An Enhanced DTC Component for the EPD-CAR Project

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Abstract

This paper describes a module which is a part of the EPD-CAR (Electronic Patient Dossier for Cardiology) project of the Interuniversity Cardiology Institute of the Netherlands. It uses general guidelines to advice on the functional tests that have to be performed depending on the diagnoses. The model differentiates between the diverse conditions under which the patient enters the medical circuit.

The model converts the detailed information into a crude code the is becoming the basis of the financial compensation for medical treatment, starting Januari 1st 2003. The system is written in Visual Foxpro 7.0 and is an ActiveX-component.

1. Introduction

To make the overall cost of healthcare more transparent a new financial reimbursement system will be introduced in the Netherlands starting January 1st 2003.In this system the financial compensation for medical treatment will be based on so called DTCs (Diagnosis Treatment Combinations). A DTC contains apart from a diagnosis also the associated standard tests, treatment and time frame information and, linked to it, the financial reimbursement. For each medical speciality a multitude of DTCs has been composed. The structure of a DTC for cardiology is formed by a 7 positions long numeric code and 2 dates (Table 1).

DTC-code	**03**-_-_-__-_
Date opening	**dd-mm-yyyy**
Date closure	**dd-mm-yyyy**
Position 1-2	Id for cardiology(03)
Position 3	Timing consult and referral
Position 4	Symptoms
Position 5-6	Final diagnosis
Position 7	Treatment trajectory

Table 1. Structure of a Diagnostic Treatment Combination (DTC).

Although helpful to create a relation between diagnosis and costs, these DTCs form a very crude representation of the medical status of a patient, since it can only contain a limited number of symptoms, diagnoses and treatments!

Through the introduction of the DTCs healthcare in the Netherlands will undergo a drastic change. In the past the healthcare "market" was driven on a supply oriented basis; where the hospitals and insurance companies negotiated on the total budget that will be spend the next year. In the new demand oriented set-up the hospital and the insurance companies will negotiate on the price of a DTC. Subsequently patients can be refered to that hospital that charges the lowest price!

As the old system generated waiting lists and budget limits the new approach possibly holds drawbacks on quality and the negative side effects of the proposed market mechanisms. Especially university hospitals having a broader task than "merely" healthcare, such as top clinical care, research and education are potentially in a vulnerable position.

A transparent registration system containing detailed medical information about the treatment of groups of patients is felt as a necessary tool in the DTC- price negotiations!

Since the set-up of the DTCs is tuned for financial and management transparency and usability, the medical content of the DTCs is quite simple and will not suffice in daily medical practise. Therefore the need for monitoring and possibly correcting this DTC approach is apparent.

As the diagnostic part of a DTC represents its medical context, detailed and accurate registration of the diagnoses is essential. Furthermore the synchronisation of all diagnoses registered in the departments of cardiology of the university hospitals will make their position towards the insurance companies even stronger.

Additional tools facilitating the implementation of general accepted guidelines concerning the functional tests that normally should be performed based on the diagnosis and documented deviations from these standards during a treatment trajectory increase the quality of the medical treatment

Above considerations led to the initiative to expand the ICIN EPD-CAR (Electronic Patient File for

Cardiology) diagnostic module [2] with extra functionality in order to serve as the tool to fulfil these goals. ICIN stands for Interuniversity Cardiology Institute of the Netherlands and forms one of the scientific institutes of the Royal Netherlands Academy of Arts and Sciences. Its primary mission is formed by promoting and co-ordinating research in cardiology between the Departments of Cardiology of the eight University Hospitals in the Netherlands. Within the ICIN organisation the CADANS working group is active in the area between Cardiology and ICT, focussing primarily on the implementation of communication standards resulting in facilitation of the exchange of new ideas and solutions.

2. Methods

The basic ingredients of a medical treatment are the following entities:

1. Complaint(s)
2. Anamnesis
3. Diagnosis
4. Functional test(s)
5. Intervention

These entities form the elements of a model for advising the user on the steps to be taken when a patient presents himself to the outpatient clinic.

Complaint	Anamnesis	Test	Differential Diagnosis	Test	Intervention
Chestpain	Location	ECG	*(Recent onset) AP	*(Exercise test)	*Medication
	Frequency Character	Enzymes	*Acute myocardial infarction	*(Echo)	*Thrombolysis/ PCI
	Triggering factors		*Aortic problem	*Echo MRI	*Surgery/ Medication
Dyspnea	Sudden onset	D-dimer	*Pulmonary embolus	*V P scan	*Thrombolysis
	Cardiac history	BNP	*Heart failure		*Medication
			*V alvular problem	*Echo	*Surgery
Arrhythmia	Regular	ECG	*Atrial Fibrillation	*Holter	*Cardioversion
Dizzyness	Fast Frequent	Holter	*SVT	*PES	*Medication/ Ablation
			*VT	*PES	*Medication/ Ablation
			*Conduction disturbance		*Pacemaker

Table 2. See text

Table 2 gives an overview of a limited number of complaints followed by possible tests leading to a differential diagnosis and consecutive tests leading to intervention. A patient for example suffering from dyspnea should at least be asked whether the onset aroused suddenly or had a long history. Depending on the outcome of the anamnesis and the physical examination, a D-dimer or BNP-test should be performed resulting in labeling the patient with the preliminary diagnosis pulmonary embolism, heart failure or valvular problems. Subsequently tests, like an echocardiogram, should be performed to further differentiate between the options or determine their severity. Eventually an intervention policy is established, either medical- or invasive treatment or a combination of both.

2.1. Diagnosis

The detailed diagnosis (and also the anamnesis process producing a "working" diagnosis) essential in correctly labeling the status of a patient. Given the above mentioned observation that a correct classification is essential in negotiating with the insurance companies, , a project was started to synchronize the different diagnosis coding schemes used in the 8 university hospitals in the Netherlands. Although both functional and anatomical approaches were used to achieve a diagnosis, there exists a striking resemblance between the different coding schemes. The differences that do exist do not result in different DTC-diagnoses! Also each department works with the scheme of main and sub diagnoses.

Nevertheless a working group of cardiologists was established to try to obtain complete agreement.

Table 3 gives an overview of the number of different codes within each used diagnostic class.

Class	# of codes
Coronary artery disease	38
Heart failure / Cardiomyopathy	29
Arrhythmia's / Conduction defects	41
Valvular heart disease	31
Congenital heart disease	21
Pathology of the large veins	14
Carditis	10
Tumors	4

Table 3. Main diagnostic classes and number of different codes per class.

2.2. Timing considerations

The status of the patient's visit to the hospital also influences his or hers medical trajectory. As a visit to the emergency room has another financial impact than a follow-up visit to the outpatient clinic, the registration of this aspect in a DTC is quite exhaustive. Table 4 shows the possible choices in a cardiology DTC.

Timing consult and referral
1. Acute visit to outpatient clinic (< 24h)
2. Elective first visit to outpatient clinic
3. Acute visit to emergency room
4. Elective follow-up visit
5. Follow-up visit within a DTC
6. Acute admission to the ward
7. Elective admission to the ward
8. Other referral

Table 4. Timing consult and referral possibilities in a cardiology DTC.

2.3. Guidelines

The general accepted guidelines concerning the functional tests that have to be performed depending on the diagnosis were converted into rules and stored in a sequential file. This file can be manipulated with a standard editor. An inference engine tests the diagnoses against the stored rules [3]. Each guideline is evaluated separately.

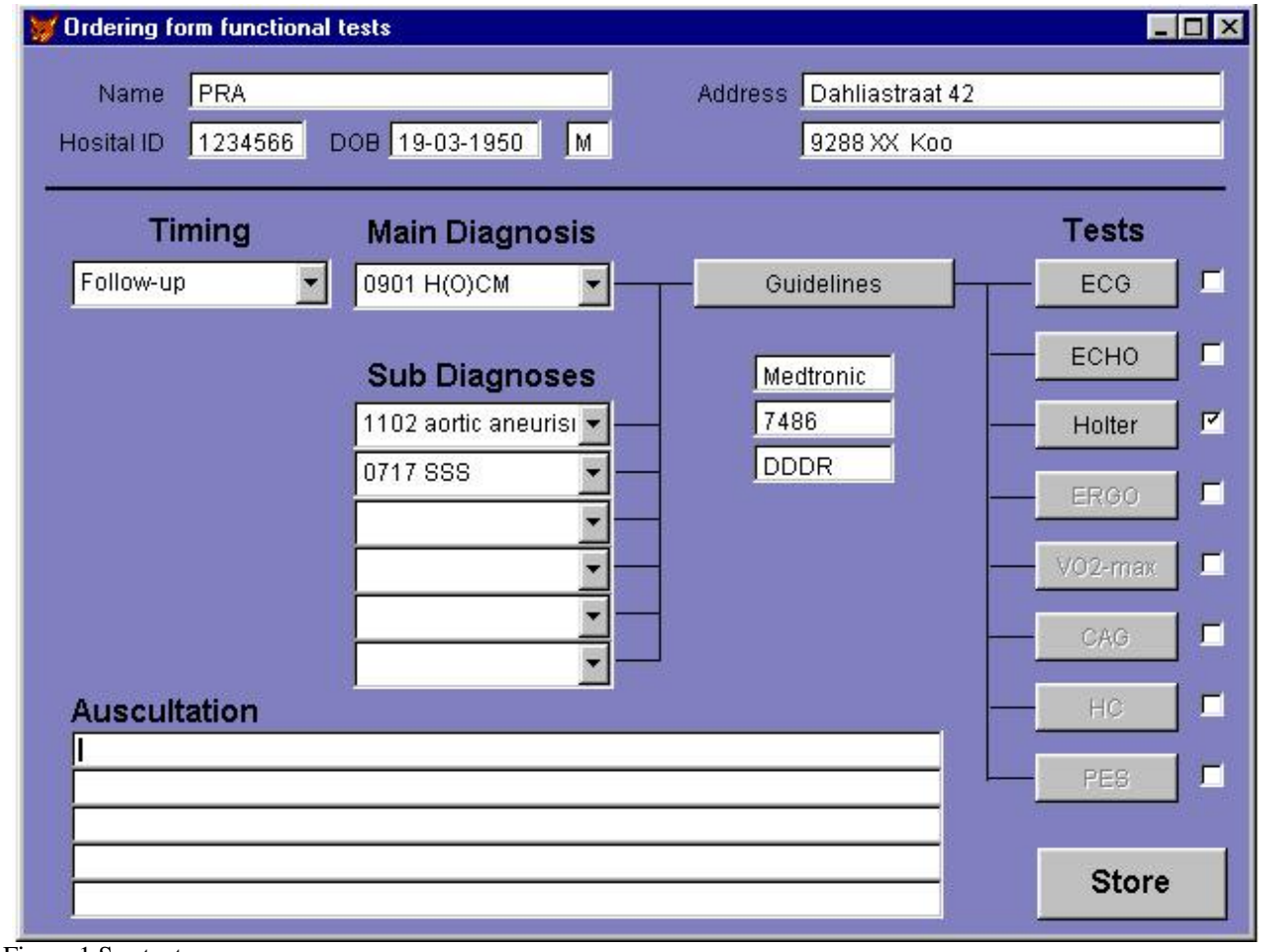

Figure 1 See text

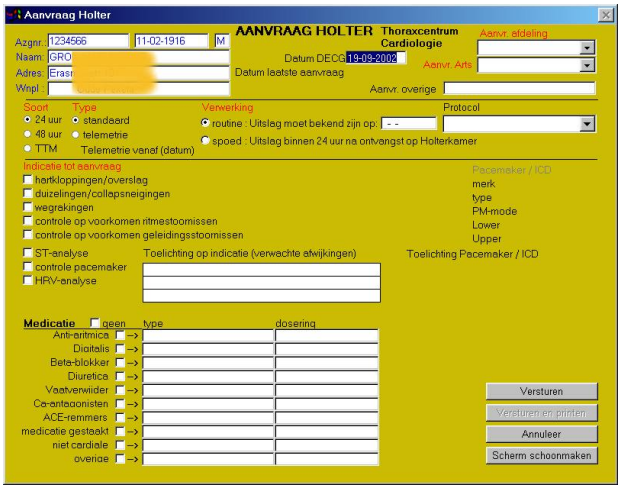

Figure 2. requestform for a 24-hour ECG-recording (in Dutch).

The generated advice concerning which functional test should be performed is an accumulation of the different results.

3. Results

The model is developed in Visual Foxpro (currently version 7.0) [3]. It is an ActiveX-component with an ODBC-DB connection (SQL-server database). It receives already known information from the local information system. The user has to check the presented information on its correctness and decide whether or not the guidelines concerning this situation should be addressed. Pressing the guidelines button enables those ordering buttons that represent the tests that will have to be taken according to the guidelines. The cardiologist can always overrule this advice by not ordering a test or ordering additional tests. Figure 1 is an example of a screen where a patient, having as main diagnosis Hypertrophic Obstructive Cardiomyopathy pays a visit to the outpatient follow-up clinic. The patient also suffers from rhythm disturbances (Sick Sinus Syndrome) for which he received a DDDR pacemaker and has an aortic aneurysm. According to the guidelines an ECG and echocardiogram should be ordered. When the user agrees with the guidelines he pushes the buttons that correspond with the specific tests. The test ordering form appears already filled with known information. After completing this form the program returns with the original screen for more orders or finishing up. In the example the user did decide that also a 24-hour ECG-recording should be ordered. He enabled the "Holter"-button by addressing the corresponding checkbox. The system registers this deviation from the standard and allows for filling in the Holter-ordering form (figure 2).

4. Discussion

The use of standard communication tools guarantees simple incorporation in EPD-CAR. Acceptance by the cardiologist proved to be more cumbersome. This is due to the fact that Dutch cardiologists are not used to getting advice from a machine. Because the DTC-approach is new, using the system gives the impression of additional work. The fact that as a reward the generated DTCs are processed automatically is beyond their imagination. Therefore the project is still in the prototype phase.

References

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