Structure of the Electronic Patient Record

EMDMI's Working Group

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Contents

List of Figures

Chapter 1

Introduction

1.1 Scope

The purpose of this paper is to name and define a set of characteristics deemed essential for the concepts described in DPRS I [4] [1]. An English definition of these concepts may be found in [2]

A secondary objective is to slot the soap items and the episode of care into the model.

Future work could investigate the codification and codifcation system of the attributes as well as the methods of updating the attributes. These results could also be refined according to the softwares labeling process during 2003.

International terminology	Belgian model	
	Dutch	**French**
Health Care Element	Zorgelement	Élément de soins
Health Approach	Zorgaanpak	Démarche
Contact	Zorgcontact	Contact de soins
Subcontact	Deelcontact	Sous-contact
Service	Dienst	Service
Health Agent	Zorgverstrekker	Prestataire
Period	Periode	Période

The following subsections introduce the methodology used by the working group.

1.2 Methodology

Bases on case discussions, expert views, review of official definitions as retained in literature, formal definitions were given based on a consensus in the working group. Definitions were critically analised (E Stanus, E Van Hoeymissen, I Vanderweert, J Devlies) and translated into an UML model (M Vastrat). Problems arising were reviewed by the working group and definition refined to consolidate the coherence of the model.

Basic characteristics needed for describing relations between basic concepts, indicating also how the 'episode of care' and the 'soap' approach can be expressed into these basic concepts are discussed.

This report lists the essential characteristics of each concept and their classes. The characteristics are classified in two groups: the structural one and the descriptive one. The relations between the concepts and their cardinalities (see [1, 4]) which are structural characteristics, are fixed by the invariants (constant requirements) of the classes.

1.2.1 Notation system

Basic relations and descriptions of the concepts are translated into an Object Oriented model.

The syntax is deeply inspired by the notation described in [3]. You will find hereafter a short description of this syntax.

Concepts (as identified in DPRS I [1],[4]) are classes. Attributes become properties or characteristics. A class is similar to a mould from which objects are generated. Objects are, therefore, instances of classes.

Short comparison of the features between classes and objects:

Class	Object
mould	class instance
software text	data structure dynamicaly created
static	exist only in the memory of a computer
semantic concept	

So we won't speak about objects but classes.

The characteristics (new formulation of attributes) of a class are a set of declarations of (logically) correlated items.

A characteristic can take 2 forms: attribute or routine

An attribute is a description of a field present in all instances of a class (memory)

A routine is a calculation defined in a class and applicable to instances of a class. A routine can be a procedure or a function (a function returns a result, a procedure doesn't)

Characteristics are logically grouped by features. The working group retains 2 types of features: the structural and descriptive features.

1.2.2 Classification

A characteristic, gathered by features, can be:

- public (accessible by any client ....−− feature{ANY}

- secret (not accessible outside the instance of the class) ....−− feature{NONE}

- of limited access to specific classes X,Y,Z (protected) ....−− feature{X,Y,Z}

The syntax (features ... as presented supra) points out the access rights of the characteristics by the other classes. The features gather sets of characteristics with similar visibilities.

A characteristic can also be described by role (fig. 1.1) or implementation (fig. 1.2). The first one has properties of interest for us because of keeping away problems of implementation. Moreover, the right branch of the figure 1.1 defined the set of characteristics coming within the scope of the working group.

The principle of uniform acces requires that a client be able to access a property of an object with an unique notation, regardless of implementing by memory or calculation (space or time, attribute or routine). So for the client (and for us), there are not any differences between an attribute and a function without attribute.

Example

To illustrate the principle of uniform acces, let's suppose we have defined 2 characteristics for the health issue: is_closed and close_date.

The type of 'is_closed' is a boolean (ie can get exactly 2 values: true or false), and that of 'close_date' is a moment (the description of moment is of little interest by now).

So, 'is_closed' can be implemented by several ways: as an attribute or as a function. As attribute 'is_closed' is updated (cf. subsection 1.2.3) when needed; as function, 'is_closed' calculates and returns true when a close_date exists.

Technically, the principle of uniform acces implies these two implementations don't need to be differenciated by the client (the user of the class). Therefore the presentation (notation) outside a class of an attribute or a function without argument is identical. This principle also implies that as the direct affectation of a function by a value is a non sense, so is an attribute updating (from outside a class of course) by direct affectation.

What is the matter of interest is the constraint linking the characteristics. This is the role of the class invariant.
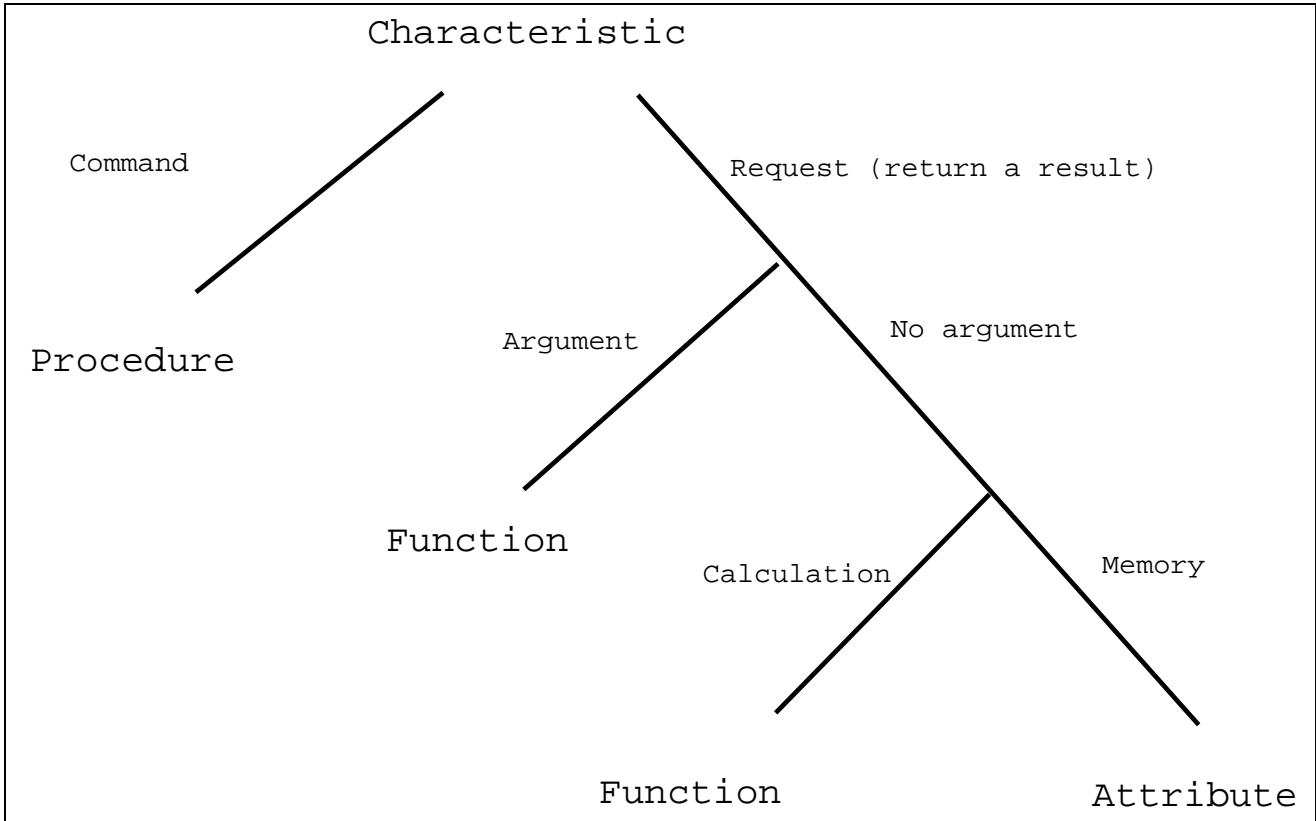
Figure 1.1: Classification of attributes by role (How does a characteristic appear to the *clients* of a class ?)
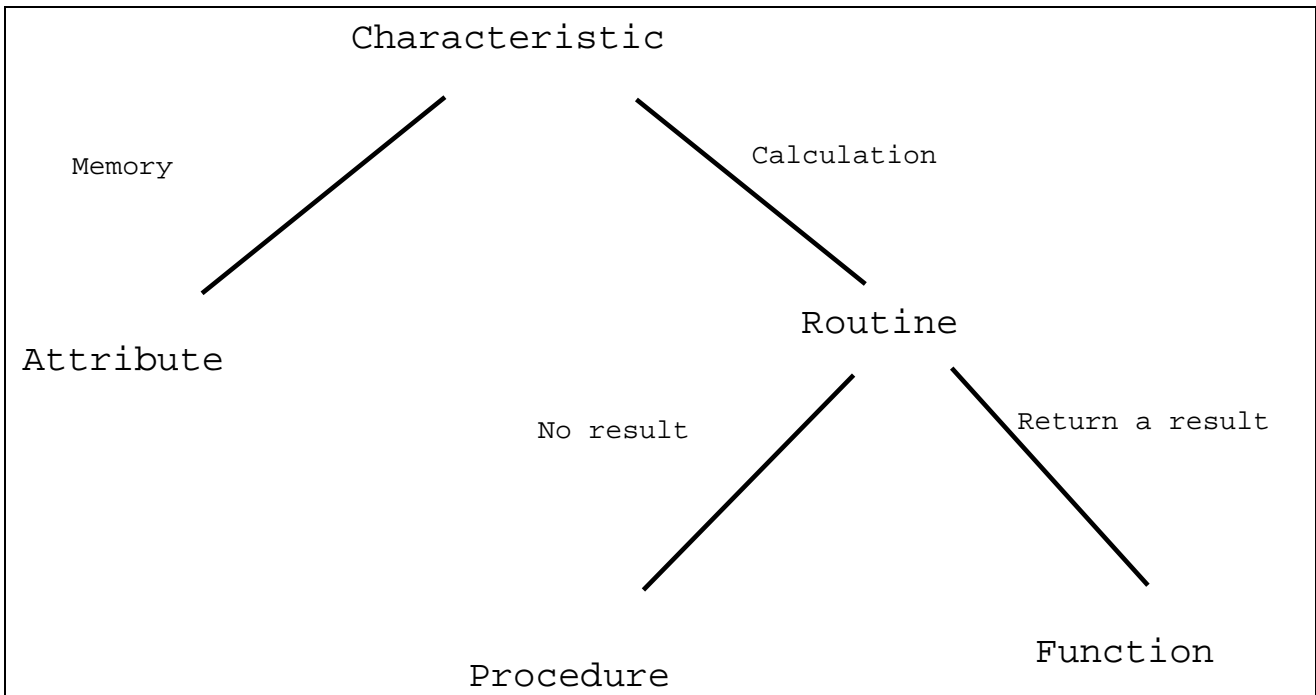

Figure 1.2: Classification of attributes by implementation (How does a characteristic appear to the *provider* of a class ?)

1.2.3 The class invariant as coherence constraint tool

The group has decided that characteristics to be retained in the proposed model will be related to class invariants. A class invariant specifies the exact nature of the relation between classes (the client relation). The class invariants result in a set of constraints between the attributes (and functions without arguments) of one or several classes.

Here is a more formal formulation:

> The invariant is an **assertion** which has to be verified at the creation of every class instance and preserved at the execution of every exported routine in such a way that it will be verified by all instances of the classes from the outside at the end of the routine.

The class invariant expresss semantic properties and constraints of integrity.

> Example
> Let us take a look at our previous example. The coherence between 'is_closed' and 'close_date' can be expressed with a class invariant:
> 'is_closed[1]' implies close_date not Void[2].

The pertinence of a characteristic thus retained was defined by the following observation:

mandatory requirement, a characteristic implied in an invariant;

structrural requirement, a characteristic used in an invariant which implies another class;

Note: The notation allows descriptions of retained characteristics independently of their implementation (function or memory) according to the approach of the first figure (cf. figure 1.1 p.6).

Note: the characteristics retained are described independently from how they are developed within a patient record system: they either can be developed by procedures, arguments, calculation or memory according to the approach of the figure 1.1.

1.3 Syntax

The most important characteristics of the syntax were described before in this section. For more details, the reader is invited to consult [3].

Here is a complement of the notation used to describe attributes and invariants:

A characteristic is presented by a identification number, a name and a class (or type). Finally, comments are putted after a double −− as:

> [reference_id] *characteristic_name*: CLASS −− Optionnal comments

Note: a comment can give more details on the definition of the attribute, on the purpose of the attribute (usefullness in views) or on a set of suggested values.

The fields of an invariant are:

> *reference_id invariant_label*: an appropriated expression or constraint −− Optionnal comment

Note 1: MOMENT: class refering to a chronological class on which comparison operator can be applied. So 'in 1970' is lesser than '3 weeks ago' is lesser than 'tomorrow'

Note 2: the ENUMERATE class modelizes a closed list of values.

Note 3: the values of attributes of some classes (as ENUMERATE) are proposed for information.

Modelisation tool: UML UML is a relatively widespread and a well known graphic formalism tool. The conversion of the syntax to an UML model is straightforward. UML model was added as developed by E. Stanus et M. Vastrat.

Clinical cases Clinical cases will illustrate the model.

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[1] 'is_closed' is an expression equivalent to 'is_closed = true'

[2] Void: equivalent to NULL

1.4   Classes used

We describe key characteristics of the main classes related to the basis concepts. However, a detailed and comprehensive description of all classes used falls out of the scope of this report (e.g. CODE_SYSTEM, PROVIDER, PROFESSION). Anyway, the name of each class and their short comments should be sufficient to capture their semantic contents. Detailed description can be found elsewhere (CEN documents, Khmer-bis, ...).

Chapter 2

Health Care Element (HCE)

Class: HEALT_CARE_ELEMENT

Features{ANY} −− Structural
  [2.1] *labels*   : LIST[HCE_LABEL]−− List of labels (ICD9/10 - ICPC2)
  [2.2] *ha_list*: LIST[HEALTH_APPROACH]
                                −− list of HA linked to the HCE
  [2.3] *hce_creation_date*: DATE   −− creation date of the current HCE

Features{ANY} −− Structural
  [2.4] *hce_id*   : GENERATOR   −− GENERATOR produces unique identifiers; identify 2 HCE as the same; unique means does not change within the health information system and doesn't have any redondancy

---

Features{ANY} −− Descriptive
  [2.5] *end_moment*   : MOMENT   −− If present then hce is considered as closed. This is just a point of view. An HCE could be reopened if needed!
  [2.6] *is_equal (e: HEALT_CARE_ELEMENT)*: BOOLEAN
                                −− Are all fields of 'e' equal to the fields of the current instance ? Communication and restructuration issues
  [2.7] *is_identical (e: HEALT_CARE_ELEMENT)*: BOOLEAN
                                −− Is e.hce_id equal to hce_id ? (both health element are the same (pathological) entity). Communication and restructuration issues
  [2.8] *version_date*   : DATE   −− Date of the last update of the HCE
  [2.9] *hce_lnk*: LIST[LINK [LIST [HEALT_CARE_ELEMENT], ENUMERATE]]
                                −− An HCE can be related to other HCE so we use a LIST[LINK[...]]. There are different types of LINK characterised by a value of ENUMERATE. The value taken by ENUMERATE can be: is_a_complication_of, is_a_risico_factor_of, ... The type of the LINK could also be used to manage splitting and joining of HCEs.
                                A detailed description and management of these links falls out of the scope of this document.
  [2.10] *diagn-2*: LIST[HCE_LABEL]
                                −− Associated (and known) diagnoses but not (yet) individualised as HCE

Invariant:

2.1 *first_contact*: creation_date = min(ha_creation_date) of ha_list −− The creation date is the first date of the HA for this HCE. This is equivalent to the date of 'taken under care' (not to be confused with the clinical_date cf. HCE_LABEL)

2.2 *not_empty_label*: labels.count $\geq$ 1 −− There are at least one label

2.3 *date_coherence*: end_moment implies creation_date $<=$ end_moment −−

2.4 *cardinality_of_the_health_approach_list*: ha_list is not Void and ha_list.count > 0 −− there are at least one health approach for each health element

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Class: HCE_LABEL

Features{ANY} −− Structure

[2.11] *label*	: STRING	−− a label could be undefined (blank)
[2.12] *creation_date*	: DATE	−− validity date
[2.13] *author*	: HEALTH_AGENT	−− The responsible health agent

Features{ANY} −− Descriptive

[2.14] *label_code*	: CODE_SYSTEM	−− coded value of the label
[2.15] *role*	: ENUMERATE	−− type of health issue: problem, diagnostic, RFE, symptom, complaint, ...: standardization needed
[2.16] *certainty*	: ENUMERATE	−− excluded, probable, proven, unprobable
[2.17] *lifecycle*	: ENUMERATE	−− time evolution of HCE: active, passive, acute, chron, ... Note: the reason of the presence of this characteristic here is justified by the ability to log who has updated the life_cycle and when.
[2.18] *significance*	: ENUMERATE	−− clinical appreciation of the importance of the HCE
[2.19] *clinical_date*	: MOMENT	−− Moment when begin this particular label (reported more often by the patient)
[2.20] *version_date*	: DATE	−− Date of last update of the label

Invariant:

2.5 *code_translation*: code not empty implies label not empty −−

2.6 *responsible_user*: author is not Void −−

2.7 *label_exist*: label is not Void −− a label not void can be an empty string

---

Class: CODE_SYSTEM

Features{} −− Out of the scope

[2.21] *code_id*	:	−− value of the code
[2.22] *label*	: STRING	−−
[2.23] *system*	:	−− system of code; implies standardization
[2.24] *version*	:	−− Version number of the codification system

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Class: LINK [L − > LIST [C], T − > ENUMERATE]   This is the notation

for genericity

Features{} −−

[2.25] *lnk*	: L	−− List of elements of type C. Identified type C are Health Care Element, Health Approach or SERVICE
[2.26] *type*	: T	−− it characterises the link of C. eg. for hce_lnk: is_a_complication_of; for ha_lnk: has_been_initiated_by; for services_lnk: is_a_response_to
[2.27] *creation_date*	: DATE	−−
[2.28] *version_date*	: DATE	−−
[2.29] *lnk_label*	: STRING	−− name of the link (most often got from the 'type')

- L − > LIST[C] mean that the type of L is a LIST of C

- the types identified for C, by now are HCE, HA or SERVICE

- T is an ENUMERATE list of values dependent of the type of C ie the values for the HCE link are different of the values of the SERVICE link!

Chapter 3

Health Approach (HA)

Class: HEALTH_APPROACH

Features{ANY} −− Structural

   [3.1] *objective*   : STRING   −− Label of the health approach (can be undefined or can take a default value)

   [3.2] *ha_creation_date* : DATE[1]   −− Date of the first contact of HA

   [3.3] *hce*: HEALT_CARE_ELEMENT

                                     −− At most one

   [3.4] *sub_contacts*: LIST [SUB_CONTACT]

                                       −− When implemented, this can be a LIST[SERVICE]

   [3.5] *author*   : HEATH_AGENT   −−

Features{ANY} −− Structural

   [3.6] *ha_id*   : GENERATOR   −−

Features{ANY} −− Descriptive

   [3.7] *initial_hce*   : HCE_LABEL   −− It records the original link with an health care element, because links between HA and HCE aren't fixed forever but can be modified by the health agent according to his clinical knowledge of the patient

   [3.8] *working_diagnoses*: LIST[HCE_LABEL]

                                       −− Working hypotheses

   [3.9] *objective_code*   : ENUMERATE   −− Coding the objective is optionnal, standardization needs to be performed

   [3.10] *post_it*: LIST[POST_PROCEDURE]

                                       −− post-procedure is defined in de SOAP model; the POST_PROCEDURE class is defined below; list of procedures planned and to be (eventually) performed later (to be standardised)

   [3.11] *ha_lnk*: LIST[LINK [LIST[HEALTH_APPROACH], ENUMERATE]]

                                       −− network of health approach of type could be 'episode_of_care', 'health_plan', 'care_process'

   [3.12] *version_date*   : DATE   −− Date of the last update of this health approach: date of the last sub_contact

   [3.13] *health_approach_status*: ENUMERATE

                                       −− opened, closed, ...

Invariant:

3.1 *valid_creation_date*: ha_creation_date = min(date) of sub_contacts −−

---

[1]DATE: a DATE is a MOMENT with some formal specific informations: YYYY-MM-DD hh:mm:ss

3.2 *cardinality_health_care_element*: hce is not Void −− Current health care approach is linked with one and only one HEALT_CARE_ELEMENT. This has to be verified at the creation (the end) of the contact

3.3 *motif_link_at_creation*: hce.labels.has(initial_hce) or else hce.diagn-2.has(initial_hce) −− It refers to one of the labels (health care element) or one of his secondary diagostises. This is verified at creation time!

3.4 *responsibility*: author is not Void −−

Class: POST_PROCEDURE

Features{HEALTH_APPROACH} −− Descritpive. This class is reserved for the HA class

[3.14] *todo*	: STRING	−− label of a planned service
[3.15] *planned_date*	: MOMENT	−− date proposed to execute the service
[3.16] *urgency*	: ENUMERATE	−− week, year, month

Chapter 4

Contact and sub_contacts

Class: CONTACT

Features{ANY} −− Structural

[4.1] *date*	: DATE	−− validity date, value affected at the closure of the contact (the end of an user session).
[4.2] *provider*	: PROVIDER	−− at most one provider
[4.3] *sub_contacts*: LIST[SUB_CONTACT]		
		−−

Features{ANY} −− Descriptive

[4.4] *location*	: LOCAL	−− care unit: (non unambiguous identification needed) physical location, system identification, ...
[4.5] *type*	: ENUMERATE	−− encounter, tel, interpretation of results, EPR restructuration, ...

Invariant:

4.1 *responsible_agent*: at least one provider −− at most and at least one provider means one and only one provider for one contact!

4.2 *valid_contact*: date, user, provider are not Void −−

4.3 *initialized_sub_contacts*: sub_contacts.count > 0 −− at least one sub_contact

---

Class: SUB_CONTACT

Features{ANY} −− Structural

[4.6] *services*	: LIST[SERVICE]	−−
[4.7] *ha*: HEALTH_APPROACH		
		−− at most one health approach
[4.8] *contact*	: CONTACT	−− at most one contact

Features{ANY} −− Descriptive

[4.9] *sc_reason*	: STRING	−− Reason of subcontact: patient complaint(s) of the day in relation with the problem (HCE) and the HA as interpreted by the physician e.g. persitent headache (within the follow up of a headache HCE) (cf. Service note 5.0.3, p.16)
[4.10] *sc_logic*	: ENUMERATE	−− Identification of the structure of the sub_contact. Values could be 'SOAP logic', 'SOPAP logic', unstructured, ... It identifies the logical link between the various actions (Services) performed during a sub_contact (the professional reasoning during a sub_contact). It could be deduced from the various types of the Services related to the sub_contact or from the use of a specific class (cf. SOAP class 5.0.1, p. 16).

Invariant:

4.4 *services_cardinality*: services is not Void and services.count > 0 −− at least one service

4.5 *ha_cardinality*: ha is not Void −− one and only one health approach

4.6 *contact_cardinality*: contact is not Void −− one and only one contact

The UML model points out one specific way to implement the subcontact rendering it virtual. Other solutions are possible.

Chapter 5

Service

Class: SERVICE

Features{ANY} −− Structure

[5.1] *label*	: STRING	−− service name (anamnesis, laboratory request, ...)
[5.2] *author*	: PROVIDER	−− User logged in and recorded with the role specified by the health agent (= contact provider).
[5.3] *sub_contacts*	: LIST [SUB_CONTACT]	−− A service may be related to several HCEs
[5.4] *creation_date*	: DATE	−− the creation date is the date of the contact

---

Features{ANY} −− structural

[5.5] *service_id*	: GENERATOR	−− identifies the service (useful in messages)

Features{ANY} −− Descriptive

[5.6] *content*	: LIST[RESULT]	−− Any type of information or group of informations can be the result of a service (further standardisation suggested)
[5.7] *structural_type*	: ENUMERATE	−− insertion, demand, response, update (eg to update fields of the views)
[5.8] *type*	: ENUMERATE	−− service type: anamnesis, clinical exam, lab request, Rx results, Rfe, ... (some standardization exits in ICPC2 process codes; further standardization in progress for project on codes RIZIV/INAMI)
[5.9] *services_lnk*: LINK[SERVICE, ENUMERATE]		
		−− the type of the link can take the values: is_a_response_to, is_an_interpretation_of, is_a_complement_of, cancel, ... (standardization needed)
[5.10] *status*	: ENUMERATE	−− is_validated, is_completed, prescribed
[5.11] *provider_role*: LIST [LINK [LIST[PROVIDER], ENUMERATE]]		
		−− the type of link is the role of the provider: has_done_the_service, has_writed_the_report, has_inserted_the_service, ... Most often the list of provider (provider_role.lnk.count) = 1

Invariant:

5.1 *link_sub_contacts*: sub_contacts is not Void and sub_contacts.count > 0 −− at least one sub_contact

5.2 *data_exists*: content is not Void −− There are some informations

5.3 *responsible_author*: author is not Void −− at least one author

5.4 *right_team_belonging*: for each sub_contacts, author belongs to ha.author −− author of the service belongs to each of the Health Agent teams of the Health Approaches related to

5.5 *insert_agent*: provider_role.count > 0 and provider_role.has_at_least(has_insert_the_service) cf. responsible_author −− The provider having inserted the service has to be known

5.6 *valid_creation_date*: creation_date = sub_contacts.contact.date −−

Notes

5.0.1 SOAP

Each rubric of the soap is considered as a service except the postprocedure already defined under the health approach.

S, O, A can be used as labels of the HCE

SOAP Rubrics (reminder)

S subjective: symptoms and complaints

O Objective: clinical examination, anamnesis and insertion of results, ...

A Assessment: diagnostic level/working hypothesis

P Procedure but not planning (Please note that post_procedure is an attribute of the health approach)

Class: SOAP inherit SERVICE

Features{ANY} −− Descriptive
[5.12] *soap*   : ENUMERATE   −− values: 'S', 'O', 'A', 'P'

This structure means that all the results of a service 'S' are of type 'S'.

5.0.2 DUSOI and COOP

The severity and functional evaluations as implemented by 'DUSOI' and 'COOP' scales may be considered as specific examples of services linked to a 'global health status' HCE.

5.0.3 Reason for Encounter, Reason of Subcontact and Services

A Reason for Encounter (RFE) may be defined as the current patient's complaint in relation with a problem (HCE). It could be used to give a label ('sc_reason') to the various subcontacts of a same HCE during one contact. In the clinical cases (cf. Appendix B) a specific Service call 'RFE' is used to define a label for RFE, which can be taken as sc_reason. In the UML model (cf. Appendix A) only the sc_reason (the reason of subcontact) is implemented by the mean of a specific Service. A 'sc_reason' Service may be linked to various subcontacts implementing by that way the RFE concept. Other solutions are possible.

Chapter 6

Health Agent

Class: HEALTH_AGENT

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group of users with the same profile

Features{ANY} −− Structure

  [6.1] *approach*: LIST[HEALTH_APPROACH]

                                  −−

  [6.2] *is_qualified*   : BOOLEAN   −− Are all the qualifications of all the users equal to the current one ?

Features{ANY} −− structural

  [6.3] *agent_id*   : GENERATOR   −−

Features{ANY} −− Descriptive

  [6.4] *qualification*   : PROFESSION   −− service producer; standardization needed

  [6.5] *users*   : LIST[PROVIDER] −−

Invariant:

6.1 *team_coherence*: is_qualified −− each user has at least this qualification

6.2 *health_approach_link*: approach is not Void and approach.count > 0 −− At least one health_approach

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Class: PROVIDER

Features{ANY} −− Structure

  [6.6] *provider_id*   :   −− could be the login_name (the interested reader is invited to consult
                                                    the CEN documents, for example, for more explanations)

  [6.7] *full_name*   :   −−

  [6.8] *qualifications*   : LISTS[PROFESSION]

This descritpion is a very basic and incomplete one.

Chapter 7

Period

The periode is considered as an optional concept.

Characteristics used at this level serve to gather, analyse and visualise information in favour off the healthcare process depending on the position of the physician / patient in that process. Possible **views** resulting from this activity must be relevant and helpful in solving presented medical problems(metastructure).

Time-intervals applicable to all time-related HCE concepts are always defined by characteristics as date of opening and closure. As a result the description of possible elements as diagnosis, process-codes and service-codes (sub-contact items), location, provider, status of the emphasized problem etc. brings a lot of information about the outcome of these period defined items.

Possible characteristics:

- All of the six building blocks are possible: has to be elaborated in a structural way

- Any relevant information in the EPR related to these six building blocks

Class: PERIOD

Features{ANY} −− Structure

[7.1] *label*	: STRING	−−	
[7.2] *begin_date*	: MOMENT	−−	
[7.3] *end_date*	: MOMENT	−−	
[7.4] *lowest_date*	: DATE	−− first contact of the patient	
[7.5] *uppest_date*	: DATE	−− his last contact	

Invariant:

7.1 *valid_intervall*: begin_date $\leq$ end_date and begin_date $\leq$ uppest_date and end_date $\geq$ lowest_date −−

7.2 *lower_bound*: begin_date $\geq$ lowest_date −−

7.3 *upper_bound*: end_date $\leq$ uppest_date −−

Class: EVENT inherit PERIOD

Features{ANY} −− Structure

[7.6] *where*	: LOCAL	−− admission, one day clinic, consultation, ...
[7.7] *sub_events*	: LIST[EVENT]	−− several sub_events can compose an event as several care unit transfert. So, sub_events can be empty if contacts_set aren't
[7.8] *contacts_set*	: LIST[CONTACT]	−− An event gather a set of contacts or a set of sub_events. contacts_set can be empty if sub_events aren't.

Class: PHASE inherit PERIOD

Features{ANY} −− Structure

[7.9] *related_hce*: HEALT_CARE_ELEMENT

−−

[7.10] *life_cycle_status* : ENUMERATE   −− acute, chron, remission, ...

Class: CARE_EPISODE inherit PERIOD

Set of health approaches belonging to one and only one health agent, linked to one and only one health care element. This respects the WONCA definition.

- *no care episode without health approach.*

- For one health care element and one health agent, several episodes of care can be concurrent.

- An HA can't belong to several episodes of care.

- The label can be picked from HCE label, diagn II, rfe, ...

Features{ANY} –– Structure
  [7.11] *ha_list*: LINK[LIST[HEALTH_APPROACH], ENUMERATE]
  –– reference to link of an health approach where ENUMERATE is
     'episode_of_care'

Features{ANY} –– Descritpive
  [7.12] *ec_label*   : CODING_SYSTEM –– This has to be a diagnosis (symptoms or complaints)
  [7.13] *ec_status*   : ENUMERATE   –– acute, subacute, chronic, remission, reactivation

Invariant:

7.4 *identical_agent*: all ha_list.author are identical –– All the agents of the sub_contact have to be identical to the 'provider' ?

7.5 *one_hce*: all ha_list.hce are equal –– the episode of care structure one and only one HCE

Appendix A

UML model
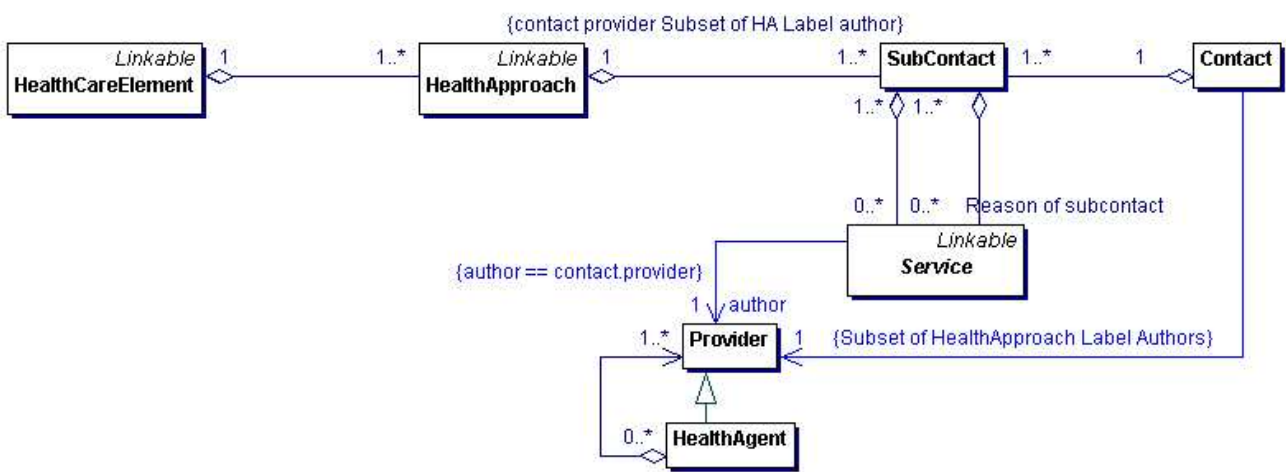
Figure A.1: Cardinalities between the basic concepts: UML model
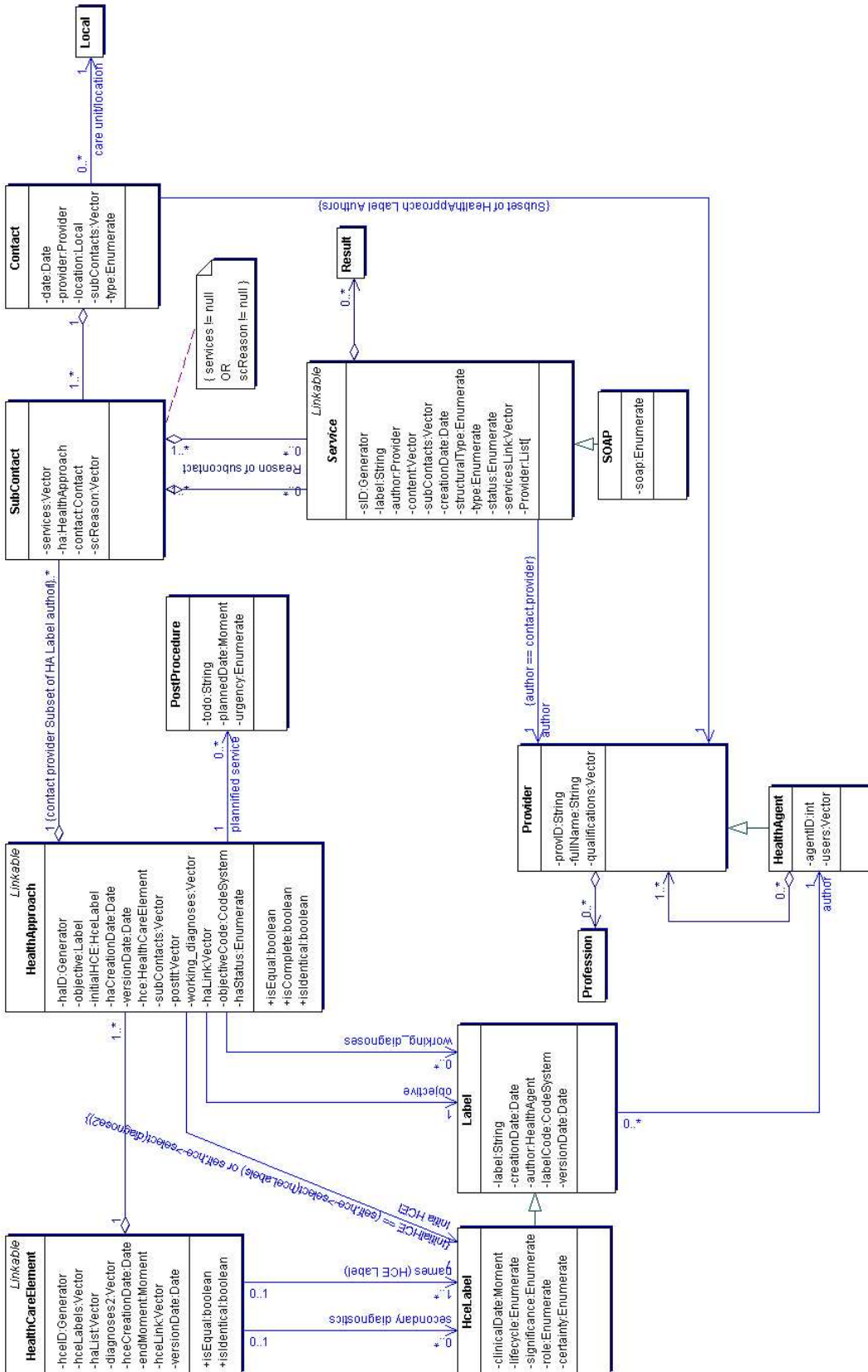
Figure A.2: Global view of the key concepts: UML model

Note: HealthApproach::ha_creation_date == Label(objective)::CreationDate == Label(objective)::verionDate
Note: HealthApproach::objectiveCode == Label(objective)::labelCode

DesignView.Basics.CareEpisode

-label:Label
-beginDate:Moment
-endDate:Moment
-lowestDate:Moment
-uppestDate:Moment
-ecLabel:CodeSystem
-haList:Linkable[]
-ecStatus:Enumerate

0..1   {approach}   1..*

interface
DesignView.Basics.Linkable

+*getLink:String*

Proposition of Care Episode:

The class CareEpisode has an Array of HealthApproach

...EPR Global.HealthApproach

-haID:Generator
-objective:Label
-initialHCE:HceLabel
-haCreationDate:Date
-versionDate:Date
-hce:HealthCareElement
-subContacts:Vector
-postIt:Vector
-working_diagnoses:Vector
-haLink:Vector
-objectiveCode:CodeSystem
-haStatus:Enumerate

+isEqual:boolean
+isComplete:boolean
+isIdentical:boolean

Note: Provider roles have been omitted

Figure A.3: Episode of care: UML model

22

Figure A.4: Link: UML model

Appendix B

Clinical cases

B.1 A classical description

Chronological and logical organisation by rubric and mapped with the SOAP logic.

C.1 Thursday 04/10/2001

  1. *reason for encounter* .... *S*
    Comes for a headache .... S
    known hypertension, ... S
    painfull toe .... S

  2. *Clinical examination, anamnesis* .... *O*
    normal physical examination .... O
    AT: 145/90 ....O
    care for the unguis incarnatus .... A/P

  3. *to do* .... *P*
    CT Scan cérébral ....P

  4. *requests* .... *P*
    advice neuro ....P
    Rx cervical spine ....P

  5. *Prescription* .... *P*
    Panadol
    Isobétadine crème

C.2 Friday 05/10/2001

  1. *reasons for encounter* .... *S*
    still having headaches.................. S
    hypertension control .... S

    D+++ unguis incarnatus.............. S

  2. *clinical examination* .... *O*
    AT: 150/95 ....O
    Healthy wound .... O

  3. *Ex. cpl. (results)* .... *O*
    Rx cervical spine ....O
    cerebral CT scan ....P

  4. *Prescription* .... *P*
    Dolzam drops

C.3 Monday 08/10/2001

  1. *reasons for encounter* .... *S*
    headache is milder .... S
    still havind AHT .... S
    Unguis cured .... S

  2. *Ph.examination* .... *O*
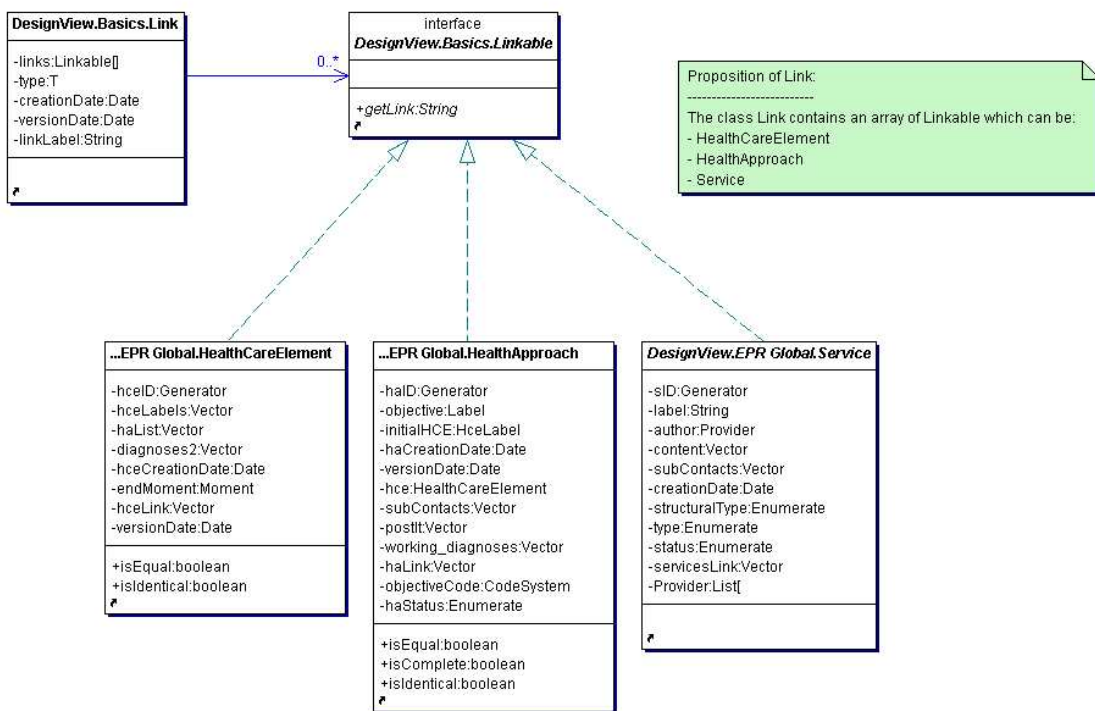   AT: 142/90 ....O
    unguis cured, healthy toe .... O

  3. *Results* .... *O*
    CT scan:...... **Meningioom** ..... **O/A**

  4. *Request* .... *P*
    Hospitalisation .... P

B.2 Clinical case: problem oriented structure

This section proposes two ways to structure the second HCE (unguis incarnatus): the first approach uses a unique health approach and the second splits the health care element into two health approaches.

For lisibility issues, the syntax used is shortly described hereafter.

B.2.1 Notation

HEALT_CARE_ELEMENT: **id: GENERATOR**, labels: LIST[LABEL, (date of label: MOMENT) [SOAP reference]]

HEALTH_APPROACH: **id: GENERATOR, label: LABEL**

SUBCONTACT: (contact.date: DATE), services: LIST[SERVICE]

SERVICE: id GENERATOR [SOAP type] label: LABEL →linked_Service LIST[RESULT]

 Note: when the info is lacking, the item is skip from the syntax

 Note: ⊙ *is a notation for planned demands. The planned demands fall out of the scope of this work but are written down for clarity issue.*

B.2.2 One health approach for one health care element

HCE 1 | AHT [A] |

HA 1.1 follow-up

(04/10/2001)	*S1 [S] Rfe*	....	known hypertension
	S2 [O] Phys. examination	....	AT: 145/90
(05/10/2001)	*S3 [S] Rfe*	....	hypertension control
	S4 [O] Phys. examination	....	AT: 150/95
(08/10/2001)	*S5 [S] Rfe*	....	Still having hypertension
	S6 [O] Phys. examination	....	AT: 142/90

HCE 2 | PAINFUL TOE (04/10/2001)[S] →UNGUIS INCARNATUS (04/10/2001)[A] |

HA 2.1 Treatment and follow-up

(04/10/2001)	*S7 [S] Rfe*	....	Painful toe
	S8 [A] Anamnesis-Phys.ex.	....	Registration of unguis incarnatus
	S9 [P] Treatment	....	Care for unguis incarnatus
	S10 [P] Prescription	....	R/Isobétadine crème
	S11 [P] Pain Treatment	....	R/Panadol
(05/10/2001)	*S12 [S] Rfe*	....	D+++ unguis incarnatus
	S13 [O] Phys. examination	....	healthy wound
	S14 [P] Pain Treatment	....	Dolzam drops
(08/10/2001)	*S15 [S] Rfe*	....	unguis cured
	S16 [O] Anamnesis-Phys.Ex.	....	Unguis Cured, healthy toe

HCE 3 | HEADACHE (04/10/2001)[S] → **Meningioom** (08/10/20001) [A] |

HA 3.1 Research (Headache)

(04/10/2001)	*S17 [S] Rfe*	....	comes for headache
	S18 [O] Phys.Ex.	....	normal physical examination
	S19 [P] neuro advice	....	(request)
	S20 [P] Rx cervical spine	....	(Request)
	⊙ [POSTPROCEDURE]	....	Cerebral CT scan planned
	⊙ ← *		
(05/10/2001)	*S21 [S] Rfe*	....	still having headaches
	S22 [O] cervical spine ⟶ S20	......	protocol
	....		photo's
	....		personal notes (interpretation)
	S23 [P] Cerebral CT scan	....	(request)
(08/10/2001)	*S24 [S] Rfe*	....	Headaches are milder
	S25 [O] cerebral scan ⟶ S23	....	Protocol
	....		Photo's

. . . . Notes: **Meningioom**

*S*26 *[A] Updating label HCE*   . . . . HCE 3.label ← Meningioom

*S*27 *[P] Request for hospitalisation*   . . Request for investigation and treatment

B.2.3 Fractioned Approaches

HCE 1 `AHT [A]`

HA 1.1 follow-up

(04/10/2001)	S1 *[S] Rfe*	....	known hypertension
	S2 *[O] Phys. Ex.*	....	AT: 145/90
(05/10/2001)	S3 *[S] Rfe*	....	hypertension control
	S4 *[O] Phys. Ex.*	....	AT: 150/95
(08/10/2001)	S5 *[S] Rfe*	....	Still having hypertension
	S6 *[O] Phys.Ex.*	....	AT: 142/90

HCE 2 `PAINFUL TOE (04/10/2001) [S] →UNGUIS INCARNATUS (04/10/2001) [A]`

HA 2.1 Diagnoses and treatments

(04/10/2001)	S7 *[S] Rfe*	....	Painful toe
	S8 *[A] Anamnesis - Phys.Ex.*	....	Registration of unguis incarnatus
	S9 *[P] Treatment*	....	Care for unguis incarnatus
	S10 *[P] Prescription*	....	R/Isobétadine crème
	S11 *[P] Pain Treatment, Prescription*		R/Panadol

HA 2.2 follow-up

(05/10/2001)	S12 *[S] Rfe*	....	D+++ unguis incarnatus
	S13 *[O] Phys.Ex.*	....	healthy wound
	S14 *[P] Pain Treatment*	....	Dolzam drops
(08/10/2001)	S15 *[S] Rfe*	....	Unguis cured
	S16 *[O] Anamnesis - Phys. Ex.*	.....	unguis cured, healthy toe

HCE 3 `HEADACHE (04/10/2001)[S] → Meningioom (08/10/20001) [A]`

HA 3.1 Research and follow-up(headache)

(04/10/2001)	S17 *[S] Rfe*	....	comes for headache
	S18 *[O] Phys. Ex.*	....	normal physical examination
	S19 *[P] neuro advice*	....	(Request)
	S20 *[P] Rx cervical spine*	....	(Request)
	⊙ [POSTPROCEDURE]	....	Cerebral CT scan planned
(05/10/2001)	S21 *[S] Rfe*	....	still having headache
	S22 *[O] cervical spine ⟶ S20*	......	Protocol
		....	Photo's
		....	Pesonal Notes (interpretation)
	S23 *[P] cerebral CT Scan*	....	(Request)
(08/10/2001)	S24 *[S] Anamnesis*	....	Headaches are milder
	S25 *[O] Cerebral Scan ⟶ S23*	......	Protocol
		....	Photo's
		....	Notes: **Meningioom**
	S26 *[A] Updating label HCE*	....	HCE 3.label ← Meningioom
	S27 *[P] Request for hospitalisation*	..	Request for investigation and treatment of meningioom

HA 3.2 Treatment

| (04/10/2001) | S11 ← * | | |
| | S28 *[P] Request for hospitalisation* | .. | Request for research and treatment of meningioom |

B.3 Cas 2

HCE 1 PRÉVENTION

HA 1.1 Primaire - Vaccination

(01/06/2002) <Demande de vaccination TÉTANOS>

     S1 *Anamnèse* .... Demande vaccination

     .... Pas en ordre

     S2 *Administration* .... TEDIVAX pro adulto

     ⊙ [POSTPROCEDURE] .... Rappel en 2012

HA 1.2 Secondaire - Dépistage

(01/06/2002) <Test HIV>

     S3 *Rfe* .... Demande test HIV

     S4 *Anamnèse* .... mari infidèle, problème de couple

     S5 *Labo: test HIV* .... precription de labo

     .... tube: prise de sang

     ⊙ [POSTPROCEDURE] .... contact programé le 15/06/2002

(15/06/2002) <Communication résultat test>

     S6 *Rfe* .... Communication résultat test

     S7 *Interprétation* .... test (-)

     S8 *Discussion* .... Documentation problème contagion et prévention MST

HCE 2 DÉPRESSION (01/06/2002) ← NÉVROSE DÉPRESSIVE (15/06/2002)

HA 2.1 Mise au point

(01/06/2002) <Conflit partenaire>

     S9 *Rfe* .... Conflit partenaire

     S10 *Anamnèse* .... Tristesse

     S11 *Interpretation* .... Dépression

     S12 *ITT* .... 15 jours incapacité

     ⊙ [POSTPROCEDURE] ⟶ PostProcedure 01/06/2002 Test HIV

(15/06/2002) <Tendance suicidaire>

     S13 *Rfe* .... Tendance suicidaire

     S14 *Anamnèse* .... Insomnie

     .... Demande de calmant

     S15 *Evaluation diagnostique* Suspicion: névrose dépressive

     S16 *Avis Psy* .... Voulez-vous examiner ...

HA 2.2 Traitement

(15/06/2002) <Tendance suicidaire>

     S13 ← *

     S17 *Prescription* .... Antidépresseurs

     S18 *Prolongation ITT* .... 15 jours d'incapacité

B.4 Cas 3 = Cas 2 with another structure

HCE 1 PRÉVENTION PRIMAIRE [A98]

HA 1.1 Vaccination tétanos

(01/06/2002) <Demande de vaccination TÉTANOS>

S1 [S] Anamnèse .... Demande vaccination	[A44]
.... Pas en ordre	[A45]
S2 [P] Administration .... TEDIVAX pro adulto	[A44]
⊙ [POSTPROCEDURE] .... Rappel 2012	[A44]

HCE 2 PRÉVENTION SECONDAIRE [A98]

HA 2.1 Dépistage SIDA

(01/06/2002) <Demande test HIV>

S3 [S] Rfe .... Demande test HIV	[B33]
S4 [S] Anamnèse .... mari infidèle, problème de couple	[Z12]
S5 [P] Labo: test HIV .... precription de labo	[B33]
.... tube: prise de sang	
⊙ [POSTPROCEDURE] .... contact programé le 15/06/2002	[B63]

(15/06/2002) <Communication résultat test>

S6 [S] Rfe .... Communication résultat test	[B60]
S7 [O] Interprétation .... test (-)	
S8 [P] Discussion .... Documentation problème contagion et prévention MST	[X45]

HCE 3 DÉPRESSION (01/06/2002) [A] [P03] ← NÉVROSE DÉPRESSIVE (15/06/2002) [A] [P76]

HA 3.1 Mise au point

(01/06/2002) <Conflit partenaire>

S9 [S] Rfe .... Conflit partenaire	[Z12]
S10 [O] Anamnèse .... Tristesse	[P03]
S11 [A] Interpretation .... Suspicion de dépression	[P03]
S12 [P] ITT .... 15 jours incapacité	[P62]
⊙ [POSTPROCEDURE] ⟶ PostProcedure 01/06/2002 Test HIV [P63]	

(15/06/2002) <Tendance suicidaire>

S13 [S] Rfe .... Tendance suicidaire	[P77]
S14 [S] Anamnèse .... Insomnie	[P06]
.... Demande de calmant	[P50]
S15 [A] Evaluation diagnostique .... Suspicion: Névrose dépressive	[P76]
S16 [P] Avis Psy .... Voulez-vous examiner ...	[P66]

HA 3.2 Traitement

(15/06/2002) <Tendance suicidaire>

S13 ← *	
S17 [P] Prescription .... Antidépresseurs	[P50]
S18 [P] Prolongation ITT .... 15 jours d'incapacité	[P62]

Appendix C

Belgian Labelling Process Definitions

Definitions of the concepts as used in the Belgian quality labelling process for GP's software (www.health.fgov.be/telematics/label/).

Health Care Element: A Health Care Element can be defined by any item in the patient record describing the patient's state of health and for which something is (has been/will be) done by a health professional. A Health Care Element is addressed by at least one Service. A Health Care Element is related to one defined patient and to one specific problem (item). Most of the time, this problem (item) can be identified by a diagnosis, by a patient's complaint, a risk factor, a life condition, ...

Health Approach: A Health Approach encompasses all what has been (will be) done by one Health Agent with a specific objective for only one Health Care Element.

Contact: A Contact is any interaction between a professional and the EPR, with or without an encounter. It includes at least one Service (i.e. it adds something to the EPR). A Contact is related to only one Health Agent.

SubContact: A SubContact is a part of a Contact dedicated to one and only one Health Approach. It includes all the Services of a Contact related to the same Health Approach. All the services of a SubContact are thus related to the same Health Care Element.

Service: A Service is the recording (data entry) into the EPR of information related to any activity or process performed by the health professionals. Any data in the EPR is introduced through a Service. A Service is related (directly or indirectly) to only one Health Agent. A Service may be related to several SubContacts (of the same Contact), and thus to several Health Approaches (of a same Health Agent) and to several Health Care Elements (of a same patient).

Health Agent: A Health Agent is a professional (or group of professionals) responsible for the content of a Health Approach. A Health Agent is a Service producer.

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