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Setting up a common architecture for EPR in primary care: The Belgian experience

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Abstract. A couple of years ago, the Belgian Federal Ministry of Health decided to back the development of a basic conceptual model for Electronic Patient Record (EPR) in primary care. Using consensus and modeling relational techniques, a working group of experts and experienced practitioners identified 7 key structuring concepts: Health Care Element, Health Approach, Contact, Subcontact, Service, Health Agent, Period. This model could roughly be seen as a restrictive sub-model of the current CEN proposal (prENV 13940) or as a first step to assess this CEN pre-Norm in Belgium. The conceptual model is already used in teaching activities and in a Belgian software labeling process.
Keywords: Medical-Records, Primary-Health-Care, Problem-Oriented Medical Records, Models, Computerized Patient Records.

1. Introduction

A growing need for improved data communication between the various actors in the healthcare domain is well established([1]). Yet, in Belgium, to reach this goal in primary care, we lack a common patient record architecture that is widely used.

In the past decade, efforts for harmonization have already been done in this direction in Belgium ([6]) and at the international level ([2-5]), often producing divergent and controversial results. On the ground, in Belgium (where more than 40 different GP's softwares are currently used!), wild development has led to a heterogeneous set of concepts partly used by some of the numerous existing GP's softwares. In this context, we were missing to reach a common patient record architecture.

Some years ago, willing to improve seamless care and data communication, the Belgian Federal Ministry of Health decided to back a process to set up a basic conceptual model for EPR architecture in primary care. The aims were: i) to identify a few generic and structuring concepts and the relations between them, ii) to propose these basic concepts to the discussion between family doctors at the international level, iii) to give a clear definition of these concepts, iv) to standardize the basic vocabulary used in Belgium in the field of EPR architecture, v) to preserve simplicity of the model. This last point was of utmost importance in order to allow education (for GPs and students) and to give the opportunity to softwares producers to adapt their products. Incentives (around 5 millions

euros in 2002) are planned to support updating clinical record systems and to convince producers to go through a convergence process (labeling procedure), including the basic conceptual model.

This paper briefly describes the method used and the current results. After a short discussion in regard with current literature, we highlight some of the lessons learnt from this on-going process and we present some of the work that remains to be done.

2. Method

In 1999, the Belgian Federal Ministry of Health set up a specific working group. As starting point for its work, the group had to take into account a previous ministerial recommendation, requesting a Problem Oriented Medical Record (POMR) architecture for primary care.

Various experts presented the current state of the art in Belgium, in relation with the usage of such an EPR architecture in primary care, based on international researches [2, 4, 5, 7-10] (top down method) or on local systems (bottom up approach). Experienced practitioners were actively involved in analyzing and commenting these concepts, paying special attention to keep it in line with current EPR usage.

Using consensus and modeling relational techniques, 7 key concepts and the relationship between them have been defined (out of 26 main concepts).

The model has been adopted by a representative multiprofessional group (including GPs, scientists, software producers, public officers, ...), providing advice to and collaborating with the Belgian Ministry of Health.

3. Results

Following conventions of the Unified Modeling Language, Figure 1 gives an overview of the key structuring concepts and the relation between them. The 7 key concepts are:

- 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) 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: encompasses all what has been done by one Health Agent with a specific objective within one Health Care Element.
- Contact: 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).
- Subcontact: 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 Care Element. It could be structured following the "SOAP" topics [8].
- Service: 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 may be related to several subcontacts, and thus to several Health Care Elements.
- Health Agent: Professional (or group of professionals) responsible for the content of a Health Approach. A Health Agent is a service producer.
- Period (optional concept): Time interval applicable to all the other concepts and producing new sub-concepts such as "Event" (set of contacts, e.g. an

hospitalization), "Phase" (acute period for a Health Care Element). It is a generic concept.

Using these seven building blocks, we can construct other concepts, implemented by some of the widely used GP's softwares. For instance, an "Episode of Care" (concept encompassing all the services related to one Health Agent and related to the same Health Care Element) may be constructed as a set of Health Approaches belonging to one Health Agent. This "Episode of Care" may have a "label" attribute given by the Health Agent. This "Episode of Care" will be related to only one Health Care Element. Various ways exist to implement this concept.

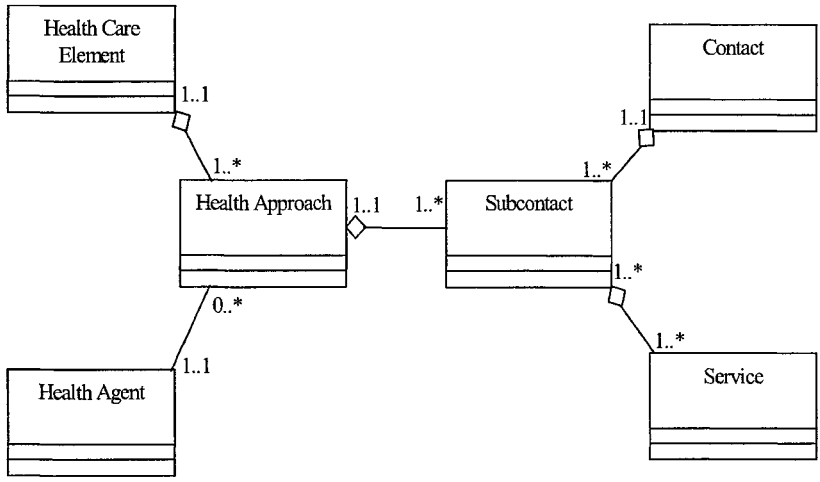

Figure 1: Belgian EPR conceptual architecture.

4. Discussion

Even if it was a prerequisite for our work, the Problem Oriented Medical Record has many advantages that have already been highlighted [11-13]. A major aspect of the Belgian model is its two layered meta-information structure (on the Problem Oriented axis): one level is related to the patient (the "Health Care Element"), the other one to the professional (the "Health Approach"). Very few international researches include both kind of meta-information [2, 3, 6, 14]. Most of the time, described EPR architectures include one kind of meta-information related to the patient's problems [11, 12, 15, 16] or highlighting professionals' objectives [17]. Our two layered meta-information model (compatible with other existing POMR models in Belgium), will help us to support continuity of care in a multi-professional environment.

One of our objectives is to keep the model as simple as possible (7 concepts in regards with the 45 concepts described by the CEN/TC251/WGI [3]). In Belgium, several education activities based on our structuring model, are currently performed by universities and scientific GPs' associations. It appears already difficult to teach such a simple model to students and medical doctors.

Even if we used a bottom-up approach to build our model, thanks to consideration paid to previous CEN works, our results are globally compatible with the more recent work in this field [3]. Table 1 gives a quick overview of the mapping between the Belgian model and CEN work. This could be seen as a first step to assess, in Belgium, the CEN pre-Norm. One important divergence is that the CEN "health_issue" concept (which is different from the Belgian "Health Care Element") is not a basic item of the Belgian model (in order to keep the model as simple as possible and compatible with the current context). In the Belgian Model, we could consider that a direct link has been put between CEN "care_plan" and CEN "health_issue_thread" (after a deeper analysis, this link could also be proposed as an improvement of the CEN pre Norm). In our model the CEN "health_issue" will be considered either as an attribute of the CEN "health_issue_thread", either as a set of CEN "care_plans". In both cases, a name (label) will be given by one CEN hc_professional to the attribute or to the set. We have also to highlight that our Health Care Element could be considered as a structuring CEN "health_issue_thread" (i.e. a "health_issue_thread" related to at least one service/action performed to tackle this issue). A detailed analysis of the compatibility of both models is still going on. We will pay a special attention to the cardinalities of the relations between the different concepts. At this stage, we think that the Belgian model could roughly be seen as a (manageable) reduction of the CEN proposal.

Table 1: Mapping between Belgian and CEN models

Belgian model	**CEN (preENV 13940)**[3]
Health Care Element	health_issue_thread
Health Approach	care_plan
Contact	contact
Subcontact	Contact_element
Service	hc_service
Health Agent	hc_professional
Period (when applied to other concepts)	period_of_service / episode_of_care / ...

Thanks to their "manageable size", our results are currently used in a Belgian software labeling process. In 2003, GP's softwares will have to be compliant with the 6 mandatory concepts of the POMR architecture (along with numerous other criteria) to get an official label. The labeled softwares will be indirectly funded by the Ministry of Health, allowing them to improve their quality in regard with additional criteria ... in order to get the label in 2004. In 2002, a yearly budget of around 5 millions euros has already been dedicated to this process. In order to assess quickly the work that remain to be done by the softwares, some key questions may be highlighted:

- Does linking possibility between "problem" and "service" exist? This is in relation with the concept of "Health Care Element". Various softwares already offer this functionality.
- Is it possible to link a "service" to several "problems". This relation is seldom implemented.
- Is the multi-professional dimension integrated in the product? This is a first step toward the Health Approach concept (with an implicit objective : to take in charge one patient's problem).
- Does a link between the recommended structure and various views implemented in the softwares exist? Concretely, is it possible to introduce any data through a service (related to a problem) and afterwards, to access it through views (such as past history, key parameters, immunization data,...)?

5. Conclusions

Our intermediate results are already used in teaching activities and for the labeling process. Yet, some important work is still going on: to define, using the same method, the key attributes of the basic concepts; to keep it in line with current international work, to promote the results on a large (mainly national) scale. Given its potential mandatory dimension (at least for software producers), it will be essential to keep it as simple as possible.

Our experience highlights that it is already difficult to teach and to promote the implementation of even this simplified EPR architecture model. We think that several years will be necessary for it to be currently in used in our country. In Belgium, advantages of POMR in ambulatory care or not for today ... perhaps for tomorrow?

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