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LESSONS LEARNED FROM AN INTERNATIONAL REVIEW OF TELEMEDICINE

Local Health System Sustainability Project

Task Order 1, USAID Integrated Health Systems IDIQ

September 2022

This document was produced for review by the United States Agency for International Development. It was prepared by the Local Health System Sustainability Project under the USAID Integrated Health Systems IDIQ.

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The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ helps low- and middle-income countries transition to sustainable, self-financed health systems as a means to support access to universal health coverage. The project works with partner countries and local stakeholders to reduce financial barriers to care and treatment, ensure equitable access to essential health services for all people, and improve the quality of health services. Led by Abt Associates, the five-year, $209 million project will build local capacity to sustain strong health system performance, supporting countries on their journey to self-reliance and prosperity.

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CONTENTS

ACRONYMS

BHN	Baltic Health Network
CARNet	Croatian Academic and Research Network
CeHis	Center for eHealth in Interaction, Sweden
CEZIH	Central Health Information System of Croatia
CJD	Creutzfeldt-Jakob Disease
CVT	Clinical Video Telehealth
ECG	Electrocardiogram
EHR	Electronic Health Record
ESPBI IS	Electronic Health Services and Cooperation Infrastructure Information System, Lithuania
EU	European Union
FCC	Federal Communication Commission, United States
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
HZZO	Croatian Health Insurance Fund
ICS	Integrated Care Systems, United Kingdom
ICT	Information and Communication Technologies
IoT	Internet of Things
IT	Information Technology
LHCR	Local Health and Care Record, United Kingdom
LHSS	Local Health System Sustainability Project
MOH	Ministry of Health
NCJDRSU	National CJD Research and Surveillance Unit, United Kingdom
NHIF	National Health Insurance Fund, Lithuania
NHS	National Health Service, United Kingdom
NHSX	National Health Service X (X stands for user experience), United Kingdom
OECD	Organization for Economic Co-operation and Development
RHCP	Rural Health Care Program, United States
SALAR	Swedish Association of Local Authorities and Regions
SMI	Severe Mental Illness
SNS	Spanish National Health Care System (el Sistema Nacional de la Salud)
USAID	US Agency for International Development

USCDI	US Core Data for Interoperability
VHA	Veteran's Health Administration, United States
VHI	Voluntary Health Insurance, Croatia
WGLL	What Good Looks Like (framework), United Kingdom
WHO	World Health Organization
WPFW	Who Pays for What (proposal), United Kingdom
LHSS	Local Health System Sustainability Project

1. EXECUTIVE SUMMARY

Introduction

Since 2015, Ukraine has been pursuing its most comprehensive health reform since it became independent. A facet of this effort has been the further development of telemedicine to strengthen transparency and efficiency in the sector, reduce opportunities for corruption, and expand access to quality health services. These needs have been exacerbated by the Russian invasion into Ukraine in February 2022, which have made telemedicine a critical tool to maintain access to health care during the war and in the period of rebuilding to follow. To develop its telemedicine system, health-sector leaders in Ukraine are seeking to leverage the experiences of telemedicine implementation globally, drawing on best practices and avoiding common pitfalls to effectively increase telemedicine access and quality.

To this end, the U.S. Agency for International Development (USAID)-funded Local Health System Sustainability (LHSS) project has conducted a review of international experiences that can further inform the development of Ukrainian telemedicine. The review includes analysis of how telemedicine can be designed and deployed equitably and inclusively. By comparing medical, social, economic, and ethical aspects of telemedicine used by peer countries and international experiences, LHSS hopes this review will assist Ukraine in establishing its own standards of telemedicine excellence.

Given Ukraine's reform agenda, aspirations for its health sector, and European Union (EU) candidate status, it is of particular importance to include country case studies in the review that are not only of immediate relevance to Ukraine's current context, but also those that can serve as aspirational examples as it charts its development path for telemedicine. Therefore, lessons from health care systems that have implemented robust telemedicine systems over the past decade and today demonstrate high health infrastructure capacity and levels of access to quality health care are of particular interest. In addition, Ukraine may also benefit from reviewing experiences of post-Soviet and post-conflict states—keeping in mind the unique challenges posed to Ukraine as it transitions away from the Semashko health care system.

Findings

All case countries have rapidly scaled their telemedicine services since 2019 amid the COVID-19 pandemic. This has frequently resulted in the integration of telemedicine into existing governance, financing, and existing interoperability structures, with the private sector playing perhaps a larger role than it would otherwise in driving service delivery and innovation. Results indicate that integrating telemedicine into existing structures with significant private-sector involvement has successfully allowed these countries to expand access to telemedicine services (though sustainability prospects of these initiatives remain unclear). Notably, EU membership proves an advantage in setting data-security standards, as well as accessing funding for infrastructure and innovative project development for the Eastern European case studies (Lithuania and Croatia).

However, the implementation of telemedicine in these countries remain challenged on a range of issues, including lack of interoperability, lack of clarity around long-term financing, slow provider and patient uptake of and comfort with telemedicine, and the integration and standardization of new telemedicine practices into regulations.

Operationalization

Prior to the COVID-19 pandemic, telemedicine was typically addressed as a subcomponent of broader electronic health (eHealth) strategies. As such, its governance remains nascent across case countries, manifesting as an extension of existing health-service and health-worker regulation, rather than as a standalone set of guidance and/or policies. In the absence of specific telemedicine regulations, most case countries have followed those established for traditional health care service provision. An exception is the UK, which has rapidly developed a robust telemedicine strategy to strengthen governance, shape regulations, and determine how technological infrastructure should be funded. Across case countries, telemedicine governance has required particularly close coordination among several government agencies pertaining to service provision, medical products, eHealth, insurance, data security, and regional bodies.

Most case countries provide access to primary-care telemedicine services through both the public and private sector. Most countries reviewed also employ telemedicine for management of chronic conditions, mental health care, and radiology. Spain and the US also use telemedicine to assist in screening for stroke patients. In addition, the UK and the US have specifically focused on using telemedicine to increase access to health care for vulnerable populations. As demonstrated by the US experience, governments can implement several measures to help ensure patients who do not have internet access can access telemedicine, including subsidizing internet services or technology, loaning needed technology, and equipping community spaces for telemedicine consultations.

Financing

Most case countries cover telemedicine services for patients under their national health financing scheme. In Spain, Sweden, and the UK, financing of these services follows the same regulations, financing structures, and costs to patients as if they were in-person services. The US is a notable exception; government reimbursement for telemedicine services comes from both Federal and state sources and is focused on serving vulnerable population pockets (such as those in rural areas and veterans) rather than entire populations.

Across case countries, infrastructure improvements and innovation for telemedicine are typically funded by both public- and private-sector sources. Private companies tend to either develop their own telemedicine solutions (as in the US and Sweden) or invest into the national system (as in Lithuania). In addition, EU funding has been an important resource for the post-Soviet countries analyzed, as Croatia uses EU funding for infrastructure development (citing challenges for health facilities to fund this development on their own) and Lithuania for innovative new digital health projects. Overall however, it remains to be seen how sustainable these financing models will be, since they were rapidly implemented in response to the pandemic.

Interoperability

Case countries have employed different approaches to the shared priority of ensuring interoperability and patient access to health records. While Sweden and Lithuania have established a single eHealth platform with an associated patient portal, the UK utilizes a universal patient app, and Spain has a personal health card that facilitates access to patient data. Croatia has a central health-information system (though many of its health facilities are not yet connected).

However, creating a central platform is just the first step in interoperability. In Croatia, patients lack trust in the data security of telemedicine services. Similarly, there is low uptake in Lithuania of the eHealth platform by both providers and patients. Incentives may be a meaningful way to facilitate

engagement; in the US, the Federal government rewards hospitals that use interoperability-certified electronic health-record (EHR) systems.

Data security

Because EU countries must comply with the General Data Protection Regulation (GDPR)—the overarching regulatory framework for data privacy and security—governments and the private sector can more easily deploy secure telemedicine solutions. The UK has created data-security requirements with which health providers must comply, including the use of designated national cyber services. Though other countries have similarly created supplemental data-security regulations, none included in this review had specific security regulations regarding telemedicine.

Taken together, the varying approaches across these issue categories indicate that no country's telemedicine system should be held as a global benchmark or set of best practices. Rather, countries use varying approaches—each with their own benefits and drawbacks—based on the specific contexts and barriers they face. Regardless of the organizational and financial models Ukraine employs for telemedicine, the challenges it faces as it develops its telemedicine capacities can nevertheless benefit from other countries' experiences and drawing on past approaches. This may result in different components of Ukraine's telemedicine system reflecting the experiences of multiple countries as it contends with issues such as interoperability, the integration of telemedicine into existing systems, and provider and patient uptake of telemedicine services. As Ukraine develops its own system, LHSS hopes this review will assist Ukraine in leveraging the experiences of other countries, drawing most on the approaches that align with its priorities, and ultimately expanding access to quality health services for all Ukrainians in a transparent, efficient, and secure manner.

2. INTRODUCTION

Since 2015, Ukraine has been pursuing its most comprehensive health reform since it became independent, with goals to improve health outcomes of its citizens, increase efficiency, and provide financial protection from high out-of-pocket payments. A key facet of this effort has been the further development of telemedicine to strengthen transparency and efficiency in the sector, reduce opportunities for corruption, and expand access to quality health services. These needs have been exacerbated by the Russian invasion into Ukraine in February 2022, which have made telemedicine a critical tool to maintain access to health care during the war and in the period of rebuilding to follow.

Ukraine's health-sector leadership and front-line workers agree that the need to expand and strengthen telemedicine in a systematic manner has never been more urgent. Additionally, telemedicine offers the potential to have an outsized benefit for certain vulnerable groups, such as internally displaced people, people living in rural districts that lack access to health care facilities, people with low income, and those with chronic diseases, disabilities, and/or in need of mental-health services. To develop its telemedicine system, health-sector leaders in Ukraine are seeking to leverage the experiences of telemedicine implementation globally—drawing on best practices and avoiding common pitfalls to effectively increase telemedicine access and quality.

To this end, the USAID-funded LHSS project has conducted a review of international experiences that can further inform the development of Ukrainian telemedicine. The review includes analysis of how telemedicine can be designed and deployed equitably and inclusively, drawing from both successful and unsuccessful examples. By comparing medical, social, economic, and ethical aspects of telemedicine used by peer countries and international experiences, LHSS hopes this review will assist Ukraine in establishing its own standards of telemedicine excellence. Given Ukraine's reform agenda, aspirations for its health sector, and European Union (EU) candidate status, it is of particular importance to include country case studies in the review that are not only of immediate relevance to Ukraine's current context, but also those that can serve as aspirational examples as it charts its development path for telemedicine.

With these aspirations in mind, lessons from health care systems that have implemented robust telemedicine systems over the past decade and today demonstrate high health infrastructure capacity and levels of access to quality health care are of particular interest. In addition, Ukraine may also benefit from reviewing experiences of post-Soviet and post-conflict states—keeping in mind the unique challenges posed to Ukraine as it transitions away from the Semashko health care system. Likewise, examining telemedicine in post-conflict environments can provide insight into how Ukraine can build its telemedicine network when active war with Russia has concluded. Across these two types of systems, the experience of EU member states can be instructive as Ukraine begins the process of membership into the bloc. Furthermore, they can serve both as examples of how countries with similar institutional environments and structural contexts have used telemedicine, as well as highlight obstacles to implementation that Ukraine may face in pursuing its own intervention. To this end, LHSS Ukraine compared telemedicine systems in six case countries: Croatia, Lithuania, Spain, Sweden, the United States, and the United Kingdom.

3. METHODS

Selection process

Before selecting countries for inclusion, LHSS Ukraine conceptualized the purpose that countries would serve in the international telemedicine review by establishing a typology of cases. The first type of case examines states that have implemented robust telemedicine systems over the past decade and today demonstrate high health infrastructure capacity and high levels of access to quality health care. Despite their differences from Ukraine's institutional environment, these states serve as useful examples to help orient policymakers and other stakeholders towards efficacious intervention practices in developing Ukraine's telemedicine capacity.

The second type of case are former Soviet states and/or post-conflict environments, and their inclusion is intended to inform LHSS and the Ukrainian policymakers of potential institutional challenges to effective reform and telemedicine that Ukraine shares. As a former Soviet state, examining Ukraine's post-Semashko legacy and regulatory environment is germane. Furthermore, selecting cases with post-conflict environments may elucidate how states have effectively reformed health systems and begun using telemedicine during and after conflict. With the initiation of hostilities following the Russian invasion of Ukraine and the resulting damage to infrastructure, understanding the complex needs of these states will be instructive in identifying potential barriers to implementation.

The team established six countries (four in the former group, and two in the latter) that would ultimately be selected for inclusion in the international telemedicine review. In selecting these six countries, the team developed a list of criteria for inclusion, broken down by case type (Table 1).

Table 1: Inclusion criteria to begin case country selection

Group A: Countries with established, robust telemedicine implementation	**Group B: Contextually relevant countries with telemedicine implementation**
• High degree of capacity in health care infrastructure • Mature telemedicine system used widely (across many fields such as primary care/infectious disease/mental health) OR one telemedicine service used by a large proportion of the population • Telemedicine implementation resulting in greater access to health care among target populations	• Former Soviet state and/or post-conflict state • Experience pursuing a telemedicine intervention (successfully or unsuccessfully) • Post-Semashko and/or post-conflict regulatory environment

Having outlined the criteria for country selection, LHSS Ukraine produced a list of potential best practices candidates and eight potential analogous cases candidates. The LHSS Ukraine team selected countries from this short list by first determining which candidate countries had sufficient data for analysis. The team then used feedback from Ukrainian stakeholders to identify the final list of countries to be included into the international telemedicine review. As a result of the selection process, four cases were selected for Group A (Spain, Sweden, the UK, and the US) and two cases for Group B (Croatia and Lithuania).

RESEARCH PROCESS

The team conducted a literature review focused on telemedicine development in selected countries. Articles were pulled from public and private sector sources, academic and medical journals, as well as publications produced by international organizations. The following resources were used: EBSCO, JSTOR, SpringerOpen, PubMed, Science Direct, WHO, World Bank, the EU, the Organisation for Economic Co-operation and Development (OECD), and respective Ministries of Health. The search terms used were "telemedicine" OR "teleconsultation" OR "telehealth" OR "ehealth" OR "mobile health" OR "mhealth" and the name of a country in question. The team supplemented these articles by pulling relevant articles from Google Scholar, white papers and gray literature, ultimately providing in-depth surveys of 260 sources in-depth.

For the purposes of this review, the team uses the WHO's definition of telemedicine: "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communications technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and the continuing education of health care workers, with the aim of advancing the health of individuals and communities" (2021). Additionally, the following WHO definition of mobile health (mHealth) is used: "the use of mobile wireless technologies for public health" (WHO, 2018). The country cases follow a standard template, addressing the six building blocks of a health care system identified by the WHO: leadership and governance; service delivery; health-system financing; health workforce; medical products, vaccines, and technologies; and health-information systems. LHSS prepared a list of guiding questions for each of the six building blocks to inform the research process (Table 2).

Table 2. Guiding questions for research by building block

Building Block	Guiding Questions
Leadership and Governance	• Is there a national/sub-national strategy on telemedicine/digital/electronic health? • Is there a published national telemedicine policy? • What is regulated in telemedicine systems and by whom (government, professional associations, etc.)? • What organization/department(s) is responsible for managing the telemedicine system? What is the organizational hierarchy? • Is there a digital health/eHealth system in place in the country? How is telemedicine data integrated into such a system? • Are key health-sector documents related to telemedicine disseminated regularly? • Are there mechanisms for obtaining client input on appropriate, timely, and effective access to health services? • What are the roles of the private sector, provider groups, communities and other non-government actors in the governance of telemedicine?
Service Delivery	• When did telemedicine service provision begin? • When (for what purpose) and how often do patients/health care providers use telemedicine services? • How does a health care provider initiate teleconsultation services? • How/when does a patient's doctor consult other doctors on their patient's case? • When are telemedicine services used voluntarily? When are they mandated?

Building Block	Guiding Questions
	• How does a patient initiate teleconsultation services? • What are the most common health care services that are provided using telemedicine at different levels of health care? Why? • What are the medical conditions that telemedicine is most commonly used to address? • What are the proportions of synchronous/asynchronous services? • What are the criteria for selecting target populations and services? • How is technology used to manage diseases such as diabetes, severe mental illness, etc.? • What monitoring systems are in place to help ensure quality of care? • What are criteria for quality of care?
Health System Financing	• Have there been any cost-effectiveness studies on telemedicine? Is telemedicine cost-effective? • How is telemedicine funded? • Does government fund the development of telemedicine solutions? • Who pays for maintaining/storing data for telemedicine imaging, telemonitoring/telemetry? • Who pays (and what mechanism) for up-front costs for health providers to start using telemedicine? • What telemedicine services are reimbursable by national systems (government funding, national insurance)? • Are there any specific contractual arrangements between purchaser and provider? • Are there any specific financial and non-financial incentives to promote the use of telemedicine? • What is the total health expenditure vs. telehealth expenditure? • Which organization/department oversees funding? • Does funding differ by type of service? • Do patients have to pay for telemedicine services? If so, how much?
Health Workforce	• Are there restrictions on type of health care provider/location of provider etc. who can practice via telemedicine? • What does malpractice liability for telemedicine look like? • Is there a sufficient number of providers to pull from or has there been a struggle to have an adequate health workforce on telemedicine? • How many health professionals are trained in using telemedicine annually? • Are training programs part of medical education? • How do health care providers feel about using telemedicine?
Medical Products, Vaccines, and Technologies	• What technologies are used and how/for what for teleradiology, telemetry, and telediagnostics? • What kind of innovative telemedicine methods/technologies are used? • How do patients use personal diagnostic devices? How do patients share data collected from these devices? • Is service provision via telemedicine reflected in the corresponding protocols/guidelines? Is this optional or obligatory?

Building Block	Guiding Questions
Health Information Systems	• Is there some universal nationwide solution? Are these platforms commercial products or there are public ones? • How is telemedicine data integrated with the existing health-information system? • What challenges were encountered in making the telemedicine system interoperable with HIS? • What are the technical standards for interoperability? • How do specialized telemedicine systems (radiology information system, telemetry, and lab information systems) interact, operate and exchange data with the health/medical systems? • Who is responsible for data management? Is it a centralized or decentralized approach? • What is the volume for each kind of stored diagnostic data (radiological, electrocardiogram [ECG], endoscopic images, magnetic resonance imaging [MRI], etc.)? And what is the term for its storage? • What regulations exist around data security and sovereignty?

4. LIMITATIONS

The team found that information surrounding telemedicine implementation was often lacking in particular countries and research areas. This lack of information posed a significant challenge in collecting data on all six building blocks of a health care system across the six case countries. Consequently, the amount of detail in individual core components and countries is unequal; those components and countries that had a greater amount of information available are more fully rendered and those that lack information were reviewed more modestly. Thus, every component of every country has at minimum some distillation of the available information that is applicable in determining best practices and highlighting obstacles to telemedicine implementation.

Additionally, while structuring research around the six building blocks of a health care system as defined by the WHO poses benefits, some weaknesses are also inherent: links and interactions among and within the building blocks may be underrepresented; the political economy and social context in which health systems operate is not sufficiently considered; and underlying social and economic determinants of health and behavior may be underdeveloped. While the six building blocks do offer a framework that helps structure our research and present data and analysis in a comparative lens, these oversights in the framework should be considered when drawing conclusions from the review.

5. FINDINGS

SWEDEN

Background information	
Population size	10,483,647 (2022 est.)
Population density	25 people per square kilometer (2020)
Real GDP per capita	$50,700 (2020 est.)
EU member country	Yes
Physician density	7.09 physicians/1,000 population (2019)
Hospital bed density	2.1 beds/1,000 population (2018)

Sources: The World Factbook; The World Bank.

Leadership and Governance

Sweden has a decentralized national health care system. The Ministry of Health and Social Affairs is responsible for setting health policy and regulation and determining the budgets for relevant government agencies and grants, while regional and municipal-level government structures are responsible for provision of health care services (Task Force Health Care and Netherlands Enterprise Agency, 2021).

In 2005, the Ministry of Health and Social Affairs established the National Board of Information Technology (IT) in Health Care, also known as the Center for eHealth in Interaction (CeHis) (Petersson and Erlingsdottir, 2016). CeHis itself came out of an agreement with the Ministry and the Swedish Association of Local Authorities and Regions (SALAR) to facilitate close coordination on IT development for the health sector. CeHis's purpose was to coordinate regions for the development of eHealth services, regulations, and infrastructure. The creation of CeHis marked the beginning of Sweden's comprehensive approach to using IT in health care (Erlingsdottir and Lindholm, 2016).

CeHis was later integrated into Inera, a private limited company that began operations in 2000. Inera is one of two major actors responsible for nationwide eHealth implementation. Inera is owned by Swedish regions and governed by a board with two politicians from each region. Inera provides eHealth services in line with the national strategy, including the national patient-accessible HER system Journalen (The Record) (Hellberg and Johansson, 2017; Erlingsdottir and Lindholm, 2016). The second major actor is the Swedish eHealth Agency. Created in 2014 as the eighth health-related government agency under the Ministry of Health and Social Affairs, the Swedish eHealth Agency aims to further develop the country's eHealth infrastructure (Task Force Health Care and Netherlands Enterprise Agency, 2021; Kirchberger, 2014).

No laws regulate the provision of eHealth services specifically, as telemedicine services are regulated under traditional health care laws and the GDPR (see Health Information Systems for more details on the GDPR) (Appelgren and Swarting, 2020). However, the Ministry of Health and Social Affairs and the SALAR have produced three eHealth strategies since 2006. Notably, the Swedish government does not explicitly reference telemedicine in these strategies; rather, it speaks to eHealth more broadly, encompassing use of information and communication technologies for health, digitization of information, and welfare technology (Ministry of Health and Social Affairs and SALAR, 2016).

These strategies have evolved from developing the required technology to implementing that technology and determining effective governance mechanisms (Ministry of Health and Social Affairs and SALAR,

2010; Hellberg and Johansson, 2017). Major themes are common throughout the three strategies, namely: efficiency, accessibility, privacy, information security, and usability. The most recent strategy for 2016–2025 also emphasizes the importance of maintaining equality and using a gender lens in the provision of eHealth services (Ministry of Health and Social Affairs and SALAR, 2016; Hellberg and Johansson, 2017).

In addition, the 2016–2025 strategy focuses on the need to better separate roles, noting several instances of different actors in central and local governments acting in parallel on eHealth activities. Although literature on whether Sweden has been successful in separating responsibilities is unavailable, it highlights the need to collaborate with non-governmental partners. Lastly, the strategy identifies the development of regulatory frameworks and standards and consistent use of common terms as key next steps in governing eHealth (Ministry of Health and Social Affairs and SALAR, 2016). This strategy is accompanied by a series of action plans developed in two-year increments, which detail specific goals for these next steps and maps out organization of governance and cooperation bodies (Ministry of Health and Social Affairs and SALAR, 2016). Through the 2017–2019 action plan, Sweden set up a joint national governance and cooperation organization to strengthen cooperation, with a focus on reaching consensus on goals and priorities in action plan implementation. The current action plan for 2020–2022 modifies this governance and cooperation organization to make roles and responsibilities clearer and allow more effective and flexible operations (Ministry of Health and Social Affairs and SALAR, 2020).

Two government actors are responsible for ensuring data privacy and interoperability, including by enforcing the GDPR. The National Board of Health and Welfare issues guidance and regulations on patient data, interoperability, and use of medical devices in health care. The Swedish Data Inspection Board is responsible for data protection, including patient data. The National Board of Health and Welfare issues guidance and regulations on patient data, interoperability, and use of medical devices in health care (Kirchberger, 2014). The National Board of Health and Welfare has also developed guidance on digital care, including when digital health services can be used for treatment and care (DLA Piper, 2020).

Lastly, two agencies under the Ministry of Health and Social Affairs play a role in reviewing and regulating medical products and technologies. The Medical Products Agency is responsible for regulation and surveillance of drug and other medical product development, manufacturing, and sales. The Swedish Council on Technology Assessment in Health Care reviews and evaluates new health care technologies with an eye to medical, economic, ethical, and social implications (Task Force Health Care and Netherlands Enterprise Agency, 2021).

Service Delivery

The provision of telemedicine is dominated by local private sector companies that conduct direct-to-consumer telemedicine consultations. These telemedicine providers often offer their services nationally while also acting as a subcontractor to primary health facilities in a specific region (Dahlgren et al., 2021). Popular private-sector telemedicine solutions include Kry, Min Doktor, Doktor 24, and Doktor.se (International Trade Administration, 2022). These applications typically allow patients to speak to a doctor or other type of health provider via video call, phone call, or chat, depending on patient preference and need. Some of these companies also have physical clinics to which patients are referred as needed. Lastly, some of these companies are established in multiple countries; for example, Kry operates in Norway, the UK, France, and Germany as well.

These private-sector solutions address a wide range of health issues during consultations, including but not limited to skin conditions, common cold and flu, mental health care, sexual and reproductive health, and allergies. In addition, there are several platforms for specialized care. For example, the mobile app Geras Solutions, provides patients and relatives with a digital self-assessment tool to detect dementia. A doctor can then review the results and administer the other portions of the procedure. This enables doctors to shorten this investigation process and see more patients (Geras Solutions, 2022).

Due to the success of these private-sector telemedicine platforms, some public primary health providers have also developed telemedicine solutions. These solutions are not as commonly used as their private-sector equivalents, but their use has increased substantially amid COVID-19 (Dahlgren et al., 2021). For example, in Jönköping region, public primary health providers created a joint telemedicine service for the region (Gabrielsson-Järhult et al., 2021).

Patients can also access health advice from nurses at the national level. 1177 Vårdguiden ("1177") is the national patient portal run by Inera on behalf of all regions in Sweden (Ahlerup and Friedmann, 2021). The portal is connected to the national patient-accessible EHR platform Journalen, which was created by Inera (Hägglund and Scandurra, 2021; Hellberg and Johansson, 2017). One of the services 1177 provides is a telephone-based health advice hotline with nurses (Hellberg and Johansson, 2017; Gabrielsson-Järhult et al., 2021). The aim of this service is to help patients seek care at the appropriate level, thereby reducing costly secondary care visits (Sundberg et al., 2021). However, a 2017–2019 study of telemedicine users in Sweden found that patients were concerned about the long waiting time required for these phone conversations and, if used, this service is considered a precursor to receive guidance in a telemedicine consultation (Gabrielsson-Järhult et al., 2021). Patients can also access their EHRs through 1177 (see Health Information Systems for more information). The Swedish eHealth Agency also provides eHealth services at the national level, although this does not include telemedicine services. Rather, these services primarily focus on provision of medication, including e-prescriptions (Swedish eHealth Agency, 2022).

Telemedicine use in Sweden has grown dramatically over the past five years. Whereas approximately 27,000 people used telemedicine services in 2017, this number increased almost 230 percent the following year (Blix and Jeansson, 2018). In 2019, there were approximately 1 million digital consultations with physicians, making up five percent of all medical appointments–a 67 percent increase from 2018 (Fernemark et al., 2020). The outset of the COVID-19 pandemic further propelled telemedicine use. In 2020, the number of digital health care consultations doubled from 1.2 million to 2.4 million. These consultations represented 11 percent of all medical appointments (International Trade Administration, 2022).

Health System Financing

Under Sweden's universal health coverage, most health care is covered by regional and municipal taxes (Tikkanen et al., 2020). Government grants also contribute, and patient out-of-pocket fees cover a small percentage of costs (Government of Sweden, 2022a). Regions are responsible for financing and delivering health care, and municipalities are responsible specifically for health care for the elderly and disabled. Services covered include inpatient, outpatient, dental, mental health, long-term care, and prescription drugs (Tikkanen et al., 2020). Each region sets out-of-pocket fees for doctor visits and visits for most other health care providers; however, there is a national limit on how much a patient can pay out-of-pocket annually. Health care services are free for children up to 19 years old, and out-of-pocket fees paid by the elderly are subsidized (Marczewska, 2011; Government of Sweden, 2022b).

Supplemental health insurance is also available; as of 2017, approximately 13 percent of employed individuals aged 16 to 64 years had supplemental insurance (Tikkanen et al., 2020). As of 2020, health care made up 11.5 percent of Sweden's gross domestic product (GDP), with 86 percent of total costs financed by the government and 13 percent financed by households through patient and other fees (Statistics Sweden, 2022). Specifically, as of 2019, Swedish regions spent $1.2 billion on health care IT, with $0.9 billion used for procurement of IT services, equipment, supplies, and software (Export.gov, 2019). Most out-of-pocket fees go toward prescription drugs and dental care (Tikkanen et al., 2020).

Teleconsultations are part of the publicly financed health care system through the Patient Act of 2015, which allows patients to access health care in any region of Sweden. Consequently, teleconsultations are accessible across the country and are covered under Sweden's universal health coverage, though patients must pay an out-of-pocket fee for a teleconsultation. This fee is the same as if the patient had gone to an in-person consultation. Therefore, as with in-person visits, each region dictates patient out-of-pocket fees, depending on type of provider seen and patient age (DLA Piper, 2020; Kry, 2022). There is no patient fee to use the 1177 health advice hotline (Dahlgren et al., 2021). This process is the same regardless of whether telemedicine services are accessed through public or private providers, as the same regulations apply. Regions contract services from private providers; consequently, health care accessed through the private-sector is still financed by the region (Government of Sweden, 2022).

Health Workforce

The health-workforce reaction to expansion of telemedicine in Sweden has been mixed. In a 2021 study on primary-care physicians' experiences using telemedicine, physicians noted that digital consultations cannot replace in-person visits. They also expressed challenges around using the technology required and that the introduction of new technology would require increased effort. There were also several concerns regarding the patient experience. Physicians worried about patient information security, increased likelihood of misunderstandings and misdiagnoses, and new referral routes resulting in delayed care. In addition, they highlighted the concern that some patients who were not comfortable with the technology may get left behind and be unable to access care (Glock et al., 2021). In its 2016 study on provider use of the patient-accessible EHR system, Journalen had similar findings. Furthermore, providers in this study expressed their anxiety around delivering bad news to patients virtually and noted that sharing this news in-person is critical in supporting the patient adequately and in answering any questions (Grünloh et al., 2016).

Sweden primarily operates on a "no-fault" system for medical liabilities. The focus of this approach is on compensating the injured patient rather than establishing provider fault or negligence. The 1997 Patient Injury Act dictates that compensation can be received for medical liability claims if a causal relationship between treatment and injury is proved but does not require that provider fault or negligence is established. This Act details the types of injuries that are compensated, namely, injuries due to treatment, faulty or wrongful use of equipment, incorrect diagnosis, and infection due to transmitted contaminants. Under this Act, all health providers are required to have patient injury insurance, which is financed by the regions. If a provider does not have patient injury insurance, patients can seek support from the non-profit Patient Insurance Association to address their claim.

The 2015 Medical Products Act regulates compensation for injuries caused by medication. As with the Patient Injury Act, this is a "no-fault" approach, but a causal relationship between the medical product and injury must be established. Injuries caused by medication are compensated under pharmaceutical insurance. Patients can also seek compensation through the 1972 Tort Liability Act, which, unlike the

Patient Injury Act and Medical Products Act, does require proof of provider fault or culpability. Compensation is sought out through the Tort Liability Act in cases where there is a lack of patient consent or lack of information shared with the patient by the provider (Hellborg, 2019).

Medical Products, Vaccines, and Technologies

Sweden has established programs in teleradiology, telepsychiatry, teledermatology, and several in telemonitoring (Cravo and Hashiguchi, 2020). For example, Coala Life has developed a Coala Heart Monitor, a smartphone-based ECG system to detect arrhythmias and atrial fibrillation. Patients use a heart monitor to record their ECG and heart sounds. Results are then transmitted to the Coala Life app and interpreted by the patients' health providers (Coala Life, 2022). By the end of 2021, about 10,000 patients and 1,700 physicians have used Coala Life (Coala Life, 2022). In February 2022, the Swedish Dental and Pharmaceutical Benefits Agency concluded that the use of the product can provide greater benefit at a lower cost with a cost saving of approximately SEK 606 to SEK 929 (approximately 50 to 80 USD) per investigation compared with a 24-hour Holter ECG (Coala Life, 2022).

Actiste Diabetes Management as a Service is a technical solution developed by private company Brighter for diabetes care. A patient with insulin-treated diabetes can use Actiste's product, a combined blood sampler, blood glucose meter, and insulin pen, to monitor blood sugar and receive insulin doses for between EUR 60 and EUR 110 per month. Measurements and doses are automatically synced with the companion mobile app (Actiste, 2022). In a 2021 survey on the solutions' impact on patients' life, patients said that the product provided them with a sense of control over their diabetes (Heald et al., 2022).

Lastly, AsthmaTuner has patients with asthma choose and connect with a participating clinic to receive a treatment plan. The patient then uses a wireless lung function meter to check their asthma, with results uploaded to the companion mobile app. Providers can view the data in an associated web portal (AsthmaTuner, 2020).

Health Information Systems

As each region within Sweden's decentralized health system determines which EHR system it will use, there are several EHR systems with historically little interoperability. In 2013, Sweden established its national Health Information Exchange platform, which helped amend interoperability issues by providing a single point of access for all client applications. As discussed in the Leadership and Governance section, one such service is Inera's patient-accessible EHR system Journalen, which compiles all patient health records from various EHRs onto one platform (Hägglund et al., 2018; Hellberg and Johansson, 2017). Patients access Journalen through 1177, the national patient portal (Hägglund and Scandurra 2021). By 2018, all regions had connected to Journalen. However, each region provides patients with different levels of access to the information. For example, a patient may be able to see medical notes and lab results from a provider in one region, but only the medical notes from a provider in a different region. As a result, the patient experience with Journalen can vary from region to region (Hägglund and Scandurra 2021).

In addition, Inera has developed Sjunet, a health care and social care communication network to exchange information among regions, municipalities, and private health providers. Organizations must pay to access Sjunet; all regions and municipalities have agreements to use the network (Inera, 2022). This network is used to securely exchange patient information and imaging among providers and facilitate provider-to-provider telemedicine via video conferencing (Voss et al., 2005).

Sweden does not have telemedicine-specific data laws; rather, telemedicine is regulated under the GDPR and supplementary Swedish legislation as required, including the Data Projection Act, the Patient Data Act, and the Pharmacy Data Act. If personal information is to be transferred across borders, the role of each participating entity must first be identified. Legal requirements under the GDPR and supplementary legislation, as required, must be met both for transfer of personal data (by the data exporter) and subsequent use of personal data in the recipient country (by the data importer). Personal data transfer outside the EU and European Economic Area is restricted unless appropriate data protections can be confirmed, explicit consent is provided, or for certain identified purposes, including contract performance. These transfers are assessed on a case-by-case basis (DLA Piper, 2020).

Takeaways

- Sweden's provision of telemedicine is dominated by private-sector companies.
- Sweden's regions contract services from private providers; in this way, the regions finance provision of telemedicine, although patients do pay some out-of-pocket fees, consistent with those paid for in-person visits.
- Due to the decentralized nature of Sweden's health system, patient experiences with telemedicine vary region to region. Out-of-pocket costs for telemedicine services vary by region. In addition, the type of health information that a patient can access digitally (e.g., labs, medical notes) is dictated by region.
- Sweden has not implemented any regulations specific to telemedicine. Rather, telemedicine provision follows regulations developed for in-person visits around financing, data security and interoperability, and medical liability. This appears to have worked well in increasing access to telemedicine thus far, although Sweden is prioritizing developing regulations and standards for eHealth in the coming years. Data security and interoperability are also regulated by the GDPR, as is the case for all EU countries.

SPAIN

Background information	
Population size	47,163,418 (2022 est.)
Population density	95 people per square kilometer (2020)
Real GDP per capita	$36,200 (2020 est.)
EU member country	Yes
Physician density	4.44 physicians/1,000 population (2019)
Hospital bed density	3 beds/1,000 population (2018)

Sources: The World Factbook; The World Bank.

Leadership and Governance

The origins of the Spanish National Health Care System (SNS) date back to 1908, when health care provision was managed by the National Institute of Welfare (Instituto Nacional de Previsión (Salvador, n.d). In 1978, Spanish authorities transitioned to a national health care system that was universal and funded through state taxes (Mahou, et al., 2021). In 1986, the General Health Care Act was adopted, establishing the foundations of the Spain's current health care system (HealthManagement, 2010), which guarantees universal coverage and access to health care to all citizens, functioning since 2002 on a decentralized model with national coordination (HealthManagement, 2010). While there are centrally

organized activities (such as national planning and the implementation of government health guidelines) that fall under the purview of the Ministry of Health (Ministerio de Sanidad), the Autonomous Communities (Organización Autonómica), made up of 17 different regions, are responsible for health competencies and oversees operational planning at the regional level,which includes resource allocation, purchasing, and provision (OECD 2021). The Ministry of Health and Autonomous Communities work together as regional authorities and are often supported by specialized national agencies (such as the Network of Agencies for the Evaluation of Health Technologies and Benefits) and via the SNS Interterritorial Council (Consejo Nacional Interterritorial del Sistema Nacional de Salud, which is composed of the national minister and the 17 regional directors of health from the Autonomous Communities (OECD, 2021). Chaired by the SNS, the role of the SNS International Council is to coordinate among the public health administrators from both the national and regional levels for tasks such as approving the national catalog of services (cartera de servicios comunes), which is divided into sections by care type (primary, specialized, supplemental, pharmacy). Within each Autonomous Community, health areas (areas de salud) direct health services management within the region across a variety of sub-areas called "basic health zones" (zonas básicas de salud) (HealthManagement, 2010). As a response to the COVID-19 pandemic in 2020, Spain also established a national-level Secretary of State for Health with the intention of supporting cooperation between the Autonomous Communities and international organizations (such as the WHO), along with bolstering the communication of national health strategies (OECD, 2021).

At the national level, the SNS has not yet published legislation that specifically deals with the implementation of telemedicine services (AFS, 2022). The SNS, however, manages the interoperability platform and defines the specifications for the health ID cards, ePrescriptions, and electronic clinical histories. In so doing, SNS effectively provides eHealth services guidance to the Autonomous Communities. The one exception is the inclusion of telemedicine services in Royal Decree 81/2014, which addresses patients' rights in cross-border health care and provides guidance on facilitating access to health care between countries (González de Castejón and Lorenzo, 2020). However, starting in 2010, the Spanish Presidency supported the creation of a national strategy focused on integrated digital health care and presented four goals in the post-2010 European Agenda: 1) to introduce a global vision for e-health policy, 2) drive a new e-Health Action Plan, 3) develop and promote ministerial agreements, particularly in relation to integrating e-health in community policy, and 4) implementation of eHealth events (such as the World of Health IT) to bring stakeholders together from across the EU (Health Management, 2010). Since then, the SNS released the comprehensive 2021-2026 Digital Health Strategy based on existing regulations including those around the national health system, general health, and data protection and the guarantee of digital rights (SNS, 2022). The summary is outlined in Figure 1.

Figure 1. SNS 2026 Digital Health Strategy

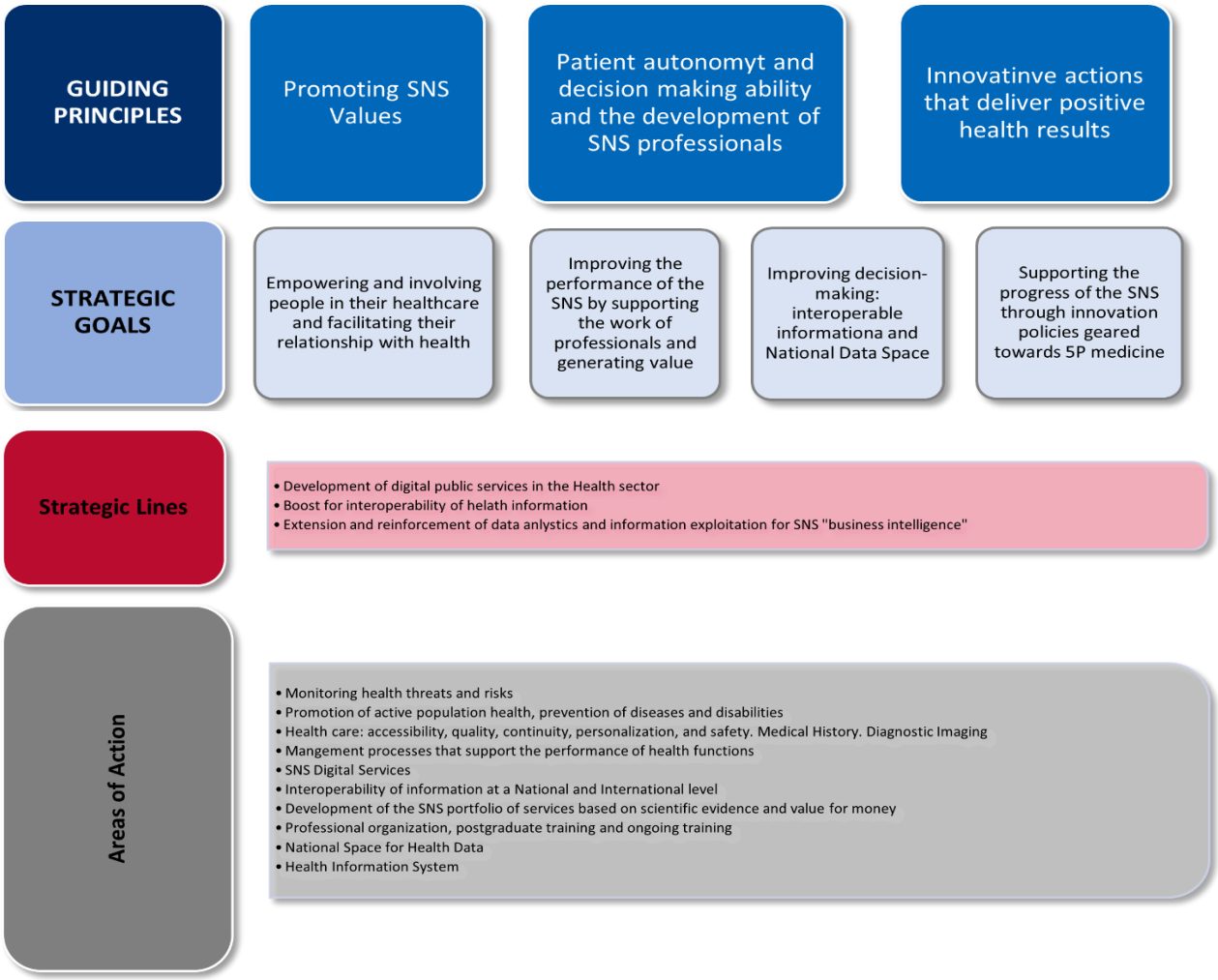
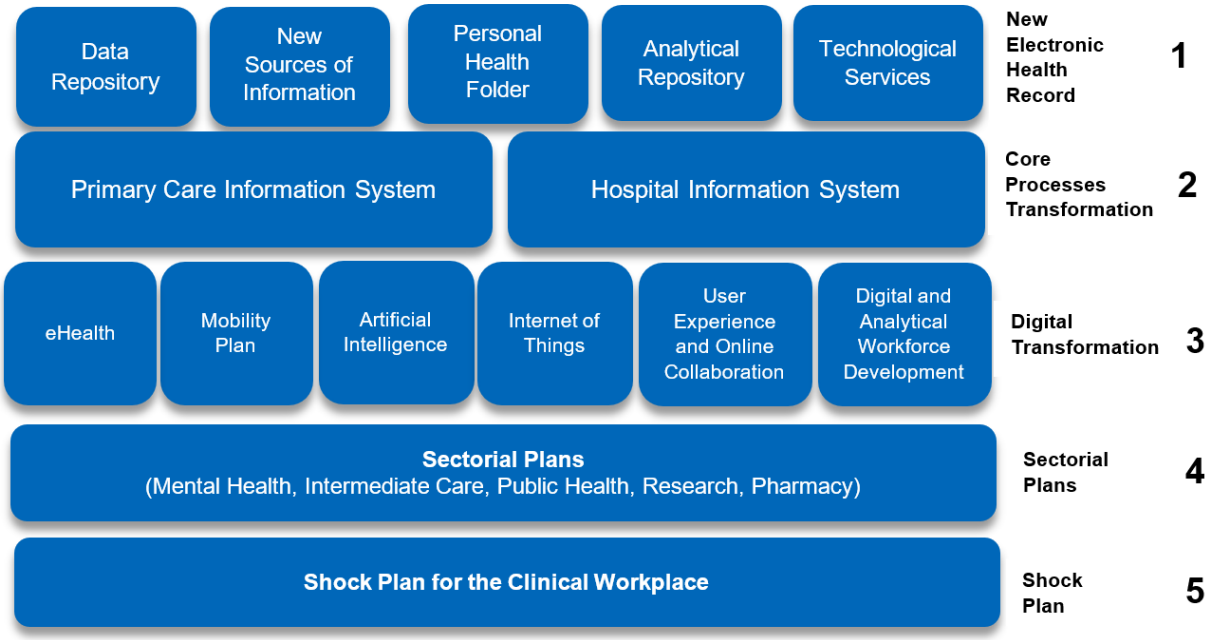


Figure 2. 15 Strategic initiatives of the Digital Health Strategy for Catalonia



In addition to the national Digital Health Strategy, regional digital health strategies—such as the Digital Health Strategy for Catalonia—are designed and implemented combining executive and regulatory authorities from the respective sub-national health system (Jiménez, Rodríguez, and Sust, 2020). Catalonia's strategy includes 15 strategic initiatives (see Figure 2 above), encompassed in five key dimensions: 1) New EHRs, 2) Core Process Transformation, 3) Digital Transformation, 4) Sectorial Plans that include intermediate mental health care, public heath, health research, and pharmacy, and 5) Shock plan to improve the conditions of the clinical workplace (Jiménez, Rodríguez, and Sust, 2020; Piera, 2021).

Service Delivery

Despite the introduction of telemedicine services in during the 2000s, Spain is still considered to be both in the entry and adoption stage of telemedicine, as progress and practices vary between the 17 Autonomous Communities (Sarria Guerrero et al., 2017; Bhaskar, Sonu et al., 2020). Many regions over the past decade have increasingly advocated for expanded use of telehealth to improve access to care, especially for those with chronic conditions (OECD, 2021). However, as a result of the COVID-19 pandemic, approximately 72 percent of the Spanish population has reported having a medical consultation either online or over the phone during the first year of the pandemic, pushing regional authorities to continue to seek enhancement to remote consultation services and contact systems to limit the physical presence of patients within health care centers (OECD, 2021). In addition to the recent adaptation of telemedicine technologies in Spain, increased adoption and usage of telehealth mobile app usage is reported (Bhaskar, Sonu et al., 2020).

Generally, telehealth services are available in Spain for a variety of categories, including dentistry, allergology, oncology, gynecology, pediatrics, dermatology, psychology, remote patient monitoring, and second opinion (among others) (González de Castejón & Lorenzo, 2020). The public approach to telemedicine access is very much decentralized by region, each of which has their own telephone assistance numbers and resources (such as eConsulta in Catalonia) to reduce patient saturation in health

centers (Baker McKenzie, 2020). Literature on patient populations using telehealth services the most was not available. In addition, the SNS has developed mobile applications for data collection to support the efficiency and accessibility of health services, such as the app, "Asistencia COVID-19" (available in Cantabria, Canarias, Castilla-La Mancha, Extremadura and the Balearic Islands) (Baker McKenzie, 2020). The private sector has also responded to the drastic increase in demand for telemedicine services by expanding services offered to health care providers on well-known sites such as the platform Top Doctors and Doctoralia, which now include medical consultations, online chat features, and advice sections for patients (Baker McKenzie, 2020). Additionally, large private hospitals, such as Quirónsalud, offer digital health plans that include phone consultations, vitals measurements, symptom evaluations, and chats with specialists (Quirónsalud, n.d.). The plans start at EUR 6.90 per month.

Health Financing

In Spain, public expenditure (particularly via taxation) is the dominant source of total health financing, reaching approximately 70.5 percent spending in the public sector while 29.5 percent is privately financed. The central government provides each Autonomous Community with financial support based on the population and demographic criteria (SNS, 2022). Since the European financial crisis, private expenditure on health has increased up to 28.9 percent of the total health expenditure during the 2009 – 2015 period (the EU average during this time was 23.8 percent) with out-of-pocket payments representing 23.9 percent of total health expenditure in 2015 (Bernal-Delgado et al., 2018). Despite the budget constraints caused by the economic downturn during the past decade, the health system remains almost universal and covers approximately 99.1 percent of the population (Bernal-Delgado et al., 2018). Additionally, in 2012, new legislation was introduced to regulate coverage conditions, the participation of patients in SNS funding, and the benefits package—which is grouped into two types of services, the common package (subcategorized into core package, supplementary, and accessory services common to the 17 regional services in the SNS), and the complementary package (which is decided by regional authorities) (Bernal-Delgado et al., 2018).

While public funding for the SNS is fixed, the health services under the jurisdiction of the Autonomous Community each have their own separate circumstances for the financing and provision, and pursue different approaches to telemedicine deployment and acquisition (SNS, 2022). While there is no telemedicine regulation specifically addressing the reimbursement of telemedicine services and appointments, telemedicine is funded by SNS as long as it follows the same guidelines that must be met for funding in-person services (e.g., treatment must be provided via SNS centers, establishments, and services or those that are subsidized by SNS, unless in an urgent and vital case) (CMS, 2020). Telehealth services follow the same regulation and are provided with the same conditions to which face-to-face are held, and thus are free of charge, reimbursed, or subsidized (DLA Piper, 2020). In addition, the private sector is a notable player in the Spanish health system and provides voluntary health insurance schemes to individuals, services not provided by the SNS (such as optical care and dental care), and works with the public sector in hospitals and pharmaceutical care – recently offering telehealth services via private health insurance companies (Baker McKenzie, 2020).

Health Workforce

Differing from neighboring countries such as the UK, doctors in Spain must be registered under the Spanish Medical Association (Organización Médical Colegial), a national organization that provides regulatory oversight of the medical profession (OMC, 2022). The Association is composed of the

General Council of Official Medical Colleges (Consejo General de Colegios Oficiales de Médicos) and represents the 52 regional medical colleges from the 17 Autonomous Communities at the national and international level (OMC 2022). According to the SNS Digital Health Strategy, Spain has a total of 3,055 health centers and 10,067 primary care clinics with a network of 468 hospitals (both owned and subsidized; 321 are acute hospitals and 147 are long-stay hospitals) (SNS, 2022). Among these facilities, approximately 665,985 professionals are staffed at a rate of 14.3/1,000 inhabitants (SNS, 2022). Specifically, the ratio of medical professionals and nursing professionals per 1,000 inhabitants is 3.2 and 4, respectively, making the overall ratio about 4/1,000 inhabitants in the public sector (among OECD average) and about 5.8/1,000 inhabitants in the private sector (below OECD average) (SNS, 2022).

Of these professionals practicing telemedicine, malpractice liability is generally understood that telemedicine (including niche services such as teledermatology) is covered by the same malpractice policies as in any other health care activity. However, it is important to note that when it comes to remote consultations, patients located in another country or of foreign origin are excluded from the mainstream policy umbrella and would be unable to make a claim before a foreign court (unless the insurer expressly accepts such claims) (Gómez-Arias et al., 2021).

Within Spain, both patients and physicians have a generally positive perception of telemedicine. Responses in research conducted in 2018 revealed that 72.5 percent of diabetes mellitus type 2 patients and 93.5 percent of physicians surveyed were willing to use telemedicine resources again (Rodríguez Fortúnez, P. et al., 2018). Additionally, 80.4 percent of patients and 97.6 percent of physicians said they would recommend telemedicine (Rodríguez Fortúnez, P. et al., 2018).

Medical Products, Vaccines, and Technologies

Spain has established programs in teledermatology, teleradiology, telepsychiatry, and telemonitoring (Cravo Oliveira Hashiguchi, 2020). During the COVID-19 pandemic, the Catalan Health Department launched an app called GestioEmocional to provide support to patients suffering from stress and anxiety. In 2020, the app was downloaded over 370,000 times (Rouger, 2020). GestioEmocional features a chatbot coordinated by psychiatrists. On average, patients using the app were provided assistance in less than five hours (Rouger, 2020).

The use of teledermatology in Spain had risen to over 25 percent of dermatology centers in Spain using teledermatology, according to a 2014 study (Romero et al., 2014). Store-and-forward teledermatology was the main technique (83%) used at that time, followed by the real-time method (12%), and a hybrid modality method (5%) (Romero et al., 2014). During the COVID-19 pandemic, research evaluating teledermatology as a tool for avoiding face-to-face consultations during lockdown showed that face-to-face consultations could be avoided entirely in 17 percent of cases, and in 68 percent of cases face-to-face consultations were postponed by at least three months (Sendagorta et al., 2021).

A telemedicine solution for acute stroke patients, TeleStroke, was implemented in Spain beginning in the mid-2000s. If a stroke is suspected upon a patient's arrival to the emergency department of a requesting hospital, a doctor can call the TeleStroke Medical Station to reach an on-call neurologist. During the consultation, the neurologist can receive images via videoconference and share instructions on further steps in patient examination (Parra et al., 2012). In Catalonia, over 1,000 patients were assessed via TeleStroke from March 2013 to December 2015, 322 of whom received intravenous thrombolysis (Lopez-Cancio et al., 2018). As a result of using TeleStroke, transfers to another health facility were avoided in 23.5 percent of hemorrhages, 46.8 percent of ischemic and 76.5 percent of transient ischemic attacks (López-Cancio et al., 2018).

In 2021, Spanish mobile operator, Yoigo, launched a family package telemedicine service DoctorGo available to its customers at EUR 6 per month (Mageit, 2021). The service includes video consultations with family doctors and specialists, as well as telepharmacy services. Additionally, DoctorGO offers consultations with specialists in psychology and nutrition (Mageit, 2021).

Health Information Systems

The SNS has been working to merge the application of new information and communication technologies (ICTs) into public administration settings, with digital health paving the way in ICT-delivered citizen services (Mahou et. Al, 2021). Individuals covered under the SNS possess a single personal identification number that links to a personal health card that grants access to health services throughout the entire country (SNS, 2022). The personal identification number is generated by the regional health services but under the specifications published by the SNS, which allows it to work across the country. Furthermore, health services and facilities fall under a common SNS coding system that is standardized under a set of classifications (covering diseases, diagnostic and therapeutic procedures, nursing interventions, and medical devices) (SNS, 2022).

While eHealth services such as electronic prescriptions, appointment setting, and electronic medical records (EMRs) have been well-established in Spain, services such as digital imaging are still lacking investment and development. As a result, Autonomous Communities have started to facilitate mobile device access for mHealth services via smartphones, tablets, wearables (Mahou et al., 2021). With the proliferation of health apps as well as mobile and wearable devices, digital health services have increasingly shifted from treatment to prevention-focused approaches in Spain (Llopart, 2022). However, digital platform providers in Spain face interoperability issues with apps, wearables, internet of things (IoT), and medical devices (Llopart, 2022).

When regard to data and privacy protection, telehealth services are required to be implemented in accordance with current legislation on personal data protection, which includes GDPR 2016/679 as well as the Spanish Data Protection Act 3/2018 (DLA Piper, 2020). The Spanish Data Protection Agency is the national authority that helps to ensure that data privacy regulations are properly followed (Llopart, 2022).

Takeaways

- As Spain has a decentralized health care system, the Autonomous Communities dictate telemedicine provision and financing, meaning that progress and practices around telemedicine differ throughout the country.
- Telemedicine services in Spain follow the same regulations and are provided to the public with the same conditions that face-to-face consultations are held to; therefore, these services are typically covered by the SNS.
- Telemedicine is generally covered by the same malpractice policies as in any other health care activity. However, for teleconsultations, patients located in another country or of foreign origin are excluded from the mainstream policy umbrella and are thus unable to make a claim before a foreign court.

UNITED KINGDOM

Background information	
Population size	67,791,400 (2022 est.)
Population density	277 people per square kilometer (2020)
Real GDP per capita	$41,600 (2020 est.)
EU member country	No
Physician density	3 physicians/1,000 population (2020)
Hospital bed density	2.5 beds/1,000 population (2019)

Sources: The World Factbook; The World Bank.

Leadership and Governance

The National Health Service (NHS) is an umbrella term for the UK's health care systems, comprised of the national health care systems of the four constituent members of the UK: NHS England, NHS Scotland, NHS Wales, and Health and Social Care in Northern Ireland. While there is devolution to the national entities, the four health care systems are highly centralized internally, with limited devolution to the regional/local level (BBC, 2008a; BBC, 2008b). The principal government agency responsible for the digital transformation of health care is the NHSX, which was established in 2019 and is broadly subsumed by NHS England.

Bringing together IT teams from the Department of Health and Social Care (England), NHS England, and NHS Improvement, NHSX aims to bring the benefits of modern technology to every patient and clinician. NHSX is the government unit responsible for setting national policy and developing best practices for NHS technology, digital and data, including data-sharing and transparency. The agency's key responsibilities include developing, agreeing, and mandating clear standards for the use of technology in the NHS; ensuring that NHS systems can talk to each other across the health and care system; supporting the use of new technologies by the NHS, both by working with industry and via its own prototyping and development capability. The NHSX commissions projects from NHS Digital, which itself is the national provider of IT systems for health and social care in England (Crouch, 2019; NHS Digital, 2017). While there are plans in the works to merge NHSX with NHS Digital, as well as for the merged entity to be incorporated into NHS England, this reorganization has yet to take place (Rapson, 2021)

Since its formation in 2019, and with the outset of the COVID-19 pandemic in 2020, NHSX has rapidly undertaken the task of establishing a British telemedicine strategy. In August 2021, the NHSX produced the What Good Looks Like (WGLL) framework which was updated in October of the same year. Noting that the pandemic had enabled the NHS to achieve a level of digital transformation that might have otherwise taken years, the WGLL framework builds on the progress in digital transformation that resulted from the pandemic, aiming to ensure that all health care providers have a strong foundation in digital practice. (NHS, 2021).

The WGLL framework sets out seven measures of success: being well-led; ensuring smart foundations; safe practice; supporting people; empowering citizens; improving care; and healthy populations. Included in these measures are clear guiding principles for the further implementation and integration of telemedicine systems. For example, the WGLL framework seeks to establish Integrated Care Systems (ICSs) that have wide-reaching digital and data solutions for improving health care outcomes. ICSs are partnerships of health and care organizations that come together to plan and deliver services. Following several years of locally led development, recommendations of NHS England and passage of the Health

and Care Act (2022), 42 ICSs were established across England on a statutory basis on July 1, 2022 (NHS, 2022). These ICSs aim to align all organizations' digital and data strategies with cybersecurity and existing programs. Furthermore, the framework argues for sustainable financial plans for ICSs' digital and data strategies. Finally, the WGLL framework outlines the need for data security under its "safe practice" measure of success asking that health care providers fully utilize national cyber services provided by NHS Digital (NHS Digital, n.d.-b), establish a process for managing cyber risk with a cyber improvement strategy, invest and progress reviews at the board level, and comply with the requirements of the Data Security and Protection Toolkit (NHS Digital, n.d.-a; National Cyber Security Centre, n.d.; NHS, 2021).

Throughout the pandemic, the NHSX has helped health providers transition to telemedicine services by producing guidance materials. For example, "Principles of Safe Video Consulting in General Practice" (2020), jointly produced by the NHS and the Royal College of General Practitioners, targets guidance to NHS general practice staff who consult with patients at home via video. The document provides guidance on utilizing video consultations as a part of the wider system of triage, how practices should procure video/online consultation solutions, and elaborates recommendations for providing solutions for patients without access to home-monitoring devices.

While the NHSX is tasked with setting national telemedicine policy and developing best practices, the broader NHS has been crucial in helping keep providers informed of updated guidelines. In addition to producing guidance of their own, the NHS has worked to widely disseminate through official channels key health-sector documents to assist providers in the transition to digital health. These channels prominently include the official NHS website, as well as through partners such as the British Medical Association. Such guidance includes documents such as "COVID-19: Video Consultations and Homeworking" (Dyson, 2022), which offers advice to doctors in all settings in acquiring homeworking equipment, when to consult patients via video, approved NHS tools for remote consultations and tips for running them. This document also provides recommendations for safeguarding confidential patient information in the context of remote consultations—a key consideration for health care providers using telemedicine.

Lastly, the Life Sciences COVID-19 Response Group was established by the UK Government in 2020 and has worked with key private-sector stakeholders, provider organizations, and non-governmental organization partners to develop an action plan for telemedicine in response to the pandemic. With an eye toward recovery and building new partnerships between the life-sciences sector, government, and NHS, the Life Sciences Recovery Roadmap (2020) provides an overview of the key issues for the sector. The roadmap also surveys the use of digital health technologies, broadly defining four interlinked areas into which the technologies fall: population management; triage and clinical decision-making systems; digital diagnostics; and remote services. Key next steps in this action plan include the development of multiagency dialogue between industry and government entities to progress strategies for regulation. Finally, the partners describe the value in how these technologies have enabled new care solutions to relieve system pressures and have accelerated the adoption of a digital-first approach to health care, providing examples of rapid telemedicine implementation during the COVID-19 pandemic.

Service Delivery

While the NHS has been making steady progress towards digitizing its health care system, the COVID-19 pandemic catalyzed this process, rapidly accelerating the pace at which the NHS sought to employ telemedicine services. In early 2020, the UK government recognized that it was vital to adopt

telemedicine across the NHS in response to the pandemic (Tyer, 2020). Consequently, in the four weeks leading up to April 12, 2020, 71 percent of routine general practitioner consultations were conducted remotely, compared to only 25 percent in the same period a year earlier (Department of Health and Social Care, 2020).

The NHS has approved multiple teleconferencing solutions that were developed by the private sector for clinical use. Health facilities are able to procure approved NHS solutions for remote consultations. The NHS has also produced guidelines for when to use video consultation, how to safeguard confidential patient information, and how to operate these telemedicine solutions. (Dyson, 2022).

Selecting target populations that might benefit from access to health care from telemedicine implementation has taken several forms. First, NHS-funded academic research has produced literature identifying prison populations and the elderly as key demographics that could benefit from using telemedicine. The Oderanti (2021) paper demonstrates how a rapidly aging population is driving strong demand for eHealth, noting that institutionalized inpatient care is expensive and less attractive than being cared for in one's own home. However, lack of familiarity and comfort with the required technologies pose a significant barrier to access to the elderly in using telemedicine. Second, health care providers themselves have identified particular areas in which vulnerable populations needs can be met. For example, leveraging telemedicine, MSI Reproductive Choices UK launched a service for early medical abortion care in early 2020 (Tyer, 2020).

Challenges to effective use of telemedicine have also been identified. In one study conducted in 2018, the Queen's Nursing Institute found that 85.1 percent of nurses had experienced poor connectivity when in a patient's home; 56.8 precent had been unable to access general practitioner electronic records; 20.8 percent had limited or no training in using telemedicine devices; 21.1 percent had used mobile devices that were not compatible with other software; and 32.7 percent had experienced uploading onto systems that did not communicate with each other leading to multiple data entries (The Queen's Nursing Institute, 2018).

Health System Financing

Financing for telemedicine services in the UK is currently in a state of flux, as the rapid rollout of telemedicine services during the pandemic brought to light previously unknown barriers to implementation. In response to this difficulty, NHSX produced the Who Pays for What (WPFW) proposal (2021), which describes the barriers to investment in digital technology for health and outlines proposed fixes for the near future. While the proposal calls for consolidation of national funding for transformational technologies into a single fund in 2021–2022, in the succeeding 2022–2023 period the WPFW proposal advocates moving away from central funding of frontline technologies, and giving ICSs increasing control over the resources to deliver their technology plans.

The WPFW proposal outlines the following as problems that need to be addressed: complex funding arrangements; payment, financial, and other policies that impede innovative technology investment; and lack of information and measurements for optimizing technology investment. In order to ameliorate these issues in the near term, a portal (Unified Tech Fund) has been established through which ICSs can bid for funding. For the 2021–2022 period, the goals of this consolidation include: improving timeliness, usefulness, and reliability of digital metrics; providing tools and case studies to help ICSs model and track benefits from technology investments; and reviewing national policies to support digital investments.

From the period 2022–2023 period onward, the WPFW emphasizes moving away from central funding. In this context, decentralized ICS funding will cover applications (e.g., electronic patient records) procurement, development and management; cloud services and data centers; core kit and supplies–including laptops, printers, telecoms, and networks; local cybersecurity measures; IT program management; training; IT service management; and system transformation (e.g., shared care records). National funding will cover national products (e.g., the NHS app); national infrastructure; pilots linked to NHS Long-Term Plan commitments in advance of national scaling; and technological resources that are needed across multiple ICS areas (e.g., Office 365).

To enable this funding transformation over the next four years, the WPFW framework plans to shift the center's role to supporting investment, setting standards, delivering national products, and assuring and approving local spending. Before the beginning of each financial year, ICSs will be notified how much revenue and technology capital funding they have been allocated and how much they may obtain from national sources. ICSs will decide on how to allocate technology investment funding to their constituent organizations. The WPFW also mandates that all technology investments meet required interoperability and cybersecurity standards.

This shift in funding arrangements for technology investment will also coincide with a change in payment policies for medical services designed to encourage system-wide evaluation, coordination of proposed digital projects, and cross-organization sharing of benefits. Specifically, by adopting "blended" payments for service providers, health care providers' income will no longer depend on performing a defined set of nationally priced activities. Over the next several years the tariff system will move from the COVID-19 block contracts toward the NHS Long Term Plan (2019) vision of blended payments, increasing the scope for local digital innovation. Block contracts–adopted to make sure that costs were fully covered during the COVID-19 pandemic–represent a highly centralized form of health system financing. NHS providers received block contract payments from commissioners,[1] but where this was insufficient to cover a provider's underlying cost base, additional top-up payments are made (NHS, 2020). The change to blended payments will increase scope for local digital innovation as it removes the disincentive in acute providers being paid only for a defined set of nationally priced activities that did not include new technologies.

Health Workforce

One attestation of health care providers on using telemedicine comes from a study on the use of telemedicine in combatting Creutzfeldt-Jakob Disease (CJD) in the UK. CJD is a human prion disease that is transmissible, progressive, and rapidly fatal—typically within a matter of months. Ongoing clinical surveillance of CJD is imperative due to concerns of secondary transmission through blood products, surgery, and occupational risk (Watson et al., 2021) and the National CJD Research and Surveillance Unit (NCJDRSU) converted to telehealth-based surveillance in March 2020. Fifty-nine cases were assessed for suspected CJD in the remainder of 2020. Feedback was obtained from the NCJDRSU on the effectiveness of the telehealth surveillance system during this time. Overall, NCJDRSU clinicians reported positive experiences; health care providers noted that telemedicine enabled rapidity of diagnosis, reduction in travel time for face-to-face interviews, and the availability of high-quality video conferencing. Furthermore, clinicians spoke favorably of telemedicine's enabling of flexibility over

[1] NHS commissioners pay for health care on behalf of patients who cannot do so themselves and on the state's behalf (Sheaff et al., 2015).

interview times and the opportunity to interview family members outside the UK, sometimes in different time zones. However, some disadvantages were also noted by clinicians—challenges surrounding remote working, limited contact with other NCJDRSU team members, and challenges in ongoing communication with members of referring teams were all downsides of using telemedicine noted by NCJDRSU clinicians surveyed (Watson et al., 2021).

Medical Products, Vaccines, and Technologies

Guidance for clinicians on procuring and operating video consultation technology was produced by the NHS and was updated as recently as May 29, 2022. Recommendations include procuring digital solutions through the digital care services framework or the dynamic purchasing system via the National Commercial and Procurement Hub. Both of these are centralized procurement systems that support health care providers and social care organizations in buying assured digital tools and systems approved for use by the NHS (NHS Digital, 2022; NHS England, 2022). Where these solutions are not available, the NHS recommends using free video conferencing tools such as Skype, WhatsApp, or Facetime, but emphasizes that these measures should be temporary (Dyson, 2022).

The NHS is also considering incentive-based approaches to encourage both uptake of established technologies and emerging innovations by NHS providers (NHS Transformation Directorate, 2021). One way in which the British health care system has leveraged technologies in telemedicine is through IoT[2] applications, several of which have been proposed to address COVID-19 challenges. These applications offer several advantages, including real-time information related to any emergency, workload reduction, and rapid screening. However, IoT interventions are also vulnerable to issues such as data security, network integration, poor internet connections, and power failure (Fagroud et al., 2021).

Telemedicine is also used to manage chronic illnesses in the UK. One set of examples is the mHealth in supporting patients with severe mental illness (SMI), which are increasingly being developed, implemented, and evaluated across the UK to assess, monitor, and reduce functioning difficulties in people suffering from SMI. Preliminary findings have suggested that mHealth technology can support recovery in those with SMI through a combination of augmentation an intervention, simplifying assessment, and increasing monitoring frequency (Jameel et al., 2022).

The use of mHealth is not confined to patients suffering from SMI. One such mHealth solution named Flo began simply as a tool to produce reminders to patients (e.g., to take medication) and to collect self-reported information (e.g., vital signs) which is then shared with their physicians. Developed in England by the NHS, this application has been widely used in the management of chronic hypertension by NHS England (NHS Networks, 2013).

Health Information Systems

Leading up to the COVID-19 pandemic, all four UK countries published strategies that committed to strengthen health care information technology (HIT), which together commit to transitioning to digital care (Sheikh et al., 2021). Wales published its "Informed Health and Care—A Digital Health and Social Care Strategy for Wales" in 2015 (Welsh Government, 2015); Northern Ireland published its "eHealth

[2] IoT describes physical objects with sensors, processing ability, and software that connect and exchange data with other devices and systems through the internet or other communication networks (Ashfaq et al., 2022; Gillis, n.d.).

and Care Strategy" (2016) and is investing in a single digital health record known as ENCOMPASS, with the goal of full implementation by 2025 (Sheikh et al., 2021). Scotland published its "Digital Health and Care Strategy: Enabling, Connecting and Empowering" (2018), which announced plans to consolidate all Scottish IT systems into a national platform ("NHS Scotland to Move to Single Health Care Digital System," 2018). In England, the Department of Health & Social Care published "The Future of Health care: Our Vision for Digital, Data and Technology in Health and Care" in 2018.

While each of the individual nations' plans are important documents, perhaps the most significant document outlining the NHS plan for uptake of telemedicine is the "NHS Long-Term Plan" (2019). This document calls for the further development of the NHS app,3 which should empower patients by enabling easy access to personalized content and digital tools and services. This health information system enables patients to follow a simple triage online to help them manage their own health needs or direct them to the appropriate service. If necessary, they may connect with local services, get an appointment with an urgent treatment center, out-of-hours services or general practitioner, or be prescribed medicine. Increasingly, automated systems will make these services more efficient, but in-person services will be retained as a built-in redundancy and to assist those who need help navigating the system. By 2024, the NHS Long-Term Plan sets the goal of every patient being able to access a general practitioner digitally and opt for teleconsultation where appropriate. Additionally, the plan also sets a goal of every patient with a long-term condition having access to their health record via the NHS app by 2020. Furthermore, the plan also looks at how health information systems may support health care providers, setting a goal of all staff having access to mobile digital services—including the patient's care record and plan—by 2022. All NHS Long-Term Plan milestones for digital technology are outlined in Figure 3.

[3] Originally released in 2018

Figure 3: NHS Milestones for Digital Technology

- During 2019 we will introduce controls to ensure new systems purchased by the NHS comply with agreed standards, including those set out in The Future of Health Care.
- By 2020, five geographies will deliver a longitudinal health and care record platform linking NHS and local authority organizations; three additional areas will follow in 2021.
- In 2020/21, people will have access to their care plan and communications from their care professionals via the NHS App; the care plan will move to the individual's Local Health and Care Record (LHCR) across the country over the next five years.
- By summer 2021, 100 percent compliance with mandated cyber security standards across all NHS organizations in the health and care system.
- In 2021/22, systems that support population health management in ICS across England, with a Chief Clinical Information Officer or Chief Information Officer on the board of every local NHS organization.
- By 2022/23, the Child Protection Information System will be extended to cover all health care settings, including general practices.
- By 2023/24 every patient in England will be able to access digital first-primary care
- By 2024, secondary-care providers in England, including acute, community and mental health care settings, will be fully digitized, including clinical and operational processes across all settings, locations and departments. Data will be captured, stored and transmitted electronically, supported by robust IT infrastructure and cyber security, and LHCRs will cover the whole country.

(NHS, 2019*)*

In addition to the NHS Long-Term Plan, the WGLL framework outlines the need for data security under its "safe practice" measure of success. The framework asks health care providers to fully utilize national cyber services provided by NHS Digital (NHS Digital, n.d.-b), establish a process for managing cyber risk with a cyber improvement strategy, invest, and progress reviews at the board level and to comply with the requirements of the Data Security and Protection Toolkit (NHS Digital, n.d.-a; National Cyber Security Centre, n.d.; NHS, 2021).

Takeaways

- In the UK, telemedicine has been used for population-level health monitoring, in addition to doctor-doctor/doctor-patient consultation. For example, the NCJDRSU, which monitors CJD, has adopted telemedicine as its primary means of monitoring outbreaks of this infectious disease throughout the country. Initial results have shown that telemonitoring has proven highly effective with a high level of satisfaction among both practitioners and patients.
- The NHS has been highly effective at disseminating guidance on telemedicine. Guidance related to the adoption of, transition to, and use of telemedicine was widely distributed to health care providers across the UK in response to the COVID-19 pandemic and has helped to familiarize health care providers with the rules and regulations surrounding the use of telemedicine, as well as make them more comfortable with operating telemedicine solutions in their practice.
- Historically, the UK's complex funding arrangements have discouraged investment in new technologies. To address this issue, the UK is adopting a decentralized approach by allocating funds

from the central level to ICSs to invest according to their technology plans.

UNITED STATES

Background information	
Population size	337,341,954 (2022 est.)
Population density	36 people per square kilometer (2020)
Real GDP per capita	$60,200 (2020 est.)
EU member country	No
Physician density	2.61 physicians/1,000 population (2018)
Hospital bed density	2.9 beds/1,000 population (2017)

Sources: The World Factbook; The World Bank.

Leadership and Governance

Telemedicine policy in the United States primarily centers around health care reimbursement, with regulation occurring at the Federal or state levels of government. Major Federal health care programs include Medicare and the Veteran's health Administration (VHA) of the US Department of Veterans Affairs (VA). Medicare is a health insurance program administered by the US Department of Health and Human Services (HHS), Centers for Medicare and Medicaid Services (CMS). Medicare serves 61.5 million people who are over age 65 or are younger and live with certain disabilities or illnesses (CMS, HHS). The VHA serves 9 million enrolled veterans each year and is the country's largest integrated health system (VA).

In addition to administering and setting reimbursement policies for programs such as Medicare and the VHA, the Federal government enforces federal patient privacy laws and prescribing laws for controlled substances (Center for Connected Health Policy 2022, KFF 2020). The Federal government also regulates mHealth apps that can be classified as medical devices and sets accessibility requirements under the Americans with Disabilities Act for remote interpreting in telemedicine video communications (ADA.gov, telehealth resource centers).

At the state level, state governments regulate health care reimbursement for Medicaid and private insurance plans. Additionally, state medical boards oversee the licensure process authorizing health professionals to practice medicine (Center for Connected Health Policy). Medicaid is an assistance program that provides health insurance for certain individuals with low income, including some Medicare beneficiaries (CMS 2022). It is funded jointly by the Federal government and states, with each state running their own program under broad requirements set by Federal law (HHS). Among individuals in the United States. under age 65, 21 percent are covered by Medicaid (CDC 2022). Sixty-four percent of people under age 65 are covered by private health-insurance plans, and there are about 1,000 health insurers nationally (National Association of insurance Commissioners 2020, National Health Statistics Reports 2022).

In the US, the COVID-19 pandemic caused an increased interest in and demand for telemedicine, and several regulations were modified or added at the Federal and state levels of government to make it easier to provide and receive telemedicine (Koorin et al., 2020, Samson et al., 2021). Some changes are temporary and will cease at the end of the COVID-19 public health emergency (PHE); other changes are permanent and will continue (Center for Connected Health Policy, HHS). The following are a few examples.

Prior to the PHE declaration, Medicare reimbursed only a limited number of practitioners, such as physicians or psychologists, for providing audio-video teleconsultation services to Medicare beneficiaries. Additionally, beneficiaries had to be an existing patient of the practitioner's, live in a rural geographic area, and be physically located at a clinic, hospital, or other health care setting during the teleconsultation (HHS, Koma et al., 2021, Koma et al., 2022, Weigel et al., 2020). During the PHE, any provider already eligible to bill Medicare for services, as well as certain health clinics serving medically underserved populations, can offer teleconsultations. Beneficiaries may be new or existing patients and live in urban or rural areas; they may also participate in audio-visual teleconsultations their own homes. In addition to these flexibilities, Medicare is covering more types of telemedicine services during the PHE. For example, teleconsultations for emergency department visits, physical and occupational therapy, and hospice care; and remote patient monitoring of patients with acute conditions. Certain services provided via audio-only telephone are also allowable (HHS, Koma et al., 2021, Koma et al., 2022, Weigel et al., 2020, USDA).

While nearly all of the Medicare flexibilities described above will expire after the PHE, one permanent change relates to behavioral health care. Medicare patients can now receive mental health and substance use services in their home if certain conditions are met. Patients that do not live in rural areas are also entitled to this service, and audio-only can now be used in addition to live video (HHS). Some additional examples of temporary and permanent changes as a result of the COVID-19 PHE are described below.

Temporary:

- The HHS Office for Civil Rights issued a Notification of Enforcement Discretion enabling covered health care providers to use everyday video- and text-based communication technologies for the good faith provision of telehealth. As long as the app is not public facing (e.g., Zoom or WhatsApp versus Facebook Live or Twitch), providers are not subject to penalties for privacy breaches that would otherwise be applicable under US Health Insurance Portability and Accountability Act of 1996 rules (HHS).

- The US Drug Enforcement Agency waved requirements under the 2008 Ryan Haight Act that a provider conduct an in-person medical evaluation before prescribing a patient a controlled substance via telemedicine. Additionally, authorized providers can prescribe buprenorphine to new or existing patients for the treatment of opioid use disorder based on a teleconsultation (HHS, Wang et al., 2021).

Permanent:

- The VHA rapidly expanded telemedicine as part of its response to the pandemic. Between March and April 2020, the number of weekly home-based live video encounters rose from under 10,000 to nearly 87,000, and weekly home-based phone encounters rose from 327,000 to over 895,000 (Heyworth et al., 2020). This expansion was possible in part because of a 2018 Federal rule change allowing VHA health care providers to deliver telemedicine services regardless of where in the country the provider or patient is located (VA).

- Many state Medicaid programs have expanded the number of services eligible to be delivered using telemedicine and types of providers eligible to deliver these services. Additionally, programs are increasingly allowing audio-only teleconsultations (Center for Connected Health Policy, 2022).

A central source of information on Federal telemedicine policy is the HHS website (telehealth.HHS.gov). HRSA funds the Center for Connected Health Policy Telehealth Policy Finder, an online database of state and Federal telehealth-related laws and regulations (Center for Connected Health Policy). In

addition, the Federation of State Medical Boards provides up-to-date information on licensing policies related to telemedicine in each state (Federation of State Medical Boards, 2022).

Service Delivery

Systematic reviews show that telemedicine can improve health, utilization, and cost outcomes for chronic conditions such as heart failure, diabetes, depression, obesity, asthma, and mental-health conditions (Agency for Healthcare Research and Quality, 2020). Effective use cases include remote patient monitoring and case management for patients with chronic health conditions, and psychotherapy as part of behavioral health treatment (Agency for Healthcare Research and Quality 2016). Telemedicine can also increase the accessibility and quality of health care for people living in rural areas. The HRSA Rural Health Information Hub maintains a database of health projects that have been undertaken by rural US communities and shown to be effective or promising models of care (Rural Health Information Hub). Examples include around-the-clock monitoring of patients in intensive care units, providing acute stroke care in emergency departments and hospitals, performing evaluations of older adults living in long-term care facilities, linking patients with high-risk pregnancies to specialty obstetrics, increasing access to pediatric care through school-based telehealth, enhancing palliative care for patients with advanced cancer, connecting survivors of domestic violence and sexual assault to psychotherapy, and delivering HIV/AIDS specialty care and preventive services (Rural Health Information Hub, Zachrison et al., 2021, Zhang et al., 2018).

In addition to some of the examples above, as the country's largest integrated health system, the VHA provides a salient case study of how telemedicine services can be delivered in any geographic setting. The three primary telemedicine modalities that are used by the VHA are clinical video telehealth (CVT), home telehealth (HT), and store-and-forward telehealth (VA 2020). CVT encompasses real-time videoconferencing between VHA medical centers and community-based outpatient clinics, and replicates patient-to-provider and provider-to-provider in-person consultations (Darkins, n.d.) HT is used for managing acute and chronic health conditions, as well for health promotion and disease prevention (Darkins, n.d.)HT technologies include remote patient monitoring, real-time videoconferencing, and secure messaging (VA.gov). Store-and-forward Telehealth is used by the VHA for asynchronously acquiring and storing clinical information (images, sounds, and video) for later clinical evaluation by a provider at another location (VA.gov).

To ensure that all patients can access telemedicine services, the VHA provides several options for patients who do not have internet access or a connected device (VA.gov). A social worker can meet with patients to determine their eligibility for subsidized internet services or technology, and the VHA can also lend patients an internet-connected tablet (VA 2021). Participating cellular plans also limit charging patients for data usage during real-time videoconferencing (VA.gov). Another service offered to increase the accessibility of VHA services is accessing telehealth through local area stations in, in which the VHA works with several organizations to offer convenient, private spaces that are equipped with videoconferencing technology (VA.gov).

The VHA is not the only example of organizations working together to provide telemedicine services in convenient locations for patients. Projects to expand medications for addiction treatment to people with opioid use disorder have developed mobile and pop-up clinic models (Bureau of Justice Assistance). For example, recreational vehicles are outfitted with telemedicine technology as well as a waiting area, counseling room, nurses' station or exam room, where nurses, counselors, and peer specialist can connect patients with addiction medicine experts via audio-visual teleconsultation. Alternately,

equipment can be packed in a travel suitcase and teleconsultations conducted within a designated room at community partner sites. The mobile and pop-up clinics follow a reoccurring schedule, so patients know in advance what days and times the clinic will be present. Similar approaches for providing health care and support services via teleconsultations to people experiencing homelessness have been used at shelters, encampments, supportive housing programs, and other housing and service programs (HUD).

Health System Financing

Though US venture capital investment in digital health is a thriving, multibillion-dollar industry (Bestsennyy et al., 2021), the Federal government is a crucial source of financing for telemedicine—particularly as it relates to addressing disparities in health and access to care. The US Congress' obligation of funds for grants and contracts on Federal agencies—in addition to the spillover effects that Medicare reimbursement policies have on the broader health system—are important drivers of health service and infrastructure modernization. The subsequent paragraphs discuss examples of relevant grants and contracts administered by the Federal Communication Commission (FCC), Health Resources and Services Administration (HRSA), and the US Department of Agriculture (USDA).

Established by the FCC in 1997, the Rural Health Care Program (RHCP) supports non-profit and public health care providers in obtaining telecommunications and broadband services. The program funds high-capacity broadband connectivity and encourages the formation of state and regional broadband health care provider networks. The program also subsidizes the difference between urban and rural rates for telecommunications services. In addition to RHCP, the FCC's COVID-19 Telehealth Program supports hundreds of eligible health care providers in modifying service delivery during the PHE (Universal Service Administrative Co., 2022). Grant dollars have been used to purchase telecommunications services, information services, and devices to provide connected care. A third FCC program, the Connected Care Pilot Program, has helped cover costs associated with providing connected care services (FCC, 2022).

HRSA's Office for the Advancement of Telehealth administers eight telemedicine grant programs (Health Resources and Services Administration, HHS). Two examples are the Telehealth Network and Licensure Portability Grant Programs. The Telehealth Network Grant Program funds telemedicine networks to improve services for medically underserved people. These networks consist of organizations such as community health centers, health departments, hospitals and emergency health care providers, social service agencies, long-term care providers, outpatient mental-health providers, dental clinics, and higher-education institutions (Rural Health Information Hub). The current cohort of grantees are networks delivering 24-hour emergency department consultation services for rural providers without emergency care specialists (National Center for Biotechnology Information, NIH).

The Licensure Portability Grant Program funds partnerships of licensing boards in various states to develop and implement policies that reduce statutory and regulatory barriers to telemedicine. The program supports multistate collaborations that enable licensed health care professionals to practice telemedicine across states (Rural Health Information Hub). So far, grants have been awarded to the Association of State and Provincial Psychology Board, which manages the Psychology Interjurisdictional Compact and has 12 participating states; the Federation of State Medical Boards of the United States, which manages the Interstate Medical Licensure Compact and has 29 participating states and the District of Columbia and Guam; and the National Council of State Boards of Nursing, which manages the Nurse Licensure Compact and has 31 participating states (Congressional Research Service 2020).

The USDA's Distance Learning and Telemedicine Grants have been awarded annually since 2010 (U.S. Department of Agriculture). During the most recent 2021 funding cycle, $57 million was distributed to rural communities for purchasing technology and training to connect educational and medical professionals with students, teachers, and patients in rural areas. Grant recipients include local and tribal governments, nonprofit organizations, for-profit businesses, and consortiums providing education or health care services via telecommunications (USDA, 2021).

Up-to-date lists of funding opportunities for telemedicine and related broadband programs are available on Telehealth.HHS.gov and HRSA's Rural Health Information Hub (HHS, Rural Health Information Hub). The Federal Telehealth Compendium also provides a detailed list of Federal telemedicine activities predating the COVID-19 PHE (Office of the National Coordinator for Health Information Technology Federal Office of Rural Health Policy - Health Resources and Services Administration 2016). A noteworthy non-governmental source of funding is the Patient-Centered Outcomes Research Institute, a non-governmental organization that was created by Congress as part of the Patient Protection and Affordable Care Act of 2010. To date, the organization has spent more than $381 million funding 119 comparative clinical effectiveness research studies that answer questions about how well telehealth works for different populations under various circumstances. At least 33 of these studies focus on mental and behavioral health (Patient-Centered Outcomes Research Institute, Prina 2021 Weinstein et al. 2021).

Health Workforce

Telemedicine is inherently complex, and health systems, hospitals, and group practices seeking to implement or expand strategies often face multiple, competing considerations (e.g., cost, revenue generation, technology customization and integration, quality outcomes, and patient and provider satisfaction). HRSA's National Consortium of Telehealth Resource Centers is an important source of telemedicine information. The Consortium consists of two national centers and 12 regional centers that offer free technical assistance, education, and resources for health care practices and organizations (National Consortium of Telehealth Resource Centers). Additionally, other stakeholders across different service settings and specialties have created toolkits for health administrators, IT, and frontline staff navigating the process of identifying, implementing, and evaluating telemedicine strategies. Selected examples are below.

- *Telemedicine: Ensuring Safe, Equitable, Person-Centered Virtual Care.* Describes a framework for providing safe, equitable, person-centered telemedicine. Focuses on issues related to access, privacy, diagnostic accuracy, communication, psychological and emotional safety, and human factors and system design (Perry et al., 2021).

- *Enhancing Your Webside Manner: Optimizing Opportunities for Relationship-Centered Care in Virtual Visits.* Reviews existing research on forming patient relationships during teleconsultations and presents a communication model and strategies that can be used for providing virtual care (Modic et al., 2021).

- *A Toolkit for Building and Growing a Sustainable Telehealth Program in Your Practice.* Discusses key considerations for family medicine practices who are looking to develop and implement a telehealth strategy (American Academy of Family Physicians).

- *Rural Telehealth Toolkit.* Compiles evidence-based and promising models and resources to support rural community health programs with developing, implementing, evaluating, and sustaining a telehealth program (Rural Health Information Hub).

- *Toolkit for Telehealth Provision for the Indian Health Service.* Provides guidance for Indian Health Service facilities seeking to implement or expand telehealth services to improve access to ambulatory care services. Organized around an eight-step sequential framework (HHS, Indian Health Service, 2020).
- *Critical Access Hospital Telehealth Guide.* Supports individuals and organizations with practical information for implementing or expanding telehealth services in critical access hospitals. Topics include quality improvement, care coordination, workflows and documentation, and legal and risk management considerations (HHS, Indian Health Service 2020).
- *Telehealth for the Treatment of Serious Mental Illness and Substance Use Disorders.* Reviews ways that telemedicine can be used to provide treatment for serious mental illness and substance use disorders among adults and provides practice recommendations and examples (HHS, Indian Health Service 2020).

Technical staff work with technology vendors to manage their telemedicine system (HHS, Indian Health Service 2020, National Rural Health Resource Center 2022). These staff might handle the deployment and maintenance of telemedicine hardware, software, and equipment; support any technology customization or integration efforts; address technical issues by coordinating with vendors and internal clinical, IT, and administrative departments; and provide ongoing user support and training (California Telehealth Resource Center 2022, Substance Abuse and Mental Health Services Administration 2021).

Medical Products, Vaccines, and Technologies

Historically, audio-video teleconsultation has been the most frequent application of telemedicine. Uses in addition to traditional patient-to-provider and provider-to-provider teleconsultations include emergency room and intensive care unit remote monitoring programs, language translation services, and continuing education programs for health care professionals (National Consortium of Telehealth Research Centers 2020). Common uses of asynchronous technology in the US include radiology, pathology, dermatology, and ophthalmology (California Telehealth Research Center 2022). For example, in ophthalmology, retinal digital cameras can be used in non-ophthalmic settings to conduct eye screenings for diabetic retinopathy, and the digital images can then be transmitted to a specialist for review (Upper Midwest Telehealth Resource Center 2020). Additionally, remote patient monitoring programs can collect a variety of patient information including body temperature, pulse, respiration rate, blood pressure, blood oxygen levels, blood sugar, electrocardiograms, and weight (Center for Connected Health Policy). mHealth is a relatively new technology. Typically, an application software (app) is downloaded onto a device and might provide messages to promote healthy behavior or alerts (Center for Connected Health Policy).

Health Information Systems

In the US, the rapid adoption of telemedicine and remote work during the PHE has increased the digital footprint of health care organizations and their vulnerability to cybersecurity threats. Industry experts report that targeted attacks and mentions of health care and telemedicine companies on the dark web have proliferated during this time, putting patients' sensitive health information at risk (Perez et al. 2012). In 2021 alone, 50 million people in the US were affected by health data breaches, a threefold increase from three years earlier (Center for Connected Health Policy).

The Federal government regulates aspects of telemedicine data and security. This includes devices that capture patient physiologic data; storage of information related to a telemedicine encounter; and

technology used to establish a connection and view or exchange information (Center for Connected Health Policy). As mentioned earlier, HHS eased restrictions on the use of everyday communication technologies for teleconsultations during the PHE. However, due to data security concerns, stakeholders have advocated that full enforcement of patient privacy protections be reinstated (Darkow.com 2020). Several industry stakeholders also lead the development of guidance documents and toolkits to help ensure cybersecurity best practices and monitoring.

The Health Care and Public Health Sector Coordinating Council (HSCC), a public-private partnership between the Federal government and a coalition of health care entities, releases resource materials for health systems, vendors, and providers that use electronic health records, health information exchanges, and telemedicine products. In 2021, the Council published Health Industry Cybersecurity – Securing Telehealth and Telemedicine, which addresses topics including why telemedicine is a target of cyberattacks, major types of attacks against telemedicine systems; cybersecurity considerations and risks; Federal and state regulations; as well as organizational best practices and audit tools (Leonard 2022). Additional guidance documents include the Medical Device and Health IT Joint Security Plan, which provides device manufacturers and vendors with a framework and recommendations for medical device security; Medical Device Cybersecurity Regional Incident Preparedness and Response Playbook, which provides guidance for health delivery organizations on planning for and responding to medical device-related cybersecurity incidents; and the Securing Telehealth Remote Patient Monitoring Ecosystem, which demonstrates how organizations can implement privacy and cybersecurity solutions for remote patient monitoring systems (Healthcare & Public Health Sector Coordinating Councils 2021, Taskforce on Telehealth Policy 2020).

Hospitals participating in a quality payment program created by the Federal government are required to perform reoccurring security risk analyses to ensure they meet HIPPA privacy standards (Health care & Public Health Sector Coordinating Councils 2019). The program promotes meaningful use of EHR technology by rewarding eligible hospitals that use EHRs certified for promoting interoperability. Certified EHRs must be able to collect and share with other EHRs important patient medical record data, such as demographic, medication, and allergy information, as well as clinical notes and other details. These are known as US Core Data for Interoperability (USCDI). To adapt with changes in clinical technology and information, the Federal government plans to expand the USCDI list annually, and this may include certain telemedicine data (MITRE Corporation 2018, National Institute of Standards and Technology 2022). USCDI information and an up-to-date list of certified health IT products are available at the Federal government's HealthIT.gov website (HHS 2016, PEW 2021).

Many certified EHRs integrate with third-party video conferencing solutions or have created their own video solution that is embedded within the EHR. A teleconsultation platform embedded within the EHR is ideal for multiple reasons. It can improve clinical workflows when providers do not have to download separate software, access a third-party application, or switch between multiple platforms and devices during the teleconsultation. When a computer or mobile device has an integrated camera, providers are able to video conference with the patient while also accessing their medical records and test results, sending messages or referrals, and completing scheduling, billing, and other documentation tasks. Some products can notify the provider when a patient enters the virtual waiting room, offer built-in voice recognition and transcription technology so staff can dictate notes, and enable other care team members or medical interpreters to join the visit (Office of the National Coordinator for Health Information Technology). Integrated solutions can also more accurately capture clinical visit time data, which is important for billing and optimizing operational workflows (HealthIT.gov). Similarly, for patients,

an EHR integrated teleconsultation can be a more streamlined experience where they may not need to create a separate account or download an app (HealthIT.gov).

Takeaways

- The COVID-19 pandemic caused a historic increase in and demand for telemedicine, and the United States has enacted several permanent and temporary policy measures to make it easier to provide and receive these services.
- Government funding for telemedicine and related connectivity infrastructure is crucial to ensuring equitable access to health care, especially for rural and medically underserved populations.
- There are several workable options for delivering telemedicine services to patients that do not have internet access or a connected device.
- Telemedicine, including remote patient monitoring, can improve health, utilization, and cost outcomes for chronic conditions such as heart failure, diabetes, depression, obesity, asthma and mental health conditions.
- Telemedicine resource centers and education toolkits provided at no-cost to individuals and organizations can help support decision-making related to telemedicine service selection, implementation, evaluation, and sustainability.

LITHUANIA

Background information	
Population size	2,683,546 (2022 est.)
Population density	45 people per square kilometer (2020)
Real GDP per capita	$36,700 (2020 est.)
EU member country	Yes
Physician density	5.08 physicians/1,000 population (2020)
Hospital bed density	6.4 beds/1,000 population (2018)

Sources: The World Factbook; The World Bank.

Leadership and Governance

Like many post-Soviet countries, Lithuania inherited a centralized health care system characterized by inefficient resource allocation and management (Jakušovaitė et al., 2005). Since restoring its independence in 1990, the country gradually began to decentralize its health care system. Today, councils and municipalities are responsible for provision of primary and secondary health care, while tertiary care falls under the government level and is provided by specialized university hospitals (Meižis, 2013).

The MOH is responsible for managing the entire health care system in Lithuania. It is involved in drafting the legislation and issuing regulations for the health sector, as well as developing health care infrastructure (Liveri et al., 2015). The National Health Insurance Fund (NHIF) under the MOH is responsible for health care services financing (Meižis, 2013). In the early 2000s, the MOH established an eHealth Development Coordination Board. The Board is tasked with preparation and implementation of the national eHealth strategies and assessments of the compatibility of all eHealth-related projects with the eHealth strategy (Kiskiene et al., 2010). It consists of MOH officials, representatives of Lithuanian health care institutions, and members of research organizations (Kaldoudi, 2016).

There are no specific laws that regulate provision of eHealth services in Lithuania; however, the Ministry of Health has adopted several eHealth strategies since the mid-2000s (Kirklytė and Žigutė, 2020). In 2007, the MOH approved the "Strategy of Lithuanian eHealth development for the years 2007–2015" (Kiskiene et al., 2010). The main objectives of the document were to create an effective eHealth system and to ensure quality and accessibility of eHealth services (Liveri et al., 2015). The strategy was divided into three phases: the infrastructure of the National Electronic Health System was supposed to be established by 2011; the majority of the health care institutions were expected to start using the EHR system and receive access to the National Electronic Health System client services between 2011 and 2014; and by 2016, the universal use of eHealth information tools by patients, general practitioners, primary health care institutions, and hospitals was envisioned (Kiskiene et al., 2010).

In 2009, the MOH adopted the "eHealth System Development Program for 2009–2015." The document aimed to provide a uniform and convenient access to eHealth services to the population; facilitate cooperation between health specialists and institutions; and reduce the costs of eHealth solutions implementation and operation, as well as risks of the implementation failures and incompatibility (Kiskiene et al., 2010).

The most recent national strategy is "eHealth System Development Program for 2017-2025." It was approved in 2017 with a goal to ensure that all health care facilities participate in the development of the eHealth system (European Commission, 2019). The document also introduced a plan to develop provider-to-patient telemedicine services in 2020–a considerable change, given that initially telemedicine was used only for provider-to-provider interactions (Cravo Oliveira Hashiguchi, 2020). The MOH adopted the Action plan for the strategy in 2018.

In the beginning of the COVID-19 pandemic, the Prime Minister's Office initiated changes to legislation to introduce remote consultations (Liseckiene et al., 2021). These changes were led by the MOH in collaboration with other ministries, including the Ministry of Social Affairs and the Ministry of Education, as well as municipalities (Liseckiene et al., 2021). Such multilevel and multistakeholder approaches contributed to wide approval of the legislative changes. In addition, a national connection network between the MOH and the municipalities was established as a result of this cooperation (Liseckiene et al., 2021).

Service Delivery

In Lithuania, municipalities are important players in service delivery. They own many of the primary health centers and some hospitals in the country. Private providers are involved in the delivery of dental services and publicly financed specialist outpatient care (OECD/European Observatory on Health Systems and Policies, 2021). Private sector teleconsultation solutions have also been developed in Lithuania. For example, Fleming is an app that allows physicians to connect with patients via video consultation and provide symptom diagnoses (Tracxn, 2022). The solution is partially funded by the European Regional Development Fund (Fleming, n.d.).

Since the beginning of eHealth development in Lithuania, the use of telemedicine was allowed only for provider-to-provider interactions (Cravo Oliveira Hashiguchi, 2020). However, following the adoption of the eHealth System Development Program for 2017-2025 and as a response to COVID-19 pandemic, remote provider-to-patient consultations were introduced in March 2020 (Liseckiene et al., 2021). During the pandemic, all primary health care workers switched to remote consultations. Face-to-face consultations were possible only after being triaged through teleconsultation with a primary health care

provider (Liseckiene et al., 2021). During first 12 months of the pandemic, 56 percent of Lithuanians reported using teleconsultations (OECD/European Observatory on Health Systems and Policies, 2021).

Health System Financing

In 2022, health expenditure was seven percent of Lithuania's GDP (World Bank, 2022). Lithuania has a single payer health financing system; the National Health Insurance Fund (NHIF) purchases services for the insured population, intending to cover all residents. This includes covering services provided by private facilities that have contracts with the NHIF. The less than one percent of people who are not covered by the NHIF are likely not residents in the country. The NHIF provides free access to primary care, outpatient specialist care with referral, and inpatient care. Research on telemedicine in Lithuania indicates that NHIF coverage extends to teleconsulations; however, the MOH does not address telemedicine in its guidance on benefits under NHIF (Puteikis and Mameniškienė, 2021). All permanent residents have access to free emergency care, even if they are not insured (Murauskienė and Thomson, 2018).

The NHIF is funded by required payroll contributions, transfers from the national government to cover non-working populations, payments from self-employed workers, and other specific transfers from the national government. In 2019, 66 percent of health care was publicly financed, with the remainder funded by private sources. That year, the share of out-of-pocket spending (32%) was double the EU average, primarily due to spending for pharmaceuticals (OECD/European Observatory on Health Systems and Policies, 2021).

Lithuania uses both public and private funding to develop its eHealth infrastructure and digital solutions. Most government funding goes to providing hardware and software products for telemedicine projects applying for the EU Technical Support Instrument, the successor of the EU Structural Reform Support Program (Mountford et al., 2016; European Commission, 2022). The Technical Support Instrument provides technical expertise for all EU Member States to design and implement reforms. As of 2016, the government of Lithuania required that providers who received funding under this mechanism were required to contribute at least two percent of their annual income to the NHIF to fund development and maintenance of eHealth (Kiskiene et al., 2010). In 2022, the EU Commission continued its history of funding Lithuania's eHealth system development by adopting a new project entitled "Leveraging digital skills to transform health and care systems" (European Commission, 2022). International programs and projects, local authorities, and private investors also contribute to eHealth funding (Kiskiene et al., 2010).

Health Workforce

Lithuania has the fifth highest number of physicians per capita in the EU, at 4.6 doctors per 1,000 population, compared to the EU average of 3.9 (OECD/European Observatory on Health Systems and Policies, 2021). At same time, the country is experiencing a shortage in number of nurses, at 7.7 nurses per 1,000 population, while the EU average is 8.4 (OECD/European Observatory on Health Systems and Policies, 2021). The aim of the National Health Strategy 2014-2025 of restoring the nurse to doctor ratio to 2:1 has yet to be achieved (OECD/European Observatory on Health Systems and Policies, 2021).

A countrywide survey conducted in 2011 showed that most Lithuanian health care institutions were planning to participate in the implementation of the National eHealth Service System (Vanagas, 2011). Respondents demonstrated interest in implementing eAdministration (77.9%), eReimbursement (47.1%)

and Institutional Electronic Patient Record (EPR) systems (47.1%) (Vanagas, 2011). The survey participants demonstrated a lower willingness to start implementing Telemedicine (13.2%) services, ePrescriptions (4.4%), a picture archiving and communication system (8.8%), and an eLaboratory (11.8%) (Vanagas, 2011). A recent study shows that Lithuania has the lowest rate of eHealth implementation by general practitioners in the EU (Ardielli, 2021). According to a 2021 study conducted by the researchers from Kaunas University of Technology, lack of digital training in medical schools, lack of competence in using technologies on both patient and provider ends, and insufficient managerial shift toward remote patient care have been identified as main obstacles to telehealth expansion (AAAS, 2021).

Lithuanian universities have established undergraduate and graduate programs to educate students in business, technical, and health care management aspects of the health care systems (Mountford et al., 2016). For example, Klaipeda University offers two relevant graduate programs – a Master of Electronic Information System Engineering that offers courses on Technical Information Systems Engineering in the context of eHealth, Biomedical and Health Informatics, and Data Analytics; and a Master of Management that offers courses on Health Care Management, including both Connected Health and Data Regulation system (Mountford et al., 2016). Literature on whether health workers in Lithuania need to complete any certification requirements prior to using telemedicine solutions was not available.

Medical Products, Vaccines, and Technologies

Lithuania has established programs in teledermatology and teleradiology (Cravo Oliveira Hashiguchi, 2020). For example, Dermtest is a private solution that allows physicians to send dermatological images to specialists who usually respond within days (Cravo Oliveira Hashiguchi, 2020). BalticRAD is a diagnostic teleradiology group that consists of radiologists from Vilnius and Kaunas University hospitals and Vilnius Oncology Institute who provide remote radiology reporting services in the following sub-specialties: oncology (including Response Evaluation Criteria in Solid Tumors reporting and magnetic resonance imaging staging); head and neck radiology; neuroradiology; pediatrics neuroradiology; neurocardiology; cardiovascular radiology; musculoskeletal radiology; thoracic radiology abdominal radiology; and mammography (BalticRAD, n.d.).

Additionally, the country has implemented a regional project that combines telemonitoring and interactive telemedicine to provide palliative care at home. Through this project, nurses travel to patients' homes, take blood tests, and measure blood pressure and saturation levels. The data are then digitally recorded and transmitted to physicians, who provide feedback (Cravo Oliveira Hashiguchi, 2020). Lastly, Lithuania participated in regional eHealth projects, including Baltic eHealth, R-Bay, and eHealth for regions. Although these projects were implemented in the 2000s, they provide a valuable example of how collaboration can be facilitated among EU countries to strengthen telemedicine implementation. Please consult Figure 4 below to learn more about eUltrasound and eRadiology pilots in the Baltic Sea region.

Health Information Systems

Historically, Lithuania has struggled with interoperability across health information systems; consequently, several information systems were developed and implemented by different providers (Kiskiene et al., 2010). In response to this issue, Lithuania developed a national database to manage health information called the Electronic Health Services and Cooperation Infrastructure Information System (ESPBI IS). This database consists of separate databases for patients' EHRs, medical devices, medical images, classifiers, ePrescriptions, and other relevant reports and data. In this way, data from

health providers' internal information systems are integrated into one central system. If a health provider does not have an internal information system, they can transfer patient data through a special eHealth portal developed for ESPBI IS. Patients can access this system through a national internet portal called E.sveikata (European Commission, 2019). As of March 2019, about 850 (out of 900) health care institutions were connected to ESPBI IS and had sent at least one document electronically to the central eHealth system. In addition, all pharmacies are connected to this system and can dispense medicines using ePrescriptions. As of April 2019, 91 percent of all reimbursed drugs were prescribed electronically (European Commission, 2019).

However, there are concerns that the use of ESPBI IS by both patients and providers is limited and should be improved to better tap into the benefits of this central platform (Kirklytė and Žigutė, 2020). Lithuania also has a State Information Resources Interoperability Platform, which is the main public interoperability platform created by the Information Society Development Committee. Patients who visit this website are redirected to the E.sveikata portal if they are looking for eHealth support (European Commission, 2019).

Lithuania has several laws regarding data exchange, access to and management of public information resources, and cybersecurity broadly. Lithuania adopted the Law on Legal Protection of Personal Data in 1996, which was last updated in 2018. In compliance with the European Union's GDPR, this law outlines procedure on personal data processing, the role of the State Data Protection Inspectorate and Inspector of Journalist Ethics, and the process to investigate data protection infringements. In the case of an infringement, the party at fault is subject to administrative fines from the State Data Protection Inspectorate and the Inspector of Journalist Ethics (European Commission, 2019).

Takeaways

- Lithuania has been able to access EU funding and exchange regional telemedicine experience by participating in multiple regional eHealth projects and applying for funding through the EU's Technical Support Instrument.
- In response to interoperability challenges, Lithuania has created a centralized eHealth database called the Electronic Health Services and Cooperation Infrastructure Information System (ESPBI IS). The ESPBI IS connects information systems from all health providers and facilitates health provider and patient access to eHealth materials.
- Health providers have expressed concern and reluctance to participate in the implementation of the National eHealth Service System in Lithuania. Lack of digital training in medical schools, lack of competence in using technologies, and insufficient managerial shift toward remote patient care have been identified as main obstacles to telehealth expansion.

Figure 4: Baltic eHealth case study: collaboration between regions facilitates telemedicine development

Baltic eHealth was a project between Danish, Swedish, Norwegian, Estonian, and Lithuanian telemedicine actors and hospitals (University of Southern Denmark, n.d.). The project took place from 2004 to 2007 and was spearheaded by MedCom, the government-funded organization responsible for the Danish health care network (Cisco, 2007). Its primary goal was to examine whether telemedicine can help ensure access to health care in rural areas of the Baltic Sea region and prevent migration from rural to urban areas (University of Southern Denmark, n.d.). The Baltic eHealth initiative was financially supported by the European Union under the BSR INTERREG IIIB program (Rasmussen and Voss, 2006).

To achieve its main objective, in 2005 the project created Baltic Health Network (BHN), a transnational network for eHealth that connected the following networks: the national networks of Denmark, Norway, and Sweden; and networks at the East-Tallinn Central Hospital in Estonia and Vilnius University Hospital Santariskiu Klinikos in Lithuania (Cisco, 2007). Once established and implemented, the BHN connected 200 hospitals and over 6,000 practitioners in participating countries, making it the first cross-national health care network in Europe (Cisco, 2007; eHealth Conference, 2007).

Two pilots were launched under the Baltic eHealth project:

eUltrasound. The National Center for Fetal Medicine in Trondheim, Norway, and Norrland's University Hospital in Västerbotten, Sweden (Rasmussen and Voss, 2006) piloted eUltrasound. The doctors from Sweden would send videos of an ultrasound for complex cases via secure email to their Norwegian counterparts, who in turn would respond with evaluation within two days. In especially complicated cases, the Norwegian specialists offered real-time support by live streaming the ultrasound and simultaneously providing guidance on the case via videoconference (Cisco, 2007). The eUltrasound trial deepened the Norwegian specialists' knowledge and expertise by providing them access to highly specialized cases. Simultaneously, the hospital in rural Sweden benefited from specialist advice (Cisco, 2007).

eRadiology. The second trial involved Funen Hospital in Denmark and the East-Tallinn Central Hospital and Vilnius University Hospital (Rasmussen and Voss, 2006). The goal was to create a system that would allow clinicians in Denmark to transmit images to Estonia and Lithuania over the BHN (Cisco, 2007). To achieve this goal, the project team used software they had developed in-house with streaming technology from Danish company Medical Insight. The server streamed images from both picture-archiving and communication systems and Radiology Information Systems in Denmark to Estonia and Lithuania (Cisco, 2007). Beyond technical requirements, several other challenges arose and had to be addressed by the team. For example, significant differences in reporting methodologies had to be resolved for the specialists to continue cooperation in an efficient manner. The team developed a structured reporting tool that would allow radiologists to select phrases they needed from the pull-down menus for automatic translation into the preferred language. Since the reporting tool was able to process about 95 percent of all cases, to cover the remaining reporting needs radiologists would write elements of a report in free-form text, in their native language. Then a dedicated team of multilingual medical assistants would translate the text (Cisco, 2007). As a result of the pilot, the backlog of X-rays awaiting radiology reports at the Funen Hospital in Denmark was significantly reduced. Additionally, after the trial, the Danish has signed a contract to purchase reports on X-ray images from the Estonians, independent of the Baltic eHealth Project (Cisco, 2007).

In August 2007, the Baltic eHealth project moved into a different phase with a new EU-funded initiative called R-Bay. The goal of the initiative was to corroborate the business case for eRadiology. More countries participated in the project, including Czech Republic, Denmark, Estonia, Finland, Lithuania, the Netherlands, and Norway (Cisco, 2007). The project ended in May 2009 (Rasmussen et al., 2010).

CROATIA

Background information	
Population size	4,188,853 (2022 est.)
Population density	72 people per square kilometer (2020)
Real GDP per capita	$26,500 (2020 est.)
EU member country	Yes
Physician density	3.47 physicians/1,000 population (2019)
Hospital bed density	5.5 beds/1,000 population (2017)

Sources: The World Factbook; The World Bank.

Leadership and Governance

Health care in Croatia is semi-devolved, but still somewhat centralized in comparison with Western European countries. Important actors in the realm of telemedicine include the MOH and the Croatian Health Insurance Fund (HZZO), a quasi-public body that administers the universal health care system. HZZO is the country's national health insurance fund and its primary source of health financing, providing coverage for 4.18 million people in 2019–virtually the entire population (HZZO, 2020). The digitization of Croatia's health care system began with the health care reform of 1993. In 1994, the government began designing an integrated health care system under the HZZO. The system called "e-Croatia" was launched at the beginning of the 21st century. The goals of the introduction of e-health were defined as improving the quality of health services for citizens while achieving significant financial savings (Osvaldić, 2021). The reform provided several organizational solutions to improve the efficiency of the system and improve the quality of health care delivery, such as the digitalization of primary health care, emergency care reform, and the introduction of national waiting lists.

In 2004, Croatia adopted an eHealth Action Plan aimed to implement the use of EHRs, implement e-health systems from the EU, and define interoperability and its objectives (Georgiev & Tzouni, 2020). In 2016, the HZZO and the MOH of the Republic of Croatia implemented a project titled "Preparing a practical basis for building the e-HZZO" system with the aim of better integrating cooperation with other state, interstate, regional, and local stakeholders. The project made efforts to connect all stakeholders within the health system for more efficient management and more effective supervision of telemedicine, especially in the management and monitoring financial resources. (Ministry of Health, 2016). Literature providing further details and evaluation of these efforts is unavailable.

Current eHealth Infrastructure in Croatia is subsumed under the HZZO. The HZZO has created a database that contains data on all insured persons, taxpayers, and health care institutions. The basic health information system of the Republic of Croatia is the Central Health Information System of Croatia (CEZIH), which is owned by the HZZO. The health information system's purpose is to support the functioning of health processes in public health, implement special health care programs, and connect all other health information systems that represent an entity for themselves, all to provide appropriate health care to citizens of Croatia (Osvaldić, 2021).

Service Delivery

Steps toward telemedicine development in Croatia were first made in the 1980s, when an ECG was recorded and sent to the Clinic for Cardiovascular Diseases in Zagreb. Significant progress toward service delivery was made only after the development of Integrated Services Digital Networks, as well as the establishment of the government agency Croatian Academic and Research Network (CARNet) in 1991. Integrated Services Digital Networks are sets of communication standards for simultaneous digital transmission of voice, video, and data over the digitalized circuits of public switched telephone networks (Bocker, 1988).

CARNet was founded with the express purpose of facilitating progress of individuals and society as a whole through the use of new information technologies (Hrvoje Mihalj et al., 2021). In 1993, a national telepathology[4] system with remote hospital centers was established in Zagreb; in 1995, a telemedicine program monitoring patients with diabetes was launched; in 1996, a telecommunication program for cardiac electrostimulation was piloted; in 1998, the national teleradiology and tele-neurosurgery programs were fully up and running (Hrvoje Mihalj et al., 2021).

In 2005 the Government established the Croatian Institute of Telemedicine, a state health institute responsible for regulating telemedicine nationally (Zorica, 2017). The Institute's goal was to coordinate the work of telemedicine centers and health care professionals who use telemedicine. As of 2017, telemedicine network in Croatia included 113 interconnected telemedicine centers (Zorica, 2017). In 2009, the Government replaced the Croatian Institute of Telemedicine with the Croatian Institute of Emergency Medicine, a public health institution responsible for emergency medicine and telemedicine activities in Croatia. Establishment of telemedicine centers began in 2009, and one of the first services that was provided was cardiology. The telemedicine centers were established in general practitioners' offices on Croatian islands and other remote areas without a cardiologist. The Croatian Institute of Emergency Medicine equipped the general practitioners' offices with Holter ECG devices and software. Patients receive a Holter device at their general practitioner's office and wear it for one day. When they return the device to the general practitioner's office, the physician sends the digital data from Holter to a cardiologist in a different location. On average patients receive the results within three business days. Using telemedicine on this case has proven to save patients' time and money, as they did not have to travel far to see the cardiologist but could instead go to the general practitioner's office in their community (Zorica, 2017). Today various Croatian health specialists use telemedicine, including dermatologists, cardiologists, radiologists, neurologists, nephrologists, and gastroenterologists (Zorica, 2017). Table 3 provides data on number of telemedicine centers by department type. Telemedicine services are provided on primary, secondary, and tertiary levels. The data on telemedicine usage by patients in Croatia is not available. However, OECD data shows that 42 percent of Croatians used telemedicine during the first 12 months of the pandemic (OECD/European Observatory on Health Systems and Policies, 2021)

[4] Telepathology is the practice of remote pathology using telecommunication links to enable the electronic transmission of digital pathology images. Telepathology can be used for remotely rendering primary diagnoses, second opinion consultations, quality assurance, education, and research purposes (Farahani & Pantanowitz, 2015).

Table 3: Telemedicine center utilization by department

Department	Centers
Dermatology	2
Gastroenterology	8
ER	4
Intensive care	2
Cardiology	3
Maxillofacial surgery	2
Nephrology	8
Neurosurgery	7
Neurology	8
GPs	14
Radiology	49
Thoracic surgery	1
Transfusion medicine	2
Traumatology	3

The Croatian Association for HIV and Viral Hepatitis, a non-profit organization, has adopted a digitalization process to better reach people living with HIV, viral hepatitis, and other sexually transmitted infections. A patient completes a short, anonymous questionnaire soliciting sociodemographic and behavioral data on sexual practices (risk exposure) to identify whether the individual meets criteria for testing. If the user meets the criteria for testing, the system automatically sends an email with a link to choose preference for collecting testing kit (in person or by courier). Afterwards, the user self-tests and reports results into the online system, guided by detailed explanations of the meaning of results, the ability to download the findings, and the ability to contact expert support. Results of self-reported patient satisfaction evaluations shows their high satisfaction with the services provided (Nemeth Blažić et al., 2022).

Another sphere in which telemedicine has been deployed in Croatia is in diabetic retinopathy screening. Diabetic retinopathy is the leading cause of preventable blindness in working-age adults. Diabetic retinopathy screening in Croatia is commonly performed annually and only by ophthalmologists. However, due to a dearth of ophthalmologists and the lack of a formal invitation and reminder system to invite people with diabetes for regular screenings, many diabetic patients do not perform annual screening. One proposal for digitalizing diabetic retinopathy screening includes using nurses in each diabetes center or general hospital through Croatia (17 as of 2020) to perform dilated fundus photography. Electronic images from diabetes centers would be transferred for remote grading to the same hospital's ophthalmology department. In the areas of Croatia where there are no ophthalmologists, the images would be transferred to a central grading center for diabetic retinopathy. Patients would be invited annually by mail from the National Diabetes Registry to come to the nearest diabetes center, and each patient with a positive result would be referred to the closest ophthalmology department for further examination and treatment (Tomić et al., 2020).

Health System Financing

In 1993, the Croatian Health Care Act consolidated the decentralized governance and financing schemes under a single public entity, HZZO, providing universal health insurance coverage to the whole population. The public health system includes telemedicine services. According to Article 128(2) of the Health Care Act, health institutions that perform professional and scientific activities in the field of telemedicine are considered "state health institutes." (DLA Piper, n.d.). Croatia's accession to the EU in 2013 was accompanied by harmonization with EU legislation. In 2017, the government adopted the National Reform Program, which is focused on creating a financially sustainable health system. The document sets out a hospital restructuring plan to achieve higher quality, improved health outcomes and patient satisfaction, and the long-term cost rationalization in the health sector (Republic of Croatia, 2017). However, progress in implementation has been varied with implementation still at an early stage in the areas of hospital reform, primary care, and human resources management and planning (Dzakula et al., 2021).

The Mandatory Health Insurance Act offers a fairly comprehensive benefits package under HZZO insurance. Voluntary Health Insurance (VHI) also exists in Croatia. VHI can play both a complementary role in covering co-payments and a supplementary role, covering preventive examinations, specialist outpatient consultations, diagnostic imaging, laboratory tests and physical therapy, and enhanced accommodation in HZZO-contracted hospitals. A relatively small portion of the population has supplementary VHI; In 2015, 2.5 percent of the population were covered by supplementary VHI. Complementary VHI which covers co-payments for HZZO health services is provided through both HZZO and private insurers. This type of VHI is much more common; In 2015, complementary VHI covered a total 64 percent of the population (Voncina & Rubil, 2018). For the most part, telehealth services are included in public HZZO insurance, though some services are subject to co-payments which can be paid out of pocket or with complementary VHI (DLA Piper, 2020).

A limiting factor in the implementation of telemedicine in Croatia is the cost of telecommunication infrastructure and technology. Sophisticated telemedicine devices are often over the budget of hospitals, particularly in economically disadvantaged areas (Hrvoje Mihalj et al., 2021). The lack of financial resources and financial incentives likewise means that access to and use of databases for research and innovation is limited (Ivanuša, 2014; Osvaldić, 2021). However, Croatia's EU membership helps to offset this issue; Croatia will receive a total of €9 billion from Cohesion Policy in 2021-2027 to promote its digital transitions (among other goals). Much of this funding will go towards improving connectivity through investment in infrastructure (European Commission, 2022).

Health Workforce

The National Health Development Strategy 2012-2020 published an analysis of the situation in the hospital, which states that about 45,000 employees were employed in Croatian hospitals in 2012. In 2012, 36 hospital wards had separate IT departments; a hospital information system existed in 42 public hospitals, while in 20 public hospitals, there was no central information system (Ministry of Health, 2016). Historically, Croatia has had fewer doctors and nurses per capita than the EU average, with only 6.6 nurses per 1000 population in 2016 (EU average was 8.5) and 3.4 doctors per 1000 population (EU average was 3.6). Despite concerns over of Croatia's EU accession in 2013 prompting outmigration of health professionals, the ratio of doctors and nurses to population increased between 2013 and 2017, approaching the EU average.

There are no official guidelines on how to provide telehealth services adopted by the Croatian Government. Therefore, general guidelines on privacy and the code of ethics for health workers

adopted by Croatian authorities and guidelines of European Union authorities are most relevant. Lack of technical skills among medical professionals, particularly middle-aged and elderly ones, also represents a barrier to the further development of telemedicine in Croatia (Ivanuša, 2014). To establish telemedicine communication in Croatia, medical staff need proper training to understand the complexity of telemedicine systems (Hrvoje Mihalj et al., 2021). While this problem has been recognized, with the Faculty of Medicine in Osijek introducing a compulsory elective module on telemedicine basics as part of the Postgraduate Doctoral Study Program of Biomedicine and Health in 2009 (Hrvoje Mihalj et al., 2021), little has been done to solve the problem of already practicing health care professionals receiving the training they need to leverage telemedicine in their provision of health care services.

Medical Products, Vaccines, and Technologies

In 2020, Croatia launched Andrija, an AI-based digital assistant aimed to provide guidance to patients on how to diagnose and manage COVID-19. Andrija was created by Croatian IT companies in cooperation with epidemiologists and some of the world's leading IT companies such as Oracle. The tool is free and is available to all Croatian smartphone users (Rödl & Partner, 2020). Andrija's main task was to manage panic and connect citizens with relevant health authorities and to prevent the health system from becoming overburdened. Within a week since its launch, the tool has managed to reduce the number of calls to medical professionals across all health centers in Croatia by 25 percent. Additionally, 87 percent of users said that Andrija helped them (OHCHR, 2022).

MEGI is a telemedicine solution that was created within the Croatian Magdalena Clinic–one of the largest privately owned cardiovascular centers in Central Europe. MEGI reminds patients to measure their blood pressure and ECG daily; helps patients track their symptoms; and alerts Telemedicine Center which connects doctor with the patient in case of unregulated blood pressure or ECG values (MEGI, n.d.). One of the main benefits that MEGI provides is a reduction in the time a specialist spends on gathering information about the patient during an examination. The average examination lasts 22 minutes, of which the doctor gathers information for 15 minutes. If the patient has used MEGI before, the solution will prepare information for the provider based on the data collected. On average, instead of 15 minutes, it takes only 4 minutes to collect the data, and the excess time can be used to improve the quality of the examination (European mHealthHub, 2021).

EUDoctor is a Croatian private telehealth solution that provides video consultations with physicians within the EU. The app provides the following services: doctor consultation (EUR 25 for 15 min), chronic therapy prescription refill (EUR 22 for 15 min), premium doctor consultation (EUR 28 for 15 min), and counseling (EUT 31 for 30 min) (EUDoctor, 2022). EUDoctor was created in 2022, therefore the information on patient experiences using the app is not available.

Vams Tec is a Croatian company that has been developing software solutions for image processing. For example, the company's Issa PACS/RIS software streamlines patient registration and scheduling, procedure requests, billing, verifications, etc. Issa has been installed in more than 50 health institutions throughout Croatia (Vams Tec, n.d.).

Health Information Systems

In Croatia, the basic health information system is CEZIH, within which there are two sub-information systems. The first information system is for primary health care providers (family medicine clinics, polyclinics, pharmacies, etc.), i.e., the primary health care information system. The second information system is composed of secondary and tertiary health care, which refers to information systems in clinical

hospital centers, hospitals, and institutes Health care(Osvaldić, 2021). Health facilities can select from a variety of publicly and privately owned health information systems to employ, which are then connected into CEZIH (Osvaldić, 2021).

Despite this progress, many health facilities still have information systems that are not connected, resulting in health facilities' inability to integrate and cooperatively use data in a coordinated manner. Moreover, due to incompatibility of digital solutions and lack of support for data exchange, general hospitals, specialized hospitals, clinical hospitals, and clinical hospital centers are not interconnected with the primary hospital information system. In the case of transfer of a patient from one hospital to another, medical documentation is most often submitted in paper form (Osvaldić, 2021). In addition, confidence in the security of e-Health data poses a significant challenge to encouraging patients to use telemedicine services. Despite Croatia having established an e-Health Portal connected to the CEZIH in 2016 (a mobile version followed in 2017), adoption remains low. In a recent survey, Bosanac and Stevanovic (2022) show that despite 73 percent of participants being aware of the portals' existence, only 34 percent were using it. The survey also reveals that participants had significantly greater confidence in doctor's confidentiality than online data protection. Indeed, distrust of institutions is characteristic of post-socialist countries and may pose a threat to uptake if not properly addressed.

Telehealth services provision in Croatia is regulated by the following laws: the Act on Implementation of the GDPR, the Ordinance on the use and protection of data from medical documentation of patients in the Central Health Information System of the Republic of Croatia, and the Ordinance and Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (DLA Piper, 2020). The Act and Ordinance on the use and protection of data provide for the obligation on users of medical data to keep the patient medical data secret. The Ordinance establishes that audio and video recordings during the provision and reception of telemedicine services is allowed only with the written consent of the service recipient. For a service recipient who is unconscious, has a severe mental disorder, or is a minor, the written consent shall be given by the legal representative or guardian of the recipient (DLA Piper, 2020).

Takeaways

- A major obstacle to telemedicine implementation in Croatia is lack of confidence in data security. This is likely fueled by latent distrust in government institutions, typical of post-Socialist countries, which in turn hinders the adoption of eHealth solutions by wide swaths of the population. Initial data show those with higher degrees of technological literacy have more confidence in the data security of eHealth applications, which points toward fostering high technical literacy in all levels of society as a long-term solution to mitigating this problem.
- Despite having established a central health information system, interoperability represents a significant problem for telemedicine implementation in Croatia. Because various health information systems at the primary, secondary, and tertiary care level are not compatible with one another, information exchange between care facilities is hindered.
- Croatia's health workforce is inadequately trained to use telemedicine, which has become a barrier to wider adoption of telemedicine by the health providers. While some measures have been adopted to educate future health care providers, such as mandatory classes in certain medical schools, little has been done to combat a lack of familiarity and knowledge among already practicing providers.

6. CONCLUSION

All case countries have rapidly scaled their telemedicine services since 2019 amid the COVID-19 pandemic. This has frequently resulted in the integration of telemedicine into existing governance, financing, and existing interoperability structures, with the private sector playing perhaps a larger role than it would otherwise in driving service delivery and innovation. Results indicate that integrating telemedicine into existing structures with significant private-sector involvement has successfully allowed these countries to expand access to telemedicine services (though sustainability prospects of these initiatives remain unclear). Notably, EU membership proves an advantage in setting data-security standards, as well as accessing funding for infrastructure and innovative project development for the Eastern European case studies (Lithuania and Croatia).

However, the implementation of telemedicine in these countries remain challenged on a range of issues, including lack of interoperability, lack of clarity around long-term financing, slow provider and patient uptake of and comfort with telemedicine, and the integration and standardization of new telemedicine practices into regulations. Rather than 'global benchmarks,' key findings from this review could be considered 'emerging features' as the featured countries continue to refine their governance, practices, and collaborations, and determine what their long-term strategy will include.

Summarized findings are broken out by health sector building block below.

Leadership and Governance

Governance of telemedicine is nascent across case countries and has manifested as an extension of existing health services and health worker regulation, rather than as a standalone set of guidance and/or policies in most countries. Before COVID-19, telemedicine was typically addressed as a small subcomponent under broad eHealth strategies. Since 2019 it has been rapidly scaled up due to the pandemic, and as most case countries did not have existing specific telemedicine regulations, they followed those established for traditional health care service provision. Some, such as the US and Lithuania, supplemented existing regulations with temporary, targeted additions to increase telemedicine access due to the pandemic. This approach appears to have functioned relatively well during the rapid scale-up of services, but many supplemental regulations are temporary and will be removed as the pandemic improves. The UK, on the other hand, rapidly developed a robust telemedicine strategy in 2021 to strengthen governance and inform regulations. Countries such as Sweden are prioritizing developing specific eHealth standards and regulations in the coming years.

Across case countries, telemedicine governance has required particularly close coordination among several government agencies pertaining to service provision, medical products, eHealth, insurance, data security, and regional bodies. In several cases, a private or non-profit organization also plays a significant role in telemedicine governance. Sweden and the UK have created working groups (eHealth Joint National Governance and Cooperation Organization and The Life Sciences COVID-19 Response Group, respectively) to bring together cross-sectoral partners for telemedicine coordination, with Sweden's current eHealth strategy specifically emphasizing the need to better distinguish roles and responsibilities.

In decentralized systems such as Spain's, regions are responsible for service provision and may create their own eHealth strategies. This approach can result in inconsistencies across regions/states in telemedicine provision, cost, and patient access to data. However, this approach may better facilitate access to services and foster regional ownership of telemedicine – which can encourage innovation.

Service Delivery

Use of telemedicine services has grown rapidly across case countries due to COVID-19. For example, in the UK, in a one-month period in 2020, 71 percent of general practitioner consultations were conducted remotely, compared to 25 percent in the same period the previous year. Similarly, in Sweden, in 2020 alone, use of teleconsultations doubled from 1.2 million to 2.4 million, representing 11 percent of all medical appointments. In Lithuania, 56 percent of the population reported using teleconsultations during the first 12 months of the pandemic. Most case countries provide telemedicine services through both the public and private-sector. Most case countries provide access to primary-care services through telemedicine; the impetus for this comes from a desire to reduce unnecessary in-person patient visits originally due to COVID-19 social distancing requirements and, in Sweden and Spain, to limit costs. These services can include cold and flu, sexual and reproductive health, pediatrics, allergies, and dermatology. Most countries reviewed also employ telemedicine for management of chronic conditions, mental health care, and radiology. Spain and the US also use telemedicine for stroke patients.

The UK and the US have specifically focused on using telemedicine to increase health care access for vulnerable populations. The UK has identified incarcerated individuals and the elderly as priority populations for telemedicine, although there are concerns about older people's ability to effectively use telemedicine technology. US government support for telemedicine focuses on veterans and rural populations. The US uses both synchronous and asynchronous telemedicine—leveraging asynchronous tools particularly in areas with poor internet. As seen in the US, there are several steps governments can take to ensure patients who do not have internet connection can access telemedicine, including subsidizing internet services or technology, loaning needed technology, and setting up spaces in the community equipped for telemedicine consultations.

Health System Financing

Infrastructure improvements for telemedicine and innovative approaches are typically funded by both public and private sector sources. For example, the UK has made a robust, phased plan that decentralizes technology investments to regional ICSs that are given funding from the center. It also details how to align existing policies to support technology investments. The US similarly provides grants directly to health facilities for infrastructure and innovative solutions, although these are focused on addressing health disparities. In other countries, such as Sweden, infrastructure is funded by the regions.

Private companies tend to either develop their own telemedicine solutions (such is the case in the US and Sweden) or invest into the national system (as is the case in Lithuania). Governments can, as Sweden as, also contract private providers to provide telemedicine services under the national health financing scheme. Non-profits also play a role in multiple countries, and international programs have specifically provided funding for Lithuania. Lastly, EU funding has been an important resource for the post-Soviet countries analyzed, as Croatia uses EU funding for infrastructure development (citing challenges for health facilities to fund this development on their own) and Lithuania for innovative new digital health projects.

There is no universally followed financing scheme for telemedicine services. Most case countries cover telemedicine services for patients under the national health financing scheme. In Spain, Sweden, and the UK, financing of these services follows the same regulations, financing structures, and costs to patients as if they were in-person services. As both Spain and Sweden have decentralized health care systems,

each region dictates the contribution expected from the patient, but the cost to patient does not differ from if it were an in-person service. The US is a notable exception; government reimbursement for telemedicine services comes from both the federal and state levels and is focused on serving vulnerable populations (such as people in rural areas and veterans) rather than the entire population. Rapid scale up of telemedicine due to COVID-19 has also resulted in unclear financing for telemedicine services for certain countries; in Lithuania, although research around telemedicine indicates that these services are provided under national health insurance, the Ministry of Health does not reference telemedicine in its description of benefits provided under the insurance scheme. Overall, it remains to be seen how sustainable these financing models will be, since they were rapidly implemented in response to the pandemic.

Health Workforce

Health providers are often reluctant to provide services through telemedicine because of a lack of understanding and comfort using telemedicine. Case countries have taken varied approaches to address this concern. The UK and US have created several guidance materials on use of telemedicine for health providers; the US also has a consortium of telehealth resource centers to provide free education, technical assistance, and resources to the health workforce. Lithuanian and Croatian universities have established undergraduate and graduate programming on eHealth; however, there does not appear to be training available for practicing providers. In Spain, both physicians and patients have highly positive views of telemedicine. It is also unique among the case countries in that it requires doctors to register with the Spanish Medical Association to provide telemedicine services. This measure could be considered in addressing provider and patient lack of comfort using telemedicine.

Medical Products, Vaccines, and Technologies

Across case countries, the private sector is the leader in developing innovative technologies for telemedicine. One area of growth has been in provider-to-provider telemedicine. In Spain, the TeleStroke solution allows an emergency room doctor to call an on-call neurologist if a stroke case is suspected. The doctors conduct a video consultation, and the neurologist provides further steps for patient examination. Spain, as well as the UK, is also leveraging IoT applications for telemedicine. In addition, multiple countries are using mobile applications, particularly for patient monitoring. For example, the Swedish technology company Coala Life's smartphone-based ECG system allows a patient to use a mobile heart monitor that uploads results to a mobile app, which the patient's doctor can then review. If a health provider cannot access digital care services, the UK has put out guidance that facilities can use free video conferencing tools such as Skype, WhatsApp, or Facetime, although their use should be temporary until access to digital care services is obtained.

Health Information Systems

Case countries have employed different approaches to the shared priority of ensuring interoperability and patient access to health records. While Sweden and Lithuania have established a single eHealth platform with an associated patient portal, the UK utilizes a universal patient app, and Spain has a personal health card that facilitates access to patient data. Croatia has a central health-information system (though many of its health facilities are not yet connected).

However, creating a central platform is just the first step in interoperability. In Croatia, patients lack trust in the data security of telemedicine services. Similarly, there is low uptake in Lithuania of the

eHealth platform by both providers and patients. Incentives may be a meaningful way to facilitate engagement; in the US, the Federal government rewards hospitals that use interoperability-certified EHR systems.

Because EU countries must comply with the GDPR—the overarching regulatory framework for data privacy and security—governments and the private sector can more easily deploy secure telemedicine solutions. The UK has created data-security requirements with which health providers must comply, including the use of designated national cyber services. Though other countries have similarly created supplemental data-security regulations, none included in this review had specific security regulations regarding telemedicine.

Taken together, the varying approaches across these issue categories indicate that no country's telemedicine system should be held as a global benchmark or set of best practices. Rather, countries use varying approaches—each with their own benefits and drawbacks—based on the specific contexts and barriers they face. Regardless of the organizational and financial models Ukraine employs for telemedicine, the challenges it faces as it develops its telemedicine capacities can nevertheless benefit from other countries' experiences and drawing on past approaches. This may result in different components of Ukraine's telemedicine system reflecting the experiences of multiple countries as it contends with issues such as interoperability, the integration of telemedicine into existing systems, and provider and patient uptake of telemedicine services. As Ukraine develops its own system, LHSS hopes this review will assist Ukraine in leveraging the experiences of other countries, drawing most on the approaches that align with its priorities, and ultimately expanding access to quality health services for all Ukrainians in a transparent, efficient, and secure manner.

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