

# Developing an integrated e-health system in Estonia

## Overview

In the early 2000s, as part of an overarching strategy for the advancement of information and communication technology developed during the 1990's in Estonia, the government prioritized the development of an electronic national health information system. The system was envisaged as a means to overcome fragmented communication flows, streamline services, increase efficiency and improve the coordination of care. The Ministry of Social Affairs headed the project; adopting legislation, developing policies and creating the necessary regulatory framework to establish the Estonian National Health Information System (ENHIS). In 2005, the Estonian e-Health Foundation was created to coordinate the implementation of the ENHIS and oversee its management. Under the Foundation's guidance, electronic care summaries, digital imaging and e-prescriptions were gradually incorporated into the system in the late 2000s, as detailed in the Estonian Health Information System Development Plan 2005–2008. Use of ENHIS by health providers and the electronic submission of patient data is mandatory. The ENHIS centrally stores care summaries and serves as a coordinating tool for the health system, connecting providers across levels of care and between disciplines. Electronic decision-support tools and virtual transfers of prescriptions and test results help to further integrate and streamline services delivery. An online patient portal has also been incorporated into the ENHIS to increase patient involvement in care and provide individuals with secure access to their health information. Monitoring data shows use of the ENHIS by both providers and patients is high, with 98% of providers uploading patient information to the system. The Estonian e-Health Foundation continues to improve the ENHIS and support the advancement of eHealth and telemedicine. Private sector innovations met with provider-derived solutions help to expand available applications and drive improvements.

## Problem definition

In the late 1990s, the flow of information between professionals and across care levels was described as fragmented, with providers often relying on patients to provide their personal medical history. With rising chronicity as rates of hospital

discharge for circulatory disease, for example, reached from 2337 per 100 000 in 1990 to 3175 per 100 000 in 2000, attention was put to the imperative of improving management and continuity of care for patients with complex chronic conditions (Box 1).<sup>1</sup>

## Box 1

What problems did the initiative seek to address?

- Fragmented flow of information between health providers.
- Poor management of the growing number of patients with chronic care needs.

## Health services delivery transformations

### Timeline of transformations

In the early 1990s the Estonian government spearheaded a movement to develop electronic information systems across government sectors (Table 1). As part of this commitment, the Ministry of Social Affairs was tasked with developing the Estonian National Health Information System (ENHIS). Government policies and legislation throughout the 2000s supported this goal. In 2005, the Estonian Health Information System Development Plan 2005–2008 was adopted to guide the development of the ENHIS and the Estonian e-Health Foundation was founded to oversee these activities. Features of the ENHIS - including electronic health records, digital images, digital prescription and a patient portal - have been phased in gradually. Use of the ENHIS is now widespread and the Estonian e-Health Foundation continues to support the advancement of eHealth.

## Description of transformations

**Selecting services.** Services available to patients are being expanded through the introduction of home care interventions enabled by eHealth, such as online monitoring of blood pressure and interactive rehabilitative support services for patients with brain injuries.

**Designing care.** Treatment guidelines for primary care have been developed to guide referrals to specialist care. Electronic

**Table 1**

What were the chronological milestones for the initiative?

1992	Political commitment made to develop an information society across government sectors.
1998	Principles of Estonian Information Policy approved by the government as an action plan to guide development of an information society.
2000	Legislation passed requiring health providers to have access to a computer with internet.
2001	Discussions and planning for the development of ENHIS begin.
2002	Rollout of electronic patient ID cards begins.
2004	Estonian Health Information System Development Plan 2005–2008 published.
2005	Estonian e-Health Foundation created; development of ENHIS begins.
2006	Estonian Information Society Strategy updates and replaces Principles of Estonian Information Policy.
2007	Digital imaging system (known as PACS) launched within ENHIS.
2008	Electronic case summary system launched within ENHIS; legislation passed requiring all providers to upload information to ENHIS.
2009	Patient online portal launched within ENHIS.
2010	e-Prescription service launched within ENHIS.
Present	Estonian e-Health Foundation continues to actively monitor ENHIS and support eHealth.

consultation via the ENHIS has also been introduced in select disciplines, where a patient's status is written up and sent to specialists for their input.

**Organizing providers.** All providers have access to patient care summaries using the ENHIS and are able to make electronic referrals as necessary. Patients may choose to opt-out of allowing their information to be accessible by all providers; however, this may be waved in emergency circumstances. Alignment across disciplines and

care levels has increased and providers use the ENHIS to share test results, run diagnostics, make referrals and issue prescriptions. Providers are also able to utilize technologies in place for distance consultations, including with foreign providers. The patient portal has helped improve access for patients by enabling online appointment booking for six out of 19 hospitals.

**Managing services.** The Estonian e-Health Foundation is the legal entity founded by the Ministry

of Social Affairs and other key stakeholders. The Foundation's management board is responsible for overseeing the ENHIS. In facilities, all providers are required to have access to a computer with internet connection and maintain the necessary infrastructure to connect to the ENHIS.

**Improving performance.** The initiative has strengthened health providers' computer literacy. Trainings on navigating ENHIS are offered by the private sector contributing to the development of the software systems. Additionally, virtual tutorials on software systems are under development to further build the technical capabilities of providers.

### Engaging and empowering people, families and communities

Work at the macro level has led the way in developing a culture around information and communication technology where the entire population is able to fully participate in and benefit from its offerings through eHealth. An online patient portal empowers patients by providing read-only access to their personal health information, including treatment plans, test results and prescriptions. Clauses permit providers to temporarily block patient access if considered necessary for their protection. Patients can connect to the portal using their personal ID card or Mobile ID, which are both linked to their unique personal identification number. Since its introduction, use of the portal by patients has been steadily increasing and new applications continue to be developed and added to further engage, support and empower patients.

### Health system enabling factors

Several factors have promoted the development of eHealth services in

**Table 2**

How was the delivery of health services transformed through the initiative?

Before	After
<b>Selecting services</b>	
No telemedicine or eHealth services available.	Online delivery of certain diagnostic services; on-going piloting and development of telemedicine services.
<b>Designing care</b>	
Lack of guidelines for primary care.	Treatment guidelines developed for primary care to help guide referrals.
<b>Organizing providers</b>	
Primary care serves as the gatekeeper to higher-level services; communication between providers fragmented.	Providers connected via ENHIS; virtual consultations and electronic referrals now possible; access to care improved by the online patient portal. <sup>2</sup>
<b>Managing services</b>	
Limited use of computers; no electronic health system in place.	Providers required to maintain the necessary infrastructure to connect to ENHIS; private sector sells necessary software to providers.
<b>Improving performance</b>	
Limited technological capacities of health workforce.	Tech-literate health workforce; ad hoc trainings on software programmes available; virtual software tutorials in development.

Estonia, including in particular the wide political support for information and communication technology. The Ministry of Social Affairs – who has stewardship over the health system – led the development of a regulatory environment to support the initiative, establishing the Estonian e-Health Foundation and putting laws and regulations in place to require and regulate the use of the ENHIS. The Health Services Organization Act and Health Information System Statute require providers to enter into contracts with the Estonian e-Health Foundation, holding them accountable for uploading patient information to the ENHIS. Adherence to privacy, patient rights and data protection laws is monitored by the Data Protection Inspectorate. In addition to government-mandated regulations for the ENHIS, local providers and hospitals may implement their own supplementary internal regulations.

Significant investments have been made to establish the necessary health system infrastructure for the delivery of eHealth. Private companies compete to develop the software for providers required to access the ENHIS. Individual software systems connect to a government data-exchange platform – known as X-road – which integrates and secures all data in a central database. X-road digitally records all interactions for secure access to information. Further, the centralized database facilitates monitoring and evaluation of data by the Estonian e-Health Foundation and anonymized health data is also made available for research.

With eHealth infrastructure now in place, the Estonian e-Health Foundation continues to focus on supporting innovation and the expansion of eHealth. Investments in eHealth research, partly financed by the national health insurance

fund, enable the investigation of new technologies at university research centres dedicated to eHealth and telemedicine. The Estonian e-Health Foundation also collaborates with other national and international organizations working in eHealth and telemedicine to connect with new innovations in the field.

### Outcomes

Impact on health system performance process indicators is evident and monitoring data show widespread adoption of eHealth and high usage rates of ENHIS (Box 2).

#### Box 2

What were the main outcomes of the initiative?

- Computers connected to the internet are present in 100% of Estonian general practices<sup>3</sup>.

- Over 90% of the population have documents recorded in ENHIS.<sup>2</sup>
- Over 90% of stationary case summaries are uploaded to ENHIS. Over 90% of all prescriptions and hospital discharge letters are sent digitally via ENHIS.<sup>2</sup>
- Approximately 140 000 monthly log-ins to the patient portal were recorded in late 2013 and trends show patient use of ENHIS is steadily increasing<sup>2</sup>.

implementation strategy. Prior to development of the ENHIS, the Estonian e-Health Foundation was created to assume management of the initiative. The Estonian e-Health Foundation Board is made up of varied stakeholders including the Ministry of Social Affairs, Estonian Society of Family Doctors and Estonian Hospital Union, among others. The Foundation has created a unified platform for stakeholders and has facilitated cooperation across different groups, giving them an active role in steering the development of eHealth nationally (Box 3). At the local level, general practices and hospitals have established ad hoc working groups to support eHealth implementation efforts in facilities. Valuable local eHealth solutions resulting from these working groups are disseminated nationally by the Estonian e-Health Foundation, enabling all providers to benefit.

## Change management

### Key actors

The Ministry of Social Affairs oversaw the initial eHealth planning efforts, passed legislation to enable planned changes and devised the guiding

### Box 3.

Who were the key actors and what were their defining roles?

- **Government.** Prioritized the development of an information society; served as role model for the adoption of information technology across all government sectors.
- **Ministry of Social Affairs.** Led the development of the ENHIS; adopted legislation supporting eHealth; created the Estonian e-Health Foundation along with key partners; holds three of 11 votes on the Foundation's management board.
- **Estonian e-Health Foundation.** Headed by a multistakeholder board; oversees the management and monitoring of ENHIS.
- **Private software development companies.** Eight main companies compete to supply ENHIS-compatible software to providers and offer providers training on purchased systems.
- **Health providers.** Maintain necessary infrastructure to connect to ENHIS.

Table 3.

How has the health system supported transformations in health services delivery?

System enablers	Example
Accountability	<ul style="list-style-type: none"> <li>• Legislation requires providers to maintain necessary infrastructure to connect to ENHIS and upload patients' medical data to the system.</li> <li>• ENHIS permanently records all users accessing data, increasing transparency and accountability.</li> <li>• Data Protection Inspectorate oversees adherence to data protection laws.</li> </ul>
Incentives	<ul style="list-style-type: none"> <li>• Financial penalties for providers in place for non-compliance with contracts requiring use of ENHIS.</li> </ul>
Competencies	<ul style="list-style-type: none"> <li>• Development of a tech-literate society promoted across government sectors.</li> </ul>
Information	<ul style="list-style-type: none"> <li>• Entire population registered via electronic ID cards.</li> <li>• Central data-exchange platform integrates data and secures access.</li> <li>• Estonian e-Health Foundation monitors and evaluates ENHIS data.</li> </ul>
Innovation	<ul style="list-style-type: none"> <li>• On-going research conducted on telemedicine and eHealth.</li> </ul>

### Initiating change

The development of the ENHIS was sparked by a broader government-led effort to transition to an information society during the personal computer revolution occurring in the 1990s, seeing this as an opportunity to develop more streamlined and efficient services across government sectors.

### Implementation

The relatively small size of Estonia's population facilitated implementation of the ENHIS and its widespread adoption. The ENHIS was phased in gradually as new system applications were developed in line with the Estonian Health Information System Development Plan 2005–2008. Initially, use of the ENHIS by

providers was voluntary. However, after an introductory period, widespread uptake of the ENHIS was achieved by implementing a strong regulatory framework reinforced with disincentives for non-compliance.

While an overarching government framework guiding implementation of the ENHIS, there was considerable room for adapted eHealth solutions to be implemented at the local level. Input and local initiative from health providers helped ensure successful implementation of activities. Leaders of the initiative recognize that greater inclusion of providers in the early design phases could have improved usability of services as, despite providers generally being successful in operating ENHIS, variable system usage capabilities are still seen.

### Moving forward

With the ENHIS now well-established and widely implemented throughout the country, the Estonian e-Health Foundation continues to investigate ways to improve the system's functioning, performance and ease of access. In parallel, national

universities continue to lead telemedicine research and build a genetic database for the population. Linkages with foreign institutions help address potential challenges and inform future directions for eHealth in Estonia.

### Highlights

- Early introduction of legislation provided a clear framework for activities and established the necessary regulatory environment for change.
- Development of eHealth aligned with a broader government strategy, enabling change and motivating necessary political support.
- Legislation supported with aligned incentives helped encourage provider uptake of eHealth.
- Partnerships with universities and research organizations helped drive inn

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1 World Health Organization (2015). "European Health for All Database"

2 Mill, Raul. 2014. "Estonian Health Information System." In Estonian E-Health Foundation. PowerPoint.

3 Doupi, P., Renko, E., Giest, S., Heywood, J., & Dumortier, J. (2010). eHealth Strategies: Country Brief: Estonia. Brussels: European Commission.