Digitalization of Pneumological Care in the Outpatient Sector: An Inventory

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1 Introduction

The world is currently undergoing digital change. This raises the question of why digitalization has become more widespread in the private sector than it is currently in the healthcare sector. Social networks have become a matter of course, and apps are used to control forms of organization and conduct business. This is not the case to this extent in the outpatient medical sector. Here, digitization has so far been limited to billing processes and documentation. However, various factors have recently necessitated a rethink towards the use of digital products in the context of outpatient treatment of pneumological patients. The leading factor here is an orientation of the doctor-patient contact away from traditional treatment in the practice towards the use of digital contacts in the patient's home environment. This development is accelerated because outpatient pneumologists are underrepresented in Germany. In the outpatient sector there is a ratio of 0.6 pneumologists per 100,000 inhabitants, which represents the lowest pneumological coverage within the European Union. In contrast, Greece, the leader in this field, has a rate of 13.2 pneumologists per 100,000 inhabitants (Barzok 2016). In addition, individual practices are no longer adequately staffed and the pneumological presence will be increasingly lost especially in smaller cities. However, demographic developments will lead to an increase in the number of cases due to the high co-morbidity of the patient group, which means that a pneumological presence can be created through telemedicine especially in rural areas with long distances to travel.

This article deals with the possibilities of digitalization in the pneumologic outpatient setting. The first chapter describes the possibilities and limits of telemedicine in the outpatient sector. The subdivision of telematics into telemonitoring and its

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contribution to intersectoral cooperation using the example of sleep medicine is the topic of the following chapter. Subsequently, the current state of development of digital products and their limitations especially in the area of patient data protection will be shown. Finally the currently existing obstacles to development and solution modalities are discussed.

2 Telematics: Telemedicine and Telenursing

The term telematics defines the use of means of telecommunication for specific purposes, such as the control of systems. Telemedicine is a sub-area of telematics in the health care system which includes both diagnostic and therapeutic bridging of spatial and temporal distances between the participating physicians, service providers (providers, pharmacists), cost units and patients (WHO 2020). Telemedicine is intended to optimize the quality of doctor-patient contact and the treatment outcome. Telemedical interventions can also ensure improved care for patients with chronic lung diseases in particular (Sulaiman et al. 2018). In addition, there is the organizational will and the technical-digital know-how to combine virtual clarification and clarification appointments with further treatment on site. The technical prerequisites already exist for establishing intersectoral cooperation with the family doctor using telemedical possibilities (Merchant et al. 2016). Digital aids will improve doctor-patient contact and will complement personal contact.

2.1 Virtual Consultation Hours

Particularly in pneumological practices with catchment areas of more than 100 km telemedicine services are tested and promoted with the professional political support of the Federal Association of German Pneumologists (Simoni-Wastila et al. 2012). It is possible to create an electronic file card by means of a technical device. After approval by the patient the virtual file can be processed by the treating professions, such as family doctors, specialists, and pharmacists (Häussermann 2020). Additional data such as lung function, laboratory values, and other diagnostic data can be entered via the physician. The patient's medication or adherence to therapy is digitally documented and entered into standardized questionnaires (Price et al. 2017). This should enable family doctors and pneumologists to analyze the course of asthma and COPD patients at any time and to react quickly and specifically to any problems (Van Boven et al. 2014). Corresponding possibilities (Vitabook) are currently being tested. Telemedical engagement is being accelerated, especially in the context of the Corona Pandemic, where the intensity of a tele-video contact is rated higher by patient groups than a telephone call or e-mail contact (Randerath et al. 2017).

2.2 Digital Training Material

A focus for the implementation of telemedical intervention in pneumology is on patients with unstable asthma or severe COPD (Dekhuijzen et al. 2018). Telemedical concepts are developed to improve the quality of life, shorten reaction times, and avoid inpatient treatment. An example is the successful project of the German Respiratory League, which has developed training videos for improved inhalation therapy (Vestbo et al. 2009). Further illustrative material is to be made available to patients in the simplest possible way via smartphone. One way to ensure the rapid penetration of information and general availability is to make the material available on the video platform You Tube (Sulaiman et al. 2018). Electronic instructional videos from various scientific journals (New England Journal of Medicine) as well as (company-) sponsored knowledge platforms are available within the academic training programs of the medical profession. In the pneumological-German-speaking area, the LehrApp Leila was sponsored by the German Society for Pneumology in order to offer the most up-to-date availability of medical information which is presented in a product- and company-neutral environment.

2.3 Digital Patient Training Programs

There are training programs for outpatient pneumologists to care for asthmatics and COPD patients. These are the National Outpatient Training Program for Adult Asthmatics (NASA) and COPD Patients (COBRA). Both programs show proven positive effects (Van Sickle et al. 2016). In the future digital aids and smart devices will support these patient education programs. This will help especially those patient groups who are unsure how to use digital applications (Black et al. 2008). In this context the employees of the practices , e.g. MFA, must not be disregarded. Because telemedical programs also enable an integrative approach to understanding the training devices (Duiverman et al. 2019). These measures will lead to a sustainable improvement in the care and stability of the patients' health (Barzok 2016).

2.4 Telenursing

Telenursing means the digital integration of medical professions into patient care. In programs such as training within the Disease Management Programme (DMP) COPD or asthma, pneumology assistants (PFA) already play a major role in Germany (Merchant et al. 2018). By including this profession in telemedical projects, decisions on further therapy planning can be made appropriately. In this regard a pilot project exists in Baden-Württemberg involving the associations of physicians and two ministries (Wallenfels 2020). For example, vaccination programs can be controlled, which provide digital information on medical measures. Furthermore, at the beginning of a hypersensitization through telenursing appointments can be

made and patients can be checked for adherence (Foster et al. 2014). Telenursing can also be used to monitor treatment with topical steroid therapy. Due to the easy access to implement guidelines these measures can be controlled very well without the intervention of a physician (Dreher et al. 2019).

3 Telematics: Telemonitoring

Telemonitoring is the remote examination, diagnosis, and monitoring of the patient by his treating physician. Randerath et al. have shown the possibilities and limitations of telemonitoring for sleep-related respiratory disorders. After all, the comprehensive care and long-term support of patients represents a challenge for medical care (Taylor et al. 2006).

3.1 Data Processing with the Therapy Device

The rate of sleep-related breathing disorders and their prevalence with clinical symptoms is gradually increasing (Kohler et al. 2015). Today, approximately 13% of men and 6% of women in the USA are affected by sleep-related breathing disorder (SBAS) requiring treatment (Nilius et al. 2016.) In the currently possible digital diagnostics, the data is transmitted to a central sleep medical center. Doctor-patient contact is then established via a digital consultation hour (Bohning et al. 2011). In the future, web-based questionnaires and telephone doctor-patient contact will allow the recorded data to be expanded. This is because checking compliance and improving long-term care for high-risk patients, including professional drivers, is the therapeutic goal of care and treatment (Goldstein and Zee 2010). At present, it is technically possible to read out treatment data from the therapy devices via modem during follow-up monitoring (telemonitoring).

3.2 Sleep-Related Respiratory Disorders and Telemonitoring

Scientific publications on SBAS telemonitoring have mostly dealt with the issue of treatment compliance. Here, a positive effect on the patient's use of the devices was proven (Isetta et al. 2015). In addition, telemedical care has a positive effect on the physician's scope of action. Here he prescribes the equipment, but also determines to what extent the provider is allowed to take over the problem treatment. The provider delivers the device to the patient and instructs him or her on its functions, including the possibility of telemonitoring. The provider is responsible for informing the health insurance company about any mandatory data. For telemonitoring, the legal framework of data protection laws applies to the processing of personal patient data. The prescribing physician is responsible for the entire therapy including the telemedical component (Randerath et al. 2017). The telemonitoring of the therapy devices via modem allows a personal doctor-patient

contact to take place as soon as abnormalities are measured (Sparrow et al. 2010). Problems related to the therapy compliance of the devices or the occurrence of mask leakages are detected early. It is also possible to close gaps in care because patients in rural regions in particular are reached via telemedicine within the pneumological undersupply (Godden and King 2011). Digital process flows simplify the possibility of standardized quality in follow-up care and avoid unnecessary stays in the sleep laboratory for therapy control (Nasu et al. 2011).

3.3 Real-Time Analysis and Data Protection

The attending doctors are responsible for the entire sleep medicine therapy. Therefore, they also prescribe the extent and type of telemedical processing and collection of patient-related data, after consultation with the patients. The medical aid provider may only store data within the scope of the prescription. A use for third parties or own purposes is not permitted. Real-time analysis or continuous online transmission may not be carried out during use by a provider for reasons of data protection law. In the contractual relationship between health insurance companies and providers all usage data can only be transmitted if the patient has given his consent (Bohning et al. 2011). In summary, the technical possibilities of a digital analysis of the equipment used for SBAS therapy are already available today. However, real-time analysis or even complete transfer and exchange of the measured data between handlers, providers, and health insurance companies is not possible without the explicit consent of the patient.

4 Digital Products: Increasing Adherence

Adherence is defined as the extent of an agreed adherence to a therapy, for example, in the context of taking medication. To improve adherence management, the development of the so-called apps is in the clinical foreground. Apps are programs that fall under the term application software systems. These are sometimes operated by several users and can ideally be processed via smartphone or tablet. In Germany, electronic diaries in the form of apps are available for outpatient settings. In addition, digital inhalation devices (smart devices) are being developed that can document the correct use of the inhaler (Häussermann 2020).

4.1 Electronic Diaries

There are electronic diary functions via App. The course of the disease, medication, and symptoms are documented on the smartphone. In addition, activity parameters such as the peak flow meter and a pedometer can be implemented via the app. An additional reminder function ensures that the medication is taken. Separate data analyses, such as pollen count, can also be switched on (Barrett et al. 2018).

Due to the improved display options and the subdivision of the data into the treatment groups of doctors and pharmacists, the course of the disease and the success of the therapy are decisively influenced and consecutively improved. The integration of relatives into this data world is possible. The measurements within the electronic diary can also be forwarded to the treating physician as a pdf document (Häussermann 2020).

4.2 Apps

Adherence not only means taking the correct medication at the prescribed time, but also the correct use of the inhaler (Lewis et al. 2016). Due to the different ways in which the various apps can be used, adherence can be extended to include nutritional recommendations and other treatment suggestions from the treating physician (WHO 2020).

However, a pure reminder function is not sufficient to increase the success or compliance of treatment (Charles et al. 2007). A significant increase in adherence is only achieved if the correct use of the medication is also monitored (Morton et al. 2017). Some apps for the treatment of chronic respiratory disease have already enabled improvements in inhalation treatment of pneumological diseases with the help of artificial intelligence (Smartphone App CARTA) (Montes de Oca et al. 2017). In addition to learning control, the app includes a reminder function and logs whether the individual steps of the inhalation process have been completed. The patient is informed via images and text whether the active ingredient has reached the lungs (Cushen et al. 2018).

4.3 Adds-on for Inhalation Devices

For a better control of the handling of the inhalation devices (Devices) there are the so-called hardware adds-ons with corresponding App. This can improve adherence (Baddar and Al-Rawas 2012). Triggering processes can be recorded by these products. In the future, add-ons will compete with each other, which can be adjusted to a wide variety of inhalation devices. The devices are connected to the smartphone via Bluetooth and store the frequency of the inhalation maneuver. Furthermore, charging maneuvers, the inspiration and inhalation process of the devices are recorded. A feedback is correspondingly possible. These systems are currently being tested and are not available on the German market (Häussermann 2020).

4.4 Smart Devices/E-Devices

On the US market there is only one product with integrated add on. This so-called smart inhaler records when the patient uses the inhalation device. The recording

does not go beyond that of the clip-on add-ons. Nevertheless, the breathing pattern can be displayed as a feature. The German professional associations DGP, Atemwegsliga and the Verband pneumologischer Kliniken (2020) recommend the further development of the E-Devices based on therapy and medication adherence. The use of E-Devices in pediatric and adolescent medicine is particularly interesting as patients become more independent (Westerik et al. 2016). Due to the complexity of the market, the German Respiratory Tract League has created a seal of quality that is independent of company influence. The aim is to create a uniform data format without open interfaces, which can also be used for scientific studies and which takes data protection into account.

5 Challenges

What are the challenges to be met in order to promote the further development of telemedicine in the ambulatory pneumology sector? On the one hand, digital intersectoral cooperation between the hospital and practice institutions must be promoted. This is because the lack of digital communication between the respective software programs means that no meaningful data exchange can take place. In addition, it must be possible to process patient data in accordance with strict data protection regulations. Finally, the reimbursement modalities (EBM) must be quickly adapted to the current needs of treatment partners and patients.

5.1 Intersectoral Cooperation with Standardized Interfaces

The introduction of digital aids or the possibilities of telemedicine is a great challenge in the field of pneumology. In particular, an interlocking of intersectoral cooperation between hospitals and branches is necessary (Dreher et al. 2019). A forced further development is barely necessary, which does not only concern the digital aids and the further development of the so-called smart devices. Rather, standardized interfaces between the individual documentation systems must be created. Without a standardization of the current practice and clinic software, a concentrated development of, e.g. digitalized consultation hours and telenursing as well as telemonitoring will not take place.

5.2 Data Protection

Compliance with the strict German data protection laws as an unconditional criterion has top priority in the treatment of patients. In the case of sleep medicine, there is a field of tension between the providers of therapy devices (providers) and the Internet companies on the one hand, and the patients and their doctors on the other. This is because the generated data can be used economically, especially by provider-respecting internet providers. Therefore, patients must have control over

their treatment data at all times. In addition, the companies' handling of data storage outside the EU must be taken into account.

Regulatory frameworks such as the German government's Digital Agenda 2014 to 2017 and data protection laws (DSGVO 2018) must be taken into account when developing digitized products and communication channels. The processing of personal patient data may only be further developed using procedures that guarantee data protection and information security. At present, user groups and graduated user rights are being defined, because data must be processed in the quality appropriate to the purpose of use. The EU is currently planning to introduce a Medical Device Regulation (MDR) in 2021, which will uniformly regulate EU data protection and medical device legislation. This is because it defines the selectivity between, for example, an app and a medical device (Schöbel and Woehrle 2020). With the help of providers, a complete care concept can be guaranteed, but the evaluation may only be carried out with the express consent of the patient. This must also be documented. Currently, the evaluation of medically recorded data in Germany is carried out within the framework of scientific studies and investigations. A comprehensive evaluation by the providers is not possible due to the local data protection laws.

5.3 EBM (Uniform Assessment Criteria of the Federal Association of Statutory Health Insurance Physicians)

A shift of the ambulatory supply happening to the telemedical consultation is necessary in the context of the shortage of the ambulatory active pneumologists. In this way, standardized care can be established for patients who have a stable disease. In this way, the appointments for acutely ill patients can be focused. This development is opposed by the current EBM, which mainly rewards technical services such as lung functions (Heimann 2020). This is because telemedicine is expected to lead to a decline in case values while the number of cases remains unchanged. Therefore, according to the experience of the COVID pandemic, the focus is currently on the evaluation and efforts of outpatient pneumologists. Only after a reorganized reimbursement structure of the EBM will digitalization and all its possibilities be actively integrated into the outpatient care structures for pneumology.

6 Conclusion

We showed that within the pneumological ambulant patient care far-reaching possibilities of digital supply by telemedicine, telenursing, and telemonitoring from the virtual consultation hour up to adhesion improvement are already available today.

In the event that problems such as data protection, digital interface, and reimbursement structures are solved, a completely new supply unit will be created. The promising possibilities of telemedicine and telemonitoring can be fully exploited.

In addition, there is the chance of a reorganization of the intersectoral cooperation. By guaranteeing legal security, a new cooperation of the cost units with the treating parties—doctors, pharmacists, and developers—will be possible. If these aspects combine, an improvement in the medical quality of patients with pneumological diseases can be achieved.

The digitalization of the field of pneumology in Germany has a slowed down dynamic in the ambulatory sector, although the inclusion of telemedicine and its subgroups telemonitoring and telenursing makes it possible to treat a broad group of patients outside the existing practice structures, even with the addition of apps and monitoring of inhalers. The possibility to create professional networks and an intersectoral structure between the outpatient and inpatient sectors is desired and technically possible. Here, the field of sleep medicine is leading, whereby the existing obstacles to the development of data protection, reimbursement structures, as well as company-neutral data networks must be overcome.

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