The digitally connected healthcare system of the future has to provide efficient healthcare services, reduce administrative costs, enable cross-institutional documentation of therapy activities, and make room for innovative value-added services. It must produce sustainable improvements in medical care for patients and increased profitability for care providers and cost bearers.

However, these potentials can only be exploited if and when all participants are connected across and beyond their individual sphere of activity. This lets them engage in rapid, loss-free exchange of information and documentation, if and when they are duly authorized and fulfill various other conditions. This in turn requires interoperable, compatible information formats and a communications and security infrastructure for exchanging confidential data.

Germany’s new electronic health card (eGK) and a core supporting telematics infrastructure (TI) designed in large part by exceet Secure Solutions AG fulfill all these requirements.

The electronic health card (eGK), which has been mandatory for all public health insurance clients since January 2015, represents the first step towards a connected healthcare system in Germany. At first glance, it doesn’t represent any great leap forward from the previous health insurance card: The change is indicated only by the photo ID on the front and a visual ID emblem on the back for the European Health Insurance Card, or EHIC. And thus far, the card’s functionalities are indeed limited to storing administrative data such as name, date of birth, address, insurance number and insurance status.

As it exists today, the eGK fulfills only one major purpose: It lets insured individuals prove that they have health insurance coverage and are entitled to statutory health care services in Germany and many other European countries. The photo ID serves to identify the bearer and thus helps prevent misuse of the card. For the physician, it is the basis for all billing processes.

A telematics infrastructure (TI) has been developed to support the introduction of the eGK. In future, the TI will act as the core interaction platform for all actors within the healthcare system and form the basis for rapid, cross-sector and – most importantly – secure exchange of information. As part of an online rollout process (Phase 1), on-the-ground TI operation will be put to a series of tests as of October 2015. The go-live of the first telematics applications is scheduled and approved for June 2016. Below, we offer a short overview of the individual applications and the ways in which patients, service providers and cost bearers can benefit from them.

Actor: Patient

The patient is no doubt the most important element of the digitally connected healthcare system. The aim is to maintain, and ideally enhance, the life quality of the patient. To fulfill this aim, the patient must receive the best and most timely medical care possible whenever he or she needs it. Treatment procedures have to be optimized wherever possible, and the number of visits to doctors and other healthcare providers should be minimized. Applications such as the electronic case file (eCF), emergency data management (EDM) or data management for medication therapy security (MTS) are just a few examples for ways in which patient and emergency data will in future be rapidly and easily accessible (e.g. information on a patient’s medical history, allergies, implants, contact data of next of kin, medication data, etc.) and provide a systematic documentation record.
This will enable physicians to take rapid, systematic risk management measures and helps prevent treatment errors and problems associated with negative interactions between different medications.

However, all this is possible only where the patient has given his or her clear, unequivocal consent. The patients retain sovereignty over their medical data at all times, and it is up to them to decide who gains access to the relevant information. It also means that patients can view their own data at any time. In this way, the eGK aims to encourage patients to take responsibility for their individual health, health control and general wellbeing.

**Actor: Healthcare Provider**

The electronic health card not only offers tangible benefits to the patient, but also to doctors and other healthcare professionals, pharmacists, therapists, medical suppliers, rehab centers, hospitals, etc. Here the first and most important step is cross-institutional communication between the individual service providers (COM-SP) to enable seamless medical care – an especially important aspect wherever a number of different institutions or physicians are involved in providing care services to a single patient.

The electronic physician’s referral (eReferral) and the electronic discharge letter (eDischarge) are potential applications in this field. They can be used to forward comprehensive information and documentation (e.g. operation room findings, examination results, lab reports, medication plans, X-rays) to primary systems such as practice management systems, hospital information systems or pharmacy management systems, and from there onwards to the various service providers. Such electronic transfers of information must be guaranteed to be legally binding, secure and compatible across systems, and they have to be free of media interruptions, time delays or information losses. The aim is to present differently structured information (text, image, audio, video …) in a uniform manner, with all data transmission covered by confidentiality and integrity protection as well as access safeguards. This permits the automation of documentation processes and the structuring of treatment procedures while avoiding redundancies, errors and incorrect entries. What do we get out of it? A drastic reduction in administrative effort, yet maximum planning security.

**Actor: Cost Bearer**

Apart from patients and service providers, a digitally connected healthcare system also benefits health insurers and accredited doctors’ associations. For them, the system produces a significant reduction in costs, particularly personnel costs. An example for this effect is the Insured Clients Master Data Management System (ICMDM System), which will be one of the first applications to be implemented. Via online reconciliation, a query is sent to the relevant health insurer whenever an eGK is inserted into a card reader. First of all, this process serves to determine whether the card is still valid, is duly registered, or has been reported as lost. It also helps update the patient’s data: Whenever there is a change in information e.g. on name, address or payment status, the new data is immediately recorded, stored and written onto the eGK via the telematics infrastructure. This makes millions of card replacements and change notifications obsolete.

Contrary to much-publicized allegations, health insurers and doctors’ associations only have access to the master data of the insured individuals. They can access medical data only if and when they have received express consent from the patient.
No matter how modern the IT systems in medical facilities or institutions may be: They can only unfold their full potential if the individual data-processing systems can be interconnected to cross the boundaries between them. For this reason, the telematics infrastructure is the heart of digitally connected healthcare.

The TI can be viewed as a sort of network connection that lets all the trusted participants within the healthcare system communicate with one another by way of a closed, trusted ecosystem. Access to the information, however, is only possible via a secure element embedded in a microprocessor chip on the eGK, the corresponding healthcare professional card (HPC) or an institution’s own card. The secure element contains security features for storing and utilizing cryptographic keys that ensure secure data exchanges – the basic prerequisite for any online use of applications via the TI. This includes the unambiguous identification of people, cards and devices, mutual identification of the patient and the service provider, as well as secure end-to-end encryption.

This equals exceedingly high requirements in terms of quality, stability and utmost security, as well as compliance with the specifications of gematik (Association for Telematics Applications of the Health Card mbH) – requirements reliably fulfilled by exceet Secure Solutions, a security specialist which has been closely involved in the development of the core telematics infrastructure of the electronic health card and has thereby assumed a key role in securely connecting all the actors in Germany’s future healthcare system. In addition to providing support services for obtaining approval for eGK release processes and specifications development for the online rollout, exceet Secure Solutions has been responsible for developing the eGK public key infrastructure (PKI) and an eGK-specific quality management system (QMS).

A public key infrastructure is an indispensable component of any trusted ecosystem. It permits the issue, distribution and verification of digital certificates that safeguard the authenticity and integrity of the transmitted data packages and thus ensure trustworthy data exchange. The PKI already validates the authenticity of the data before it is sent and encrypts it prior to dispatch. It relies on electronic signatures to ensure that only authorized persons can access information, and can access only the information for which they have been specifically cleared. This protects data within healthcare networks, e.g. patient master data, administrative data or user data, from unauthorized access or manipulation. The quality management system (QMS) acts as an effective safeguard against the production of faulty eGKs.
Outlook

Once the telematics infrastructure and its various applications (e.g. eFA, NFDM, eReferral, VDSM) are launched, the digitally connected healthcare system of the future will open up entirely new and profitable possibilities to all participants: Patients will get much quicker access to individualized, targeted treatment. Service providers will be able to plan and design procedures and downstream processes more securely and more transparently while at the same time reducing treatment costs. Cost bearers will be able to cut administrative costs significantly.

And there is a further development stage on the horizon. Today it can merely be guessed at, but not yet understood in its full implications: The increased interest of people in their own health, the effects of demographic change, the scarcity of doctors particularly in rural areas, and technological progress are all leading to a surge in the market for wearables and telemedicine solutions. Used in combination with mobile devices and apps, digital trends such as fitness trackers, activity trackers, sleep trackers, headbands or smart body analyzers are growing ever more popular, and they are kick-starting a whole range of new developments.

Even today, they can provide meaningful contributions to preventive healthcare, personal wellness and active health management. They allow patients to continually monitor their current health status and alert them to changes in vital parameters like heart rate, blood pressure, oxygen saturation or other developments caused e.g. by incorrect medication. Likewise, self-care options such as the self-medication “smart blister” will soon be commonplace.

If these devices were to be linked to other healthcare participants via a TI, it would create virtually unlimited possibilities for all healthcare actors. For example, manufacturers of medical devices or wearables could optimize and customize their products based on data transmitted by the users. Health insurers could develop new bonus and incentive programs based on their patients’ physical activity and fitness levels. Doctors could manage and plan preventive checkups more effectively because they are already continually monitoring the vital data of their patients. Therapists could provide better aftercare support because they have easy access to the entire therapy history.

But connecting wearables, telemedicine devices and solutions to the TI also means that they have to feature security structures and satisfy conditions equivalent to those of the gematic applications currently in the pipeline. These include a secure public key infrastructure (PKI) and an embedded secure element to store and manage the cryptographic key via microcontroller chip or smartcard.

The objective now is to recognize and exploit these potentials. For medical institutions and device manufacturers, now is the time to examine potential use scenarios for their products and services and to use them as a basis for developing eGK-compatible applications and models to satisfy future user demand and boost profitability. For sensor and electronics specialist exceet Secure Solutions, this is our field of focus as we broaden and deepen the scope of the digitally connected healthcare system of the future.
7 Reasons for a Digitally Connected Healthcare System

- Improved treatment quality
- Reduced treatment costs
- Enhanced planning security
- Increased efficiency
- Optimized processes
- Reduced administrative costs
- Individual healthcare management