

eHealth and HL7 in Estonia

Kerli Linna

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■ Kerli Linna

■ My background:

- Optometry (until 2012)
- Master's degree in Healthcare Technology (2010-2013)
- Standardization Specialist at Estonian eHealth Foundation (ETSA) (2012-2015)
- Member Forum rep of Estonia in Snomed International

■ Currently:

- Head of Data Management Division at TEHIK (from 2018)
- eHealth & Healthcare Technology lecturer at Tallinn Healthcare College
- Interoperability and Quality Management lecturer at TalTech
- General Assembly rep of Estonia in Snomed International
- Estonian rep at eHN Subgroup of Semantics



Estonian ehealth is built on top of eEstonia

essential

Best secret weapons.

- + internet is a social right
- + every Estonian resident has an electronic ID
- + 99% of services are online
- + Estonians trust e-solutions

- + population: 1.3 million
- + area: 45,228 km²
- + currency: Euro
- + member of: EU, NATO, WTO, OECD, DIGITAL 9
- + ICT sector employees: 5,9% of workforce



National Health Information System



Electronic Health Record

- ▶ The National Health Information System (ENHIS) started in Estonia in **2008**.
- ▶ *Data are visible to **all clinicians** who treat patients and **patients** can see their own data through Patient Portal and see who have accessed their data.*

PRINCIPLES

- All healthcare providers must send data to Health Information System
- Access only to licensed medical professionals (incl: healthcare specialist like speech therapist, physiotherapist, optometrist)
- Patient has the right to close his/her own data collected in the central database (opt out)
- Patient can access their own data (Patient's Portal)
- Patient can declare their intentions and preferences
- Patient can monitor visits to their HIS



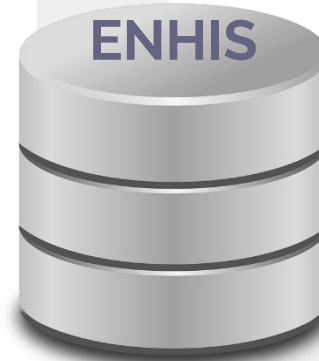
Estonian National Health Information System



Patient portal



Healthcare provider IS



Ambulance



Labs



Alarm Centre



Social Insurance Fund



eBooking system



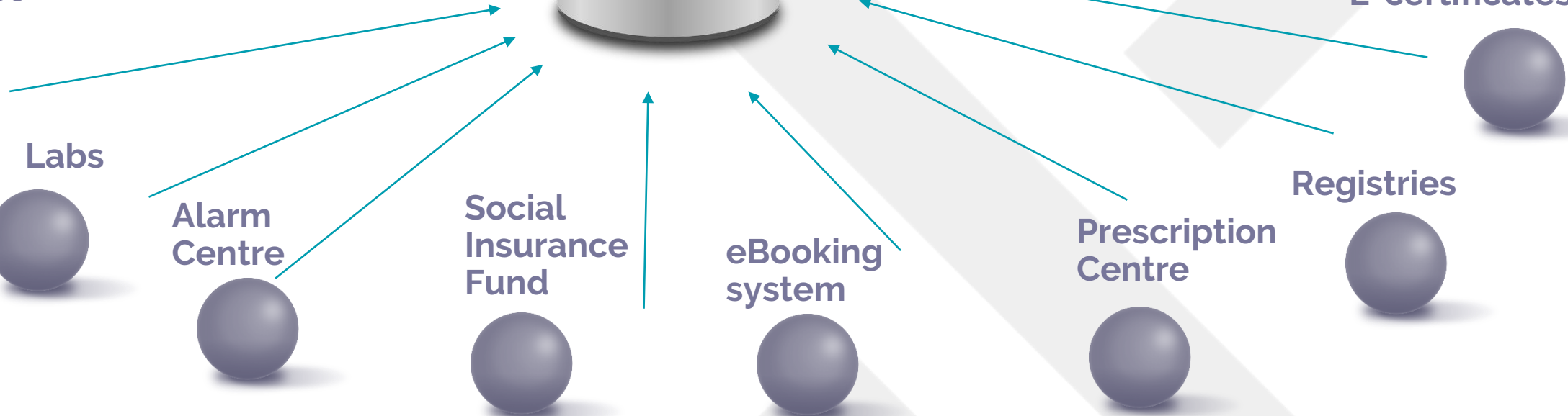
Prescription Centre



Registries



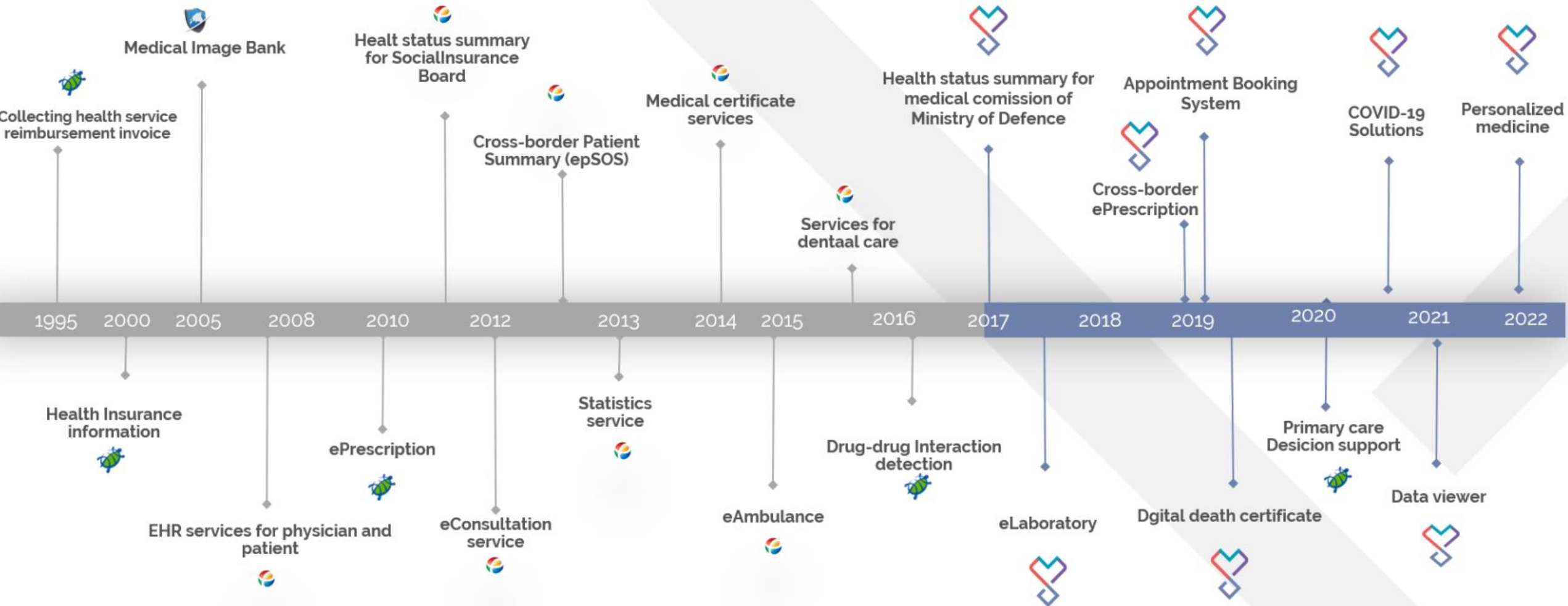
E-certificates



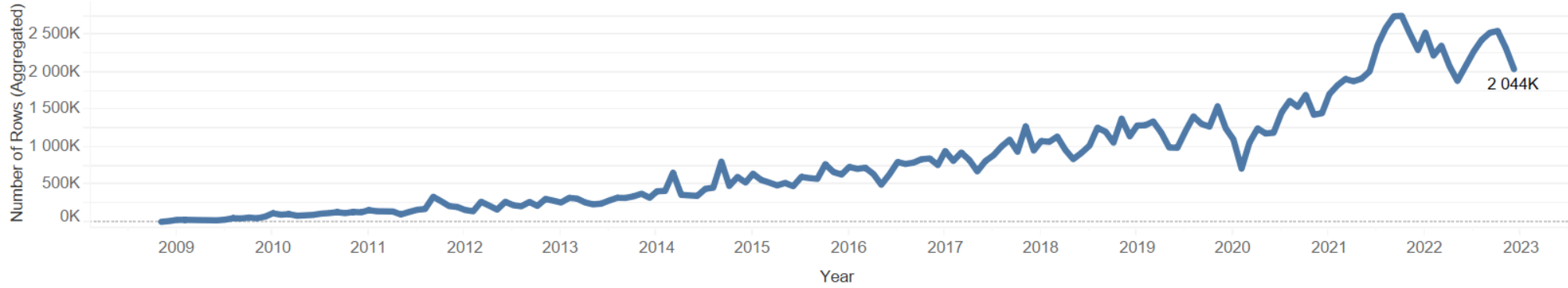
Current EHR basics

- ▶ **Integration through central system**
- ▶ **Opt-out policy in form „patient can close data from doctors“**
- ▶ **XML based HL7 v3 (extended) messages**
- ▶ **Documents are kept in XML format (HL7 CDA R2)**
- ▶ **Reuse of national infrastructure**
 - ▶ e-ID for authentication and digital signature
 - ▶ X-road for secure data exchange

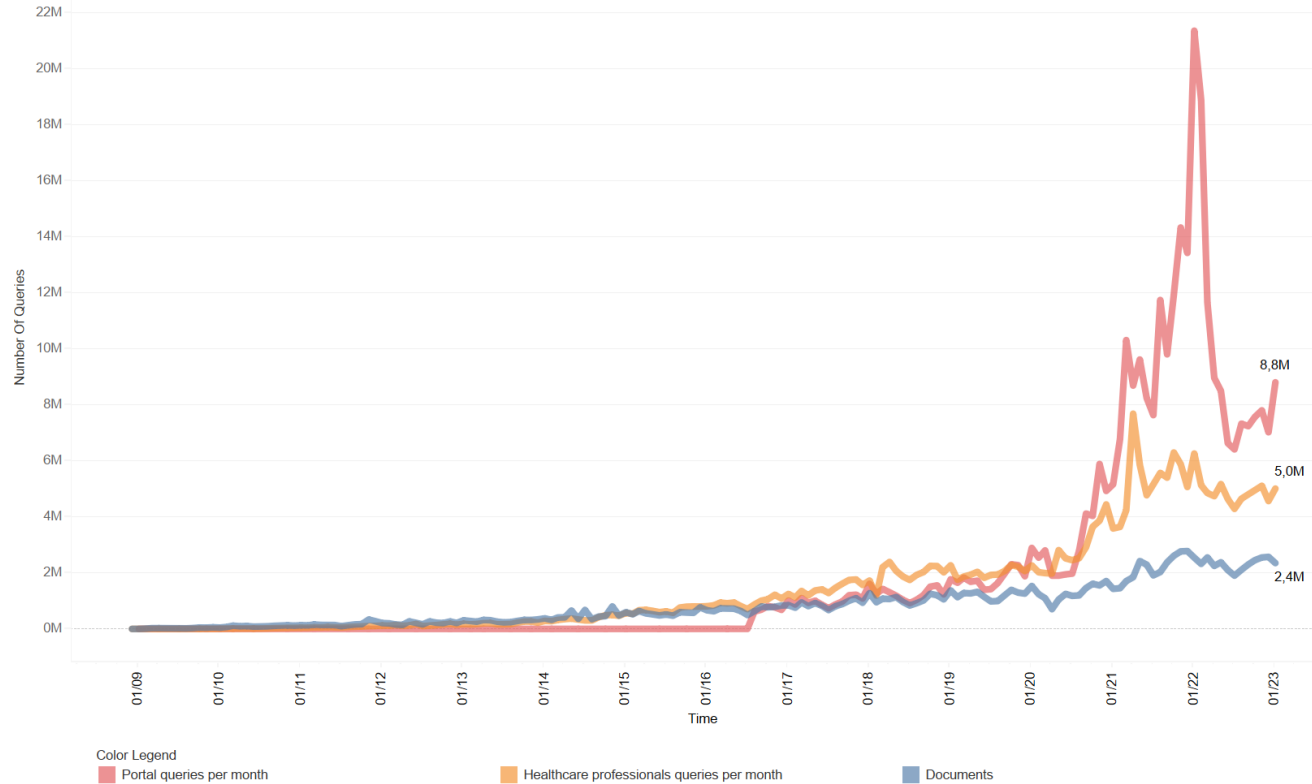
E-Health Services



Documents stored in EHR 2008-2023 (incl. Documents prepared by both the healthcare professional and the patient)



Usability of the Health Information System 2009-2023



Total number of documents received

Year	Total
2008	0,0M
2009	0,3M
2010	1,2M
2011	2,0M
2012	2,5M
2013	3,5M
2014	5,8M
2015	6,9M
2016	8,4M
2017	10,6M
2018	12,8M
2019	14,8M
2020	15,6M
2021	24,6M
2022	27,8M
2023	4,4M
Total	141,2M

STATISTICS



Documentation regulation

- ▶ **Health Services Organisation Act**

Compliance with the requirements for maintaining records, use of the **classifications, directories, address** details prescribed in the State Information Systems and standards of the Health Information System is mandatory upon maintaining records of the provision of health services.

- ▶ **Regulation No. 53 of the Minister of Social Affairs**

“Data compositions of documents sent to the Health Information System and conditions and procedure for their submission”

The Regulation establishes the **data sets of documents** sent to the EHR and the conditions and rules for their submission.



Documents sent to central EHR

Case summaries

- Out-patient case summaries
- Day-Care case summaries
- In-Patient case summaries
- Newborn discharge summaries
- Home nursing and independent inpatient nursing summaries
- Ambulance charts

Referrals & Examinations

- Referral letters
- Image references
- Referral reply letters

Immunization notifications

Prescriptions

Dental care

- Dental care treatment report
- Dental status chart

Children health checks

- Pediatric development assessment reports
- Pediatric growth reports
- Pediatric health examination reports
- Pediatric consultation reports

- Outpatient medical case opening and closing report
- Inpatient medical case opening and closing report

Working ability assessments

Health Certificates

Health Declarations

Statement of intentions

Death documentation:

- Death report
- Causes of death report
- Cause of perinatal death report

Notices for communicable diseases

- HIV infection report
- Communicable disease report
- Suspected communicable disease report

Documents composed by central EHR

- Time-critical data
- Statement request (medical tests, medical diagnosis, medical cases, prescriptions, declaration of intentions, appointments)
- Pediatric Health Record
- State of health description
- Dental status record
- Immunisation Passport
- State of health description for health care professional
- Patient Summary
- Health certificate
- COVID-19 services

[Ruske](#) [English](#)

Hamba staatuse kaart

[Loe lisa info](#)

[Täpsustatud staatus](#)
[Uldstaatus](#)
[Karioloogiline staatus](#)
[Parodontoloogiline staatus](#)

Hamba staatuse kaardi nr 20200228084045785, versioon 1.

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4890606986

[Tagasi ühivaatesse](#)

Hammaste staatused

Intaktnete hammaskond jah [Terve allikas](#)
 Kõrge kaarite risk ei

Radioloogiline staatus on määratud

Dokumendi nr: 18956 versioon 1
 Kuupäev: 04.12.2015 13:21
 Koostaja: JAAANUS KARI(D95431)
 Asutus: Eesti Tervise Sihtasutus(90009016)

[Näita hammaste allikad](#)

Hamba nr	Hamba üldstaatus	Terve allikas
14	X - Eemaldatud hammas Dokument nr: 18012 versioon 1 Kuupäev: 09.09.2015 15:41 Koostaja: JEKATERINA RAKETSKAJA(D07727) Asutus: OÜ Hekamerki(11228309)	<input checked="" type="checkbox"/>
15	X - Eemaldatud hammas Dokument nr: 18012 versioon 1 Kuupäev: 09.09.2015 15:41 Koostaja: JEKATERINA RAKETSKAJA(D07727) Asutus: OÜ Hekamerki(11228309)	<input checked="" type="checkbox"/>
17	Terve hammas Dokument nr: 16339 versioon 1 Kuupäev: 08.06.2015 10:12 Koostaja: KERLI LINNA(D07704) Asutus: Eesti Tervise Sihtasutus(90009016)	<input checked="" type="checkbox"/>
18	0 - Suhu lõikuv hammas Dokument nr: 16339 versioon 1 Kuupäev: 08.06.2015 10:12 Koostaja: KERLI LINNA(D07704) Asutus: Eesti Tervise Sihtasutus(90009016)	<input checked="" type="checkbox"/>



International data exchange standards used in Estonian EHR

▶ HL7 V3 - Version 3

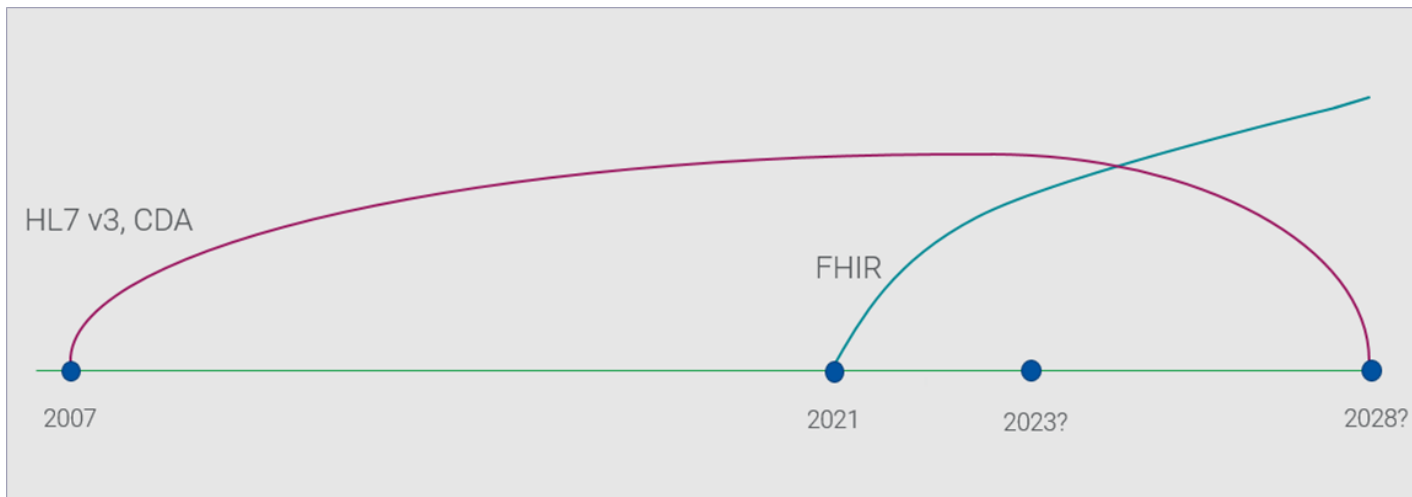
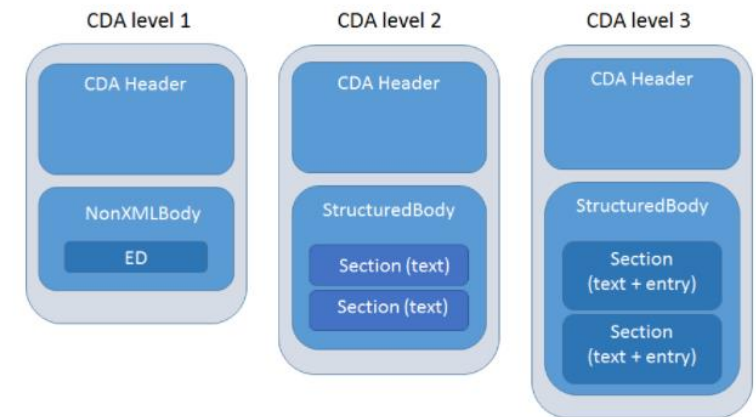
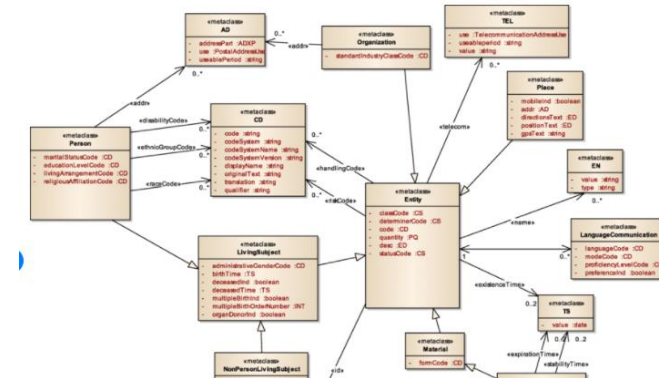
XML based Messaging Standard – an interoperability specification for health and medical transactions

▶ HL7 CDA® R2 - Clinical Document Architecture Release 2

XML based exchange model for clinical documents, based on HL7 Version 3

▶ HL7 FHIR® R4 - Fast Healthcare Interoperability Resources

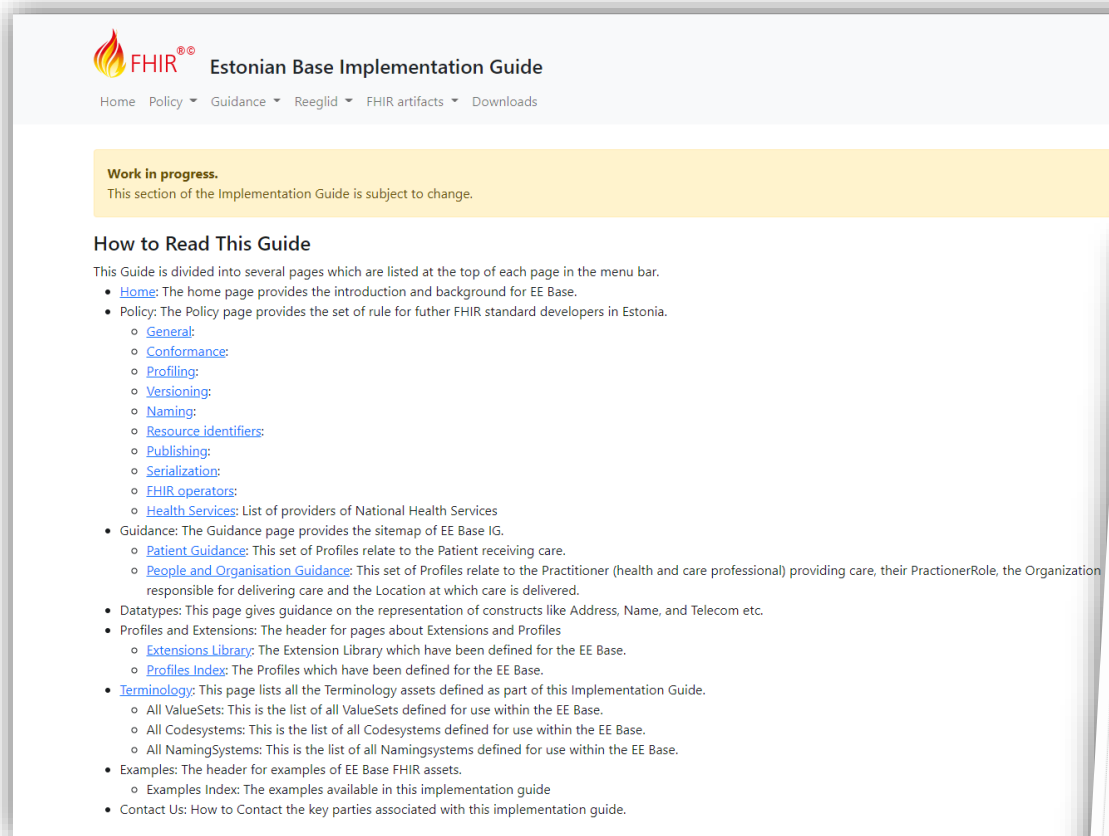
XML or JSON based standard for the exchange of resources



8.1.2 Resource Content

Name	Flags	Card.	Type	Description & Constraints
⊞ Patient	N		DomainResource	Information about an individual or animal receiving health care Elements defined in Ancestors: id, meta, implicitRules, language
⊞ identifier	Σ	0..*	Identifier	An identifier for this patient
⊞ active	?! Σ	0..1	boolean	Whether this patient's record is in active use
⊞ name	Σ	0..*	HumanName	A name associated with the patient
⊞ telecom	Σ	0..*	ContactPoint	A contact detail for the individual
⊞ gender	Σ	0..1	code	male female other unknown AdministrativeGender (Required)
⊞ birthDate	Σ	0..1	date	The date of birth for the individual
⊞ deceased[x]	?! Σ	0..1		Indicates if the individual is deceased or not
⊞ deceasedBoolean			boolean	

Implementing FHIR



FHIR® Estonian Base Implementation Guide

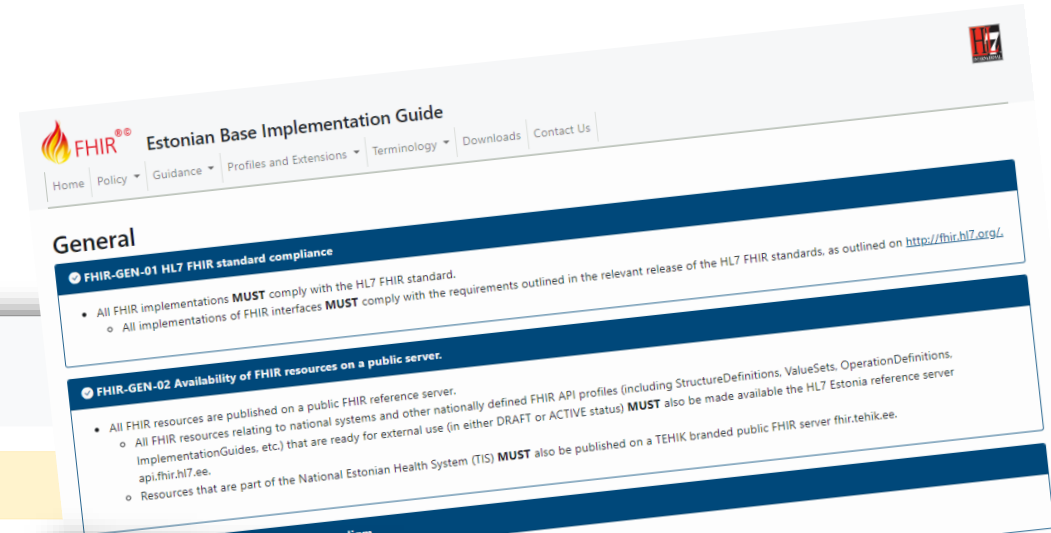
Home Policy Guidance Reelgid FHIR artifacts Downloads

Work in progress.
This section of the Implementation Guide is subject to change.

How to Read This Guide

This Guide is divided into several pages which are listed at the top of each page in the menu bar.

- [Home](#): The home page provides the introduction and background for EE Base.
- [Policy](#): The Policy page provides the set of rule for futher FHIR standard developers in Estonia.
 - [General](#):
 - [Conformance](#):
 - [Profiling](#):
 - [Versioning](#):
 - [Naming](#):
 - [Resource identifiers](#):
 - [Publishing](#):
 - [Serialization](#):
 - [FHIR operators](#):
 - [Health Services](#): List of providers of National Health Services
- [Guidance](#): The Guidance page provides the sitemap of EE Base IG.
 - [Patient Guidance](#): This set of Profiles relate to the Patient receiving care.
 - [People and Organisation Guidance](#): This set of Profiles relate to the Practitioner (health and care professional) providing care, their PractionerRole, the Organization responsible for delivering care and the Location at which care is delivered.
- [Datatypes](#): This page gives guidance on the representation of constructs like Address, Name, and Telecom etc.
- [Profiles and Extensions](#): The header for pages about Extensions and Profiles
 - [Extensions Library](#): The Extension Library which have been defined for the EE Base.
 - [Profiles Index](#): The Profiles which have been defined for the EE Base.
- [Terminology](#): This page lists all the Terminology assets defined as part of this Implementation Guide.
 - All ValueSets: This is the list of all ValueSets defined for use within the EE Base.
 - All Codesystems: This is the list of all Codesystems defined for use within the EE Base.
 - All NamingSystems: This is the list of all Namingsystems defined for use within the EE Base.
- [Examples](#): The header for examples of EE Base FHIR assets.
 - [Examples Index](#): The examples available in this implementation guide
- [Contact Us](#): How to Contact the key parties associated with this implementation guide.

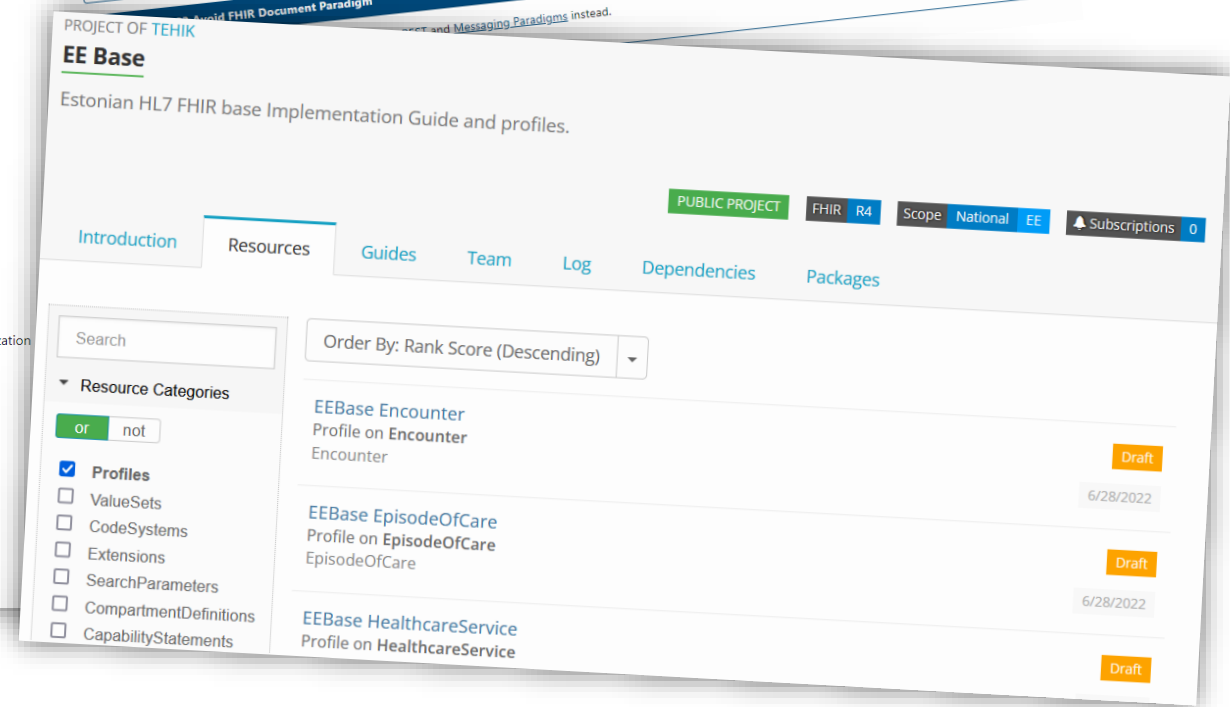


FHIR® Estonian Base Implementation Guide

Home Policy Guidance Profiles and Extensions Terminology Downloads Contact Us

General

- **FHIR-GEN-01 HL7 FHIR standard compliance**
 - All FHIR implementations **MUST** comply with the HL7 FHIR standard.
 - All implementations of FHIR interfaces **MUST** comply with the requirements outlined in the relevant release of the HL7 FHIR standards, as outlined on <http://fhir.hl7.org/>
- **FHIR-GEN-02 Availability of FHIR resources on a public server.**
 - All FHIR resources are published on a public FHIR reference server.
 - All FHIR resources relating to national systems and other nationally defined FHIR API profiles (including StructureDefinitions, ValueSets, OperationDefinitions, ImplementationGuides, etc.) that are ready for external use (in either DRAFT or ACTIVE status) **MUST** also be made available the HL7 Estonia reference server api.fhir.hl7.ee.
 - Resources that are part of the National Estonian Health System (TIS) **MUST** also be published on a TEHIK branded public FHIR server fhir.tehik.ee.



PROJECT OF TEHIK

EE Base

Estonian HL7 FHIR base Implementation Guide and profiles.

PUBLIC PROJECT FHIR R4 Scope National EE Subscriptions 0

Introduction Resources Guides Team Log Dependencies Packages

Search

Order By: Rank Score (Descending)

Resource Categories

or not

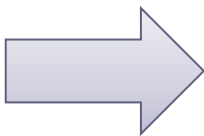
- Profiles
- ValueSets
- CodeSystems
- Extensions
- SearchParameters
- CompartmentDefinitions
- CapabilityStatements

EEBase Encounter Profile on Encounter Encounter	Draft	6/28/2022
EEBase EpisodeOfCare Profile on EpisodeOfCare EpisodeOfCare	Draft	6/28/2022
EEBase HealthcareService Profile on HealthcareService	Draft	

<https://simplifier.net/guide/ee-fhir-base?version=current>

New solutions for viewing health data

Tüüp	Loomise aeg	Looja asutus	Autor	Nr	Haiguslugu	Toimingud
Ambulatoorne epikriis	30.04.2018 11:41	OÜ Hekamerk		(1.3.6.1.4.1.28284.1.149.2.2) 29806	29806	Ava
saatekirja vastus	04.10.2017 17:25	Sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 7480		Ava
saatekirja vastus	18.09.2017 15:59	OÜ Hekamerk		(1.3.6.1.4.1.28284.1.149.2.2) 26908		Ava
Ambulatoorne epikriis	18.09.2017 15:54	OÜ Hekamerk		(1.3.6.1.4.1.28284.1.149.2.2) 26900	26900	Ava
saatekirja vastus	12.09.2017 14:01	sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 7990		Ava
saatekirja vastus	14.07.2017 10:30	sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 7482		Ava
Saatekirja vastus	17.02.2017 14:35	sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.29907.1.1.76.2) 17-268-1--medicum.SK-E-74	20170124-0087	Ava
Saatekirja e-konsultatsioonile	07.02.2017 00:14	MEDICUM PEREARSTIKESKUS AS		(1.3.6.1.4.1.28284.1.182.2.2.6) medicum.SK-E-114	3737306	Ava
Saatekirja e-konsultatsioonile	25.01.2017 12:07	MEDICUM PEREARSTIKESKUS AS		(1.3.6.1.4.1.28284.1.182.2.2.6) medicum.SK-E-80	3737095	Ava
Saatekirja e-konsultatsioonile	24.01.2017 12:48	MEDICUM AS		(1.3.6.1.4.1.28284.1.182.2.2.6) medicum.SK-E-74	3737074	Ava
Vastus saatekirjale	16.01.2017 16:05	sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 5234		Ava
Vastus saatekirjale	12.01.2017 15:04	Sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 4986		Ava
Vastus saatekirjale	29.12.2016 10:25	sihtasutus Tartu Ülikooli Kliinikum		(1.3.6.1.4.1.3516.13.1.2.1.5.1.3) 5019		Ava



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Saatekirja number: 13031000001
Saatekirja tüüp: Saatekirja ambulatoorsele vastuvõtule
Saatekirja: Veli Kopper (D12345)
Erilise: E17 - üldarst

Sünniaeg: 05.05.1989

[Näita kõiki andmeid](#)

Lõplik kliiniline diagnoos

Põhihaigus

Kliiniline diagnoos	RHK-10 kood ja nimetus	Statistiline liik
Käärsoole pahaloomuline kasvaja	C18.8 Käärsoole osalt kattuvate paikmete pahaloomuline kasvaja	+

Kasvaja andmed

Diferentsseerimise aste	Pahaloomulise kasvaja levik	Residuutuumor	Lümfoskulaarne invasioon	Stadium
Kõrge diferentsseerimine (aste 1)	pT4b cN2b pM1b	R1 - mikroskoopiline	esineb lümfoskulaarne invasioon	IIA2

Patomorfoloogiline diagnoos

M8210/3 Adenokartsinoom in situ adenomatooses polüübis

Aplasia

New health portal for citizens

My e-Health

My data

Kerli Linna
INSURED
Family doctor:

Update

COVID-19

SUBMISSION OF VACCINE INJURY COMPENSATION DATA

AUTHORISING A NEW REPRESENTATIVE

Recent documents

Health data

Time critical data

Dental care documents

Dental care charts

Dental status chart

Passport of Immunization

Ambulancecharts

Prescriptions

Referrals

Invalid referrals

Valid referrals

Referrals related to an appointment

Health declarations

Health certificates

Case summaries

Out-patient case summaries

Day-care case summaries

In-patient case summaries

Birth case summaries

Notifications

Development assessment notifications

Immunisation notifications

Growth notifications

Examination notifications

Counselling notifications

Examination results

Image references

Referral responses

Working ability assessment

National eBooking system

DIGIREGISTRATUUR

Invoices submitted to the Estonian Health Insurance Fund

Click on the box to view medical invoices, click on the information sign for more information

Statements of intention

Click on the box to view and prepare statements of intention, click on the information sign for more information

Managing accesses to health data

Managing access rights of the medical committees under the Estonian Ministry of Defence area of government. Managing Emergency Response Centre and cross-border data exchange. Click on the information sign for more information.

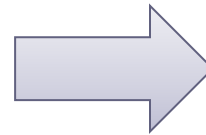
Notifications

Click on the box to view notifications, click on the information sign to receive notifications on your e-mail or to view additional information

Hospital links

Logbook

Ambulance/emergency 112
Family doctor's hotline 1220
Poisoning information phone number 16662



Minu vererõhk

Aeg: 20.01.2022, 10:32
Mõõtja: Kairi Sarapuu

142/76 mmHg

82 lööki / minutis

◆ Süstoolne (ülemine) ● Diastoolne (alumine)

Sisesta andmed +

Ava täisvaade >

Kehamassiindeks

Viimane uendus: 24.01.2022, 08:42
Muutja: Kairi Sarapuu

82.7 kg

Sinu kehakaal

186.7 cm

Sinu pikkus

79.5 cm

Sinu vöö ümbermõõt

24.8 cm

Sinu kaela ümbermõõt

Kehamassiindeks (KMI)

Sisesta andmed +

Ava täisvaade >

< Kitsendan menüü

Avaleht

Vastuvõttud ja digiregistratuur

Minu tervis

Minu tervise ülevaade

Toimunud vastuvõttude ja haiglaravi kokkuvõtted

Analüüsid ja uuringute tulemused

COVID-19

Vaktsineerimised

Hammaste seisund

Ligipääsetavus

KEEL: EST

Avaleht / Minu tervis / Toimunud vastuvõttude ja haiglaravi kokkuvõtted

Toimunud vastuvõttude ja haiglaravi kokkuvõtted

Siin on vastuvõttude, õendusabi, haigla- ja päevaravi kokkuvõtted ehk epikriisid ja kiirabikaardid.

Toimunud vastuvõttude ja haiglaravi kokkuvõtted

Erila	Dokumendi liik ja staatus	Asutus	Aeg
Vastuvõtt Perearstiaabi	Ambulatoorne epikriis Staatust: aktiivne	Kukekanna PAK	15.07.2021
Vastuvõtt Günekoloogia	Ambulatoorne epikriis Staatust: aktiivne	Nõmme naistekliinik	17.07.2018
Vastuvõtt Ortopeedia	Ambulatoorne epikriis Staatust: lõpetatud	PERH	05.07.2016

← 1 2 3 4 5 6 ... → Kuvan korra

e-health

the healthiest system

- + digital health data
- + e-prescription
- + e-ambulance
- + e-booking
- + biobank with 200 000 donors
- + personalised medicine



**Thank you for taking
the time to think along!**

Kerli Linna

kerli.linna@tehik.ee

