A National combined Messaging & Data Sharing Infrastructure Framework in Denmark

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Scope and goals

For two decades, electronic bilateral messages between the different health providers of the Danish healthcare sector have been transmitted over a VANS network, in which there have been limited market competition and limited overview of the transmissions themselves, e.g., in respect to security.

Also, the Danish health sector is faced with changes to which a supporting paradigm shift in the national infrastructure is required:

- Fewer, highly specialised hospitals with short care pathways and fast handing-over of patients for follow-up within primary care
- Close, parallel cooperation between primary and secondary care concerning diagnostics, treatment, rehabilitation, and care
- Patients, e.g., from own homes, are increasingly taking an active part in the management of their health

This adds new demands to the functionalities of and possibilities within a national infrastructure. Health professionals across the sectors aim to collaborate more closely and hence needs access to health information on patients and citizens quickly, on-demand, based on relevance and their role etc. Thus, data sharing as a multilateral exchange must also be available. Denmark's ambition is therefore to build an infrastructure that combines messaging and data sharing communication and data access flows.

In 2018, a Proof of Concept (PoC) was carried out to test if the European eDelivery building blocks for exchange of documents and data could be used to build a multifaceted infrastructure that would enable the Danish healthcare sector to exchange and share vital patient information between the different actors more smoothly, more transparent and more securely. eDelivery has not so far been introduced in the health domain but possesses the possibilities for creating a safe, flexible and interoperable communication flow.

Following a successful PoC, an architectural vision for future national health communication was published by the Danish Health Data Authority and based on the principles of this, MedCom initiated a project, where the goal was to:

- Make relevant data accessible for online sharing when needed by the healthcare community cooperating on patient and citizen care coordination
- Support a fast, reliable and safe transition of relevant data sets, when the patient responsibility unambiguously shifts between parties
- Make data available for the citizen on health portals and apps
- Manage a continuous adaptation of standards to the business needs in a fast and agile approach

Early 2022, a connectathon with primary care actors (general practitioner system and homecare system) and secondary care actor (hospital system) demonstrated the set-up. Thus, interoperability through the whole chain of actors and with both messaging and data sharing communication was achieved. The plans

for building and implementing a new national infrastructure based on eDelivery building blocks for all health data communication in Denmark that combines and enables both messaging and data sharing are now taking form and will be a priority amongst both authorities, healthcare providers and vendors in the years to come. In this way, Denmark has a robust and sustainable infrastructure onwards, which can meet both the complex needs of the sector in regards to digital support of patient pathways as well as higher security and market requirements.

Trust-inspiring in the field of health data interoperability

In the messaging part of the infrastructure, security aspects of the new infrastructure rely on the security of eDelivery, meaning that every message is encrypted between the sending and receiving parties' Access Points (AP) through the National Danish PKI-infrastructure.

The Architectural Vision guiding the project explicitly expresses that all message-exchange should be encrypted from Corner1 to Corner4 in the eDelivery model. In the pilot this was not the case between the applications and their APs but is on the roadmap for further development.

The PKI infrastructure tokens also handles the general access to provide and retrieve data, based on IHE XDS, in the data sharing scenario. Access to single parts or the full patient record is managed by the citizen's own consent and blockage of certain parts of their record for certain clinicians. All access to a citizen's record is monitored and checked for clinical relevance with focus on potential unlawful access.

Citizens can access their own record and parts hereof through this infrastructure, also using the national PKI infrastructure for security.

The whole infrastructure runs on the closed Health Data Network in Denmark, called SDN. This network only allows for registered parties within the healthcare sector to communicate.

Innovative in the field of health data interoperability

The infrastructure project is unique in that it applies eDelivery for the health domain and aims at an entire health sector of a member-state.

It is also highly innovative in achieving full interoperability independent of messaging or data sharing:

- The messaging part aims to serve all participants of a communication flow:

  o The sender through a national health addressing service based on several authoritative sources

  o The sending parties by encrypting the communication and the non-repudiation nature of the communication. By adding reliable messaging to the mix in all layers the clinicians will know if their communication went well

  o The network supporters by adding a Track&Trace component to the mix, so that the supporter will know, which network nodes a message has passed

- The data sharing part aims to serve all participants in a patient pathway:

  o The citizen by providing access to both the message about their own treatment and the Track&Trace information

  o Combining messaging and data sharing provides the benefit of direct messaging between bilateral directly involved parties with the sharing of the same data to clinicians, patients and their relatives, so that all parties involved in the patient pathway will be on the same page

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Technically Excellent in the field of health data interoperability

The project bases the infrastructure on the best and most suitable open international standards and components. Hence, eDelivery building blocks were chosen having proved its worth in the Peppol network. Aiming at adding eDelivery's reliable messaging and security features to the whole healthcare messaging network, extends the reliability and secure transmission of data within the network.

A Track&Trace functionality makes detecting delays and errors in the network much faster and helps free and utilise IT staff time more efficiently when delays and errors occur, all to the benefit of the clinicians and patients involved in a healthcare condition. Adding a directory of receivers for unsolicited messages also helps the sector address the right clinicians involved in a patient's condition.

For data sharing, a HL7 HAPI FHIR Server is the repository for shared messages, where every message is base-64 encoded and wrapped into FHIR Bundle with appropriate metadata and handled in the XDS Registry/Repository like HL7 CDA Documents. This way old legacy messaging standards is managed in the same way as upcoming native FHIR messaging profiles.

All messages and associated Track&Trace information is - besides being available through traditional data sharing channels - also visible to the patient in their app 'MyGP'.