Final Report RFI openEHR 2023

2023-09-11

Summary

In Spring 2023, Region Östergötland, in collaboration with Regions Västra Götaland, Uppsala, Stockholm, Skåne, Kalmar, and Jönköping County, conducted an RFI for openEHR platforms and tools.
Thirteen suppliers responded, out of which nine were invited for digital demonstrations.

The goals of the RFI were:

- To reach all providers of openEHR solutions active in the European market, to gain a current understanding of the market landscape, and the maturity of providers in the field.
- To particularly focus on usage within the Swedish context and legal framework, as this was not explored in previously conducted RFIs.

The most significant insights provided by the RFI were:

- Among the respondents, there is currently (in 2023) one platform offered by multiple suppliers in the RFI that is more mature than the other platforms, but several other suppliers will be able to offer complete solutions during 2023/24.
- Several RFI responses demonstrated the technical capabilities necessary to configure solutions that allow the system to comply with the Patient Data Act and other important Swedish legal requirements.
- It is not possible to identify a single supplier that is best for all customers; rather, it depends on the specific purpose of each customer in implementing openEHR-based solutions.
- Increased standardization in GUI/form management is desirable. While waiting for this, procurement should carefully consider functionality for the export and import of forms to facilitate future migration of forms between different competing openEHR systems.
- Mature openEHR-based products exist for agile development of new features as a standardized complement to a region's main EHR system.
- Development of new functionality can be shared nationally among multiple regions.
- Organizations looking to implement openEHR must be aware that it is not a complete end-user IT system being acquired, but rather a technical platform upon which applications are built to add operational value.

Please note that this document does not explain what openEHR is. To gain a comprehensive understanding of openEHR and its purpose, there are several good sources referenced in the appendix "Where to learn more?"

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Introduction

In Spring 2023, Region Östergötland, in collaboration with Regions Västra Götaland, Uppsala, Stockholm, Skåne, Kalmar, and Jönköping County, conducted an RFI (Request for Information) for openEHR. These regions, collectively, cover two-thirds of Sweden's population. Most regions operate university hospitals with a significant emphasis on research and advanced healthcare.

The goal of the RFI was to reach all providers of openEHR solutions in the European market to gain an up-to-date understanding of the market landscape. Special focus was placed on implementation according to Swedish legislation. The collaboration was solely focused on conducting the RFI, with no agreements for potential procurement or joint procurement.

The previous RFI conducted by Region Östergötland in 2020 served as the foundation for this work.

The following three objectives were outlined in the RFI for the implementation of openEHR-based healthcare data systems:

- Faster adaptation of IT systems to the ever-evolving needs of healthcare operations, including a more efficient development process.
- Increased control over stored medical record data, enhanced reuse of information structures within and between applications and healthcare providers.
- Greater autonomy for the regions when healthcare-related data is stored in a vendor-neutral and open format.

Background

In Sweden and worldwide, there is growing recognition that no single electronic health record (EHR) system can be all-encompassing and excel in every aspect. Alongside traditional EHR systems, there's a need for open healthcare data platforms to which supplementary (in-house developed or purchased) applications can be connected. These platforms are used to store and process data in a vendor-independent open format, avoiding lock-in effects.

Today's EHR systems with proprietary locks often result in:

- Patient exclusion from contributing their own health data.
- Duplication and excessive documentation.
- Inability to generate cross-system overviews.
- Difficulty in tracking patients across the entire healthcare continuum.
- Patient safety risks due to inaccessible information for the right person at the right time.
- Barrier to data transfer automation.
- Dependency on vendors, incurring costs and time to retrieve data.
- Inaccessibility of a significant portion of health-related data for research purposes.
- Obstruction of decision support, AI applications, and other innovative solutions to aid healthcare.

- Impediments to sharing information with other regions, quality registries, universities, or the business sector.

To address these challenges, several organizations and regions worldwide have opted to collect and manage clinical data, using healthcare data platforms based on the open standard/specification called openEHR. This standard outlines the storage, management, retrieval, and exchange of health data within electronic patient records.

In openEHR, information is structured using data types and constructs from the technical reference model (RM). These are assembled and configured into clinical data models known as archetypes (e.g., an archetype for pulse and another for blood pressure). Templates are then created, for various use cases, consisting of parts from one or more archetypes.

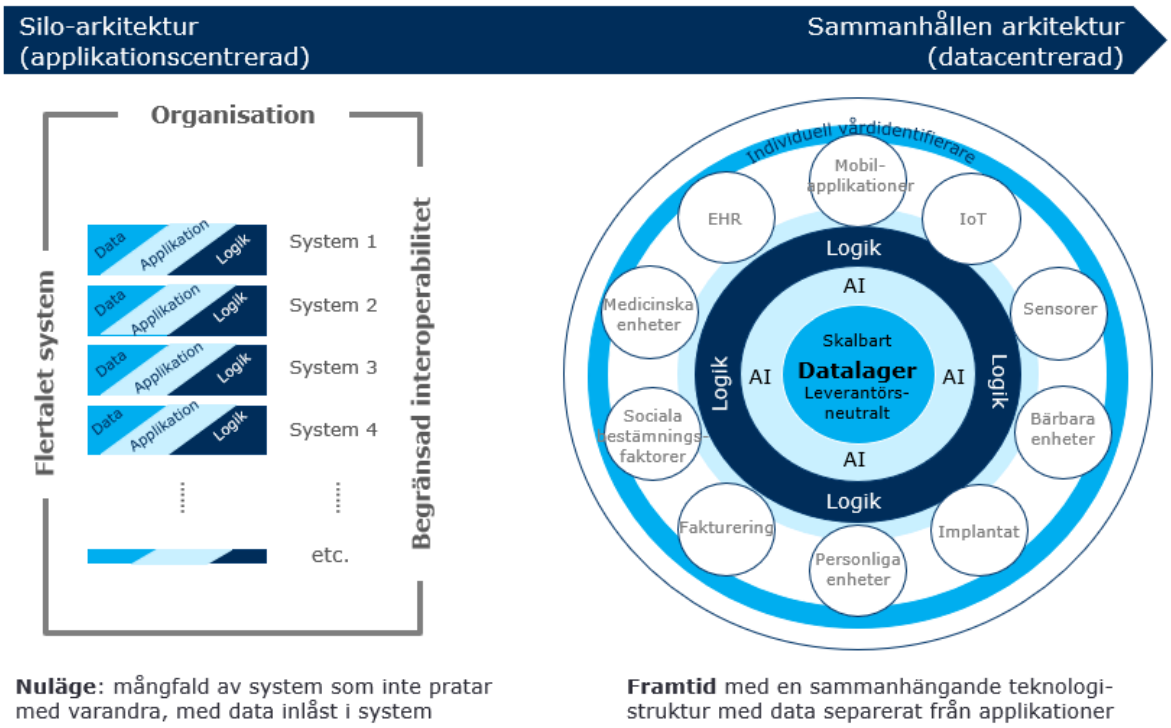
Developing IT systems and associated information models for healthcare is complex, and time-consuming for individual healthcare providers. A key advantage of openEHR is the concept of reuse. This is facilitated by the international archetype library known as the Clinical Knowledge Manager (CKM)[1], and the sharing of work through openEHR Sweden[2] and the global openEHR organization[3] and community[4]. Existing archetypes allow for rapid creation of templates using free tools, which then serve as the foundation for building user interfaces (forms, etc.), integrations, and AQL[5] queries using various openEHR tools.

Handling and structuring clinical information are time-consuming and costly regardless of the system used. Through the openEHR ecosystem, however, one can leverage work already done globally across numerous clinical areas. Pre-existing models, tools, and methods offer a quick and comprehensible way to develop solutions independently, or in collaboration with others nationally and internationally.

By strategically combining interoperability standards within the healthcare sector, we lay the groundwork for efficient and innovative IT solutions in the future. For instance, HL7/FHIR and openEHR are two standards that complement each other. While HL7/FHIR, other APIs, and formats can be used for data transfer/access. Through integrations, when data is stored in an openEHR-based platform, such flexibility aligns well with the goals outlined in the EU's data strategy, the government's Life Science strategy, the national strategy for sustainable regional development, and the Swedish National Board of Health and Welfare's Vision eHealth 2025.

The figure below illustrates the necessary evolution of the architecture for healthcare information storage, transitioning from today's application-centric architecture to a data-centered modular architecture.

[1] https://ckm.openehr.org/ckm/
[2] https://openehr.atlassian.net/wiki/spaces/healthmod/pages/90796248/openEHR+Sweden
[3] https://www.openehr.org/
[4] https://discourse.openehr.org/
[5] https://specifications.openehr.org/releases/QUERY/latest/AQL.html



Nuläge: mångfald av system som inte pratar med varandra, med data inlåst i system

Framtid med en sammanhängande teknologi-struktur med data separerat från applikationer

Image source: "Investigation on the effects of choosing openEHR as standard within Region Stockholm". Regional management office Region Stockholm. Case no: RS 2022-0070-6

Method description

Collaboration was established among interested regions, and a decision was made to conduct a joint RFI. The number of participating regions increased during the work, encompassing seven regions by the publication date. Region Östergötland coordinated the efforts, and the RFI was administered through their procurement system. The RFI was published on TED[6] and is also available for download from openEHR's Discourse[7]. Since suppliers had the option to request confidentiality for all or parts of their RFI responses, confidentiality agreements were also established among the participating regions.

The working group was loosely composed, with each region determining the resources they wished to involve, which varied over time. The work was led by Åsa Skagerhult (Östergötland), and each region had a designated point of contact: Henrik Löf for Stockholm, Jenny Harrysdotter for Uppsala, Johan Åhlin for Skåne, David Lindahl for Kalmar, Ylva Linderstam for Jönköping, and Noak Eldh for VGR.

Initially, the collaboration was intended to be based on the requirements set out by Region Östergötland in 2020 for consultation. However, this wasn't possible due to confidentiality reasons. Therefore, the collaboration was split into two separate tracks. One track was to conduct the RFI described in this report. In the second track, not detailed in this report, Regions Stockholm, Östergötland, and Uppsala proceeded to review the submitted

[6] https://ted.europa.eu/udl?uri=TED:NOTICE:231835-2023:TEXT:EN:HTML
[7] https://discourse.openehr.org/t/the-swedish-openehr-platforms-and-tools-rfi-2023/3840

requirements and establish a shared question bank that can support future requirement work. This question bank is intended to be usable by entities beyond the three regions that compiled it.

The RFI was conducted in two steps:

1. Part one consisted of a series of questions to be answered in writing, along with an appendix describing openEHR within a Swedish legal context. This part was open for any supplier to respond to.
2. Part two involved digital product demonstrations. For this part, suppliers needed to qualify based on criteria outlined in the RFI document.

Thirteen suppliers responded, offering various types of solutions. Of these, nine were selected to demonstrate their solutions based on predefined use cases. There are also several international openEHR suppliers[8] that did not respond to the RFI.

The supplier demonstrations were recorded and are available in a playlist on the openEHR International YouTube channel[9]. Some suppliers chose to take advantage of an offer to stop recording during the last quarter to discuss matters they wished to keep confidential.

The collaboration around this RFI resulted in the following materials, which will also be accessible on openEHR's Discourse[10] forum (except for documents marked as confidential):

- This report
- Submitted RFI responses
- Recorded and published product demonstrations
- Presentation materials from the product demonstrations

In addition to the RFI itself, the following materials will also be made available:

- A question bank to support requirement specification for future procurements

The table below provides an overview of the suppliers that submitted responses, those that conducted demonstrations, links to the recorded product demonstrations, the Clinical Data Repository (CDR) and Form Tool offered by each supplier, and whether the supplier requested confidentiality for their written responses.

Supplier	Product demonstration	Confidentiality requested
Better	Demo 2h https://youtu.be/neTwY7cPDnw	No
Cabolabs	Demo 1h 15m Fokus: demografi https://youtu.be/Kacn8b9oLjE	No

[8] Se t.ex. fler på https://openehr.org/community/industry_partners/
[9] https://www.youtube.com/playlist?list=PLhWi0RtmG26VsdOWYUhEAdVlbBfgAQjCK
[10] https://discourse.openehr.org/t/the-swedish-openehr-platforms-and-tools-rfi-2023/3840

Cambio	Demo 2 h https://youtu.be/tGWDe_c57ec	Yes
Cerner	Did not offer CDR, not invited to demo	Yes
Dedalus Sweden	Interesting solution, but was not invited to the demo because the offer was similar to that from another supplier. For time reasons only one of these two suppliers was offered demo time.	No
DIPS ASA	Demo 2h https://youtu.be/uo8bjeCuSsw	No
Ernst & Young	Demo 1h Fokus: federation och ancillary services https://youtu.be/nqu5aHydfK8	Yes
Eweave AB	Demo 1h Fokus: demografi https://youtu.be/lB2LK0zXmXU	No
IBM	Demo 2h https://youtu.be/rDfvF0KaN2M	Yes
Infosolutions	Did not offer CDR, not invited to demo	No
Leyr	Did not offer CDR, not invited to demo	No
Medblocks	Demo 1h Fokus: Medblocks UI (open source) https://youtu.be/h9NMl_7P2d0	No
Tieto	Demo 2h (mainly in swedish) https://youtu.be/CWhpAgJ25Hk	Yes

Table 1: Overview of the RFI's results (sorted by supplier in alphabetical order).

Result

Overview of What Suppliers Can Offer

In addition to the library of clinical models (archetypes and templates) and a community, openEHR primarily consists of a set of technical specifications. To be able to store and use healthcare information, a supplier needs to build a solution based on these specifications, involving various forms of technology such as interfaces, databases, application servers, and infrastructure. The quality, robustness, and usability of such an implementation are determined by the supplier's expertise and experience, providing them with an opportunity to compete in an open market.

The data is stored in a Clinical Data Repository (CDR), and data retrieval from many suppliers in the RFI can be achieved using openEHR's query language AQL[11] (Archetype Query Language), through calls via openEHR's REST API[12], or other interfaces for reading and writing information. These interfaces serve as a foundation when developing and realizing various types of healthcare applications. However, they do not otherwise specify how the application should function. It remains the responsibility of the application developer to realize user interfaces and functionality. Nonetheless, the CDR removes data storage itself from the equation, which, in addition to benefiting developers, also contributes to portability between different openEHR-based systems and eliminates data vendor lock-ins.

As openEHR's information models are machine-readable, it opens up an opportunity for suppliers to create tools that allow us to build and generate graphical interfaces. Together, the CDR and associated development tools, create a cohesive healthcare data platform with the goal of easily realizing various types of applications for reading, and writing healthcare information.

The composition of such a platform varies among suppliers. Some have a strategy to deliver an all-in-one solution, while others focus on delivering specific components. The type of packaging offered or chosen depends on several factors:

- Hosting as a service or in-house
- Degree of in-house development capability, or dependency on external parties
- Level of integration with regional and national services for authorization control, functionality for Swedish legal compliance, e.g., PDL (Patient Data Law)

Currently, there are several suppliers that offers CDR components, with some also available as open-source software. In this RFI, our focus was on gathering information about the maturity of suppliers, and how we could implement a CDR in a Swedish context.
In the table below, there is a brief description of each supplier and their offerings.

Vendor	**Delivery model**	**CDR**	**Provider of form tools**
Better	Local operation, Software as a Service, Cloud service, Hybrid model	Better Platform	Better

[11] https://specifications.openehr.org/releases/QUERY/latest/AQL.html
[12] https://specifications.openehr.org/releases/ITS-REST/latest/overview.html

Vendor	Delivery model	CDR	Provider of form tools
CaboLabs	*Atomic*: Local operation, Software as a Service *EHRserver*: Open souce code, Software as a service	Atomik EHRserver	CaboLabs (simple solution for demo and training)
Cambio	Under investigation, likely: Software as a Service, Hybrid model	Cambio CDR/xCDR	Cambio
Dedalus Sweden	Local operation, Cloud service	Vita Group HIP CDR (EHRbase)	Cambio
DIPS	Local operation	DIPS EHR Store	DIPS
Ernst&Young	Confidentiality requested	Confidentiality requested	Confidentiality requested
Eweave	Local operation, Cloud service	Eweave	Eweave
IBM	Confidentiality requested	Confidentiality requested	Confidentiality requested
MedBlocks	Local operation, Cloud service	Vita Group HIP CDR (EHRbase)	MedBlocks
TietoEvry	Confidentiality requested	Confidentiality requested	Confidentiality requested

Table 2. Overview of suppliers' offers

Developer tools, portals and forms

There are differences in maturity and approaches among the suppliers. Many suppliers include some form of portal solution in which applications can be launched.

Regarding archetype and template tools, there are well-developed and good free tools available, which may explain why several suppliers do not offer their own tools for this purpose. The availability of good free tools[13] also means that these tools may not necessarily be of interest in a procurement context.

Better, Cambio and Medblocks are the three main suppliers of form tools. DIPS demonstrated a powerful form engine, which is, however, fully integrated into the DIPS ecosystem.

Medblocks demonstrated the only solution with fully open-source code. It functions more as an openEHR-template-based framework and support for web programming, targeting web/app developers, rather than a low-code tool for system administrators, informaticians, and others.

Many suppliers showcased portals that enable easy publication and integration of applications with the CDR. Some portals also allow the user to select a patient in the portal, after which all started applications open in the same shared context (same patient, etc.). This way, one doesn't need to search for the patient they are already working with in other programs.

Functionality for compliance with Swedish healthcare laws

Based on information from the market, and our collective experience of complying with relevant laws for Swedish healthcare, such as the Patient Data Act, we can conclude that there are several solutions available that have good potential to meet the authorization control, logging, and functionality requirements. By marking information in the CDR based on organizational ownership (healthcare provider, care unit), some suppliers have demonstrated how to filter out information that a user should not have access to. Several suppliers have also shown how to implement internal locks, active choices, and integrated record keeping through various types of external services.

Two suppliers that are already established in the Swedish healthcare system (Cambio and one other supplier) demonstrated different architectures for authorization control, handling patient consents, and log analysis. One relied mainly on Inera's national services and service contracts through direct integration, while Cambio used internally developed platform services with an HL7/FHIR interface that can be integrated with national services, but also used independently. The integration between these supportive services and existing systems such as EHR systems becomes an important architectural issue in a potential procurement and implementation.

Better showcased a mature Attribute Based Access Control (ABAC) system that we assessed could be configured to allow customers to meet legal requirements in a more flexible manner than many of today's EHR systems. Since Better's platform is included in several suppliers' solutions, ABAC should also be usable by others who use Better's solution.

[13] https://openehr.org/products_tools/modelling_tools/

Another supplier also mentioned that they are developing an ABAC solution.

Depending on the organization and intended use, some regions might prefer a pre-packaged solution for Swedish legal compliance (demonstrated by Cambio, one other supplier, and to some extent eWeave), while others might prefer a flexible ABAC solution, they can configure themselves.

Medical technology aspects

We assessed that the CDR itself is so general that it is difficult to classify it as a Medical Device Regulation (MDR) or CE-marking entity. However, applications for healthcare and treatment built on top of the general platform will need to meet MDR requirements (or equivalent requirements for self-manufacturing). Therefore, it is beneficial if the supplier has procedures and experience in MDR classification, and can support customers in this. Some suppliers also offer pre-classified MDR modules or applications on top of the openEHR platform.
This does not necessarily mean that each application developed needs to be MDR-classified or CE-marked. Compared to how we create templates in existing EHR systems today - we do not classify each individual template. If a CDR is combined with a portal function, it resembles functionality found in many current EHR systems. This highlights the importance of having a clear strategy for how applications are developed to avoid getting stuck with these types of requirements.

IT security

When implementing an openEHR platform, it is important to collaborate on security between suppliers, developers, and the implementing entity. Whether starting to implement part of a solution or a whole platform, organizations need to account for this work to ensure future usage, governance, and maintenance. Providing platform services generally requires higher IT security and maturity than isolated applications.

Several suppliers demonstrated basic security management:

- Compliance with Inera's reference architecture for identity and access using established standards.
- Included Identity Provider (IDP) component.
- Encryption in transit.
- Encryption at rest using underlying database technology.
- Logging support.

Many technology products are also early in their lifecycle, meaning compliance with non-functional requirements has not reached the same level as more established product categories. There are benefits to partnering with a partner experienced in IT security. It may be wise to rely on proven database technology to facilitate implementation and operation. Better's and DIPS's technology platforms stand out in terms of experience as they have been used extensively by several major customers over an extended period.

Important aspects to consider during implementation which were not, or only partially addressed by suppliers:

- Access control with different authorization levels based on roles, responsibilities, information type, and other attributes (e.g., PDL requires information filtering).
- Auditing, traceability, and reporting.
- Backup and recovery.
- Ensuring data integrity.
- Patching and vulnerability management of the platform.
- Training users and administrators in security practices.
- Physical security.
- Compliance with best practices and industry standards for API security.
- Classification of APIs for the openEHR platform (e.g., public, authenticated, restricted).
- Managing security in the applications built on the platform (collaboration between supplier and regions).

In the context of regionally owned healthcare, two suppliers stand out. Cambio and one other supplier demonstrated adaptations to the HSA catalog, employee assignments, and PDL based on SITHS/Sambi profiles.

An important architectural question is how authentication should be handled. Many suppliers included an Identity Provider (IDP) component, either used independently or in federation with an existing regional IDP. Integration and harmonization with regional authorization administration systems are additional crucial questions during implementation, as well as handling logging and compliance across all platform components. Several suppliers support logging standards like IHE ATNA.

Integration support and bulk loading

Some solutions can be delivered with a third-party integration platform to organize and manage integrations between various existing source systems. Some suppliers also offer openEHR-specific integration tools to handle loading, and conversion of information in other standards like HL7v2 and HL7/FHIR. Better's platform perhaps had the most comprehensive integration support, but another supplier also demonstrated a more or less complete capability.

Although openEHR defines standardized interfaces (REST APIs) for working with individual records and notes, these can be slow and cumbersome to use for importing and exporting large amounts of information, especially bulk operations for multiple records. To counter the risk of negatively affecting system stability and performance, some suppliers offer specialized functions to handle large amounts of information via their own implementation-dependent interfaces, such as direct access to underlying storage technology. If such interfaces are used, it is important to understand their impact on the entire platform, including how EHR IDs and personal numbers are managed, or how logging and access are handled.

Scalability and performance

The scalability of a Clinical Data Repository (CDR) mainly consists of two parts: API services and underlying database technology. Most suppliers demonstrated scalable and redundant API service architectures using container platforms based on the Kubernetes standard.

Most suppliers use a relational database at the core, which can lead to limited scalability. At the same time, reliance on a relational database provides flexibility against non-functional requirements. There are many proven solutions that can handle large amounts of transactions, such as OracleDB and Microsoft SQL Server. Both Better's and DIPS's solutions have demonstrated scalability in practice with proven databases. One supplier demonstrated a horizontally scalable (clustered) solution based on YugabyteDB, and Cambio presented a solution based on Apache Kafka and Couchbase. Some suppliers also offered tiering where older, less active data could be stored in a more cost-effective/slower manner yet accessed through the same interface as more active data.

Exit strategy and portability

The RFI responses and demonstrations did not provide a clear picture of how seamless a switch of suppliers between different openEHR solutions can be. This is probably due to not asking a sufficiently specific question in the RFI about the exit strategy. The CDR should not create portability issues since openEHR standard specifications for these are well-developed and stable, whereas portability/handling of developed forms is more uncertain, as forms are not fully specified in the standard, only "templates," etc., on which forms are based.

Although openEHR eliminates data lock-in effects and brings much fewer and milder lock-in risks than today's EHR systems, it can still be labor-intensive for system managers to switch suppliers for GUI/form management. Increased standardization in this area is desired, and while waiting for that, a prudent technical or contractual exit strategy is required for these specific parts. It is important to have a strategy that allows for the conversion of forms between solutions over an extended transition period if automation is not possible.
It is also crucial to include in procurement requirements the possibility for bulk export and import of data to facilitate future migration between different competing openEHR systems so that an API call per patient does not need to be made.

Archiving

From an archiving perspective, an openEHR platform can be seen as an intermediate layer. The RFI did not provide a clear answer regarding retention and extraction possibilities for future archiving beyond existing REST APIs. It's important for regions to stipulate requirements based on archive demands that need to be considered during procurement and system updates.

How openEHR should relate to archive laws needs to be investigated and clarified. As this is a matter of national interest, the investigation should take place at that level. An interesting question is whether any of openEHR's openly specified formats can be used as an archival format without further conversion.

Architecture description

To clarify from a technical perspective what an openEHR installation may involve, a general supplier and region-independent description of the architecture, its components, and their interrelationships is provided here. The image below illustrates a typical logical composition of various components needed to implement an openEHR-based storage solution. This image is essentially a somewhat more elaborate version than the one published in the specifications: Architecture Overview (openehr.org) [14].

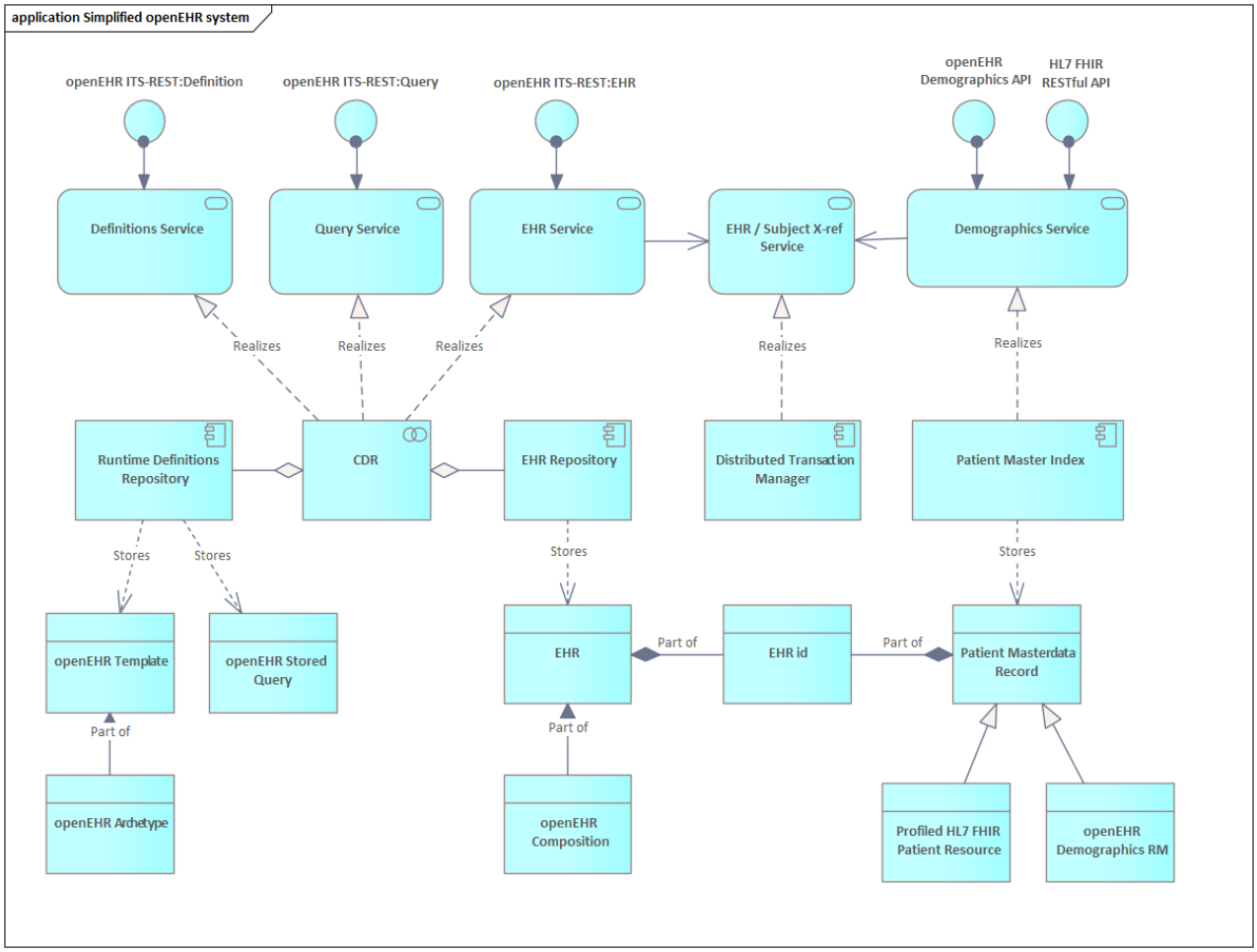


Figure: Logical composition of components needed for an openEHR-based storage solution

Applications utilize standardized services on top of the components where information is stored. There are different models for managing medical records and how these are linked to the patient. The recommended model in openEHR is based on such a solution where demographic data is managed in a separate system, such as a Patient Master Index (PMI). In the above image, an HL7/FHIR-based interface is used, but openEHR International is working on a dedicated demographic API that could also be used in the future.

In addition to what is shown in the above diagram for the storage and access to journal data, patient data, and definitions, a complete solution should include, among other things, a

[14] https://specifications.openehr.org/releases/BASE/latest/architecture_overview.html#_information_architecture

terminology server and solutions for forms, portals, etc. Variations of such functions are included in some suppliers' offerings, and a possible example is shown below. Access control functions are not shown in any of the diagrams but are, of course, also necessary (see separate earlier sections on IT security and compliance with laws).

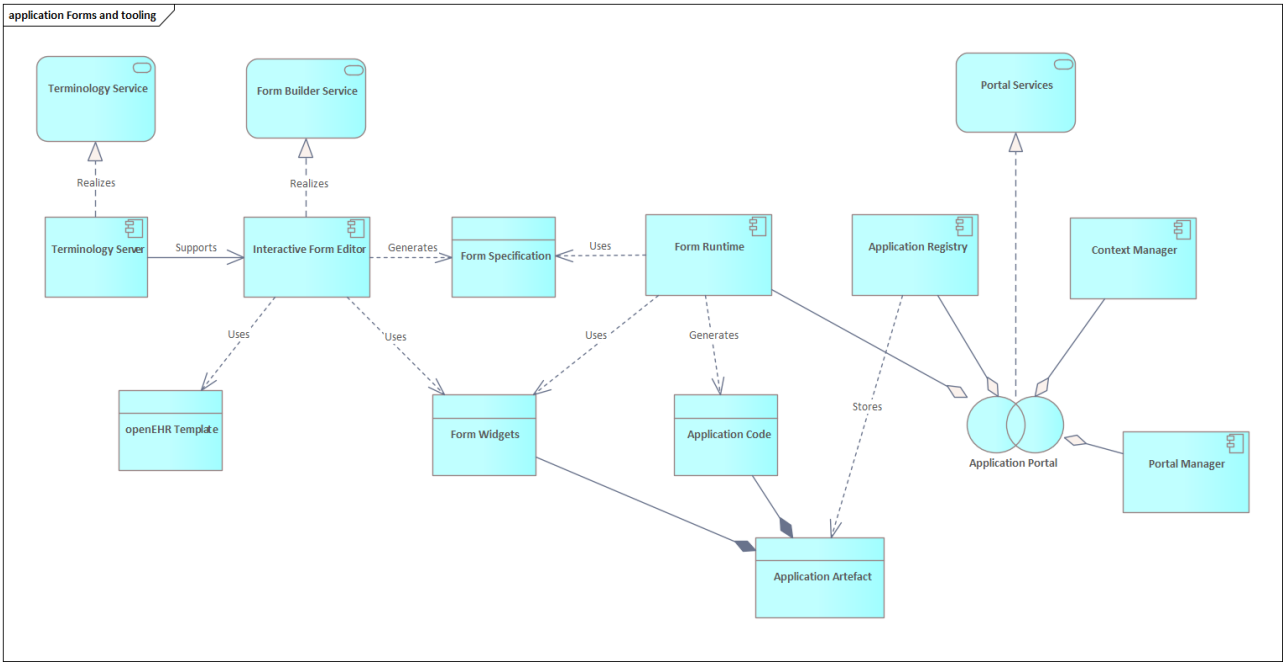


Figure: Possible example of logical composition of components needed for an openEHR-based form and portal solution

About the RFI-collaboration

The collaboration involving seven regions in this RFI effort is unusual. The collaboration has had both advantages and disadvantages.

Advantages:

- Originating from a genuine interest that provided strong motivation for the work.
- Enlightening for beginners, saving time in learning through this kind of collaboration; also beneficial for those more experienced in the field.
- The group size was not too large, allowing for speed and flexibility.
- The freedom to guide the work as needed, adopting an extremely agile approach due to tight time constraints.
- Mutual understanding that all participating regions have distinct circumstances and varying timelines.
- Open and humble attitudes from all participants, making it easy to share one's lack of knowledge, find viable compromises suitable for all, and participate according to individual capacity.
- A learning opportunity to understand how other regions reason and to identify common challenges.
- Suppliers can invest more effort in presentations when addressing many simultaneously.

- Beneficial with tight timeframes, preventing unnecessary delays in addressing questions and the risk of overworking if given more time.
- Strengthening dialogues with suppliers.
- Effective project management.
- Exchange of competencies.
- Expanded network of contacts.
- A solid foundation established for ongoing collaboration concerning openEHR.

Disadvantages:

- Difficulties with collaboration interfaces (document sharing, including confidential material).
- Challenges in scheduling meetings that accommodate all within the tight timeframe.
- Difficulties in gathering physically as a group.
- Not being able to collaborate in the originally intended open manner (regarding requirements), necessitating a rethinking, which turned out well.
- The fast pace posed challenges in planning and coordinating with so many involved; everyone had to endure short notice.

We can draw the following lessons for future collaborations of a similar nature:

- Vital to have a driven coordinating party.
- It is entirely possible to carry out such work without a steering group.
- Important to designate contact persons for each region to facilitate communication and coordination.
- The benefits of this type of collaboration are significant. Most of the disadvantages (listed above) are practical and can be resolved.
- Varied assessments of confidentiality can be a limiting factor for collaboration.

Conclusion

This report does not provide a recommendation. The reason being that a recommendation that suits everyone cannot be given. Instead, we have attempted to offer a neutral description and interpretation of the information we have received. It is up to each individual region to evaluate the report's content based on their perspectives, conditions, and strategies for making decisions moving forward.

Appendix: Where to learn more?

This document does not explain what openEHR is. To gain a comprehensive understanding of openEHR and its purpose, several excellent sources are available:

- "Investigation of the Effects of Choosing openEHR as a Standard within Region Stockholm". Regional Executive Office, Region Stockholm. Case No: RS 2022-0070-6
- Traces of openEHR at Vitalis 2021[15]
- Digital education series developed by SFMI/openEHR Sweden[16]

At the national level in Sweden, several activities are ongoing within openEHR, here are some examples:

- openEHR Sweden[17] is a working group under SFMI (Swedish Association of Medical Informatics) that coordinates national openEHR matters, develops guidelines and implementation guides for the use and localization of openEHR, engages in dialogue with authorities and national entities such as SKR and the National eHealth Agency, and collaborates with the international openEHR organization.

- In 2022, INCA/RCC West, together with Karolinska University Hospital, Skåne University Hospital, and Region Östergötland, successfully conducted a technical collaboration project[18] aiming to examine how openEHR-based pathology report templates can be created, implemented, and efficiently updated in various systems (including Sectra IDS7) within the same healthcare chain. The goal was to capture standardized data from the outset, enabling the sharing of the same template configuration basis and avoiding duplicate documentation, as well as the numerous mappings that today's national service contracts require. Related work is ongoing in the national Knowledge Governance's NAG for structured healthcare information.

- In early 2023, Vinnova initiated a major call for proposals titled "System Demonstrator for Utilizing Healthcare and Care Data"[19], where several applications include investments in open international informatics standards, including openEHR.

- National investigations about health data:
    - Health Data as a National Resource for Future Healthcare[20]
    - Enhanced Regulation and Management of Interoperability for Data Sharing within the Public Administration and from the Public Administration to External Entities[21]

[15] https://discourse.openehr.org/t/openehr-vitalis-2021/1512
[16] https://discourse.openehr.org/t/digital-utbildningsserie-om-openehr-nov-2020-jan-2021/1105
[17] https://openehr.se/
[18] https://cancercentrum.se/globalassets/vara-uppdrag/kunskapsstyrning/kvalitetsregister/slutrapport_openehr.v1.3.pdf
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