	"More and more telemedicine providers entering the German healthcare market […] pressure and big competition for small medical practices" (E)
Competition from abroad	"Among the telemedicine providers, the pressure would also be higher. German telemedicine providers are getting pressure from competition from abroad." (E)
Q10: What new features/services could be integrated into a video consultation app in the future?	
Introduction of further features	"In the future it should definitely be possible for physicians to have access to all patient-relevant data, e.g. medication plan and diagnoses of all different physicians, etc. Yes, that's how I see it in the future." (B) "The electronic prescription and sick report, but also, the medication plan and all other data of the patient[…]" (E) "[…] sickness certification, medication plan, electronic referral and prescription will be definitely available in the future." (A) "[…] the integration of electronic prescriptions, a sick report, a digital medication plan and above all the electronic patient file." (D) "[…] the app should be compatible with other software in the doctor's practice […] provide an overview with the medication, treatment and therapy details of the patient." (C) "[…] the possibility to issue a prescription, referral or sickness certification via the App." (C) "[…] payments of private insured people might be done though the App." (C) "[…] the teledoctor must document the treatment and the patient and doctor must have the opportunity to share this data with other doctors." (E)

	"Among other things, this also involves data transfer from the patient himself. So that the patient uploads or takes pictures." (E)
Q13: How long do you think it will take for the video consultation to be introduced throughout Germany? When could services such as ePrescription, sick leave be introduced?	
Assumption when VC and associated features can be properly used	"[…] two to three years. I hope it will go quickly […]" (B) "I suspect that things will go faster now than in the last few years and that in five years we will be able to use such a system, i.e. the video consultation hour and the associated electronic prescriptions, sickness reports and a networked patient file." (E) "I assume that it will not take longer than 5 years […]." (C) "at least five years […] yes I would say five to ten years" (D) "hopefully within the new three to five years […]" (F) "I can imagine that it will take up to five years until those features are available with the VC […]" (A)

Appendix 7 - Diagram: Suitable medical specialties for the video consultation

Q12: What are the most suitable specialties for the video consultation?



Appendix 8 - Percentage of indications that can be performed online

	Dr. Supper	Percentage of indications for VC	Dr. Stojkovic	Percentage of indications for VC
General practitioners	x	10%	x	10%
Pediatricians	x	15%	x	15%
Anesthetists				
Ophthalmologists				
Surgeons				
Ear, nose and throat specialists				
Oral and maxillofacial surgeons				
Neurologists				
Orthopedists	x	5%	x	5%
Gynecologists	x	5%		
Dermatologists	x	15%	x	15%
Medical specialists for internal medicine				
Psychiatrists	x	30%	x	30%
Urologists				
Phoniatrics			x	5%
Specialists in physical and rehabilitative medicine				

Radiation therapists				

Appendix 9 - Excel of the estimation for the current state (simplified version)

	Doctor Acceptance	Patient acceptance
	57%	34%
	Germany	**4 Federal States**
Inhabitants	82.792.351	35.906.688
Inhabitants with internet access	76.996.886	33.393.220
Average of doctor visits per year	8,6	8,6
Doctor visits per year	662.173.223	287.181.691
Doctor Consultancy's	377.438.737	163.693.564
Doctor Consultancy's based on patient & doctor acceptance	**128.329.171**	**55.655.812**
General Practitioner	40.295.360	17.475.925
Psychiatrists	3.079.900	1.335.739
Dermatologists	3.978.204	1.725.330
Orthopedists	5.774.813	2.504.512
Pediatricians	6.031.471	2.615.823
Total consultancies within the 5 specialties	**59.159.748**	**25.657.329**
Percentage/Share of total doctor consultancies	15,67%	15,67%
Current state of each specialty within the 5 Federal states	**Doctor visits that can conducted online**	
General Practitioner	4.029.536	1.747.592
Psychiatrists	923.970	400.722
Dermatologists	596.731	258.800
Orthopedists	288.741	125.226
Pediatricians	904.721	392.373
Amount of VC that can be done online in total	**6.743.698**	**2.924.713**
Percentage	11,40%	11,40%

Used data from secondary sources:

Barmer Health Insurance Company (2018). *Physician Report 2018*, [Online], at: https://www.barmer.de/blob/144354/4b9c44d83dc8e307aef527d981a4beeb/data/dl-pressemappe-barmer-arztreport2018.pdf, [Accessed 13.12.2018].

Coliquio (2018). *Insights of a doctor´s clinic*, [Online], at: https://www.coliquio-insights.de/wie-bereit-sind-die-aerzte-fuer-videosprechstunden-umfrage/, [Accessed 26.12.2018].

Federal Statistical Office Germany (2017). *Federal states with capitals by area, population and population density*, [Online], at: https://webcache.googleusercontent.com/search?q=cache:DchGCvchf8MJ:https://www.destatis.de/DE/ZahlenFakten/LaenderRegionen/Regionales/Gemeindeverzeichnis/Administrativ/Ak

tuell/02Bundeslaender.xlsx%3F__blob%3DpublicationFile+&cd=2&hl=de&ct=clnk&gl=pt&client=safari , [Accessed 13.12.2018].

Schwenniger Health Insurance Company (2017). *www instead of waiting room - How digital will our healthcare be?,* [Online], at: http://presse.die-schwenninger.de/fileadmin/presse/user_upload/Studien/Umfrage_www_statt_Wartezimmer_Schwenninger_Krankenkasse.pdf, [Accessed 09.12.2018].

Statista (2017). *Share of households in Germany with Internet access from 2002 to 2017*, [Online], at: https://de.statista.com/statistik/daten/studie/153257/umfrage/haushalte-mit-internetzugang-in-deutschland-seit-2002/, [Accessed 22.12.2018].

Stiftung-Gesundheit, (2017). *Doctors in the healthcare market 2016: Digitization of the medical profession*, [Online], at: https://www.stiftung-gesundheit.de/pdf/studien/Aerzte_im_Zukunftsmarkt_Gesundheit_2016.pdf, [Accessed 28.12.2018].

Appendix 10 - Sensitivity Analysis in percentage (within the five medical specialties)

		Doctor Acceptance					
		57%	60%	63%	66%	69%	72%
Patient Acceptance	34%	11,40%	12,00%	12,60%	13,20%	13,80%	14,40%
	38%	12,74%	13,41%	14,08%	14,75%	15,42%	16,09%
	42%	14,08%	14,82%	15,56%	16,30%	17,05%	17,79%
	46%	15,42%	16,23%	17,05%	17,86%	18,67%	19,48%
	50%	16,76%	17,65%	18,53%	19,41%	20,29%	21,17%
	55%	18,44%	19,41%	20,38%	21,35%	22,32%	23,29%

Appendix 11 - Sensitivity Analysis of the total market of VC

		Doctor Acceptance					
		57%	60%	63%	66%	69%	72%
Patient Acceptance	34%	6.743.698	7.098.629	7.453.561	7.808.492	8.163.424	8.518.355
	38%	7.537.074	7.933.762	8.330.450	8.727.138	9.123.827	9.520.515
	42%	8.330.450	8.768.895	9.207.340	9.645.785	10.084.229	10.522.674
	46%	9.123.827	9.604.028	10.084.229	10.564.431	11.044.632	11.524.834
	50%	9.917.203	10.439.161	10.961.119	11.483.077	12.005.035	12.526.993
	54%	10.710.579	11.274.294	11.838.008	12.401.723	12.965.438	13.529.152

		Doctor Acceptance					
		57%	60%	63%	66%	69%	72%
Patient Acceptance	34%	5,26%	5,53%	5,81%	6,08%	6,36%	6,64%
	38%	5,87%	6,18%	6,49%	6,80%	7,11%	7,42%
	42%	6,49%	6,83%	7,17%	7,52%	7,86%	8,20%
	46%	7,11%	7,48%	7,86%	8,23%	8,61%	8,98%
	50%	7,73%	8,13%	8,54%	8,95%	9,35%	9,76%
	54%	8,35%	8,79%	9,22%	9,66%	10,10%	10,54%