E-solutions in Estonian community pharmacies: A literature review

Anita Tuula¹, Kristiina Sepp¹ and Daisy Volmer¹

Abstract

Objective: Estonian innovative electronic solutions have long been leading the way in the healthcare sector. This article aims to give an overview of all e-solutions and their usability in community pharmacies in Estonia and how they compare and operate with the wider e-health system.

Methods: A comprehensive literature review was conducted on publicly accessible information regarding Estonian e-health and electronic community pharmacy solutions.

Findings: While Estonian e-health system, including the e-prescription system is developed and maintained by the nationally funded Health and Wellbeing Infosystem Center, community pharmacy owners have established many noteworthy systems such as the e-pharmacist decision-support system, commodities info systems, online pharmacies, a telehealth prescription reminder service, and an automated dosage dispense system. Some pharmacies are collaborating with private healthcare service providers to allow quick and easy prescription renewal through an electronic channel.

Conclusion: Different electronic systems have overall greatly improved Estonian pharmacy services, accuracy and flow of consultations, and accessibility of medicines. In some cases, more support and active involvement is still needed from government agencies for full implementation.

Keywords

eHealth, pharmacy, literature review, online, telehealth

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Introduction

Estonia is one of the most digitally advanced countries in the world. The country has a population of only 1.3 million, yet there are several noteworthy Estonian-founded tech companies such as Skype, Wise, Bolt, Playtech and Pipedrive that have attained the unicorn status.¹ Currently, 99% of Estonian state services such as voting and declaring taxes are already online, making the Estonian government one of the first to become paperless. Estonian e-services are even available for global citizens and their companies through the e-Residency, attracting investors, and international businesses to expand to Estonia and the European Union.² Estonia has a long and successful history of developing e-health systems—in 2019, Estonian Digital Health Index ranked number 1 compared to other European Union and OECD countries.³ There are several break-through digital pharmacy services in Estonia, although these solutions are mainly developed by the private sector with little involvement from the state.

Methods

The investigation of literature was carried out in 2021 and included both peer-reviewed publications and grey literature. As previously published peer-reviewed articles on Estonian e-health system have not included private...
initiatives, the latter was necessary to give a comprehensive overview on all Estonian community pharmacy e-solutions and their usability. In this article, we follow an elderly patient Anna and her grandson Paul in their journey of digital health and pharmacy services in Estonia.

Findings

Estonian e-health system

Estonian health information system is a nationwide central system integrating health data from all Estonia’s healthcare providers, which can then be safely exchanged between users through the X-Tee solution. The system is managed by the nationally funded Health and Wellbeing Infosystem Center. Since the launch in December 2008 until 2017, there were already more than 300 million health events and 25 million health related documents stored in the system. As it is a central nationwide system, the data entered by one healthcare provider can be accessed by a different provider in another healthcare facility within the country, allowing health workers comprehensive health information on their patients. To mitigate internal threats to the data and assure integrity of retrieved electronic medical records and system access logs, blockchain-backed technology is being used. The health information system contains following documents: time critical data, dental care documents (dental care charts, dental status charts), passport of immunization, ambulance charts, prescriptions, referrals, health declarations, health certificates, EU digital COVID certificates, case summaries (out-patient, day-care, in-patient and birth case summaries), notifications of development assessment, immunizations, growth, examination and counselling, examination results (image references, referral responses), and working ability assessment. The Estonian health information system also enables secondary use of data—for example, the Social Insurance Board can use the health information system with the help of a licensed medical expert when determining the severity of disability.

Estonian electronic state services, including e-health services, are connected through the X-tee (see Figure 1). X-tee is a secure unified Internet-based interorganizational data exchange framework. To ensure secure transfers, all outgoing data is digitally signed and encrypted, and all incoming data is authenticated and logged. To exchange data, one member of X-tee describes the shared data and other members can use this data based on an agreement. By 2021, there are almost 3000 services that can be used via the X-tee solution. Based on the number of inquiries, the most popular service providers using the X-tee are employment register, health information system, population register, prescription center, and health insurance database. Only 3% of requests on X-tee are submitted by citizens; however, it is assumed these requests alone have saved about 1345 working years just in the previous calendar year. X-tee code samples are freely available on Git repository hosting platform GitHub, which supports the development and interoperability of new digital services in Estonia.

All Estonian citizens and residents own an electronic ID (eID), which adds another layer of security as it links activities in the electronic environment to a physical identity. Carriers of eID in Estonia are ID-cards, residence cards, diplomatic IDs, mobile-ID, digital ID, and an e-Resident’s digital ID, and although a person may own several carriers of eID, the identity linked to these carriers is the same. The eID model allows digital authentication, signing documents and transferring data securely. The eID is used to access all electronic state services in Estonia.

Estonian e-health records and the patient portal

The Estonian electronic health record (EHR) functions as a centralized nationwide database, which integrates data from different Estonian healthcare providers to create a common health record. The EHR acts as a useful tool that allows doctors to access patient’s records easily from a single electronic file, read test results as they are entered, and view image files such as X-rays. The EHR retrieves data from different systems used by health providers all over Estonia and presents it in a standard format in the e-Patient Portal, where it can be accessed by the patient. Additionally, the patient can access the records of their underage children or authorize access to others such as their caregivers or family members. By logging into the e-Patient Portal using the eID, the patient can review their doctor visits and prescriptions, check which health providers have had access to their files, submit statements of intention, appoint representative(s) for themselves, act on behalf of other persons who have appointed them as their representative and more. The system also acts as a national health database and is used for statistical purposes by government agencies.

In the case of our example patient Anna, Paul has been keeping an eye on the e-Patient Portal on her behalf, as she is having difficulties operating on a computer herself. To do that, Paul has previously assisted Anna in appointing him as her representative in the system. To log in, Paul must use either his ID-card or Smart-ID or Mobile-ID solutions. Paul has been using the portal to check on his grandmother’s active prescriptions and read summaries of doctor visits; recently, he helped Anna in booking an appointment for the COVID-19 vaccination and later printed out the certificate from the system.

Estonian e-prescription system

Estonian e-prescription system was first established in 2010 and today, 99.9% of prescriptions are handled online. Doctors can issue electronic prescriptions for both
medicines and medical devices. When prescribing, the doctor uses a computer software where they fill in an online prescription form and forward the prescription to the national prescription center. The prescription then immediately becomes accessible in any pharmacy on patient’s request. For purchasing prescription medicines or medical devices, the patient only needs to present a document with their picture and personal ID code, such as the ID-card, driving license or passport, at the pharmacy. As the e-prescription system retrieves data from the national health insurance fund, any benefits the patient is entitled to will automatically appear and the medicine is discounted accordingly. Moreover, the system allows automatic billing from pharmacies to the Estonian Health Insurance Fund. The system also shares data with the e-Patient Portal, from where the patient can access information about the available prescriptions and previously dispensed medicines. The centralized paperless system saves time for both patients and health workers, as routine refills can be issued without an appointment to the doctor, but most importantly, the e-prescription system allows health workers and healthcare authorities to keep track of prescribing patterns, patient’s medicine use and monitor adherence.\textsuperscript{6,14,15} As pharmacies do not have access to patient’s e-health records, the e-prescription system acts as the primary source for pharmacists to access the most basic patient information such as the current medication regimen and diagnoses.

There are three types of e-prescriptions: public, authorized, and private. All prescriptions are public by default; however, the type can be changed by the prescriber when prescribing or by the patient in the e-Patient Portal. With the private e-prescription, only the patient themselves can purchase the medicine from the pharmacy, but they could also choose to authorize access to another specific person in the patient portal. In case of the default public prescription, anyone knowing the patient’s personal ID code could access the information and purchase the medicine in the pharmacy, although they must present their own document for the purchase and the information about the buyer will be saved in the e-prescription system.\textsuperscript{14}

As for our example patient Anna, Paul does most of the visits to the pharmacy for her. To purchase Anna’s prescription medicines, Paul presents his ID-card and tells the pharmacist his grandmother’s personal identification code. As all Anna’s prescriptions are public by default, Paul can purchase any prescription medicine on Anna’s behalf without restrictions. The prescription system always presents a full list of medicines with the prescribed active ingredient, strength, and dosage form currently available in the pharmacy and displays them based on price. As the pharmacist is obligated by law to recommend the lowest-
priced options first, the system also color-codes all products equal to or below the reference price. The pharmacist can also access information about which brand name the patient has previously chosen to purchase. Additionally, the pharmacist can access Anna’s full medication regimen in the prescription system and advise Paul accordingly.

**Cross-border e-prescription system**

Estonia has actively participated in developing the cross-border e-prescription system based on the European eHealth Digital Service Infrastructure (eHDSI). The aim was and still is to create an opportunity for Estonian citizens to buy medicines with digital prescriptions in other European countries, to ease people’s medicines management and continuity of treatment. For Estonian pharmacies it is an opportunity to dispense with digital prescriptions medicines to foreigners. The displayed digital prescription is in a standardized form and in the local language, which ensures more thorough and high-quality prescription data when dispensing medicines. By today, Estonian pharmacists can access e-prescriptions from Finland, Croatia, and Portugal, and e-prescriptions issued in Estonia can be accessed in Finland and Croatia.15,16 The reimbursement process for medicines dispensed abroad with Estonian e-prescriptions has remained the same as for foreign paper prescriptions—the patient must first pay the full price and can later reclaim the reimbursement from Estonian Health Insurance Fund by submitting an application and the receipt.14

**Dispensing and reimbursement system for technical aids**

Since December 2020, the system for dispensing technical aids in pharmacies has also been digitalized and all transactions involving a person are transferred electronically between service providers such as pharmacies and the Social Insurance Board. The user can access information about all transactions involving their technical aids from the self-service system of the Board. To offer subsidies for technical aids, the pharmacy must have an active contract with the Social Insurance Board. In the pharmacy, the patient must present their ID-card for identification similarly to purchasing prescription medicines, and the pharmacist, after authenticating themselves using an ID-card or Mobile-ID, can then access information on state subsidies applicable and enter the purchase to the mini infosystem portal MISP.17,18 MISP allows users to access X-tee via a standard Internet browser and is applied when it is not rational to establish X-tee connection within the organization’s infosystem. As the system is not connected with the pharmacy sales program, pharmacists must enter information about the purchase to both systems separately (see Figure 2).19

**Estonian register of medicinal products**

The Estonian Register of Medicinal Products is a state register with the aim of keeping account of all medicinal products and their packages sold in Estonia. The register includes basic data for each medicinal product: ATC code, active substance, pharmaceutical form, strength, available package sizes, information about the marketing authorization, the last date of import, etc. Summary of product characteristics (SPC) and package leaflet (PIL) in Estonian are added to all authorized medicinal products and are constantly updated. In case the option is provided by the marketing authorization holder, the PIL can also be found in Russian and English. Additionally, the register contains data about the reimbursement of the medicinal products, reference price, and information on medicinal products which have a retail price lower than or equal to the reference price. The register also holds the unique codes attributed to each package size which are used for identification of the packages in information systems and information exchange in health care.20

As our example patient Anna speaks Russian as her mother tongue, the pharmacist always offers to print the PIL in Russian from the register in case of new medicines. The pharmacist can also use the register to quickly access SPCS in case the patient has any specific questions about a product. Recently, Anna got prescribed a medicine which was not readily available in the pharmacy. The pharmacist used the register to find and advise on all possible products before ordering the most suitable one for Anna. As there are currently shortages of some of the medicines Anna is using, Paul has learned to use the system on his own to check when these shortages are expected to end.

**Pharmacy commodities infosystems**

There are two main online pharmacy commodities infosystems in Estonia, raviminfo.ee and apteegiinfo.ee, which provide information about the availability and prices of medicines and other pharmacy goods in all Estonian

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**Figure 2.** Data exchange between pharmacies and social insurance board.
E-pharmacist—the pharmacy decision-support system

The e-pharmacist is a breakthrough pharmacy decision-support system established in 2015 including information about all the medicines authorized by the Estonian Register of Medicinal Products and additionally some food supplements and other pharmacy goods. The e-pharmacist automatically provides information on the side bar whenever a barcode is entered to the system. The information provided by the e-pharmacist includes a quick overview of the indication, active substance, available strengths, dosage forms, dosings for different age groups or indications, requirements for administration and storing of the medicine, most common side-effects and risks, interactions with food, supplements and alcohol, pregnancy and breastfeeding warnings, and possible effects on the ability to drive or use machines. In case multiple medications are entered into the system, the pharmacist can move between pages and access information about possible drug–drug interactions. The latter is connected with the drug interaction database Inxbase. For the accuracy of all other information, the system must be constantly updated by hand based on the medicine’s SPC. Nevertheless, the E-pharmacist acts as a powerful decision-support system which allows the pharmacist to quickly assess the suitability of the medicine and provide faster and more accurate consultations. The E-pharmacist is not available for all community pharmacists, as it is connected to only one of the two available pharmacy sales programs.

Online pharmacies

From 2013 until 2019 there was only one online pharmacy operating in Estonia. The start of the COVID-19 pandemic has encouraged others to join the market and by today, there are five pharmacies operating online. In Estonia, online pharmacies cannot operate as a separate unit but as a branch pharmacy under a general pharmacy. Legal and technical requirements differ greatly compared to other online retail businesses. Logs of activities performed, including those performed by technical support, must be maintained in a distance dispensing environment. The identity of the advisor must also be identifiable from the logs. All logs must be kept for at least one year, including the order and the content of the consultation.

All five online pharmacies in Estonia provide both prescription and over-the-counter medicines, food supplements and other medical goods. To purchase prescription medicines, the patient must first authenticate their identity. Online consultations by pharmacist are always provided with the purchase of prescription medicines. Purchases will be sent to either the buyer’s home, a post office, a parcel machine, or the closest pharmacy of their choice. Retailing medicines at a distance must support the rational consumption of medicines; thus, all orders are analyzed, and, in case of suspicion of misuse or abuse of medicinal products, restrictions apply to dispensing and the State Agency of Medicines is notified immediately.

Previously, the user could also purchase prescription medicines for others such as their children or elderly relatives simply by identifying themselves and entering another person’s personal ID code in the system, as this is required by law for purchasing medicines for others in regular community pharmacies. In December 2020, the Data Protection Inspectorate prohibited this simple solution for all online pharmacies, as the sensitive prescription information was easily accessible online for anyone who knew the personal ID code of another person. As the incident coincided with the COVID-19 pandemic, fast solutions were demanded; yet the service remained inaccessible until September 2021. The solution established by Estonian Health Insurance Fund included authorizing access to representatives for purchases of prescription medicines in the e-Patient Portal and allowing pharmacists to verify the authorization.

Due to COVID-19, Anna and Paul have both been staying at home and decided to use an online pharmacy to order medicines. As Paul is already an authorized representative of Anna in the e-Patient Portal, he can also now purchase Anna’s prescription medicines through an online pharmacy. First, he logs into the system and identifies himself using his electronic ID. Paul then enters Anna’s personal identification code, and after verifying the authorization, the pharmacist will present Anna’s available prescriptions from which Paul has to choose the ones to be delivered. The pharmacist will consult Paul about the correct medicine use, and he can then finish the purchase.

The video-pharmacist

The video-pharmacist solution was first introduced in 2017 and included private patient-pharmacist communication in a customer booth via video conference solution, as the
video-pharmacist counselling the patient would physically be located elsewhere. The administrative tasks such as handing over medicines were carried out by a trained assistant without higher education in pharmacy. The solution aimed to reduce waiting times for patients, allow pharmacy services in small rural areas, and strengthen the pharmacy service by distancing the pharmacist from administrative tasks.25 Shortly after the launch of the new system, the State Agency of Medicines issued a precept demanding physical presence of a pharmacist or a pharmacist assistant in the pharmacies in question; however, this was later revoked by the court.32 Nevertheless, the service has not taken off afterwards and by 2019 was available in only two pharmacies.25

**Telehealth solutions**

In 2018, a private telehealth company MinuDoc was established. MinuDoc offers online or phone-based consultations with different health workers, psychologists, physiotherapists, and others, but also provides a prescription-renewal service for some chronic medicines. To renew the prescription on MinuDoc, a patient must first identify themselves and fill in a form for their request. Any available doctor on the platform can access the request and renew the prescription.33 Some pharmacies are also collaborating with the company and have located self-service kiosks for MinuDoc services inside pharmacies, where the pharmacist can assist the patient in using the system but cannot renew the prescription themselves.34 The renewal usually takes up to 15 min to complete and costs the patient 5 euros.33

**Targeted communication**

Since 2020, Estonian community pharmacists began to remind their patients of the possibility to participate in the screening programs of colorectal, breast, and cervical cancer. The digital solution behind the targeted communication is simple. All pharmacies own information about their patient’s birth year and gender from their client card or ID card. Once the pharmacist enters a patient’s client card or ID card in the pharmacy sales program, the program automatically notifies the pharmacist if the patient belongs to the sample population of one or more screening programs.35

By her year of birth, Anna also belongs in the screening population of breast cancer this year. The last time she visited the pharmacy to purchase her prescription medicines, the pharmacist notified her about the possibility to participate. However, Anna only recently recovered from breast cancer and has had frequent check-ups ever since. As the system does not retrieve this or any other type of data from the health information system, the pharmacist would turn off the notification for Anna so she would not be reminded again on her next visit.

**The pharmacy app**

The pharmacy application by BENU provides information about the closest BENU pharmacy in the area, offers the user personal discounts and in addition, operates as a medication reminder. The patient using the app can insert their medication regimen and the app will automatically start sending reminders.36 Another Estonian smart solution to ensure medication adherence is Medkeep. It is a mobile app for home pharmacy inventory with an intelligent reminder system, which will not only remind the patient to take their medicines, but also when medicines will expire, or refill is required. Additionally, it allows the creation of a family member’s health diary to keep in track of their medicines and health related events, for example, doctor’s visits. The app also has a global pharmacy locator, which can be useful when travelling.37

**Automated dose dispensing**

Since 2012 the automated dose dispensing (ADD) service is provided by only one pharmacy in Estonia, supporting polypharmacy patients in taking their medicines correctly and on time.25,26 The service includes a thorough medication review conducted by a pharmacist in collaboration with the patient’s doctor. After the review, the patient’s medicines are packaged into small plastic sachets according to their medication regimen using an ADD machine usually for two months at a time, although it is possible to package for shorter periods. Each sachet has printed information about the patient, the medicine, and the correct dosing time. All sachets go through an automated quality control before being delivered to the client. The pharmacist will continuously keep an account of the changes in the patient’s medication regimen. Potential benefits of the service for the patient are improved treatment outcomes and quality of life, reduced risk of adverse drug events, and potential savings due to less waste of medicines. However, there are several regulatory, technical, and social barriers hindering the full implementation of the service, for example, the pharmacy is not allowed to send out the packaged sachets to patients by post, package certain dosage forms nor package previously dispensed medicines.25,28,29

After a while, Anna’s health worsened, and Paul made the difficult decision to admit her to a nursing home. Anna, as a polypharmacy patient, has a complex treatment regimen, so the nursing home uses the ADD solution to save time and prevent medication errors. In the process of the collaborative medication review preceding the packaging, it became evident Anna’s treatment regimen needed some changes due to high risk of drug interactions. The packaging was performed based on the new corrected regimen confirmed by the doctor. The nursing staff is now assured Anna is always receiving the correct medicine at the right time with reduced risk for experiencing adverse effects.
Conclusion

Estonian healthcare system has gone through an incredible digital transformation since introducing nationwide e-health records, fully implementing the e-prescription system, and creating the comprehensive e-Patient Portal which gathers a person’s health data from all healthcare providers to a single database. All the different systems used by healthcare professionals share data through the secure data exchange platform X-tee—the backbone of all electronic state services. Digital systems implemented in community pharmacies have enhanced the pharmacy service in Estonia by allowing faster and more accurate consultations, supporting patient safety, and improving access to medicines. Except for the e-Prescription system, digitalization of pharmacy services has gained little support and affirmation from healthcare authorities and are mostly privately funded. Nevertheless, both the Estonian nationwide e-health system and different digital pharmacy services lead the way in technological advancements.

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Guarantor: DV

ORCID iD: Anita Tuula https://orcid.org/0000-0003-0682-4193

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