

CARA2 - Work Package WP10 - Use Cases

Use Case Analysis

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CR SANTEC

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Goal of the Document

This document describes how patients, general practitioners, radiologists and other health care professionals will interact with the eSanté system and with each other when using and exchanging radiology data over the platform. It represents a requirements document at the behavioural level, which is an essential part in the requirements analysis process¹. Only when the major stakeholders agree on the use case descriptions in this document the analysis should advance to the more detailed functional level.

State of the Document

The information contained in this document reflects the status of an ongoing discussion within the CARA Work Groups, and in particular within the CARA GT 2-3-4 (Groupe de Travail). In its final version the document should be approved by representative members of all the major stakeholders of the CARA project.

Change History

Version	Date	Author	Modification
0.1	26/7/2010	GB0	Initial draft
1.0	27/7/2010	GB0	Proper document layout with header, distribution list versioning etc.
1.1	2/8/2010	GB0	Integration of remarks and comments from the 28/7/10 CARA GT 2-3-4 meeting
1.2	5/8/2010	GB0	Integration of remarks from Claude Poupart and Hanan Bouzid, restructuring use cases.
1.3	10/8/2010	GB0	Integration of further remarks from Claude Poupart, some remarks left open. Synchronized with presentation CARA2-WP10-UseCasePresentation-v1.3.pptx
1.4	9/9/2010	GB0	Reorganization of the presentation order of the viewer Use Cases after discussion with Stefan Benzschawel
1.5	17/9/2010	GB0	Integration of remarks from Heiko Zimerman. Notion of 'prescriber' replaced by the more appropriate concept of 'data consumer' / 'data receiver'. Section §3.5 - Overview of Provider & Consumer/Receiver Use Cases added. Chapter §4.3 Patient Consent Management added.
1.6	7/10/2010	GB0	Important restructuring of the document after review meeting with MiSa on 28/09/2010 : Merging of the two provider UCs into a single one. Including the addendum report in the provider UC. Dropping the "Multiple Patient Viewing" UC which has become redundant. The general structure of the UCs is now much closer to the IHE XDS/XDR profiles. Adding section §4.5 - Web Viewers and Patient Management Software Integration. Removing the chapter about patient consent management (2 UCs) because out of scope. Adding a new PatientReferral UC. Lots of other minor changes.
1.7	3/11/2010	GB0	Integration of remarks from René Krippes & Claude Poupart. Correction of addendum and mammography workflow in CA-UC1. Alignment of the referral use case CA-UC6 with IHE XDS-DDR specification. Reinsertion and minor adaptation of the two Patient Consent Management UC.
1.8	5/11/2010	GB0	Minor modifications before distribution to the GT 2-3-4.
1.9	11/11/2010	GB0	Integration of comments from the GT 2-3-4 of 10/11/2010.
1.91	12/11/2010	RKr	Some additional comments to version 1.9 of the document
2.0	15/11/2010	GB0	Final version for distribution to the GT 2-3-4 members

¹ Use cases form roughly 25% - 30% of the future system's requirements. There are two more types of requirements, to be covered in separate documents called the **functional** and the **technical analysis**.

Table of Contents

§1	Introduction and Terminology	5
§2	Data Provider Use Cases	6
§2.1	CA-UC1 - HIS/RIS Data Provider	6
§3	Data Consumer/Receiver Use Cases	9
§3.1	Overview	9
§3.2	CA-UC2 - Single Patient Data Viewing & Import	9
§3.3	CA-UC3 - Patient Data Viewing.....	11
§3.4	CA-UC4 - Reliable Data Transmission	12
§3.5	Web Viewers and Patient Management Software Integration	14
§4	Other Use Cases	15
§4.1	CA-UC5 - Patient Referral	15
§4.2	CA-UC6 - Notification Subscription/Unsubscription.....	16
§5	Additional Use Case Candidates	18
§6	Glossary of terms.....	19

§1 Introduction and Terminology

The CARA use cases in this document represent a contract between the future main users of the system, also called *stakeholders*, by explaining what is expected from each stakeholder and the system in order to work properly. They accurately describe, from the perspective of its users, the system's behavior under various conditions and usage situations, and form therefore the basis of the system's functional description.

While Use Cases focus entirely on the user's point of view and his general interaction with the system, other types of analysis documents will focus more on the system itself, both from a functional and technical perspective.

The following general template will be used to present the different use cases:

ID:	CA-UCX	Name:	A short name
Short Description:	A one or two phrase summary description of the use case, stating its principal stakeholders and main purpose.		
Stakeholders & Interests:	Stakeholders:	Interests:	
	List of stakeholders and their motivations / interests in this use case	
Trigger event:	An event, which can be an action from another use case, and which triggers the actions and events of the current use case.		
Preconditions:	A list of conditions that needs to be fulfilled in order to make the use case applicable. Situations not fulfilling the preconditions are considered outside of the scope of the use case, and not covered by the specification.		
Main scenario:	Describes the normal, most likely flow of events and interactions that determine this use case. They are written down as an enumerated list of interactions, whereby the numbering suggests some timely order. However, interactions may also occur in parallel or with no predestined order.		
Alternatives:	A different flow of events in respect with the main scenario. If differences become too important, it should be considered to split the use case.		
Exceptions:	Exceptions represent failures of the system to perform normally. Contrary to the preconditions the exceptions lie within the scope of the use case and are therefore part of the specification.		
Extensions:	Extensions are the conditions under which the system performs a different behavior. Extensions, as opposite to exceptions are considered normal behavior.		
Remarks:	Additional annotations and remarks that are not covered by any other category.		
Related UCs:	A list of use cases related to this one.		

A glossary which defines the meaning of specific terms is added at the end of the document. [Hyperlinks](#) into the glossary are provided throughout the text whenever appropriate.

S2 Data Provider Use Cases

S2.1 CA-UC1 - HIS/RIS Data Provider

The first use case provides all basic CARA relevant data for [the eSanté Platform](#). All other use cases make, directly or indirectly, usage of data entered in the system through this use case. It is important to note that, depending on the [consent situation](#), a patient's medical data may

- be permanently stored on the eSanté platform in a [Shared Patient Health Record \(SPHE\)](#), if the patient has given his consent to do so;
- only transit over the platform, in order to be delivered electronically to the receiving parties such as the [prescriber](#) and other [3rd party data receivers](#). Once downloaded by all receiving parties the data will be deleted from the platform.² This is the case for patients who have not given or revoked their consent to have an SPHR, and for other exceptional cases such as tourists, or patients which could not be identified at all.

The detailed procedure for radiology exams is likely to differ from hospital to hospital. Therefore the provider use case will not go into details about prescriptions, patient appointment, exam scheduling, exam execution and report production and validation. Instead it will focus on the availability of certain types of data at precise moments, namely when this information is needed to be transmitted to the eSanté platform. Data providers (hospitals, radiologists) should check if the required information is available in their own systems when it is needed by the use case.

ID:	CA-UC1	Name:	HIS/RIS Data Provider
Short Description:	Through the existing HIS/RIS/PACS system radiologists and the hospital personnel provide radiology data to eSanté-CARA. The current paper flow for transmitting results will be maintained, at least during the early stages.		
Stakeholders & Interests:	Stakeholders:	Interests:	
	Patient	Wants his radiology data being rapidly transmitted by electronic means and possibly stored in a secure system for long term reference.	
	Radiologist	Wants to speed-up the transmission of their radiology report to the data consumers and facilitate data sharing with other colleagues.	
	Authorized data consumers , usually HCPs , such as the prescriber , the reference doctor and other 3 rd party data consumers	Want to have fast electronic access to new radiology appointments and exam results, and an easy way of sharing this data with other colleagues.	
Trigger event:	The patient has received a prescription for a radiology exam ³ .		
Preconditions:	The validating radiologist is registered with the eSanté platform as a user.		
Main scenario:	1. The patient contacts the hospital for a radiology exam appointment. The exam is scheduled by the radiology department's staff, and a worklist for the		

² There should also be a time limit for the receiving parties within which a document can be retrieved, based on the documents individual lifetime. When a document's lifetime is expired, it should be deleted permanently, even if not all receivers have downloaded it yet. Otherwise one single receiver who does not download the document would block its removal indefinitely.

³ Or an invitation, in the case of mammography exams.

	<p>appropriate modality is prepared.</p> <ol style="list-style-type: none"> 2. At this point the following information is transmitted to the eSanté platform in order to provide first information about the scheduled exam. <ul style="list-style-type: none"> • Patient identification information • Data receiver information (prescriber, 3rd party data viewers) • Data sender information (hospital, HIS/RIS/PACS) • The scheduled date and time for the exam • The type and modality chosen for the exam 3. The exam is performed, and the results, i.e. images and the radiologist's report, are stored in the hospital's HIS/RIS/PACS. The exam is now composed of the following data: <ul style="list-style-type: none"> • A set of significant images is transferred to the PACS • Optionally some additional illustrative images can be tagged • The (not yet validated) radiologist's report 4. The radiologist validates the report. 5. At that point the following information is transmitted to the eSanté platform <ul style="list-style-type: none"> • Patient identification information • Data receiver information (prescriber, 3rd party data viewers) • Data sender information (hospital, HIS/RIS/PACS) • The validated report • The set of significant images, or references thereof • The illustrative images, which may also be included directly in the report • Other meta-data required by the eSanté platform (to be provided in the functional analysis) 6. The data receivers who have subscribed to the notification service (use case CA-UC6) receive notification messages shortly after the data transmission. 7. For the radiology report, the access is automatically blocked for the patient, until the "visite d'annonce", in which the prescriber or any other authorized HCP explicitly unblocks it. 8. The results of the exam are transmitted to the patient and all data consumers, such as the prescriber and other involved 3rd party HCPs, in the usual way (letter, fax, DICOM CD, ...).⁴
Exceptions:	<p>1.a. Rescheduling or cancellation of appointment If the exam is cancelled, rescheduled or otherwise significantly modified an update containing the corresponding info is send to the eSanté platform, correcting or cancelling the previously submitted scheduling information.</p>
Extensions:	<p>4.b. - 7.b. Addendum report Sometimes an already validated report is reviewed and receives an addendum, which complements or corrects the original report. This happens some time after the original report has been validated and transmitted. In this case steps 5 to 7 of the main scenario are repeated, with a modification of step 5 which now reads as follows:</p> <p>4.b. The radiologist reopens the original report and adds an addendum to it, which he then validates again. Once transmitted to the eSanté platform (step 5) the addendum report appears as a separate report in</p>

⁴ The intend is that in the long run the electronic transmission and document sharing will replace the paper and other media, in the same way that email has largely replaced ordinary mail in today's modern business communications. Another option would be that doctors can declare which communication channel they prefer.

	<p>the patients SPHR, and the original report is clearly marked as having been made obsolete by the addendum report.</p> <p>4.c. - 7.c. Mammography exam with standard 2nd and a possible 3rd lecture Women of age over 50 are invited by the “Centre Coordinateur” (CC) for regular mammography exams. The patient selects a hospital of his choice for the exam. After the exam a first report is provided and validated by the hospital’s radiologist. A 2nd lecture report is then systematically issued by an independent mammography specialist at the CC (“<i>deuxième lecture</i>”). If both reports concur the treating physician or gynecologist receives the 2nd report from the CC. If not, both radiologists meet and together make a common final report, which may include the short diagnosis from the previous reports. In some cases the patient could also be invited for additional exams. In any case the patient’s treating physician or gynecologist receive only the last report at the end of the process. The mammography procedure is implemented as an integrated Workflow involving the hospitals’ and the CC’s RIS/PACS systems. To integrate the mammography workflow with eSanté-CARA the following extension to the main scenario is necessary:</p> <p>4.c. (replacing step 4) In case of a mammography exam covered by the government’s official mammography program two or even three reports are prepared, the first at the hospital, the others at the Ministrie’s “Centre Coordinateur” (CC). The last report, i.e. either the 2nd from the CC or a 3rd consolidated report are established and validated.⁵</p> <p>4.d. Validation by electronic signature The radiologist validates the report by signing it electronically in the HIS/RIS/PACS system. A bulk signing function for validating several documents in one single step should be provided.⁶</p>
<p>Remarks:</p>	<ul style="list-style-type: none"> • The main scenario handles all necessary data input to the eSanté Platform through the hospital’s HIS/RIS/PACS, which transmits it automatically. This requires 2 things from the RIS: <ol style="list-style-type: none"> 1. All required radiology data is available in the HIS/RIS/PACS (images, reports, meta-data). 2. All potential data receivers (prescriber, patient, 3rd party HCP) must be entered in the RIS or otherwise be present in a way that allows their identification.⁷ • Whenever the patient identification information provided by the HIS/RIS is not sufficient to identify an already existing patient uniquely, or if the patient is otherwise unknown to the system (e.g. foreigner not residential in Luxembourg) the system registers him as a new patient. As the consent situation is unclear at that moment his data will be treated in a similar way as an identified patient with no consent, meaning that the results are

⁵ This last report also contains summary descriptions of the previous ones in order to put it into context.

⁶ This would most certainly require changes in the current HIS/RIS/PACS systems, and needs to be coordinated with the general security policy of the hospitals.

⁷ While point 1 is expected to be satisfied, point 2 could require modifications in the RIS itself, at least to make sure that sufficient identification information for HCPs is available. A questionnaire and the following gap analysis conducted in the CARA project will give definite answers to those questions.

	transmitted over the platform to the receivers, but not stored in the SPHR .
Related UCs:	CA-UC6 - Notification Subscription/Unsubscription

§3 Data Consumer/Receiver Use Cases

§3.1 Overview

There are 3 [data consumers/receiver](#) use cases. All of them provide scenarios to access a patient's medical data stored on or transmitted over the eSanté platform [SPHR](#). The difference between them is that they either address different groups of data consumers/receivers, or give access to different sets of data.

- **CA-UC2 - Single Patient Data Viewing & Import** is the most basic consumer use case. It is [patient centric](#), i.e. only data for one patient at a time can be searched for. The person who searches for patient data is a [HCP](#), who can e.g. be the [reference doctor](#), the [prescriber](#), or any other health care professional authorized to see the patient's data. The patient's available and accessible data is shown, possibly limited by some yet to be defined filter mechanism, and ordered according to some ordering criteria.
- **CA-UC3 - Patient Data Viewing** is a special case of the previous use case. In this scenario the viewer is the patient himself, and he is allowed to see only his own medical data, except for critical data (e.g. radiology reports), which need to be [unblocked](#) first by an authorized HCP.
- **CA-UC4 - Reliable Data Transmission** is a [receiver centric](#) use case that allows to access in one step several data sets belonging to different patients. Here the receiving parties, mostly prescribers, can quickly download and then work with results for exams that have been sent to them over the platform. This kind of "combined download" is comparable to the functioning of today's HealthNet Labo service, but fully integrated into the eSanté platform, and more convenient to use.

The following table summarizes the major differences and similarities between the viewer use cases.

Use Case	View	Which patients?	Which data?	View /download
CA-UC2 - Single Patient Data Viewing & Import	Patient centric	Any one patient	All exams (report & images) the viewer has access to.	View, download is optional
CA-UC3 - Patient Data Viewing	Patient centric	The patient himself	All unblocked exams	View, download is optional
CA-UC4 - Reliable Data Transmission	Receiver centric	All patients with new results	Received exams	First download, then view ⁸

§3.2 CA-UC2 - Single Patient Data Viewing & Import

ID:	CA-UC2	Name:	Single Patient Data Viewing & Import
Short Description:	Reference Doctors & other authorized HCPs view & possibly import radiology data of one single patient (patient centric view).		

⁸ See section §3.5, Web Viewers and Patient Management Software Integration, for more detailed info.

Stakeholders & Interests:	Stakeholders:	Interests:
	Authorized data consumers, i.e. prescribers , reference doctor & other authorized HCPs)	Want to consult and possibly download radiology data for one specific patient.
Trigger event:	(optional) The data consumers receive notification that new radiology data is available for their appreciation.	
Preconditions:	<ul style="list-style-type: none"> • The data consumer is registered with the eSanté platform as a user. • The data consumer has been properly authorized to view all or parts of a patient's SPHR. • Patient consent for storing radiology data in the SPHR on the eSanté platform is given for all data that can be viewed. 	
Main scenario:	<ol style="list-style-type: none"> 1. The consumer authenticates himself to the eSanté platform. 2. The consumer connects to eSanté's SPHR database. 3. The consumer enters demographic identification information for a patient whose radiology data he wants to see. 4. If the patient can be uniquely identified the system presents the set of data entries for this patient, which the consumer is allowed to see over a secure data exchange channel.⁹ 5. The consumer selects individual data entries, and the system shows the corresponding data to the consumer. Different types of data are clearly distinguishable, such as appointments, reports, illustrative and significant images.¹⁰ 6. Optionally the consumer downloads the selected data and stores it on his computer, either in form of a file, or by automatically adding it to the appropriate patient record in his own Patient Management System (PMS).¹¹ This can even be a PACS, if the consumer is e.g. a radiologist working at the hospital or with his own PACS. 	
Exceptions:	<p>1.a. Connection and Identification Problems</p> <p>1.a.1. In case of technical unavailability of the eSanté Platform the system informs the user that this is the case and indicates how to proceed (please try later, call hotline etc.), and the use case ends.</p> <p>1.a.2. If the identification of the user fails, he is denied access, and the use case ends.</p> <p>4.a. Failed Patient Identification</p> <p>If the patient identification information was insufficient to identify a patient uniquely, the system informs the user and gives hints on how to improve the search criteria. The use case then ends, or continues at step 3 if the user wishes so.</p>	
Extensions:	<p>Read-block Removal</p> <p>7.a.1. If the data consumer is authorized to do so he can remove the default</p>	

⁹ The communication channel used to transfer any patient data to the consumer is securely encrypted by eSanté, and decrypted on the consumer's side. This operation runs in the background, and is therefore transparent for the user.

¹⁰ See section §3.5 for viewing modalities.

Web Viewers and Patient Management Software Integration' for a discussion of the technical viewer solutions.

¹¹Importing patient data directly into a doctor's patient management system requires that such a system be extended with an access function that acts as a connector to the eSanté platform. The functional specification of the eSanté platform will provide the necessary [APIs](#) for such an integration, but not the functionality itself. See section §3.5 'Web Viewers and Patient Management Software Integration', third schema, for more details.

	<p>read-block on the patient's radiology report. From now on the patient can read the report.</p> <p>7.a.2. The patient can also unblock the report himself if his doctor has given him a special <i>unlock code</i>. This code has been generated by the RIS/PACS and is printed on the written report that was sent to the doctor. This feature allows the patient to do the unblocking himself in cases where his doctor does not use the eSanté platform at all.</p>
Remarks:	<p>It needs to be clarified which doctor(s) can remove read-blocks from a patient's data. Possibilities are:</p> <ul style="list-style-type: none"> • the prescriber of the exam, • the reference doctor, • any HCP who has access to the data, e.g. by means of referral.
Related UC:	<p>CA-UC1 - HIS/RIS Data Provider CA-UC6 - Notification Subscription/Unsubscription</p>

S3.3 CA-UC3 - Patient Data Viewing

ID:	CA-UC3	Name:	Patient Data Viewing
Short Description:	The patient, after having been duly identified by the system, can view his own radiology data on the eSanté Platform.		
Stakeholders & Interests:	Stakeholders:	Interests:	
	Patient	Wants to consult radiology data for exams he had.	
Trigger event:	(optional) The patient receives notification that new radiology data for exams he had is available.		
Preconditions:	<ul style="list-style-type: none"> • The patient is registered with the eSanté platform as a user. • The Patient has given consent that his radiology data can be stored on the eSanté platform. 		
Main scenario:	<ol style="list-style-type: none"> 1. The patient authenticates himself to the eSanté platform by means of a secure method that identifies him legally¹². 2. The patient connects to eSanté's SPHR database. 3. The patient selects, filters and displays available data of his own exams over a secure data exchange channel, if the data has been un-blocked by an authorized doctor, usually during or after the "<i>vistite d'annonce</i>". 4. Optionally the patient downloads the selected data and stores it on his computer in form of a file. 		
Extensions:	<p>3.a. Unblocking by patient If the doctor has given the patient the unblock code for a report the patient can use it to un-block this particular report.</p>		
Exceptions:	1.a. Connection and identification problems (see CA-UC2, exception 1.a.)		
Remarks:	<ul style="list-style-type: none"> • It seems to be prudent to block radiology reports and possibly images for the patient by default, because in sensitive cases the prescriber or any other treating physician wants most certainly read the report before his patient does so, and also interpret and explain it in layman's terms to him 		

¹² Such as LuxTrust.

	("visite d'annonce").
Related UC:	CA-UC1 - HIS/RIS Data Provider CA-UC6 - Notification Subscription/Unsubscription

§3.4 CA-UC4 - Reliable Data Transmission

The following receiver use case is different from the two previous ones, CA-UC2 - Single Patient Data Viewing & Import and CA-UC3 - Patient Data Viewing, mainly because it is [receiver centric](#) instead of [patient centric](#). As a consequence the focus is on the data receiver, not on the patient whose data is to be viewed. Also this use case delivers exam results to receivers for all patients, with or without a [SPHR](#), and it works even if the patient could not have been identified.

It is therefore a reliable data transmission use case for all patients.

ID:	CA-UC4	Name:	Reliable Data Transmission
Short Description:	Receivers of radiology exams download and then view new radiology data for exams that have been sent to them.		
Stakeholders & Interests:	Stakeholders:		Interests:
	Identified data receivers (prescribers & other authorized HCPs)		Want to download and consult radiology results for exams sent to them.
Trigger event:	(optional) The data receiver is notified that new radiology data is available for his appreciation.		
Preconditions:	The data receiver is registered with the eSanté platform as a user.		
Main scenario:	<ol style="list-style-type: none"> 1. The receiver authenticates himself to the eSanté platform. 2. The receiver connects to the eSanté Platform. 3. The system shows the receiver a list with new medical data reports that have been sent to him. Only results not yet downloaded by him are shown.¹³ 4. The receiver selects a subset from the list of data entries and downloads them in one single step ('combined download')¹⁴. The system automatically marks the downloaded results as read, and from now on they will no longer be presented to him for download. 5. The system decrypts the downloaded results locally on the receiver's side.¹⁵ 6. Immediate Data Removal If the patient has no SPHR due to his consent situation, or if he couldn't be properly identified, the patient's medical data is permanently removed from the eSanté platform. Only log traces for auditing purposes, not visible for normal users, remain in the system¹⁶. The removal happens immediately after all receiving parties have acknowledged the successful download and decryption of the data on the receiver's side. 7. The receiver views the downloaded data one-by-one, and adds it to the patients' records in his own PMS.¹⁷ 		

¹³ At that point the receiver cannot see to which patient a result belongs. This is because the data and patient information are still encrypted and not available to the system, but he can see the date, source and type of each data entry.

¹⁴ A 'select all' function will be provided for convenience.

¹⁵ Now it becomes apparent to which patient a result belongs.

¹⁶ We assume that there is a logging mechanism tracing all data movements and accesses, but the description of this mechanism is out-of-scope for the present document.

¹⁷ The remarks in footnotes 10 and 11 about the technical viewer capabilities and the PMS' eSanté integration apply here, too.

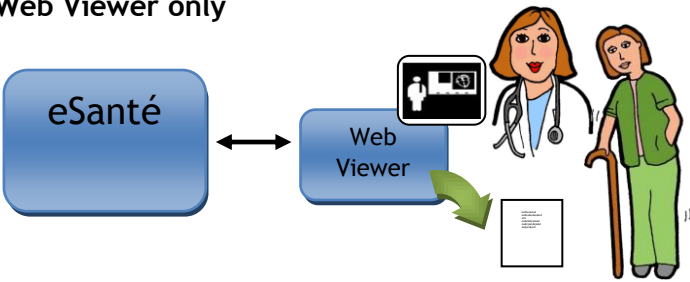
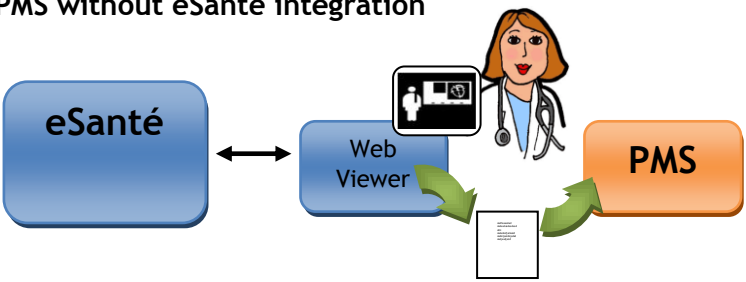
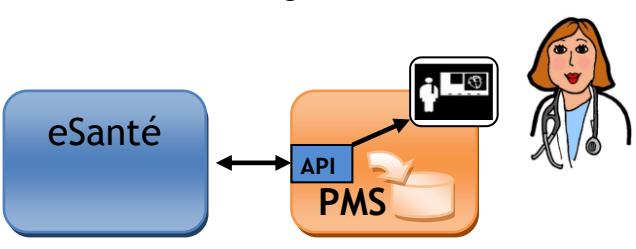
Exceptions:	1.a. Connection and identification problems (see CA-UC2, exception 1.a.)
Alternatives:	<p>6.a. Removal after exceeding a Expiry Date</p> <p>In order to avoid that a missing or unsuccessful download from any one of the data receivers would keep a patient's data forever on the platform against his explicit wishes every document has a "transmission expiry date". Documents exceeding this date will be automatically deleted from the platform, even if some of the receivers haven't yet downloaded it.</p>
Remarks:	<ul style="list-style-type: none"> • Because this use case is consumer centric there is no need to have all patients properly identified by the eSanté platform in order to be able to transfer their medical data. Only the receivers need to be clearly identified. The big advantage over CA-UC2 and CA-UC3, which require proper patient identification, is that it works for all patients, identified by eSanté or not. It is also independent from the individual patient's consent situation. It works even if the patient is not identifiable at all (unconscious accident victim with no credentials). In such cases the data is removed after a certain period of time from the platform according to the above specified rules. This use case represents therefore a reliable transfer mechanism that guaranties data delivery to the identified receivers, and should be the preferred use case for a doctor to work with on a daily basis. • Steps 3. and 4. could be merged into one download-all-available-data step, but given the fact that some of the data may be quite voluminous (images mainly) and long to download it is prudent to allow the user to make a pre-selection first, e.g. only radiology reports from one single source. It should also be possible to interrupt a combined download operation if it takes too long, having the completed downloads marked as 'read', and leaving the other ones on the eSanté platform for later download. Another possibility would be the automatic download of all data in the background, with a pop-up message informing the user of the end of the download.¹⁸
Related use Cases:	<p>CA-UC1 - HIS/RIS Data Provider</p> <p>CA-UC6 - Notification Subscription/Unsubscription</p>

¹⁸ A mix of both functions is possible too: manual start, then download in the background, signalling the end by a popup message.

§3.5 Web Viewers and Patient Management Software Integration

From the start the eSanté platform has to provide the technical means for every authorized data viewer/receiver to visualize and possibly download accessible patient data. The best solutions for doctors would be to have a fully integrated access to eSanté within their own [Patient Management System \(PMS\)](#). Doctors without PMS, or with a PMS that is not yet integrated, are given access over a Web Browser. The same holds for patients.

The following three situations will be covered by the user interfaces provided as front-end to the eSanté platform.

<p>Web Viewer only</p>  <p>The diagram shows a blue box labeled 'eSanté' connected by a double-headed arrow to another blue box labeled 'Web Viewer'. To the right, a doctor in a white coat and a patient in green scrubs are shown. A green arrow points from the Web Viewer to a document icon, indicating data retrieval.</p>	<p>Patients and doctors without a PMS can view and possibly download patient data from the eSanté platform through a Web viewer interface.</p>
<p>PMS without eSanté integration</p>  <p>The diagram shows 'eSanté' connected to 'Web Viewer'. A doctor is shown using the Web Viewer. A separate orange box labeled 'PMS' is shown to the right. A green arrow points from the Web Viewer to a document icon, and another green arrow points from the PMS box to the same document icon, indicating manual data transfer.</p>	<p>Doctors with a PMS that is not integrated with the eSanté platform can view and possibly download patient data through eSanté's Web Viewer interface. If they want to keep a local copy they need to upload the files manually into their own PMS, where they attach them to the corresponding patient records.</p>
<p>PMS with eSanté integration</p>  <p>The diagram shows 'eSanté' connected to a larger orange box labeled 'PMS'. Inside the PMS box, there is a smaller blue box labeled 'API'. A double-headed arrow connects 'eSanté' to the 'API' box. A doctor is shown next to the PMS box, and a green arrow points from the PMS box to a document icon, indicating direct data access.</p>	<p>Doctors with eSanté integrated PMS can view and optionally download patient data directly in their own software, without manually downloading/uploading it with the Web viewer. An API is provided by eSanté to allow the software vendors to integrate the required eSanté functions, i.e. viewing & downloading.¹⁹</p>

The viewer use cases described in section §3 are independent from the choice of the viewer software, which means that they should work with both the Web-Interface and the integrated PMS. The level of integration and additional eSanté functionality that the PMS will provide depends largely on the various software vendors. However, the API provided by the eSanté platform must guaranty that the functions required by the viewer use cases can be implemented.

¹⁹ The very same API could also be used in HIS/RIS/PACS systems, both in hospitals or private cabinets, to gain access to a patient's radiology data, comprising significant radiology images, and to download and import them locally.

§4 Other Use Cases

Chapters §2 and §3 described the core of the CARA use cases, i.e. data providers and consumers. The current chapter rounds up the CARA profile by providing a few supporting use cases, such as patient transferral and notification management.

§4.1 CA-UC5 - Patient Referral

ID:	CA-UC5	Name:	Patient Referral²⁰
Short Description:	A doctor refers his patient to a secondary health care provider for further treatment. The patient chooses a secondary health care provider, who may add a summary report at the end of his treatment.		
Stakeholders & Interests:	Stakeholders:	Interests:	
	Referring doctor	Wants his patient to be treated by a secondary care provider	
	Patient	Chooses a secondary care provider	
	Secondary care provider	Continues or complements the patient's treatment on demand of the referring doctor	
Trigger event:	The referring doctor decides to refer a patient to a secondary care provider.		
Preconditions:	<ul style="list-style-type: none"> The referring doctor and the secondary care provider are registered with the eSanté platform as users. Patient consent for storing data in the SPHR on the eSanté platform is given for all medical data that is involved in the referral. The referring doctor has been properly authorized to view all medical data that is involved in the referral. 		
Main scenario:	<ol style="list-style-type: none"> The referring doctor authenticates himself to the eSanté platform. The referring doctor connects to eSanté's SPHR database. The referring doctor enters demographic identification information for the patient he wants to refer to a secondary care provider. The referring doctor creates a <i>referral request</i> in the system, containing mainly a description of the patient's case. This creates a special storage zone, called the <i>referral folder</i>, in which the referral request is placed. The system also generates a <i>referral code</i> that uniquely identifies this particular referral folder, and which will be used by the secondary care provider to unlock this folder. The referring doctor identifies the additional elements in the patient's SPHR that he wants to make accessible to the secondary care provider and places them in the referral folder. The referring doctor uses the referral request to print a referral letter, which includes the referral code.²¹ This unique ID will allow the secondary care provider to get access to the referral folder and all medical elements contained in it. The letter is given to the patient, who has free choice of the secondary care 		

²⁰ This use case is largely inspired by the Document-based Referral Request IHE profile (XDS-DRR), see http://www.ihe.net/Technical_Framework/upload/IHE_ITI_TF_Supplement_Document-based_Referral_Request_DRR_2009-08-10.pdf

²¹ If the doctor rather wishes to use a referral letter of his own making he must at least include the referral code in it, otherwise the secondary care provider won't be able to unlock the patient's referral folder.

	<p>provider, but often follows the referring doctor's recommendation to go to a particular colleague.</p> <p>8. The patient chooses the secondary care provider and presents the referral letter to him.</p> <p>9. The secondary care provider authenticates and connects himself to the eSanté platform.</p> <p>10. The secondary care provider enters the referral code printed or written on the referral letter. This opens the referral folder in the patient's SPHR to him, and allows him to gain access to all the medical data elements contained in it.</p> <p>11. Optionally, at the end of his treatment the secondary care provider writes a summary report and inserts it into the patient's SPHR.</p>
Exceptions:	<p>1.a. Connection and identification problems (see CA-UC2, exception 1.a.)</p> <p>3.a. Failed patient identification (see CA-UC2, exception 4.a.)</p>
Remarks:	<p>The transmission of the referral request and letter could also be done electronically over the eSanté platform, but then the secondary care provider needs to be known by the referring doctor, or the patient himself would have to act as the <i>forwarding agent</i> of the electronic referral request to preserve his free choice of medical care. This seems to complicate the process unnecessarily and should therefore be left for future enhancements. The use case in its current form is much simpler with a printed referral letter.</p>
Related UC:	None

§4.2 CA-UC6 - Notification Subscription/Unsubscription

Although presented as one single use case, this is actually a collection of two closely related use cases which show how a user of the eSanté Platform can subscribe to and unsubscribe from a notification service. This service allows him to receive messages about the availability of radiologic exam results he has access to.

ID:	CA-UC6	Name:	Notification Subscription/Unsubscription
Short Description:	Patients, doctors and in general any person participating in the eSanté platform can subscribe to be notified when new radiology results have been sent to them and are now available in the eSanté Platform.		
Stakeholders & Interests:	Stakeholders:	Interests:	
	Patients, doctors and other registered users of the eSanté platform	Want to be informed when new results of exams they have access to be available on the eSanté Platform.	
Trigger event:	The user decides to subscribe to the radiology exam notification service.		
Preconditions:	The user is registered as a user in the eSanté platform .		
Main scenario:	<ol style="list-style-type: none"> 1. The user authenticates himself to the eSanté platform. 2. The user connects to the notification subsystem of the eSanté Platform. 3. The user subscribes to the notification service for the availability of radiology results and specifies the email delivery address. 4. The user confirms his choice and the system creates a radiology exam notification subscription for him. 		

	<p>5. The system sends a subscription confirmation to the user at the specified email address. The email message contains a link that the user has to activate in order to confirm his subscription, and thereby validate his email address.</p> <p>6. From now on, the notification service sends messages to the user informing him about events for which he has subscribed, as soon as they occur on the eSanté platform.²²</p>
Exceptions:	1.a. Connection and identification problems (see CA-UC2, exception 1.a.)
	<p>6.a. Delivery failure If a message delivery encounters a failure the system logs this fact and schedules a limited number of retrials at a later time. If all of them continue to fail the notification subscription is automatically cancelled, without further notification to the user.</p>
Extension:	Un-subscription
	Preconditions: The stakeholder is a user to the eSanté Platform notification service
	<ol style="list-style-type: none"> 1. The user authenticates himself to the eSanté platform. 2. The user connects to the notification subsystem of the eSanté Platform. 3. The user to the un-subscribes himself from the radiology result notification service. 4. The user confirms his choice and the system cancels his radiology exam notification subscription. 5. The system sends a un-subscription confirmation message to the former user. This email message contains a link that the user has to activate in order to confirm his un-subscription. 6. From now on the former user receives no more notification messages related to radiology data on the eSanté platform.
Related UCs:	<p>CA-UC1 - HIS/RIS Data Provider CA-UC2 - Single Patient Data Viewing & Import CA-UC3 - Patient Data Viewing CA-UC4 - Reliable Data Transmission CA-UC5 - Patient Referral</p>

²² Although not of relevance here, it should be mentioned that the name of patients or any specific medical information concerning them should never be mentioned in the notification messages, as this is confidential information, which should not travel over unsecure email channels.

§5 Additional Use Case Candidates

The following list of use case candidates should be considered in order to complete the whole eSanté system and make it more robust and functional. All of them refer to exceptional, but nonetheless realistic situations. They are not specific to the CARA project and apply in general to the eSanté platform.

Here we mention a few of them briefly, without further elaboration. Some of them have a strong relation with [Patient Consent Management](#), which should be tackled before elaborating these use cases.

- Data Provider: Patient adds data and information in his possession about his own health, as he would do in a Personal Health Record (PHR). These patient entries should be clearly distinguishable from clinical results and entries from HCP.
- Data Viewer: Emergency access to a patient's [SPHR](#).
- Data Viewer: Access to a patient's health record by proxy (children & parents, legally appointed guardians, ...).
- Other: Regular replacement for the reference doctor during vacation or illness.
- Other: Patient notification in case of ordinary and extraordinary access to his health record.
- Other: A detailed model of Patient Consent Management.

§6 Glossary of terms

Wherever [hyperlinks](#) are provided in the text you can jump directly to the glossary entry with a simple click in the PDF document, or using Control + Click in MS-Word.

Term	Description
3rd Party Data Viewer	Any person different from the patient, the prescriber and the radiologist who wrote the first report. Examples are: <ul style="list-style-type: none"> • a second radiologist (second opinion report) • another general physician or specialist named by the patient, the prescriber or the original radiologist • authorized medical emergency personnel
Access rights	(also called <i>access privileges</i> or <i>access control</i>) They define which user has access to what data. Access can furthermore be refined in different types such as read (= view), write (= create, delete) modify, and so on ²³ . Examples: <ul style="list-style-type: none"> • Prescribers can view and copy data for exams they have prescribed. • Radiologists can create, view, modify and delete their own radiology reports. • Patients can view the reports of their own exams, but only after the prescriber or another authorized doctor, such as the reference doctor, has unblocked them. <p>Due to the lack of a proper patient consent management model at the time of writing of this document no specific roles and privileges can be given here.</p>
API	An Application Programming Interface (API) is an interface implemented by a software program which enables it to interact with other software. It facilitates interaction between different software programs similar to the way the user interface facilitates interaction between humans and computers. ²⁴
Authentication	The act by which a physical person identifies him/herself to a computer system in order to gain entry into the system and access to its data. This is usually accomplished by using a login name and password, or more likely in this context, by using a secure token provided with a strong authentication method such as LuxTrust.
Blocked data, read-block	A radiology report is flagged as “blocked”, meaning blocked for patient access, when it is transmitted to the eSanté platform. It stays blocked until the prescriber , the reference doctor or any other authorized user removes the block, usually during the so called “ <i>viste d’annonce</i> ”, so that the patient can now read it. The patient himself can also remove the block if he has been given the specific unblock code that was printed on the written report.
Data consumer centric View	This term means that the data consumer is the pivotal point from which patient data is searched for. More specifically it means that the system shows

²³ As explained in section **Error! Reference source not found.** it is outside of the scope of this document to define the exact model and mechanisms underlying the eSanté Patient Consent Management.

²⁴ Definition from the Wikipedia, http://en.wikipedia.org/wiki/Application_programming_interface.

Term	Description
	<p>data which have been explicitly sent to the consumer, and which may belong to any number of different patients. E.g. a prescriber can see all results to exams he has prescribed. This is in contrast to the patient centric view, where a user of the system can search for all accessible data for one given patient.</p>
<p>Data consumers, data receivers</p>	<p>As opposed to data providers, the consumers / receivers are on the receiving side of the data flow. In the eSanté platform data consumers are securely identified physical persons who have access to patient data, such as prescribing physicians, reference doctors, and other 3rd party data consumers. Patients are a special case because the identification process in the eSanté platform is different for them, and they are therefore always called ‘patients’, rather than data consumers.</p> <p>“Data receiver” is essentially an equivalent term to “data consumer”, which is preferred in transfer use cases, where medical data is explicitly “send” to a limited number of “receivers”. The distinction is done to emphasis the transient character of the data transmission.</p>
<p>eSanté platform</p>	<p>The overall IT system that delivers the services and functions described in this series of use cases. Its main purpose is to store medical data related to patients in the Luxemburgish health care system, and to facilitate the secure and controlled exchange of data among its different actors.</p> <p>Beside data storage and transfer services the eSanté platform will provide other related services such as a Notification Service, the Patient Consent Management Service etc.</p>
<p>Health Care Professional Software (HCP-SW)</p>	<p>Software systems that are used by HCPs in order to conduct and manage their patients and work. Examples are</p> <ul style="list-style-type: none"> • Medical cabinet software, • HIS/RIS/PACs systems, • Medical device software for monitoring patients • ...
<p>Health Care Professionals (HCP)</p>	<p>Professionals that are working in the health care sector, such as doctors, nurses, medical assistants, Samu, etc.</p> <p>Depending on the role they play in a use case they are sometimes referred to as reference doctor, prescriber, radiologist, specialist, data consumers, data receivers, 3rd party data consumers, etc.</p>
<p>Health Care Provider Identification</p>	<p>In order to be able to use the system a health care professional has to be registered in the eSanté platform as a regular user. The minimal set of information to identify uniquely a health care professional has still to be defined, but the following elements are good candidates :</p> <ul style="list-style-type: none"> • CNS-number • Social security number (“matricule”) • Name and surname • Medical specialty
<p>Illustrative images</p>	<p>Images that the radiologist adds to an exam in order to better illustrate the case, but which are not used for the findings, which would be significant images.</p>

Term	Description
	Due to their relatively compact size it is technically feasible to include illustrative images directly in the report.
Meta-Data	Or <i>Meta-Information</i> . The system offers two kinds of information: actual radiology data (appointments, reports, images), and meta-data, e.g. date of creation, label, modality, short description, author, etc. Typically a user will first see the meta-information before accessing the data itself, e.g. in form of a summary line in the result list of a research.
MTA	Short for Medical Technical Assistant .
Notification Service	Sub-system of the eSanté platform that can be used to subscribe / unsubscribe to a notification service. This service automatically generates messages at specific events, such as the availability of new radiology exam data, or access to a patient's medical record.
Opt-in, opt-out	<p>These are basic options for the participation of patients in the consent management process.</p> <p>Opt-in means that patients by default have not given consent to participate in the eSanté platform, and therefore explicitly need to declare their consent in order to participate.</p> <p>Opt-out means participation by default (consent given), unless consent is explicitly revoked.</p> <p>At that point it can be assumed rather safely that all persons being registered with the CNS will be enrolled on an opt-out basis, while other persons coming in contact with the Luxemburgish Health system are managed on an opt-in basis.</p> <p>The option that is finally chosen, does not impact the present use cases. It only determines the group of people that participate when the system is launched.</p>
Patient Centric View	This means that the patient is the pivotal point from which patient data is searched for. It specifically means that one search operation can only return data for one given patient. This is in contrast to the consumer centric view , where a data consumer such as the prescriber can search for results he is the consumer of, no matter for which patient.
Patient Consent Management	<p>Or shortly Consent Management. A system of roles and rules that allows a patient to define the access conditions to his SPHR. Wikipedia defines it as:</p> <ol style="list-style-type: none"> 1. Enables consumers to affirm their participation in eHealth initiatives in cases where participation cannot or should not be implied or assumed. 2. Enables consumers to establish privacy preferences / policies to direct who shall have access to their electronic personal/protected health information (PHI), for what purpose and under what circumstances. 3. Supports the dynamic creation, management and subsequent enforcement of consumer, organizational and jurisdictional privacy policies through access control mechanisms.
Patient	Patients are identified by the <i>Master Patient Index</i> of the eSanté platform.

Term	Description
identification information	<p>This is done by providing a set of info attributes such as the national Social Security Number (SSN), demographic information such as name(s), address(es), age, sex etc.</p> <p>The Master Patient Index then tries to find a unique match for the patient and after an additional <i>pseudonymisation</i> step by the TTP returns a patient pseudonym, which allows to access the patient's SPHR on the eSanté platform.²⁵</p>
PMS	<p>The PMS or Patient Management System is a Health Care Professional Software that supports a HCP in the management of his patients. Those systems have usually a database containing both administrative/demographic and medical information about patients. Other functions such as billing, letter generation, agenda and waiting room management often complete the PMS to a Medical Cabinet Management System.</p>
Prescriber	<p>(also sometimes called <i>prescribing physician</i>) is, in the context of CARA, a doctor who has prescribed a radiology exam to his patient. It is, however, not a formal role in the CARA use cases. What is important about the prescriber is that he receives the results of his exam prescriptions, and therefore the use cases rather calls him the data consumer/receiver. There is also the similar concept of the reference doctor, which is in most of the cases also the prescriber of an exam. But this doctor has other functions that go beyond making prescriptions.</p>
Radiology data	<p>Refers to radiology reports as well as significant and illustrative images in relation to such report.</p> <p>Meta information such as the date of creation, a subject/title, the type of data (several types of images, reports) and the producer of the data are also considered as radiology data.</p> <p>In addition a patient's appointments for a radiologic exam, together with relevant meta data, are also considered as radiology data.</p>
Reference Doctor	<p>A physician who has a special trust relationship with a patient. In the eSanté platform the reference doctor has special privileges and functions in respect with his patients' medical data such as:</p> <ul style="list-style-type: none"> • having a privileged access to his patient's medical data record • to unblock critical data so that the patient can see them²⁶ • sharing his patient's medical data with other HCPs in agreement with the patient <p>He also happens to be the principal prescriber of most of the patient's exams.</p>
Significant images	<p>Images that are the basis for the radiologist's findings and report. Falls under the general notion of radiology data.</p> <p>Significant images are of higher quality than illustrative images, and will therefore mostly remain in a PACS where they can be retrieved using a</p>

²⁵ Actually it's even more complicated, because the TTP never returns the pseudonym directly to an external user of the platform. Instead it returns a time-limited transaction ID which the eSanté platform can then use during a well defined time window to obtain the real pseudonym from the TTP, and with it get to the patient's SPHR.

²⁶ This function is not limited to the reference doctor.

Term	Description
	resource locator link.
SPHR	<p>A SPHR or Shared Patient Health Record is an electronic health record for individuals that is located on the eSanté platform, and which can be viewed by anyone who has the necessary electronic credentials to access this information.</p> <p>An ideal SPHR would provide a complete and accurate summary of the health and medical history of a person by gathering data from many sources.</p>
TTP	<p>Short for Trusted Third Party - is a component of eSanté that allows for the pseudonymisation of a patient's identity, for the purpose of providing a secure reference to a patient without revealing his actual identity. This is achieved by sending demographic patient identification information to the Master Patient Index, which in case of a positive match returns a unique ID which is then exchanged for a pseudonym by the TTP. This pseudonym replaces the patient information in the data sets stored on the eSanté platform, so that medical data is not stored together with readable patient information.²⁷</p>

²⁷ This is only appropriate for data where the patient identification info can be removed automatically and without compromising the data's integrity. Good examples are: structured radiology reports, labo results in XML format. Bad examples are: text documents such as Word and PDF documents, bitmap pictures with embedded text, scanned reports and letters, etc.