Building a National Functioning Information Architecture: The Finnish ICF-FHIR Experience

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Heidi Anttila, Mikko Härkönen, Mervi Pättikangas, Jaana Taina, Heidi Niemelä, Niina Palm, Jatta Kivelä
Finnish Institute for Health and Welfare (THL), Finland

Abstract Finland has started transforming fragmented free-text functioning information into structured, interoperable and reusable data through a national ICF-FHIR-based architecture. The model combines standardized structures, metadata services, professional guidance and FHIR implementation, strengthening readiness for future European Health Data Space (EHDS) use.

Introduction

Finland has a long tradition of ICF use in rehabilitation and education, but functioning data is still often documented as fragmented free text, limiting interoperability, comparability and reuse across organizations and systems.

Aim: To build a national information architecture that transforms functioning information into structured, ICF-based and FHIR-enabled data for interoperable use across Finnish social and health care (fig. 1)

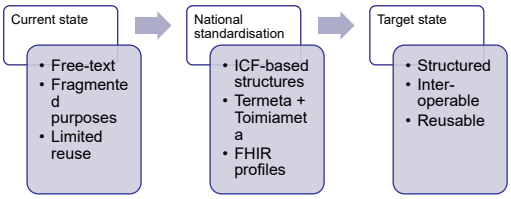


Figure 1. From free text to interoperable functioning data.

Methods & Materials

This work is conducted as a national development and specification process coordinated by THL. The materials included the National Concept for Work Ability and Functioning Data, nationally defined document structures, ICF categories and qualifiers, stakeholder workshop input, public consultation feedback, and requirements for Kanta-compatible implementation.

The work combined semantic modelling, document structure definition, professional documentation guidance, metadata modelling for functioning measures and alignment with HL7 FHIR implementation in the national Kanta services (table 1).

Table 1: Methods and materials used in national specification work

Area	Method / material
Data structures	Expert definition and stakeholder consultation based on a national component model, ICF categories and qualifiers
Recording guidance	Development and public consultation of a practical guide with examples from social and health care
Functioning measures	Metadata modelling for questions, response options, scoring, results, licences and lifecycle
FHIR implementation	Alignment with Kanta requirements and HL7 FHIR profiling

Results

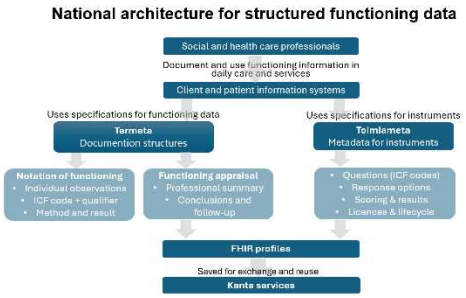


Figure 2. Termeta defines national document structures and ICF-based content, Toimiameta defines metadata for functioning measures, and FHIR profiles enable implementation in Kanta services.

The architecture defines two core structures for functioning documentation: Notation of functioning for individual ICF-coded observations and Functioning appraisal for professional summaries based on one or more notations (fig. 2 & table 2).

The timeline illustrates Finland's shift from ICF education and regional use towards national data structures, Kanta implementation, AI-assisted ICF coding and EHDS readiness (fig 3).

Table 2: Key elements from national specifications to implementation.

Component or layer	What it is	Role in the architecture
National Information Structures (Termeta)	National information structures and ICF-based content definitions for functioning information	Define what functioning information is recorded and published for system implementation.
Recording Guide	National guidance for professionals	Supports consistent production and documentation of structured functioning information in practice.
Functioning Measure Metadata (Toimiameta)	Metadata model and service for functioning measures	Defines metadata for measures, including questions, response options, scoring, results, licences and lifecycle.
FHIR Profiles	Technical interoperability specifications	Implement national information structures and metadata requirements in interoperable data exchange.
Information Systems	EHR and social care systems	Implement national specifications and support structured documentation in everyday practice.
Kanta Services	National health and social care data infrastructure	Enable national storage, sharing and reuse of structured functioning information.

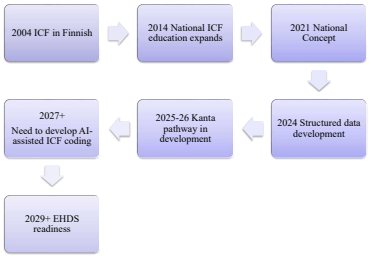


Figure 3: Implementation timeline 2014–2029+

Conclusions

Structured functioning data can improve continuity of care, support rehabilitation and work ability services, enable comparability across social and health care, and strengthen knowledge-based management.

The Finnish ICF-FHIR architecture forms a national ecosystem that can make functioning data more comparable, reusable and actionable across social and health care. As the national structures and FHIR implementation mature, Finnish structured functioning data could also become ready for EHDS-related use and European-level interoperability.

Key recommendations

- Build implementation around three coordinated layers:
  1) national data structure specifications,
  2) metadata for functioning measures, and
  3) national infrastructure for data storage and exchange.
- Ensure that client and patient information systems vendors can implement structured functioning documentation consistently across organizations.
- Support professionals with practical guidance, training and change management.
- Develop AI-assisted ICF coding to make routine use of ICF feasible, scalable and quality-assured.*
- Maintain sustainable governance for specifications, measures, licenses, access control, data quality and EHDS readiness.

* An extensively validated semantic language model (Nieminen et al. 2025) automatically suggests ICF codes from clinical text. The model uses self-supervised learning and supports a human-in-the-loop workflow: AI proposes, professional validates, enabling efficient, consistent, and auditable ICF documentation.

Acknowledgements

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Notes

FHIR = Fast Healthcare Interoperability Resources
EHDS = European Health Data Space
Kanta = a unique solution used all over Finland for the safe storage and seamless use of social welfare and healthcare data.