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Digitization in healthcare:

The CHF 8.2 billion opportunity for Switzerland

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Switzerland is known for its world-class healthcare system, but rising healthcare-related costs have been a topic of growing concern. Switzerland has among the highest healthcare expenditures in the world, reaching CHF 82.1 billion or 11.3% of GDP in 2019*. Premiums for mandatory basic insurance have steadily increased over time, at 3.8% per year between 1998 and 2019, well above average inflation of 0.5% per year in the same time frame. In addition, demography and the increasing prevalence of chronic diseases point toward further health-care expenditures and a need for structural change.

* Federal Statistical Office, Kosten und Finanzierung des Gesundheitswesens seit 1960, status as of April 2021

Introduction

Although measures to manage healthcare-related costs have been proposed or introduced, one important lever has by far not been exploited to its full potential. Digitization—the consistent use of digital technologies in healthcare delivery—could help modernize healthcare delivery and lower healthcare costs without imposing painful restrictions on patients, providers, and payers or negatively impacting clinical outcomes. Digitization could also further shift the Swiss healthcare system from acute care to more chronic disease centered, thereby addressing ongoing structural trends. Indeed, the introduction of digital patient self-care and remote monitoring tools in combination with classic care models is a solution that promises to significantly lower the expenditure growth from chronic disease management while having the potential to improve provider and patient safety and satisfaction.

Digital solutions are being introduced around the world to reduce redundancies through better exchange of data, increase efficiency through better and faster access to healthcare or remote doctor-patient interactions, and empower patients with digitally enabled self-service tools. The recent COVID-19 pandemic accelerated this trend as customers expected more digital offerings (for example, teleconsultations) and legislators, providers, and payers have to find creative ways to encourage the use of and ensure financing for digital health solutions. When done right, digitization has helped promote behavioral change, increase efficiency across providers, democratize medicine, improve quality, and accelerate progress.[1]

In Switzerland, healthcare digitization has progressed more slowly than in some of its neighboring countries or in other industries. While some progress has been made in specific areas such as telemedicine and the electronic patient dossier (EPD), adoption of digital health solutions has remained limited. In the 2018 Digital Health Index conducted by the Bertelsmann Stiftung, Switzerland ranked 14 out of 17 for its digitization status. However, Switzerland fulfills many requirements for successful healthcare digitization—from high coverage of broadband internet to a population with high digital literacy—and is host to a vibrant scene of over ~900 healthcare start-ups working on a broad range of solutions, including digital therapeutics, blockchain-based data exchange solutions, or process digitization.

CHF 8.2 bn

total improvement potential from digitizing healthcare in Switzerland in 2019

In this article, we will explore the potential of healthcare digitization in Switzerland to overcome increasing healthcare expenditures. We estimate that the overall improvement potential in Swiss healthcare from fully implementing digitization possibilities available today is up to CHF 8.2 billion[2], or 11.8% of the total addressable healthcare expenditures of CHF 69.7 billion.[3] This amount does not yet reflect implementation cost. The analysis focuses on improvement potential from 26 digital, healthcare-related technologies in three categories, which are defined as follows:

- **Digital health:** Solutions that directly involve patients in the health management activity
- **E-health:** Solutions that are mostly focused on healthcare professionals and provider efficiency
- **Enabler:** Solutions and systems that support all stakeholders and processes in the healthcare ecosystem

1 Elgar Fleisch, Christoph Franz, Andreas Herrmann, "The digital pill: A journey into the future of our health system", 2021.
2 Out of the CHF 8.2 billion full potential, a value between CHF 200 million and 350 million has already been captured to date. This is due to existing solutions in Switzerland, mainly telemedicine-based OKP models, e-triage, and online booking.
3 This excludes dental health services costs, healthcare delivery provided by the state or insurers directly, and services from prevention and support organizations from the CHF 82.1 billion.

The benefits of each technology for the healthcare system were quantified in monetary terms or "value pools." The assessment of the specific impact of each value pool was based on an evaluation of more than 500 scientific publications. This methodology has been used several times in previous publications for other countries[4].

In what follows, we will explore in more detail where the digitization potential for Switzerland lies, what it means for participants in the healthcare ecosystem, and what it would take for Switzerland to realize its potential of CHF 8.2 billion. To this end, we will present a series of best practices from around the world and reflect on implications for the Swiss healthcare system. Given the "evolutionary pressure" of digital health solutions—which naturally comes with their promising results and positive patient experience—we believe it is a question of time until they scale up and eventually become prevalent, despite structural barriers and low adoption from consumers, doctors, and payers so far.

Voices from practice

The corona virus crisis clearly shows: there's a lot of catching up to do in the healthcare sector when it comes to digitization! That's why health insurers are taking action themselves and are vigorously pushing digitization. Best example: the open communication standard SHIP from SASIS AG, which more and more service providers and health insurers are using to electronically handle administrative processes efficiently and securely. The virtual insurance card (VICARD) is another established feature. More than three million Swiss people already have the option of using the function with their health insurance app to make a contactless appointment with a doctor, hospital, or pharmacy. However, the commitment of health insurers alone is not enough—all stakeholders are needed. One important thing is that electronic patient files are finally implemented. This helps avoid unnecessary examinations and inquiries because patients always have access to their personal health data.

Verena Nold, *Director, santésuisse*

Value pools for digitizing healthcare in Switzerland

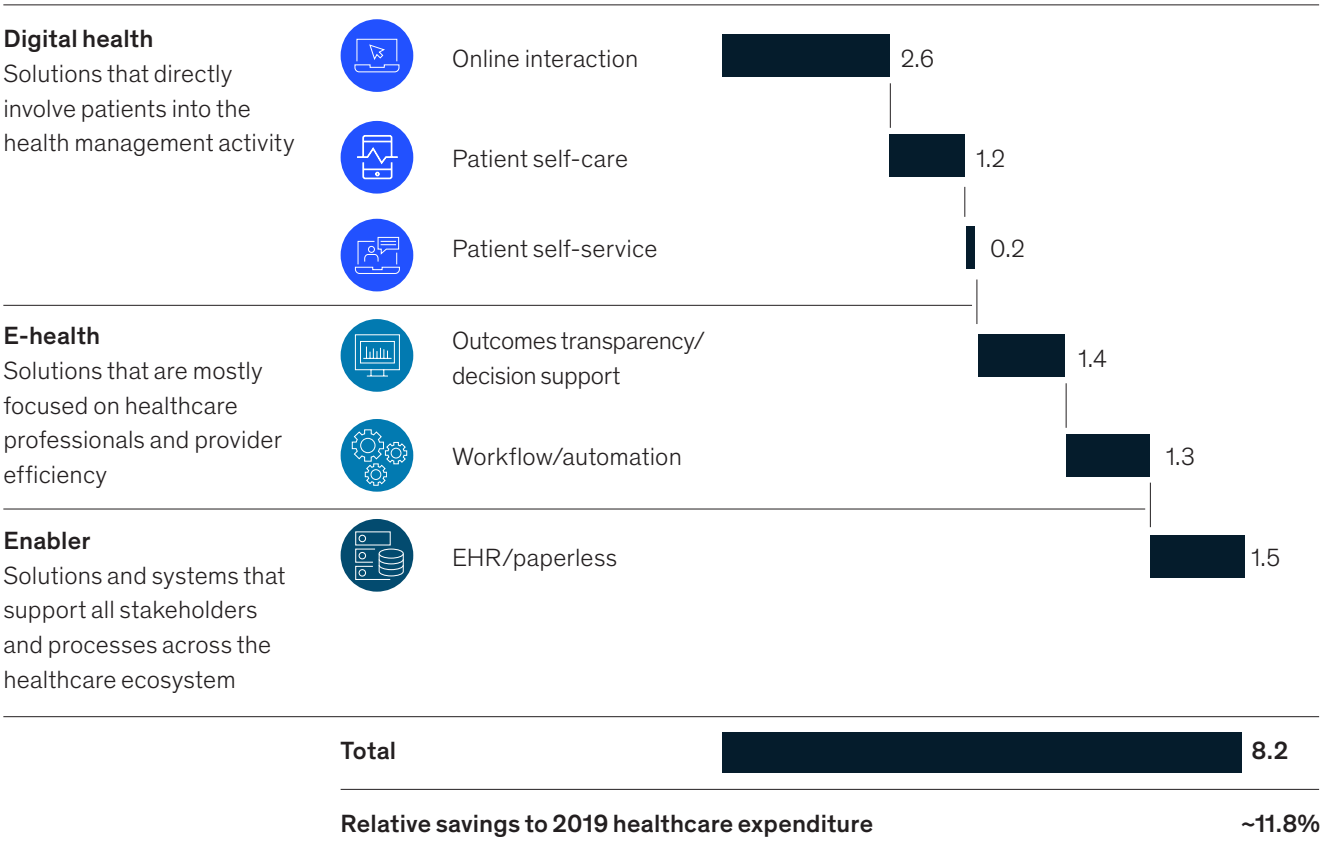
In this chapter, we provide estimates for the untapped value pools from digitizing healthcare in Switzerland across existing technologies in the areas of digital health, e-health, and enabler technologies.

We analyze the reduction potential of direct costs of healthcare delivery achievable through digitization. Further benefits from digitization of related aspects of the healthcare value chain (for example, gains from more targeted pharmaceutical R&D and resulting therapeutic effectiveness, efficiency gains from digitization, and automation of insurer processes) or downstream economic effects (for example, less sick leave days for employees) are not taken into account in our analyses. Such additional benefits are much more difficult and uncertain to quantify but would be of significant size and come on top of our estimate. In addition, we have used realistic achievable digital adoption and implementation rates and therefore consider the resulting potential as a conservative estimate realizable in five to ten years with existing technologies at a reasonable scale and adoption (from patients, doctors, insurers).

[4] McKinsey, 2021: Digitalisierung im Gesundheitswesen, die 4,7 Mrd. Euro Chance für Österreich; McKinsey, 2018: Digitalisierung im Gesundheitswesen: Die Chancen für Deutschland

Exhibit 1

Benefits of 26 digital health technologies, CHF billions, 2019



Example: Quantifying the improvement potential

A unified electronic health record (EHR) is one of 26 technologies that comprise the total improvement potential. To estimate the improvement potential from the introduction of a unified EHR, we have looked at multiple instances of medical practices that would be positively impacted by an EHR. An example of such an instance or "use case" is the reduction of time spent by general practitioners (GPs) on specific paper-based documentation tasks supported by an EHR. Here, savings are calculated based on the percentage reduction of GP time spent on these tasks by multiplying the total estimated time spent on documentation tasks with the estimated time savings due to the use of an EHR. Both estimates are drawn from scientific evidence. The percentage of time spent on documentation (estimated at 26%) is extracted from an observational study (Ammenwerth and Spötl, "The time needed for clinical documentation versus direct patient care," 2009); the percentage of time saved due to using an EHR (estimated at 11%) is based on a Canadian study published in 2016 that looks at efficiency drivers such as time saved from using automated templates for dossier generation after the introduction of an electronic record in Canada (Canada Health Infoway, "The emerging benefits of EMR use in ambulatory care in Canada," 2016). As such, the time reduction as a result of this particular use case for an EHR is 3% (26%*11%). In cases where different scientific studies identify different levels of potential, these have been interpolated following a consistent protocol. This effect size is multiplied by the respective baseline healthcare costs in Switzerland to determine absolute estimated savings from this particular use of an EHR.

The study is based on McKinsey's bottom-up health value pool analysis framework (see Appendix for further information on methodology). It evaluates the improvement potential of 26 best-practice digital health technologies currently available and considers the specific starting point and system conditions in a given country. The impact assessment of each technology itself is derived from the evaluation of more than 500 scientific publications and has been applied already in other countries in Europe like the United Kingdom, Austria, and Germany.

Our analysis shows that the potential benefits of digitizing the Swiss healthcare system using existing technologies could be CHF 8.2 billion per year (Exhibit 1) or ~1% of GDP. These benefits come primarily from efficiency improvements (for example, based on workflow automation and decision support) at providers and payers and reductions or shifts in demand (for example, based on data exchange or patient self-care).

~49%

savings come from (patient-oriented) digital health solutions

~33%

savings come from (provider- and payer-oriented) e-health solutions

~18%

savings come from the introduction of enabler technologies

- CHF 4 billion (~49%) comes from (patient-oriented) digital health solutions, such as online interactions, patient self-care, and self-services, which free up time for both patients and doctors and encourage the use of more affordable cost alternatives, where appropriate.
- CHF 2.7 billion (~33%) comes from (provider- and payer-oriented) e-health solutions, such as workflow support, automation, outcomes transparency, and decision support. These reduce provider costs by improving provider efficiency and (indirectly) decreasing healthcare demand. Provider costs are reduced by decreasing provider time spent on administration. Healthcare demand is indirectly reduced by improving outcomes through augmented medical decision-making, which reduces the need for downstream treatment.
- CHF 1.5 billion (~18%) comes from the introduction of enabler technologies, for example, EHR, paperless standardized data exchange, and e-prescriptions. Similar to e-health solutions, these reduce provider costs by improving provider efficiency and decreasing healthcare demand. Provider costs are reduced by decreasing provider time spent on administration, for example, searching for already available information. Healthcare demand is reduced indirectly by increasing information availability, which reduces redundancies and improves outcomes by preventing medical errors.

Of the CHF 8.2 billion impact potential of health technologies along the healthcare value chain, the bulk of potential improvement is based on provider efficiency gains and medical cost savings benefitting payers. Provider efficiency improvements are split across inpatient hospital care (CHF 2.2 billion) and outpatient (GP) care (CHF 2.2 billion). For example, resource management through radio frequency identification (RFID) creates savings through improved staff efficiency and reduced inventory losses in acute care hospitals. Eventually, these efficiency improvements could lead to either an increased provider capacity or a reduction in overall provider costs, which would ultimately contribute to slowing down expenditure and therefore premium increases over time. Payer savings (CHF 2.7 billion) result from a reduction or shift in demand for healthcare services, for example, reducing inpatient hospital care admissions for chronic patients through remote monitoring. Eventually, this could also translate into lower premiums (or reduced premium growth) for patients.

Our analysis distinguishes between six technology categories, of which online interaction is expected to have the greatest impact (CHF 2.6 billion) and the remaining five technologies to save between CHF 0.2 billion and 1.5 billion each (EHR/paperless data, outcomes transparency/decision support, workflow/automation, and patient self-care). Examples of online interactions include remote patient monitoring and e-triage through AI chatbots. This is expected to free up time for both doctors and patients.

The results of our analysis show that with the application of only five out of the 26 prioritized technologies, CHF 4.0 billion of the improvement potential of CHF 8.2 billion can be realized (Exhibit 2) while enabling the implementation of others. In addition, the analysis of the technologies leads to four important findings:

— Service providers in particular benefit from digital technologies through efficiency gains, which positively impact their cost structure or free up time. Many service providers argue that digital technologies mean only more work for them and no benefit. The analysis, on the other hand, shows that about 67% of the achievable benefits are generated by increasing productivity among service providers, that is, doctors and hospitals. This presupposes that a key requirement, namely user-friendly technology that adequately responds to the needs of medical staff as well as patients, is in place. These efficiency gains then allow healthcare providers to spend more time on value-adding activities, which again has a positive effect on overall costs. The remaining 33% of the potential can be allocated to the other actors in the system. These are mainly health insurance companies that can benefit from a reduction or shift in demand, for example, through better care or avoidance of hospital stays.

— Online interaction is a significant value driver, with teleconsultations and remote monitoring comprising CHF 2.2 billion in potential value, which is ~26% of the total potential. In general, these technologies free up provider time and thereby increase provider efficiency (for example, chatbot triage service that reduces unnecessary appointments), improve treatment quality as physicians can spend more time on value-added work, and decrease healthcare service demand (for example, reducing inpatient hospital care admissions for chronic patients through remote monitoring).

— Unified EHRs and e-prescription also play a key role. They directly enable efficiency improvements of CHF 1.1 billion, driven by freeing up provider time by removing tasks that can be automated (for example, reduction of staff time spent on specific paper-based administration tasks) which again allows service providers to spend more time on value-adding activities that increase treatment quality. They also lead to an indirect benefit if the data are used for other digital applications, such as teleconsultations.

— The largest lever in patient self-care is chronic disease self-management with a high impact potential for improving experience and outcomes for patients, but also leading to direct healthcare cost savings of CHF 0.7 billion (e.g., due to a reduced number of hospital stays).

Exhibit 2

5 of the 26 technologies account for almost 50% of the improvement potential

Estimated improvement potential, CHF billions		
 Online interaction	**Live audio/video consultations**	**1.1**
	Remote monitoring	**1.1**
	E-triage (web-/algorithm-based risk assessment)	0.5
Total 2.6		
 Patient self-care	**Chronic disease self-management**	**0.7**
	Medical chatbots	0.3
	Prevention of disease tools	0.1
	Patient supporting networks	<0.1
	Digital diagnostics	<0.1
	Virtual reality for pain management	<0.1
Total 1.2		
 Patient self-service	E-booking	0.2
Total 0.2		
 Outcome transparency/ decision support	Performance dashboards	0.5
	Patient flow management	0.4
	Clinical decision support	0.3
	Analytics for payers	0.1
	Genetic testing and analysis	<0.1
Total 1.4		
 Workflow/automation	Nurse mobile connectivity	0.3
	Bar-coded medication administration (BCMA)	0.3
	RFID	0.3
	Vital parameter tracking (eICU)	0.2
	Hospital logistics robotics: robotic automated guided vehicle (AGV)	0.1
	Process automation through robotics	0.1
	E-referral	0.1
Total 1.3		
 EHR/paperless	**EHR**	**0.9**
	Intrahospital staff communication software	0.2
	E-prescribing	**0.2**
	AI virtual assistant	0.2
Total 1.5		
The sum of the potential benefits of all highlighted technologies amounts to CHF 4 billion; that is almost 50% of the total improvement potential		

Online interaction:

— **Teleconsultations:** Tools for web-based interaction between doctor and patient, especially in case of uncomplicated inquiries or follow-up examinations

— **Remote monitoring of chronic patients:** Remote monitoring of clinical parameters for chronically ill, high-risk patients

— **E-triage:** Online tool or telephone service to clarify in advance whether a visit to the emergency room, advice on primary care, or aftercare is necessary

Total: CHF 2.6 billion

Patient self-care:

— **Tools for chronic disease self-management, for example:**

- Mental health: Mood diary, online courses for behavioral therapy and reminder of adherence to therapy, involvement of personal caregivers
- Diabetes: Reminder of adherence to therapy, connected insulin testers
- Respiratory diseases: Online program for lung rehabilitation, networked inhalers
- Cardiovascular disease: Patient education, networked heart rate sensors/pulse monitors with alarm function

— **Medical chatbots:** Complete AI/rule-based chat app or phone hotlines to answer simple requests or make initial estimates

— **Tools for disease prevention:** Apps, virtual trainers, and fitness trackers to change an unhealthy lifestyle that can lead to chronic illness (for example, diet, smoking)

— **Patient support networks:** (Social) Online networks for patients to exchange information, experiences, and treatment options

— **Digital diagnostic tools:** Technologies that enable remote diagnostics

— **Virtual reality for pain treatment:** Use of the pain-relieving effect of virtual reality comparable to that of drugs (for example, in the case of burn victims)

Total: CHF 1.2 billion

Patient self-service:

— **Electronic appointment (e-booking):** Online portals for the agreement of home and specialist appointments with reminder functionality

Total: CHF 0.2 billion

Outcome transparency/decision support:

— **Performance dashboards:** Dashboards that provide internal information about the performance of doctors and teams and help identify opportunities for improvement

— **Patient flow management:** Software for optimal patient guidance through (diagnosis) wards

— **Clinical decision support:** Use of individual data and physical evidence to provide rule-/AI-based treatment recommendations

— **Advanced payer analytics:** Cross-provider patient care management and uncovering of illegitimate claims

— **Genetic testing:** Cases of patient-specific treatment decisions based on patient-relevant genomic, proteomic, and other data

Total: CHF 1.4 billion

Workflow/automation:

— **Mobile connectivity for nursing staff:** Full access to patient information for home care staff, documentation of findings via tablet

— **BCMA:** Fail-proof barcode-based identification of all (prescribed) medications as well as confirmation at the hospital bedside

— **RFID tracking:** Location of all assets (for example, diagnostic tools, beds, expensive medicines) using RFID technology

— **Vital parameter tracking (eICU):** Remote monitoring of the vital values of patients in the ICU

— **Robotics for hospital logistics:** Takeover of repetitive logistics activities by robotic automations (for example, stock replenishment, goods/patient transport)

— **Process automation using robotics:** Execution of simple tasks such as vital parameters monitoring or sample treatment by robotic systems

— **E-referrals:** Forwarding of referral and discharge information (including test/clinic data) to the attending physician

Total: CHF 1.3 billion

EHR/paperless:

— **Unified EHR:** Infrastructure to view, record, and store all patient information that is accessible to every provider of care and from any care situation

— **Electronic prescriptions (e-prescribing):** Digital version of drug prescriptions that can be transmitted to pharmacies in real time. Allows the use of prescription data for automatic testing, such as drug interactions

— **Intrahospital staff communication:** Software for the communication/coordination of hospital staff (instead of paper-based systems)

— **Virtual medical assistants (AI):** Virtual tools that make everyday work easier for doctors (for example, text to speech, voice-based electronic medical records)

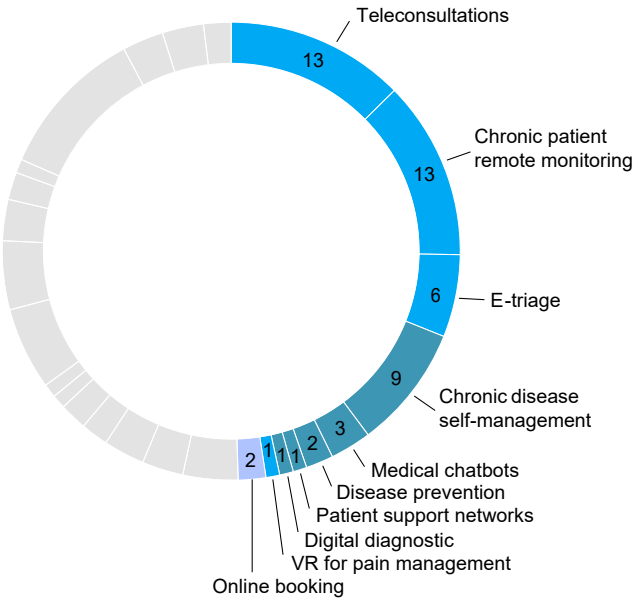
Total: CHF 1.5 billion

Exhibit 3

Digital health value pools in Switzerland

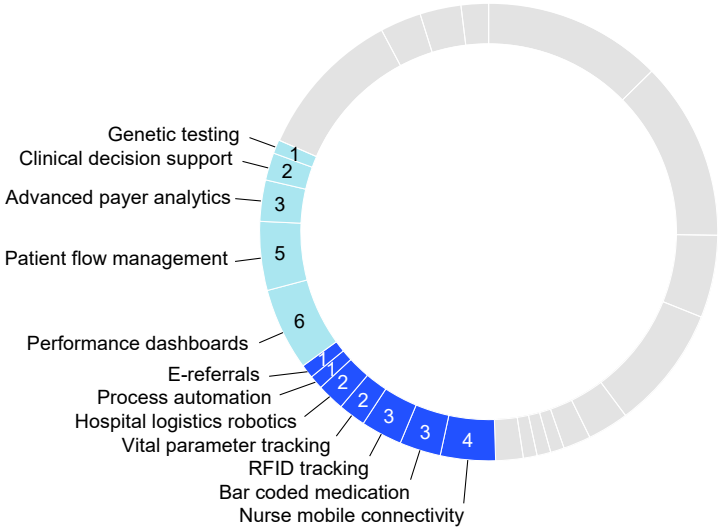
Digital health, CHF billions

- Online interaction 2.6 (~32%)
- Patient self-care 1.2 (~15%)
- Patient self-service 0.2 (~2%)



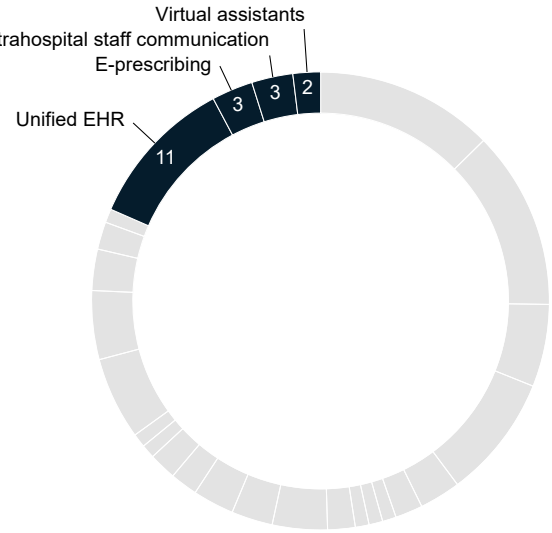
E-health, CHF billions

- Workflow/ automation 1.3 (~16%)
- Outcomes transparency 1.4 (~17%)



Enabler, CHF billions

- EHR/paperless 1.5 (~18%)



Lessons from neighboring countries and best-practice examples

Switzerland could learn from having a look at other countries, who are in similar situations. Many countries have already implemented some technologies and realized the expected improvement potential to a certain extent, have been able to pull off even further benefits from digitization or have encountered difficulties. We have selected five technologies with the largest value and enabling potential and compared the maturity status of these technologies in Switzerland to eight peer countries (Exhibit 4).

The technologies with the largest value and enabling potential in Switzerland are teleconsultation, chronic patient remote monitoring, chronic disease self-management, unified EHR, and e-prescription (Exhibit 2).

While the digitization of the economy in Switzerland has progressed rapidly in many areas, our analysis shows that it falls behind peers in terms of maturity of regulation, reimbursement, and level of adoption across the five most relevant value pools (Exhibit 4).

In the following, we compare best-practice examples with the Swiss status quo and draw implications for Switzerland across these five technologies.

For additional best-case examples, please see "The digital pill: A journey into the future of our health system."

Voices from practice

The level of digitization in the Swiss healthcare sector is below average. The pandemic has cast a glaring spotlight on this. Isolated solutions and data silos are making us lag behind in international comparison. Switzerland needs a digital interface that enables seamless interaction between doctors, hospitals, and health insurers. Digitization is one of the prere-quisites for sustainable healthcare. This makes it possible for patients—and particularly the chronically ill—to receive high-quality treatment at lower cost.

Philomena Colatrella, *CEO, CSS Versicherung*

Exhibit 4

Comparison of Switzerland's maturity across the 5 most relevant digital health value pools

Maturity status [status quo]

Area	1 Not at all	2 First immature solution in place, e.g., pilot projects	3 Partially in place, e.g., existing solutions but not at scale	4 Very mature solutions in place with significant adoption	5 Yes, to the fullest extent
1 Teleconsultation			IT, FI, DE, CA, **CH**, NL, UK	PL, SE	
2 Chronic patient remote monitoring		**CH**, SE, DE, IT, UK, PL	FI	CA NL	
3 Chronic disease self-management (digital therapeutics)		PL, **CH**, SE, IT, CA, UK, NL	DE, FI		
4 Unified EHR			**CH**, DE, UK, NL, CA	PL, FI, IT	SE
5 E-prescription		DE*, **CH**, CA		GB, NL	IT, SE, PL, FI

Detailed in text

* While E-prescription is not yet fully in place in Germany to date, its nationwide use will be mandatory from January 1, 2022 and most pharmacies have already installed the required infrastructure. Thus, a shift towards a scaled and very mature solution could happen very soon.

Example: Country maturity assessment

For each technology, the maturity of a given country has been assessed based on a series of questions and is ranked on a scale from one to five. A rank of one generally means that a technology is not available at all in a given country, while five means the solution is fully implemented with a high degree of adoption. For each technology, a series of underlying questions have been defined to assess the degree of maturity. For example, for teleconsultations the underlying questions are: Is teleconsultation implemented in the primary care supply? How widely is it used/how high is the adoption rate? Is it reimbursed by payer or only financed through out of pocket? Are there any restrictions in its use? For each technology and country, these questions were answered based on publicly available data and judgement by local health experts. The eight countries have been selected based on their ability to provide insights and lessons learned for Switzerland and do not mean to be representative.

Teleconsultation

Teleconsultation best practices

Teleconsultation tools range from phone calls to dedicated videoconferencing platforms to enable remote healthcare provision from doctors or nurses. It is worth having a look at the United Kingdom and Sweden.

Voices from practice

Digitization in healthcare requires innovation, and this in turn is the result of the interplay of (unmet) needs, technical and medical progress, and risk-friendly entrepreneurship. This is exactly the situation in Switzerland: At the end of August 2021, the Swiss Healthcare Startups association alone had 463 start-up members. Most companies are active in medical technology (59%), digital health (47%), and e-health (29%). Overlaps between these areas are frequent and the last two are the fastest growing sectors in Swiss healthcare start-ups. However, a recent survey of all start-up members showed that their digital health activities focus on three areas: telemedicine, age tech (solutions for the digital support of geriatric and chronic diseases) and "do-it-yourself" technologies. These are the sectors whose value potential is particularly promising, also according to the present study.

Olivia Zollinger, *CEO, Swiss Healthcare Startups*

In the United Kingdom, about 30% of routine GP consultations before the pandemic were conducted remotely, further increasing to about 70% during the start of the pandemic. The UK government has played an important role in the success of establishing remote health technologies by enacting policy changes to favor teleconsultations (which included shifting the default NHS GP consultation from face-to-face to teleconsultation[5]). In addition, the UK government funded the Babylon Health app for all NHS GP practices and outpatient specialists. The app provides both an AI-powered patient's triage solution and a platform for teleconsultations. While most of the remote consultations are still conducted via phone, the share of video consultations is rising.

In Sweden, 17% of the population uses digital consultations in general, and ~9% of all consultations were digital in 2020. In contrast to the United Kingdom, teleconsultation was initially introduced by the private sector and was later adopted in the public system. Teleconsultation in Sweden encompasses typically both e-triage and fully dedicated platforms for remote consultations. An example platform is the Kry app, through which patients can choose an appointment time, fill in symptoms, and upload photos prior to a video or telephone consultation. A driver for the high degree of adoption in Sweden is the high digital literacy of the population and wide use of other digital tools such as the national digital and bank IDs.

Teleconsultation in Switzerland

The major use case of teleconsultation in Switzerland is in the form of a stage gate for acute care, provided by insurance companies as a basic health insurance option with lower premiums compared to standard models. Patients must consult a telemedical doctor or assistant from a large telemedicine provider as the first point of entry to the healthcare system. Swiss payers have provided this model for over 20 years to lower expenditure in mandatory basic health insurance. As of 2019, 13% of the population in Switzerland was insured in a

[5] UK Department of Health and Social Care and The Rt Hon Matt Hancock MP, "The future of healthcare," July 2020, https://www.gov.uk/government/speeches/the-future-of-healthcare (accessed August 4, 2021).

As of 2019, **13%** of the population in Switzerland was insured in a telemedicine model, generating around 2.5 million patient contacts.

telemedicine model, resulting in around 2.5 million patient contacts per year.[6] On the other hand, teleconsultations outside the stage-gate basic health insurance model have not been widely adopted (although there are some successful players for specialties, for example, onlinedoctor.ch for dermatology). This may be due, among other reasons, to persistent tariffrelated questions for general teleconsultations with physicians through video/phone calls.

In response to the COVID-19 pandemic, tariffs were temporarily defined to cover remote consultations, leading to a surge in teleconsultations across medical disciplines. In the Swiss eHealth Barometer 2021, one-quarter of GPs said they had used telemedicine in the last three months, which is two to three times more than in the past years. However, teleconsultations were often run using telephone or basic videoconferencing services. In contrast to the United Kingdom, the pandemic has not led to a lasting adoption of remote consultations, and the provisional decision for remote consultation tariffs, for example, for psychotherapists, was even reversed in summer 2021. Other than the absence of tariffs, additional reported reasons for limited adoption of remote consultations include the lack of interoperability between remote consultation technology and practitioners' own systems as well as security and liability concerns.[7]

Chronic patient remote-monitoring

Chronic patient remote-monitoring best practices

Patient monitoring technologies enable patients with chronic diseases (for example, chronic lung diseases such as COPD, diabetes, heart failure), who often are at high risk, to have their vital parameters monitored while they go about their usual activities, which allows for earlier detection of deterioration or more timely and targeted interventions. It is worth having a look at adoption in the Netherlands and Canada.

In the Netherlands, ~75% of hospitals report applying some form of remote patient monitoring for diseases, including heart failure and COPD (both 66.6%), chronic intestinal diseases, and diabetes.[8] Given that these programs are often provider initiatives, the digital platforms used for monitoring are heterogenous across the country, with different hospitals using different technology providers (for example, the Luscii COPD home app). Adoption is supported by the fact that programs are often reimbursed within basic health insurance. This is the case when programs are contracted by payers. To remove ambiguity on which programs can be contracted, the Netherlands Healthcare authority has co-developed a pricing and reimbursement framework wherein clear requirements are set. This framework supports bottom-up innovation, as healthcare providers and payers can apply for temporary (that is, three- to five-year) coverage of a digital innovation while it is in the experimental phase of evidence generation. When evidence supports benefit, the temporary coverage may be transferred to permanent coverage.

In Canada, several provincial Telehomecare pilots and projects have been launched successfully to encourage remote patient monitoring. To implement these projects, provincial ministries of health and Canada Health Infoway, a government-funded not-for-profit entity that encourages healthcare digitization through targeted investments, have funded provincial networks responsible for providing Telehomecare services to referred patients. An example of a provincial network

6 Zingg et al., "Digitalisierung in der ambulanten Gesundheitsversorgung," 2019.
7 Röthlisberger et al., "Die Digitalisierung aus Ärztesicht (Teil II)," 2018.
8 NVZ, "Telemonitoring aangeboden door grootste deel ziekenhuizen," February 2, 2021, https://nvz-ziekenhuizen.nl/nieuws/telemonitoring-aangeboden-door-grootste-deel-ziekenhuizen (accessed August 4, 2021).

is OTN in Ontario. Current services offered mainly focus on COPD, heart failure, and diabetes but have extended to COVID-19 since the pandemic. Implementation of Telehomecare is further rolled out on a regional level by Local Health Integration Networks (LHINs). The LHINs each select healthcare providers to deliver the nursing services and provide the patient equipment needed to implement and support remote monitoring.

Chronic patient remote-monitoring in Switzerland

In Switzerland, chronic patient remote-monitoring is mostly limited to bottom-up initiatives (for example, pilot programs, partnerships, research studies) by healthcare providers, technology companies, and insurers. Selected hospitals run programs across disease areas, including diabetes (glucose monitoring), life-threatening ventricular arrhythmias (LifeVest, a wearable cardioverter defibrillator), and COPD. Several partnerships between technology providers and hospitals have formed (for example, Leitwert and University Hospital Basel) to develop further remote patient-monitoring programs. To reduce the increasing demand for hospital bed capacity, Universitätsspital Zürich, for example, plans to reallocate its investment in hospital campus expansion to digital infrastructure to enable at-home treatment. Another example is the insurance company SWICA launching the primary care TytoHome program, which provides patients with a diagnostic kit for remote measurements to be shared with GPs. Other insurance companies like Sanitas and CSS offer the program Care4Cardio for chronic heart failure. The pandemic has sparked additional demand for home monitoring, pushing companies to repurpose existing technologies for remote management of COVID-19 patients (Ava AG) and form new partnerships (for example, CSEM SA and hospitals). Despite these advances, doctors and other healthcare workers are still reluctant in many cases to use home monitoring for their patients. Reported reasons include lack of evidence supporting its effectiveness and cost reductions and concerns regarding alert fatigue, patient compliance, data security, and liability.

Voices from practice

Thanks to digitization, we will be able to tailor our services much more closely to the needs of our patients and offer them the best possible quality of life. Digitization creates the prerequisites for personalized therapies and shifting medical treatment into our patients' familiar environment (keyword: Hospital@Home). This allows us to get to know our patients better while they are still healthy, to treat them specifically in good time, thus avoiding complex procedures as much as possible. In the long term, this will enable us to save more than the 10% of healthcare costs in the hospital sector calculated in the McKinsey and ETH study.

Gregor Zünd, Prof. Dr. med., *CEO and Chairman of Hospital Management, University Hospital Zurich*

Chronic disease self-management (digital therapeutics)

Chronic disease self-management best practices

Germany introduced an innovative approach to digital therapeutics (DTx): self-managed medical interventions based on apps aiming at a direct impact on the course of disease. As the first country in Europe, Germany adopted a clear regulatory framework for DTx enabling physicians to prescribe and insurers to reimburse DTx in a manner similar to drug therapy. Technology providers can now submit their DTx through a dedicated fast-track procedure and request a preliminary approval for a period of 12 months, during which evidence for their effectiveness can be generated. As such, physicians can prescribe (preliminarily) approved DTx to any publicly insured German citizen since September 2020 . Despite the innovative regulatory framework,

challenges remain on fostering wider adoption of DTx, as payers criticize pricing levels and prescribing DTx is not yet a standard practice.

Chronic disease self-management in Switzerland

Today DTx adoption is in its infancy in Switzerland. Initial partnerships between insurance companies, universities, and providers have begun to form to support the development of DTx, such as the CSS Health Lab, and ETH's and University of St. Gallen's Centre for Digital Health Interventions. Development of DTx has been initiated across disease areas (for example, respiratory diseases, mental health, and COVID-19) and in support of healthcare planning. Selected disease-specific apps have been launched, such as Manoa by Pathmate, Digital Physiotherapy Coach, and Nala, for self-management of chronic care, physiotherapy, and eczema, respectively. In addition, the first digital health platform was recently launched in Switzerland by a consortium of payers and providers under the name of Well. Conceived as an open platform and currently in the testing phase, it will allow patients to make online doctor's appointments, get quick answers to their medical questions, and order prescriptions. Yet despite this active entrepreneurial landscape, the structural adoption of DTx remains limited. Switzerland has not yet introduced a dedicated mechanism to bring beneficial DTx into standard healthcare and support their reimbursement. Therefore, application of DTx remains mostly limited to early adopters who actively search and pay for digital solutions on their own.

Unified EHR

Unified EHR best practices

A unified EHR is an infrastructure to view, record, and store all patient information in a standardized format. It should be accessible to patients and, where relevant, to providers across the health-care systems (including outpatient, inpatient, and other care settings). Sweden and to some extent Italy have demonstrated successful nationwide availability and high penetration rates of an EHR.

In Sweden, an EHR has already been in large-scale use since the 1990s. End users played a role in design and decision-making processes for the introduction of Sweden's EHR. This culture of public participation in design has been reported as a major reason why Scandinavian countries have been successful in adopting EHRs[9]. The Nationell patientöversikt (NPÖ) is a nationally coordinated, centrally accessible EHR offered to regions, municipalities, state authorities, and private care providers that are publicly funded. After patient consent, a provider can access and add to an individual's file. Patients are also able to view their own records by logging in with their national BankID. The development of the NPÖ is part of the national IT strategy for health-care and social care and grounded in the Patient Data Act of 2008.

Similarly, Italy embedded the purpose, requirements, and use of EHRs in national law in 2012. In contrast to the centralized Swedish system, Italy opted for a regional system with limited national coordination. Today 21 different EHR systems are in place, with different content and functionalities added in each regional system on top of the national requirements. Patients are at the center of the EHR and determine which data are accessible for which healthcare professional. Additionally, they can add information in their citizen's notebook to provide a more comprehensive medical view, including medical documents originating from private care or care outside of Italy. Both the Swedish and Italian examples show that wide adoption of an

[9] Maria Hägglund, "Nordic countries lead new initiative on patient access to EHRs," May 18, 2021, https://blogs.bmj.com/bmj/2021/05/18/maria-hagglund-nordic-countries-lead-new-initiative-on-patient-access-to-ehrs/ (accessed August 4, 2021).

EHR can be achieved through embedding the use and requirements of EHRs in national law, repurposing existing secure login identification, removing hurdles for access by providing patients' web-based access, and utilizing a regional implementation strategy.

Unified EHR in Switzerland

Despite initial attempts, Switzerland does not yet have a unified EHR in place across all cantons and has encountered a number of challenges in its implementation. Like Sweden and Italy, Switzerland made adoption of the Swiss version of a unified EHR, or EPD, mandatory by law in 2017, though only for inpatient providers at first. For both patients and outpatient providers, the use of an EPD is voluntary to date as stipulated by the principle of "double voluntariness" anchored in the law, though political measures have been taken to eventually expand the mandatory adoption of the EPD to outpatient providers. The belated integration of outpatient care providers will limit the potential positive effects from EHR adoption once it is implemented. In addition, the fragmented Swiss healthcare landscape (across cantons, hospitals, and technology providers) has led to delays in implementation and threatens to undermine positive scale effects. At the current stage, four EPD solutions have received certification for rollout in different regions, while five additional EPD solutions are still in the process of being certified.[10] Finally, demand for adoption is limited among key stakeholder groups (patients, outpatient providers) and has even decreased over time in some cases[11] as no compelling solution exists today although discussions have been going on for years. For example, a recent report shows that while ~80% of hospital physicians support the planned introduction of an EPD, this is the case for only ~55% of general practitioners.[12] Additionally, 43% of the general adult population still indicate they do not know about the EPD.[13] Patients as a core stakeholder group have likely not been sufficiently involved in the design and implementation process of the EPD.

43%

of the general adult population still indicate they do not know about the EPD.

[10] eHealth Schweiz, Patientendossier.ch, EPD Anbieter, status as of July 2021.
[11] Golder et al., "Swiss eHealth Barometer 2020: Bericht zur Bevölkerungsbefragung," February 2020.
[12] Golder et al., "Swiss eHealth Barometer 2021: Bericht zur Befragung der Gesundheitsfachpersonen und Akteure des Gesundheitswesens," March 2021.
[13] Golder et al., "Swiss eHealth Barometer 2021: Bericht zur Bevölkerungsbefragung," March 2021.

E-prescription

E-prescription best practices

E-prescriptions, a digital version of a drug prescription that can be transmitted to pharmacies outside of the issuing institution in real time, are heavily used in Finland and Poland. In Finland and Poland, the issuing of e-prescriptions was made obligatory by law. As a result, over 90% of prescriptions dispensed in Finnish pharmacies were electronic only two years after law adoption.[14] In both cases, a clear driver of success is the synergy between combining implementation of e-prescription with a larger national healthcare digitization initiative. In Finland, implementation was part of the Kanta digitization initiative. In Poland, implementation was part of a uniform nationwide e-health system, also interlinking an EHR and e-referral solution.

E-prescription in Switzerland

Rollout of e-prescription is ongoing in Switzerland and is part of the larger national e-health strategy that also covers the implementation of the EPD. E-prescriptions are among the patient data that will be stored in an EPD, and the EPD infrastructure can be used for secure transmission of electronic prescriptions among authorized healthcare professionals, including to prevent abuse. With the delay in implementing the EPD, the introduction of e-prescriptions has also been lagging. While the use of e-prescriptions in the form of PDF documents is possible in the EPD offers being rolled out this year, the development of a standardized architecture and format for e-prescriptions across healthcare providers and EPD solutions remains a major challenge.[15] In addition, offering e-prescriptions as an alternative to paper-based prescriptions is voluntary for Swiss doctors. As a result, actual and systematic use of e-prescriptions is mostly limited to pilot projects or early adopters today.

Voices from practice

We are still facing a fragmented healthcare system: instead of customer-centric solutions, isolated offers from different service providers and payers dominate the market, leading to inefficiencies, losses in medical effectiveness, and dissatisfaction. The solution: a "continuum of care" based on the needs of healthy and sick individuals, consisting of both physical and digital service providers—including insurers—that cooperate in a spirit of partnership.

Digital processes, secure and simple data exchange, and networking in digital ecosystems independent of time and place, are the keys to enabling the healthy and sick to make autonomous decisions and providing need- and quality-oriented care. Much of this would have been possible and affordable today if the relevant players had worked together more consistently and made greater use of existing funding opportunities, for example, the added value of supplementary insurance contributions for digital innovations.

Daniel Liedtke, *CEO, Hirslanden Group*

[14] Lämsä et al., "Pharmacy customers' experiences with electronic prescriptions: Cross-sectional survey on nationwide implementation in Finland," February 2018.
[15] eHealth Suisse, Factsheet eMedikation, status as of June 2021.

Capturing the value potential: Five actions for Switzerland going forward

The Swiss society is aging and healthcare costs keep rising. By digitizing the system, health services can be provided at higher quality, and at less rapidly rising costs. At the same time, we have seen that the digital infrastructure of the Swiss healthcare system is lagging compared to peer countries. Acceleration of digitization is one major lever to address increasing healthcare costs and could provide up to CHF 8.2 billion in healthcare savings based on technologies available today. The benefits of healthcare digitization have already been validated in countries that have been quick to adopt it, such as Sweden or the United Kingdom.

Every Swiss canton has over

98%

standard broadband coverage and

82%

of the population uses social media.

In general, Switzerland has a strong infrastructure to support healthcare digitization and can benefit particularly well from a digital healthcare system, since 26% of the population lives in rural areas, having more difficulty to access in-person care.[16] The country can leverage its existing digital infrastructure and digital literacy to support healthcare digitization. For example, every Swiss canton has over 98% standard broadband coverage[17] and 82% of the population uses social media.[18] Furthermore, Switzerland is ranked sixth on the IMD World Digital Competitiveness Ranking and has the means to invest in its health infrastructure.

However, several challenges have slowed down the adoption of digital technologies in the Swiss healthcare system. These include a lack of incentives for all stakeholders, skepticism among providers, data protection and liability concerns, as well as a fragmented stakeholder landscape as a result of federalism.

From the best-practice cases discussed above, we have identified five key actions for driving digitization of Swiss healthcare going forward and thus capturing at least part of the CHF 8.2 billion value potential.

Voices from practice

The COVID-19 crisis has made it clear to all of us how enormous the potential in the digitization of the healthcare system really is. We should not allow this potential to remain untapped for Switzerland for years to come. Some actors have already started, but the necessary acceleration requires both political will and healthy competitive conditions, as it is common in other sectors.

Walter Oberhänsli, *CEO, Zur Rose Group*

Structural enablers

1. Get incentives right—consider reimbursement for payers and technology providers

One first action is to bring digital healthcare on par with traditional delivery methods by introducing and establishing an adequate reimbursement scheme. This includes both the reimbursement of teleconsultations without financial disincentives and the reimbursement for digital therapeutics, where appropriate. This approach has had early success: Germany, for example, has put a framework in place for digital technology reimbursement, and in the United Kingdom, teleconsultations are now covered publicly.

[16] World Bank, "Rural population (% of total population – Switzerland)", data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=CH (accessed August 4, 2021).
[17] point-topic.com/free-analysis/mapping-broadband-coverage-switzerland/#:~:text=Coverage%20of%20both%20standard%20and,both%20standard%20and%20cable%20services (accessed Month xx, year).
[18] Simon Kemp, "Digital 2021: Switzerland," datareportal.com/reports/digital-2021-switzerland (accessed August 4, 2021).

Given the steady increase of healthcare expenditures in Switzerland, payers have been understandably concerned that an expansion of reimbursements to digital services may result in further increasing costs. To address this concern, the introduction of reimbursement for digital services would need to be accompanied by a set of rigorous monitoring and cost-controlling measures. These could include outcome- or usage-based reimbursement for novel digital technologies, by which reimbursements are conditional upon effective use or therapeutic success. Conveniently, the data-collecting nature of digital technologies makes them exceptionally fit to enable usage-based and, ultimately, outcome-based schemes. In addition, payers can start testing the reimbursement of digital healthcare services within supplementary health insurance to understand effectiveness and adoption, before expanding basic insurance coverage.

2. Have the basics in place—accelerate the implementation of enabling digital tools
A basic digital infrastructure such as the EPD is imperative to scale up the digitization of healthcare. As such, Swiss policy makers, payers, and providers should double down to overcome the challenges encountered during rollout of the EPD, for example 1) by rapidly replacing the legal principle of voluntary participation for outpatient doctors and patients by a mandatory participation scheme for all (potentially with opt-out functionality for patients), 2) by engaging with patient organizations in design improvement, rollout, and future development processes to ensure the EPD will be easy to use and brings tangible benefits to customers, and 3) by adopting a more top-down implementation and operation approach in all cantons to leverage positive scale effects. Countries like Sweden and Finland have been successful in adopting enabling digital infrastructure nationwide. We believe that what has made them successful was a top-down mandate for a nationwide rollout (for example, incorporation into law and opt-out versus opt-in approach), adopting user-centered design with participation from patients and patient organizations early in the process. These countries also provided clear standards for system requirements in their territory, thus incentivizing a common approach across actors and regions. Some countries even have established one unit that operates the EHR database for all patients, similar to what SIX is doing in Switzerland for financial market services, which is also sensitive data, even if not as sensitive as health data. All these success factors so far have not been sufficiently considered in Switzerland.

Bottom-up engagement

3. Create clarity to foster trust—establish clear guidance on standards for data privacy and protection
One of the main obstacles for a broader adoption of digital services and tools (by providers and patients alike) are concerns about data privacy and protection as well as resulting liability questions. To overcome this obstacle, it is crucial that healthcare professionals and consumers can trust technology providers to hold their interest at heart and be informed on how their data are processed and stored. Given Switzerland's long-standing tradition of bottom-up policy making as well as the successful track record of civil society organizations and actors working together to establish trust-building frameworks outside legislative processes, we believe the stakeholders along the (digital) health value chain should come together to develop privacy and security standards in discussion with the wider public. These standards could then be implemented in the form of an industry-wide privacy and security certification, which would be awarded to demonstrated technologies, potentially involving an industry-wide governance. If set up right and with the buy-in of key representatives of all stakeholder groups, this approach could substantially accelerate trust building and thus acceptance of digital health solutions.

4. To measure is to know—promote continuous evidence generation to stimulate innovation and adoption

Technology providers and healthcare providers should continuously collaborate to design and launch evidence-generating pilot programs for digital health solutions. Adoption of innovation in healthcare systems is based on evidence, and healthcare professionals will and should take a similar stance toward their adoption of digital tools. Therefore, they will expect proven cost reduction with maintenance or improvement of clinical outcomes before they consider implementing and adopting a digital solution as justified. As a result, effort is needed to generate evidence for digital health, and it is again the providers, patients, and technology providers that can jointly work toward creating the necessary basis. In addition, regulators should provide clear guidance on evidence thresholds for approval and reimbursements, but also provide the requirements for collecting longitudinal evidence from real-world data (e.g., facilitating data aggregation from different sources). They can also encourage evidence generation by provisionally providing approval, as demonstrated in Germany and the Netherlands with the regulatory framework for digital technologies. Tech providers could take the lead in leveraging the evidence, generating functionality of digital tools to quantify outcomes. To be successful, they should embed evidence generation in the earliest stages of technology design and collaborate with payers and healthcare professionals in all areas to determine the most relevant outcomes to be measured. The functionality developed to generate evidence can in turn be repurposed by payers to inform outcome-based reimbursement at a later stage. The close collaboration of technology providers and healthcare providers early on in the development process can finally be used to continuously iterate on improving user experience to further increase adoption.

5. Don't wait—invest in partnerships that can make a difference now

Despite the regulatory and reimbursement environment not being optimal, there are many opportunities for players in the Swiss healthcare system to make a difference today. We believe a winning strategy is for stakeholders along the value chain to create partnerships around specific use cases which can create "win-win-win" dynamics, bringing benefits to patients, providers, and payers alike (for example, combining better convenience with higher provider efficiency and lower medical costs). Successful use cases generated by these partnerships will create a business case for the entire healthcare ecosystem and will fuel buy-in from other stakeholders and the wider public. This will then lead to the increased "evolutionary pressure" we cited up front and drive the system forward. Successful cases of bottom-up innovation can be found in many countries with well-advanced digitized healthcare systems. For example, in the Netherlands, payers, tech providers, and hospitals collaborated to jointly launch, among others, remote consultation services. There is no reason why this dynamic would not play out successfully in Switzerland, and we see promising early examples unfold in the Swiss healthcare system. With its vibrant scene of over 900 healthcare start-ups and many world-class healthcare institutions, Switzerland has a great potential for successful partnerships to push digitization forward. We are confident that this will eventually lead to growth and adoption of digital health-care in Switzerland, with the benefits it can bring.

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Appendix (methodology)

The study seeks the most effective digital solutions that simultaneously benefit the patient and reduce costs. The methodology is based on a robust approach that has already been validated in Germany, Austria, the United Kingdom, Canada, and Sweden:

— Digital solutions: Based on expert interviews, we have selected 26 digital health solutions (for example, e-prescription, remote monitoring, teleconsulting) in six solution categories.

— Research reports: We reviewed over 500 publications and case studies to define 85 evidence-based use cases. These show how digital solutions can reduce healthcare spending.

— Supply areas: The use cases were applied to Swiss basic data in five areas of care: inpatient acute care, rehabilitation, family doctor, specialist, and care (including medical and long-term care). Expenditure on medicines and ambulance transport was divided between inpatient care, family doctor, and specialist. Wherever possible, maintenance-specific assumptions were made for the use cases.

— Analytical tools: A multilevel driver tree logic was used (for example, cost = unit price x activity per person x number of people) to ensure that use cases were applied only to the correct baselines.

The model was then adjusted to account for the rate of likely digital adoption in each use case; the impact of each use case was associated with each digital health solution to determine the improvement potential per solution. The overall country improvement potential reflects the sum of improvements of all digital health solutions (adjusted for any double counting in use cases), with an allocation to the main value recipient (payer or provider) in each use case.

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