Assessing the Potential of FHIR as a Standard

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Patient transfer files in the Netherlands are moving from one GP to another using messages that are based on the EDIFACT standard. This standard brings along a set of disadvantages that impede the interoperability in the healthcare sector. The current message sends incomplete ambiguous information. HL7 has produced an information standard, FHIR, specifically for the healthcare sector. This paper focuses on the challenges observed with the UN/EDIFACT data standard and dives into the potential of FHIR as an information standard for the specific use case of patient data transfer between GP's. By performing an ontological analysis, the implementation problems that would occur when mapping the EDIFACT message onto FHIR are exploited.

Additional Key Words and Phrases: FHIR, EDIFACT, interoperability, healthcare, patient transfer data

1 INTRODUCTION

In 2004, the European Union presented an action plan for e-Health. This plan offers European citizens opportunities for an improved access to better health care[1]. Since the adoption of the action plan, the healthcare sector has been struggling to achieve the highest level of interoperability. In an ideal world, with the highest level of interoperability, data can be shared while adhering to confidentiality, integrity and availability. The Dutch healthcare sector is still far away from the ideal situation. The Dutch ministry of Health formulated a list of 11 different types of data exchanges. A new law was enacted in April this year, mandating the electronic enxchange of healthcare date for only 5 of the 11 types of data exchanges. Moreover, the implementation of this law is being phased in over a period of nearly 2 years.

One of the type of data exchanges, is the data exchange between General Practitioners (GP's). When a citizen moves to a different part of the country, he/she will have to change General Practitioner (GP). An electronic message, which facilitates the transfer of patient data, needs to be sent. This message is called the 'Patient Overdracht Bericht'. The NHG[1], a Dutch association of GP's, has provided the GP's with a guideline outlining the required medical data in the message[15]. The message is still based on the EDIFACT-standard. However, Nictiz, the Dutch competence Centre for digital information management in healthcare, has mentioned that they are working on a new message that will follow the HL7-FHIR standard instead[3]. One could assume, that this change is motivated by the disadvantages associated with the message based on the EDIFACT standard. Medical information received by the first GP after the transfer, needs to be forwarded as well. However, these messages are left out of the scope of this paper.

In light of the above, this paper aims to explore the motivation behind the transition. Furthermore, this paper will investigate the potential impact of the proposed new standard on the interoperability between GP's. To assess this potential impact, the following research questions need to be answered.

- What are the disadvantages of the current EDIFACT application of patient data transfers between GP's?
- What are the GPs' requirements concerning a message standard for patient data transfer?
- Can the FHIR standard be used as a standard for patient data transfer, to align with the functionalities required for interoperability between GP's?
- Can the current message effectively be mapped onto the new FHIR standard?

The remainder of this paper is structured as follows. Section 2 explains the current state of the art concerning patient data transfers, with its corresponding limitations and other disadvantages. Building upon the current limitations, section 3 explores the requirements that GPs have with regards to an information standard. Section 4 will answer the third research question by discussing whether FHIR fulfills the requirements set by GPs. Section 5 handles the mapping of the current message to the new standard.

2 EXISTING SOLUTION

2.1 Overview

Patients changing their GP assume that their new GP has the same knowledge about the patient and can offer them the same healthcare that they received from their previous GP. The emergence of Electronic Health Records (EHR) has played a big role in fulfilling this assumption. EHR's have provided GP's not only with a structured way of patient documentation, quality assurance and patient confidentiality. EHR's have increased the portability of a patients' health records[17]. The health records of patients function as a source for the patient transfer message, sent from GP A to GP B. One of the main things preventing complete interoperability, are the agreements that decide what to put in the patient transfer message and how to structure it. These agreements are part of one of the five layers of the Nictiz layered model (See figure 1)[9]. This model shows all the layers on which agreements between parties should be made in order to reach higher interoperability. The use of EDIFACT as an information standard in the healthcare sector relates to the 'Information' and 'Application' layer. The 'Information' layer contains the agreements on the semantics of the exchanged messages, while the 'Application' layer handles the technical agreements on the actual exchange of messages.

[1]Nederlands Huisartsen Genootschap

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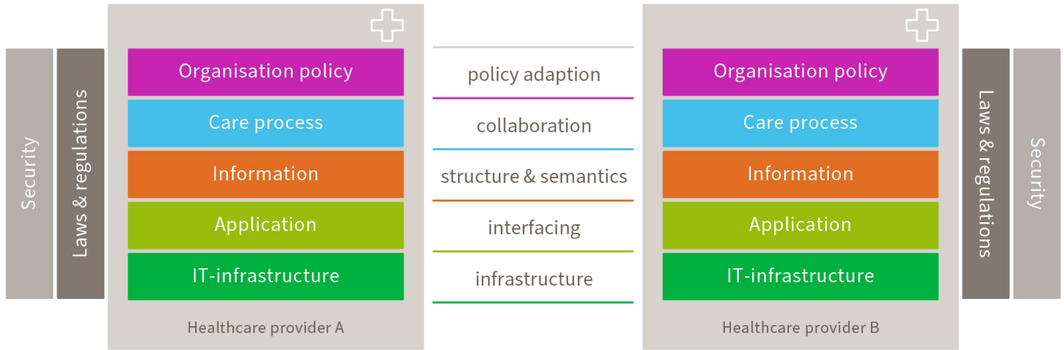

Fig. 1. Ontological analysis showing anomalies.

In the Netherlands, patient data is transferred through a 'MEDEUR'[2] file, which adheres to the standard created by Nictiz. This file is based on a previous generic message, able to contain lots of medical information[3]. The transfer file makes use of the EDIFACT standard, a standard developed by the UNECE (United Nations Economic Commission for Europe). A commission of the UNECE, UN/CEFACT[3], is responsible for providing various industries, including the healthcare sector, with a set of syntax rules and standard messages to structure electronic data interchange. Nictiz released an implementation guide that explains in detail how the medical information should be represented in the EDIFACT syntax[15]. The message consists of different segments that each stands for a component that is crucial for the complete overview of the patient's medical status and history. A complete message should include all the information that the GP needs in order to practice the best healthcare.

2.2 Disadvantages

The current way of transferring files, as described in sector 2.1, has not brought the healthcare sector the desired result. Several papers have shown that the current transfer of patient data, with the use of the EDIFACT standard, comes with a set of limitations and other disadvantages that impede the interoperability[4, 12, 13].

First of all, when looking at the application layer, the availability of information in the current situation is suboptimal. While the exchange of information is based on a transmission of a message from one GP to another, a potential delay in the immediate availability of information for a new GP is introduced.. This delay is directly tied to the reliance on the previous GP for the transfer of relevant information. Consequently, the assurance of immediate access to information cannot be guaranteed for a new GP.

Using EDIFACT as a standard also has consequences on the information layer. The primary goal of interoperability, is to facilitate the exchange of data and information [7]. Shared data will only turn into useful information if the shared data is complete, and there is a common understanding of the data. However, the current situation of transferring patient data, does not fulfill these requirements. The existing 'MEDEUR' message does not represent the complete patient file that the GP needs [10]. Vital information such as treatments, treat limits or prophylaxis are not included in the message, despite its significance. All necessary data elements, including crucial information that is stored in a HIS[4], GP information system, has been described in the HIS reference model. This model is being updated regularly to encompass all relevant data elements in the health sector. The 'MEDEUR' message is a standard EDIFACT message being sent from one HIS to another, but since 2010, it no longer aligns with the HIS-reference model [3]. Reasons for not updating the EDIFACT message will be explained later in this section.

Besides the issue of incomplete data in the current messages, there is a challenge related to the understanding of the data itself. With the current way of sending patient transfer data, there are no agreements made upon mutually acceptable definitions [4]. As a result, GP's have a certain freedom in the way they express their findings. Different ways of expressing increases the risk of a GP who misinterprets the findings. This can lead to discrepancies and inconsistencies, that can be crucial when providing health. In addition to that, The HIS also sends and receives messages to and from information systems that are not solely owned by GP's, for example the hospitals and pharmacies. Misinterpretations therefore do not only influence data stored at the GP, but will flow throughout the entire healthcare sector. The incompleteness and ambiguity of data pose a significant risk to the quality of healthcare. Incomplete data files can be resolved, although repairing and complementing files takes away valuable time of the GP's. Moreover, the diverse interpretations of data can lead to serious consequences, and will not be solved unless all information systems in the healthcare have a unanimous definition of the data.

2.2.1 Updating the message. The task of updating the EDIFACT messages is an inefficient job and has not happened for a while, resulting in GP's transferring incomplete files. There are several reasons that make the updating of the MEDEUR message complicated. Firstly because of the structure of an EDIFACT message. EDIFACT

[2]Medisch Elektronisch Dossier Uitwisseling Regio
[3]United Nations Centre for Trade Facilitation and Electronic Business
[4]Huisarts informatie systeem

namely creates messages with a flat file format[13]. This format has a fixed structure, where the position of data fields in the message are defined by their physical location. Adding new data elements, due to the changing requirements of the healthcare sector, must be done without changing the overall structure of the message. EDIFACT was originally created for the general electronic data interchange[8], not specifically for the healthcare sector, leading to another reason explaining the lack of updates on the MEDEUR message. Because of the origin of EDIFACT, the semantic model is more focused on general logistic messages. The limited semantic model therefore makes it challenging to represent, in a structured way, the diverse complex data structures and hierarchies.

3 REQUIREMENTS FOR A SOLUTION

As argued in section 2.2, the current state of art leaves much to be desired. Based on the disadvantages, a number of requirements have been set up, that the alternative solution must fulfill.

3.1 Availability

In an ideal world, availability of information is no longer the limiting factor in the health care. This entails that data can be accessed at any point, by anyone with the right competences. The GP should be able to obtain a comprehensive data profile of the new patient as soon as the registration has been finished.

3.2 Flexibility

The message should be based on an information standard that matches the needs of the flexible healthcare sector. The message should be regularly updated with all the required information. Consequently, the information standard itself must be able to accommodate additional fields and options within the specification, enabling to provide the message with these data fields. By maintaining an up-to-date message, GP's can establish a foundation for efficient information exchange, where repairing and complementing files has become trivial. Time should no longer be spent on complementing patient data files, but solely on providing care to the patients.

3.3 Unambiguous

To encounter the problem of the interpretation of data, there must be a unanimous definition of the data elements throughout the entire healthcare sector. For instance, when it comes to medication data, there should be a uniform definition for information flowing from pharmacist to GP's as well as from GP to GP. To achieve this consistency, it is required to adopt to Health and Care Information Models (HCIM), which are used to capture functional and semantic agreements for the standardization of information used in the care process [5].

The HCIM are used for several purposes in the healthcare, describing care-based concepts in terms of the exact content. They encompass the exact content, including data elements, data types and possible values. Patient transfer files however, are not yet based on these agreements. Incorporating HCIM into patient transfer files establishes a unified understanding and ensures consistent data interpretation. This would significantly improve the interoperability of patient data across healthcare providers.

4 FHIR APPROACH

In 2011, HL7[5], an organization dedicated to standards for all transactions with electronic health information, released their first version of the FHIR – Fast Healthcare Interoperability Resources – framework [6]. This framework's objective was to improve interoperability in the healthcare sector, by combining all the best features of previous HL7 products (HL7 v2, HL7 v3 and CDA, Clinical Document Architecture).

HL7 built a set of HTTP-based REST application programming interfaces (API's). The use of API's enables a real-time communication between systems. GP's can perform a simple HTTP request and obtain the required information immediately. These API's can be used to access and use 'resources'[2]. Resources can be compared with the concept of HCIM, they contain a definition of a common health care concept. Once they are grouped together, they will establish a specific context [13]. This already shows part of the flexibility of the FHIR framework. Further flexibility is shown in their design with the 80/20 rule in mind. 'Focus on the 20% of the requirements that satisfy 80% of the interoperability needs.'[14]. The other 20% of the needs consist of use cases that require extensions or customizations on existing resources. The FHIR framework allows these use cases to be built as well. In combination with the fact that HL7 is constantly updating its framework, there will be no reason for sending incomplete patient data transfer files.

That transfer message will be a collection of HCIM, based on the required data that was prescribed in the guideline written by the NHG[16]. The collection will be translated into FHIR resources, forming the technical representation of the patients' data. This representation is understood and can be stored by the information systems of the GPs. Since FHIR has become a national standard for information exchange in the healthcare sector, data that comes from a transfer file can also be exchanged with other sectors of the healthcare. The interpretation of data leaves no room for discussions since it is built on HCIM.

5 MAPPING EDIFACT ONTO FHIR

5.1 Methodology

In order to see whether the current FHIR standard can be used as a new standard for the patient transfer message, we need to assess the extent to which the data elements included in the EDIFACT message can be represented in the FHIR framework. The FHIR framework is created upon the published HCIM. HL7 successfully created the framework such that all HCIM can be represented by FHIR resources. Mapping the EDIFACT messages to the HCIM data elements will therefore expose all the problems, with regards to the content of the message, that arise when the healthcare replaces the EDIFACT standard by the FHIR standard. For that reason, this paper will solely focus on the extent to which the EDIFACT message complies with the HCIM. This will be explored by performing Weber's ontological analysis. This analysis involves a two-way mapping between an ontology (HCIM) and a modelling grammar (EDIFACT message),

[5]Health Level Seven

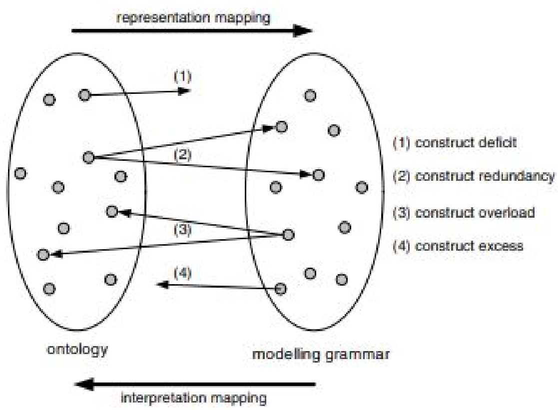

Fig. 2. Ontological analysis showing anomalies.

as shown in Figure 2. Firstly, we will perform the interpretation mapping. All data elements from the EDIFACT message will be separately reviewed to see which data element of which HCIM matches the best with the element of the EDIFACT message. After that, we will perform the representation mapping. All the data elements existing in the HCIM will be mapped onto elements in the EDIFACT messages. For this mapping, only the HCIM that were needed for the interpretation mapping were taken into account. Based on these two mappings, the existing anomalies depicted in Figure 2 will be explored.

5.2 Results

During the ontological analysis, it was determined that a significant portion of the data elements could be successfully mapped between the two mappings. Appendix A provides an overview of the mapping in the form of a table. The table includes details such as the data group, element name, example value from the EDIFACT message, and the corresponding HCIM and specific attribute to which the element is mapped. All the EDIFACT elements mentioned in the table are sourced from the implementation guide released by Nictiz[15]. The mapping process considered only the HCIM available in the 2020 release[5].
It is important to note that certain issues and challenges were identified during the mapping process. These whill be highlighted in this section.

While performing the interpretation mapping, it was first of all noted that the current EDIFACT message lacks the same level of precision offered by the HCIM, leading to construct overloads. In the EDIFACT message, different data elements are sometimes grouped together within the same segment, whereas HCIM has published numerous different data elements. An example can be seen in the transferring of measurements. 15 different HCIM are published to cover all the different patient measurements. These HCIM encompass distinct data fields, thereby providing precise structures for various types of measurements. In comparison, the EDIFACT message makes use of one data segment with the same, limited, specifications (value, lower- and upper limit, normal range) for every sort of measurement. Due to this big construct overload, the specifications of measurements have not been included in the mapping

Furthermore, a significant amount of 'free text'-segments instead of predefined data fields are still utilized in the EDIFACT message. Consequently this leads to a higher risk of misinterpretation, which decreases interoperability. The HCIM are rich data structures that have defined a numerous amount of data fields. Free text fields are less available, and only used when the predefined data elements cannot represent the information. Overall, the interpretation mapping included 42 unique data elements from the current EDIFACT message, excluding data elements related to the measurement. A total of 14 different HCIM were used to map these elements. There exist 4 construct excesses, which are shown in table 1 of Appendix A. These elements were included in the EDIFACT message, but could not be mapped onto one of the HCIM.

With the obtained HCIM from the interpretation mapping, the representation mapping was performed. The used HCIM can contain lots of information in a predefined way. Some fields in the HCIM are required, others are optional. While setting up a list of construct deficits, only data elements that are required in the HCIM were taken into account. The list of construct deficits, fields of the HCIM that have no representation in the EDIFACT message, is shown in table 2 of appendix B. Elements of the HCIM that were represented multiple times in the EDIFACT messages, have not been found.

A transition from the EDIFACT message to a FHIR-complying message thus has some effects. Assuming that the HCIM contain all required information for the GP's, the excesses in the EDIFACT message will not be used and do not form a problem in the transition. Construct overloads present the opportunity to depict information in a more detailed way. The FHIR message will be able to distinguish certain data elements which the EDIFACT standard could not. The presented construct deficits implicate that the notation is ontologically incomplete[11]. Meaning that the EDIFACT message is not a complete representation of the HCIM. When transitioning to the FHIR standard, GP's will have to look after these specific data fields, and possibly fill them in manually.

6 DISCUSSION

The research conducted in this paper offers valuable insights into the advantages and disadvantages associated with different standards used for transferring patient files between GPs. While the results provide compelling evidence for the positive impact FHIR as a standard, on the interoperability in the healthcare, it is essential to acknowledge the limitations of this research.

Firstly, the results indicate that the current EDIFACT standard gives trouble to the GP with regards to completion, reparation and/or interpretation of data files. The consequences of this problem are not taken into consideration. Further research must be done on the actual time spent on such problems by GPs. Moreover, the severeness of the explained anomalies in section 5 should be determined. The problems arising from the construct deficits depend mainly on how often these data fields are needed. A field that is not supported in the EDIFACT message but also rarely needed, causes less of a problem than a frequently occurring data field. The extent to which anomalies cause problems for the interoperability, and the difficulty of solving these anomalies, should emerge from further research. Additionally, the potential implementation problems and challenges that may arise during the transition to FHIR, as well as the learning curve associated with the adoption, have not been addressed in this paper.

Furthermore, it is important to note that the research as well as the mapping were performed only by one student without a medical education background. Due to too little knowledge from the author on the medical aspect, the importance of data fields, which are missing in the EDIFACT message but required in the HCIM, is left outside of this research. The absence of validation of the results reported in this paper by GPs or other individuals with greater domain knowledge than me, presents a limitation.

7 CONCLUSION

The main objective of this paper was to identify the reasons for the proposed transition of standard from EDIFACT to FHIR. By identifying the weaknesses of the current standard, setting up the requirements of the possible new standard, and exploring whether that standard meets the requirements, the objective could be achieved. The current solution based on EDIFACT lacks regular updates, resulting in incomplete and unstructured data exchanges within the healthcare system. The absence of a standardized definition for specific data fields leads to varying interpretations among healthcare providers, hindering effective communication and collaboration. The adoption of a new standard that aligns with the references described in the HIS reference model is crucial.

The FHIR standard emerges as a suitable alternative. With a balance between flexibility and predefined elements, it functions as a comprehensive framework for mapping the HCIM to its resources. The standard enables the creation of new resources and customizations of existing resources, to ensure that all use cases in the healthcare sector are covered. The findings of this paper concluded a successful mapping between the data fields in the EDIFACT message and the corresponding data fields within the HCIM. This paper highlights the necessary data elements that should be incorporated to align with the HCIM. This small disadvantages do not outweigh the advantages of the new framework. Adopting FHIR, allows GP's to communicate effectively, by sending complete, structured, messages, with a uniform interpretation of data, increasing the interoperability throughout the healthcare sector.

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A ANOMALIES

Table 1. Construct Excesses

Data Group	**Element**	**Description**
Family history	Age of revelation	The age on which the condition was revealed at the patient's family member
Measurements	Information status	Number representing the state of attention of a specific problem
Diagnosis	SOAP code (value: 'P')	The value 'P' represents the history of a diagnosis
Therapy (Medication)	Type of Intervention	Describes whether it is a first prescription or a repeated recipe

Table 2. Construct deficits

HCIM	**Data field**	**Description**
Signaling	DateDetermination	Date on which the Signaling Plan was measured.
Signaling	PhaseName	The phase of signaling the condition to which the particular actions and observations relate
Problem	ProblemStatus	Describes the condition of the problem
FamilyHistory	BiologicalRelationship	Indicates the biological relationship of the family member to the patient
Payer	StartDateTime	Date from which the insurance policy coverage applies.
Payer	EndDateTime	Date until which the insurance policy coverage applies.
Patient	MultipleBirthIndicator	An indication stating whther the patient has died

B MAPPING

Table 3. Mapping EDIFACT to HCIM

Data Group	Element Name	Example value	HCIM	Attribute of HCIM
Sender	Identification	23836	HealthProfessional	HealthProfessional-IdentificationNumber
Sender	Party name (Last name)	Vught	NameInformation	LastName
Sender	Party name (Initials)	I	NameInformation	Initials
Sender	Party name (Prefix)	van der	NameInformation	Prefix
Sender	Address component (Street)	Erasmusweg	AddressInformation	Street
Sender	Address component (House Number)	259	AddressInformation	HouseNumber
Sender	Address component (Number addition)	A	AddressInformation	HouseNumberLetter
Sender	City Name	The Hague	AddressInformation	PlaceOfResidence
Sender	Postcode identification	2538KL	AddressInformation	Postal Code
Sender	Service Provider Position	'Doctor in training'	HealthProfessional	HealthProfessionalRole
Sender	Communication Number	06222367467	ContactInformation	TelephoneNumber
Sender	Communication channel	telephone/fax	ContactInformation	TelecomType
Sender	Email Address (FTX)	pmail@nhg.knmg.nl	ContactInformation	EmailAddress
Receiver	Identification	23836	HealthProfessional	HealthProfessional-IdentificationNumber
Receiver	Party name (Last name)	Vught	NameInformation	LastName
Receiver	Party name (Initials)	I	NameInformation	Initials
Receiver	Party name (Prefix)	van der	NameInformation	Prefix
Receiver	Address component (Street)	Erasmusweg	AddressInformation	Street
Receiver	Address component (House Number)	259	AddressInformation	HouseNumber
Receiver	Address component (Number addition)	A	AddressInformation	HouseNumberLetter
Receiver	City Name	The Hague	AddressInformation	PlaceOfResidence
Receiver	Postcode identification	2538KL	AddressInformation	Postal Code
Receiver	Service Provider Position	'Doctor in training'	HealthProfessional	HealthProfessionalRole
Receiver	Communication Number	06222367467	ContactInformation	TelephoneNumber
Receiver	Communication channel	telephone/fax	ContactInformation	TelecomType
Co-Practitioner	Identification	23836	HealthProfessional	HealthProfessional-IdentificationNumber
Co-Practitioner	Party name (Last name)	Vught	NameInformation	LastName
Co-Practitioner	Party name (Initials)	I	NameInformation	Initials
Co-Practitioner	Party name (Prefix)	van der	NameInformation	Prefix
Co-Practitioner	Address Component (Street)	Erasmusweg	AddressInformation	Street
Co-Practitioner	Address Component (House Number)	259	AddressInformation	HouseNumber

Data Group	Element Name	Example value	HCIM	Attribute of HCIM
Co-Practitioner	Address Component (Number addition)	A	AddressInformation	HouseNumberLetter
Co-Practitioner	City Name	The Hague	AddressInformation	PlaceOfResidence
Co-Practitioner	Postcode identification	2538KL	AddressInformation	Postal Code
Co-Practitioner	Service Provider Position	'Doctor in training'	HealthProfessional	HealthProfessionalRole
Co-Practitioner	Communication Number	06222367467	ContactInformation	TelephoneNumber
Co-Practitioner	Communication channel	telephone/fax	ContactInformation	TelecomType
Co-Practitioner	Email Address (FTX)	pmail@nhg.knmg.nl	ContactInformation	EmailAddress
Patient data	Identification Number	111222333	Patient	PatientIdentification-Number
Patient data	Name component (Born Last Name)	Bruin, den	NameInformation	LastName, Prefix
Patient data	Name component (Name Husband)	Linden, van der	NameInformation	LastName, Prefix
Patient data	Party ID identification	111222333	Patient	Patient Identification-Number
Patient data	Address component (Street)	Erasmusweg	AddressInformation	Street
Patient data	Address component (House Number)	259	AddressInformation	HouseNumber
Patient data	Address component (Number addition)	A	AddressInformation	HouseNumberLetter
Patient data	City Name	The Hague	AddressInformation	PlaceOfResidence
Patient data	Postcode identification	2538KL	AddressInformation	Postal Code
Patient data	Sex	male	Patient	Gender
Patient data	Date/time/period	19981119	Patient	DateOfBirth
Patient data	Communication Number	06222367467	ContactInformation	TelephoneNumber
Patient data	Communication channel	telephone/fax	ContactInformation	TelecomType
Patient data	Insurance Type	Private insurance		
Patient data	Insurance Organisation, coded	0201 (Ohra)	Payer	IdentificationNumber
Patient data	Insurance Number	362830	Payer	InsurantNumber
Patient data	Reference Number	373892093	Payer	AccountNumber
Signallings patient	Clinical information identification	02	Problem	ProblemName
Signallings patient	Clinical information	'Mamma carcinoom'	Problem	Comment
Problems patient	Clinical information identification	02	Problem	ProblemName
Problems patient	Clinical information	'Mamma carcinoom'	Problem	Comment
Problems patient	Date/time/period (Start date)	19940518	Problem	ProblemStartDate
Problems patient	Date/time/period (End date)	19951020	Problem	ProblemEndDate

Data Group	Element Name	Example value	HCIM	Attribute of HCIM
Episodes patient	Clinical information identification	02	Problem	ProblemName
Episodes patient	Clinical information	'Mamma carcinoom'	Problem	Comment
Episodes patient	Date/time/period (Start date)	19940518	Problem	ProblemStartDate
Family history	Clinical information identification	02	Problem	ProblemName
Family history	Free text (Textual identification)	'Mamma sparende operatie'	Problem	Comment
Family history	Free text (Family member with problem)	Mother	FamilyHistory	BiologicalRelationship
Family history	Free text (age of death)	66	FamilyHistory	AgeAtDeath
Family history	Free text (extra comments)	'No Complications'	FamilyHistory	Comment
Medical data from contact	Processing indicator	'Home visit'	Encounter	EncounterType
Medical data from contact	Processing type identification	'Process laboratory results'	Encounter	CommentEncounterReason
Medical data from contact	Date/time/period (Execution date)	'20231115'	Encounter	DateTime
Measurement values	Processing Indicator (SOAP code)	O	SOAPReport	SOAPLineHeader
Measurement values	Investigation characteristic identification	HBB	SOAPReport	SOAPLineCode
Measurement values	Investigation characteristic	'Mass'	SOAPReport	SOAPLineText
Measurement values	Text literal	Free text	SOAPReport	SOAPLineText
Diagnosis	Processing Indicator (SOAP code)	S/E/P	SOAPReport	SOAPLineHeader
Diagnosis	Investigation characteristic identification	HBB	SOAPReport	SOAPLineCode
Diagnosis	Investigation characteristic	Free text	SOAPReport	SOAPLineText
Diagnosis	Text literal	Free text	SOAPReport	SOAPLineText
Therapy	Processing Indicator (SOAP code)	'P'	SOAPReport	SOAPLineHeader
Therapy (Medication)	Clinical Intervention Identification	'13650380'	Pharmaceutical- Product	MedicationCode
Therapy (Medication)	Free Text	'Liquor carbo detergens'	Pharmaceutical- Product	Description
Therapy (Magistral Prescriptions)	Clinical Intervention Identification	'13650380'	Pharmaceutical- Product	MedicationCode
Therapy (Magistral Prescriptions)	Free Text	'Liquor carbo detergens'	Pharmaceutical- Product	Description
Therapy (Magistral Prescriptions)	Magistral Prescription	Free text	Pharmaceutical- Product	SubstanceCode

Data Group	**Element Name**	**Example value**	**HCIM**	**Attribute of HCIM**
Therapy (Non-drug)	Clinical Intervention Identification	R45.0 (Observation)	CareAgreement	Activity
Therapy (Non-drug)	Free Text	'Education risks of smoking'	CareAgreement	Explanation
Therapy	Quantity (total number)	8	Range	nominalValue
Therapy	Dosage identification (Frequention)	'3 times a day'	InstructionsForUse	Interval
Therapy	Dosage identification (Time unit)	'3 pills each time'	Range	minimumValue
Therapy	Dosage identification (Pharmaceutical form)	'tablet'	PharmaceuticalProduct	PharmaceuticalForm
Therapy	Quantity (repetitions)	5	Range	nominalValue
Medical Referral	Processing Indicator (SOAP code)	'P'	SOAPReport	SOAPLineHeader
Medical Referral	Specialty identification	Cardiology	HealthProfessional	Specialty
Medical Referral	Process type identification	'Home visit'	Encounter	EncounterType
Medical Referral	Free text (Referral)	Free text	Encounter	CommentEncounter-Reason