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Coronavirus Disease 2019

Digital concepts in patient management

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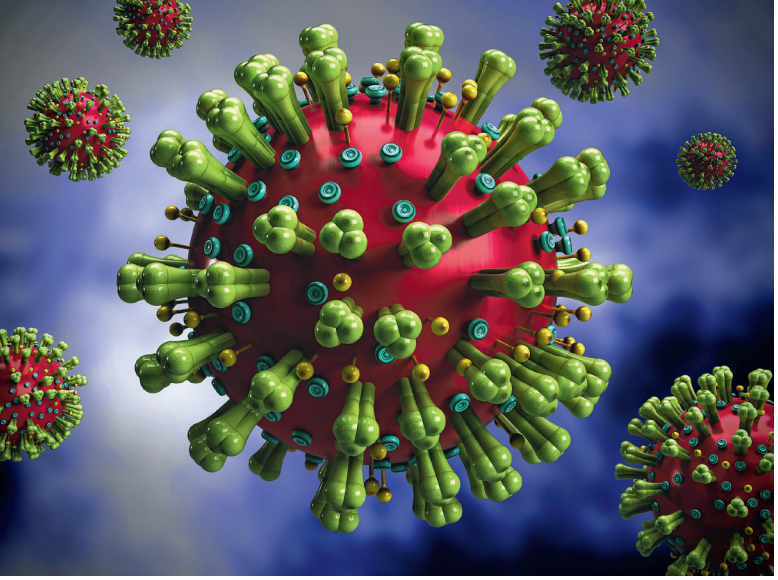

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SARS-CoV2 pandemic

The corona pandemic has put a tremendous burden on health systems around the world. The numbers of infected, newly infected, recovered and deceased patients rose steadily during spring 2020, and although national systems were moving towards a "new normal" with protective measures such as regional curfews, lockdowns, testing and quarantine regulations,as well as travel restrictions and mandatory face coverings, numbers are rising once again.

Among other things, hospital capacities, the number of wards with ventilators, and the number of corona tests carried out have a decisive impact on the medical management of the corona crisis. As a result of changes in the legal framework and the need to limit personal contact, alternative options in health technologies and medical care have become increasingly important and accepted during the pandemic - including telemedicine. The marked increase in video consultation hours with doctors this year is just one such example.

Medical management

Depending on their severity, symptomatic patients are currently treated as outpatients (85%), inpatients (14%) or on intensive medical care units (1%) [1]. At present, therapeutic patient management depends on the symptoms and the severity of the disease. The various strategies available for the treatment of this viral infection serve to stabilize vital functions and prevent late sequelae. Especially at the beginning of the pandemic, providing the necessary outpatient, inpatient and diagnostic capacities was a major challenge for the health system. Based on known detection methods, various diagnostic test procedures were employed (serological techniques for the indirect detection of SARS-CoV-2 antibodies in serum and the direct detection of the SARS-CoV-2 pathogen from nose and throat swabs by RT-PCR).

In addition to the medical management of patients suffering from COVID-19, the monitoring, care and nursing of patients with chronic pre-existing conditions is also of utmost concern. These are patients in regular contact with outpatient nursing staff, who visit the offices of general practitioners and specialists and who often require hospital admission for inpatient care.

It is these patients in particular who may benefit from telemedical services, since patients with pre-existing conditions are at higher risk of developing severe COVID 19 disease.

Telemedical concepts

The definition of the German Medical Association offers a suitable description for telemedical products and services: "Telemedicine is a collective term for various types of medical care concepts which have in common the fundamental approach that medical health care services are provided to the population in the areas of diagnostics, treatment and rehabilitation as well as in medical decision-making advice over physical distances (or with a time lag). This includes the use of information and communication technologies." [2]
Before the introduction of digital health applications (DHA), there were only a few telemedical care services provided and financed as part of general care - for example, the telemedical functional analysis of implanted cardiac resynchronization therapy systems [3].

In addition, a large number of new care concepts were tested in recent years in pilot projects, selective contracts with statutory and private health insurance companies and within the framework of research projects; they provided detailed and application-oriented evidence of medical benefits for patients and an economic gain for the health care system.

Benefits of telemedicine through documentation and communication components

According to the definition of the German Medical Association, one decisive criterion for telemedicine is the physical separation of health care professional and patient. In the context of pandemic management, this raises the essential preventive objective (Z) of employing telemedicine epidemiologically and to reduce the risk of infection through contact avoidance (Z1).

Other health care objectives indirectly attained by telemedical solutions include monitoring of vital signs, acquisition and assessment of findings, symptoms and status information for follow-up and diagnostics (Z2). In addition, telemedical software applications can be used to provide patients with targeted individual and needs-based information to guide them to medical and health-promoting measures and to motivate and activate them into taking responsibility for their own health (Z3).

For the use of telemedical applications in the context of the corona pandemic, various criteria are being differentiated: healthy or sick, level of risk for a severe course of the disease, positive or negative corona test.

The following four groups (G) can be considered in this way: People in the healthy population (G1), patients with pre-existing conditions and low risk of developing severe COVID-19 disease (G2), patients with pre-existing conditions and higher risk of developing severe COVID-19 disease (G3), and patients with a positive corona test result (G4).

Telemedicine applications can be classified according to the nature, type, and objective of the data collected and processed by the application. For example, applications allowing automated monitoring of physiological parameters via point-of-care or implanted sensor systems can be summarized under the term telemonitoring (A1).

Here, applications for manual recording of vital signs as well as symptoms, findings and the current state of health are referred to as symptom diary (A2). Both types of applications (telemonitoring, symptom diary) are primarily aimed at patients known to the health care professional. Telerounding (A3) is a supplementary option. In this case, the patient contacts a health care professional and is advised by telephone or video consultation and, if necessary, prescribed medication. One focus in telerounding is on common acute diseases.

Within the framework of telediagnostics (A4), health care professionals assess medical measurements collected from patients on an event- and symptom-triggered basis. The patient uses mobile medical devices to record electrocardiograms, for example, or smartphone cameras to image skin lesions. The data is then transmitted to the telemedical health care professional for analysis and assessment. Many patients are already undergoing medical treatment, are informed and only need specific advice.

Another application, teletherapy (A5), uses a limited range of telemedically monitored measures to support the patient in the recovery process. The main benefit here is a shift of inpatient and outpatient care to the patient's home. In this context, such examples include DHA services for the treatment of tinnitus and anxiety disorders, which have been approved by the German Federal Institute for Drugs and Medical Devices (BfArM) and are now offered as part of the statutory health insurance services.

Functional monitoring (A6) of telemedical implant systems (ICD/CRT) serves, among other things, to ensure highly reliable treatment. This service is part of the German statutory health insurance system.

Furthermore, other telemedical applications offered are aimed at providing information and competence transfer (A7). Patients are provided with health-related information to support the incorporation of medical knowledge and health-promoting lifestyles as well as individual motivation. In particular, competence mediating applications are offered frequently combined with teletherapeutic applications (A6) as well as telemonitoring (A1) and symptom diary applications (A2).

Tabelle 1 provides a summary of telemedical applications (A) with reference to the stated care objectives (Z) and the defined groups of persons and patients.

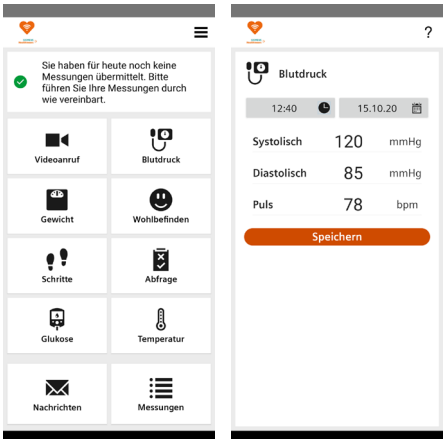

Figure 1: Smartphone app and myCare companion (Siemens Healthineers)

Practical examples of use

teamplay myCare Companion

teamplay myCare Companion was originally developed for the care of patients with chronic disorders such as heart failure, respiratory and metabolic diseases. It supports medical staff in monitoring the state of health of patients in their home and allows for targeted intervention in people requiring such services. For example, patients quarantined due to corona infection note their readings (oxygen saturation in the blood and body temperature) and symptoms and answer questions about their current condition via a smartphone app or web browser. The data is securely transmitted via a data server. Based on the transmitted data, medical staff can reliably identify patients whose readings or symptoms have deteriorated noticeably and inform or contact those affected. Individual thresholds can be set for each patient, appointments and tasks planned and supplementary documents stored electronically. The app also allows acknowledgement of messages from the medical staff. Every communication and all data are stored such that they can be traced *(see fig. 1)*.

TeleReha

EvoCare® makes it possible for different centers and hospitals to provide joint telemedical care of patients at home. Patient care is supported by modern technology and, depending on the treatment regimen, is carried out in direct interactive or time-asynchronous mode. Various applications indicated in orthopaedics, internal medicine and neurology (telemonitoring of vital signs, telerounding for direct exchange with the therapist, teletherapy for treatment at home, telerehabilitation following hospital stays. and telecoaching for compliance and adherence promotion) are used. EvoCare® is reimbursed as part of the German statutory health insurance system and is an eHealth service provided by and for healthcare institutions.

Legal and technical requirements

With the legal foundations through, for example, the Digital Health Care Act, Digital Health Applications Ordinance and the latest revision of Section 7 (4) (remote treatment) in the (model) professional code of conduct for physicians, the prerequisites for the implementation of telemedical services in practice have also been established. For example, there are state-specific funding programs which provide financial support for setting up the technical infrastructure for carrying out telerounding and teleconsultation and for continued

Objectives / Groups	Social distancing and risk reduction (Z1)	Course and symptom monitoring (Z2)	Information and competence transfer (Z3)
Healthy population (G1)	**A3** Telerounding	**A2** Symptom diary, e.g. for workers with an increased risk of contact [6] [7] **A3** Telerounding	**A3** Telerounding **A7** Information, e.g. corona warning app [8]
Patients not at special risk of serious course of disease (G2)	**A2** Symptom diary **A3** Telerounding, e.g. phone or video consultation with a specialist, possibly with prescription of medication and sick leave [9][10][11][12][13][14] **A4** Telediagnostics **A5** Teletherapy	**A2** Symptom diary **A3** Telerounding **A4** Telediagnostics, e.g. specialist services such as dermatological issues [15] **A5** Teletherapy, e.g. after orthopaedic surgery [16] or digital health applications in tinnitus treatment [4]	**A3** Telerounding **A5** Teletherapy, e.g. information and treatment instructions in anxiety disorders [5] **A7** Information and competence transfer
Patients at special risk of serious course of disease (G3)	**A1** Telemonitoring **A2** Symptom diary **A3** Telerounding, e.g. consultation of "rescheduled" patients whose TAVI procedure had to be postponed due to the corona situation [17] **A4** Telediagnostics, e.g. corona consultation, rapid testing, antibody testing [10][18] **A5** Teletherapy **A6** Functional monitoring	**A1** Telemonitoring, e.g. telemonitoring the ventilation data [19][20] **A2** Symptom diary, e.g. documentation for patients with COPD or heart failure [21][22] **A3** Telerounding **A4** Telediagnostics **A5** Teletherapy **A6** Functional monitoring, e.g. follow-up care of patients with cardiac rhythm implants [23]	**A3** Telerounding **A5** Teletherapy, e.g. telerehabilitation after stroke [16] **A6** Functional monitoring **A7** Information and competence transfer
Patients tested positive for corona (G4)	**A1** Telemonitoring **A2** Symptom diary e.g. with the digital symptom questionnaire [24] **A3** Telerounding **A4** Telediagnostics **A5** Teletherapy	**A1** Telemonitoring, e.g. by monitoring vital signs and measurements [25] [26] **A2** Symptom diary **A3** Telerounding **A4** Telediagnostics **A5** Teletherapy	**A3** Telerounding **A5** Teletherapy **A7** Information and competence transfer, e.g. by providing information on risks and symptom management [10][21][27]

Table 1: Telemedical applications (examples)

medical education of staff in the field of telemedicine, particularly for practice-based physicians. Throughout Germany, the Hospital Future Act will provide approx. 3 billion euros (plus 1.3 billion euros through co-financing by hospital operators and the states), which can be used, among other things, to establish and expand cross-sector telemedical network structures. At present, health care professionals can provide and bill for video consultation hours, teleconsultation (e.g. between practice-based and hospital doctors), functional checks and teletherapies provided via telemedicine. Reimbursement of telemonitoring services under the German statutory health insurance system is not possible at present - the existing providers marketing their services use contracts for special care in accordance with Section 140a, Book V of the German Social Security Code (SGB V), with health insurance providers or on a pay as you go basis.

Depending on the product and application, the provision and use of telemedical services by doctors and patients may require the realization of infrastructural and organizational requirements. Depending on the technical implementation, interfaces must be created in the medical information systems for the exchange of digital data between the doctors and clinics involved in the treatment continuum. According to the Digital Health Care Act, the basic plan is to connect all practice, pharmacy and hospital information systems to the telematics infrastructure (TI) by 1 January 2021. Special eHealth platforms can fulfil the role of a technical broker.

During the corona pandemic, many have gained a clearer understanding of the potential telemedicine can provide for the German health care system, and this is reflected in a higher acceptance of telemedical services both by health care professionals and patients. In the coming year, based on the positive experience seen with adapted reimbursement models and financial incentives, it is expected that the number of telemedicine services will increase and the range of applications broaden. The necessary technical solutions are already available. Hospitals and practices will continue to focus on the patient, medical expertise and efficient and safe treatment processes when introducing and expanding their own telemedical services.

References from author upon request

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For more information on the Hospital Future Act go to www.siemens-healthineers.com/khzg