Creating an Electronic Out-of-Hours Health Record

Designing, creating and testing a new Web-Based Electronic Health Record for Out-of-Hours use with special emphasis on coding matters.

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Context: Master thesis Health Information Management.

Introduction

Primary Health Care (PHC) in Belgium is only provided by General Practitioners (GP's) and this mostly in Private Practices.[1] Therefore Out-of-Hours (OOH) Care is organized in rotation in those Private Practices for each specific area. At present there are also new pilot projects with a central OOH post, which are funded by the Belgium government.

When a patient consults an Out-of-Hours GP, this GP has no access to the patient's Health Record. What's more, the GP's Electronic Health Record does not allow him to make an electronic record of the patient's visit that can be sent to the patient's own GP.

Also, Belgium has no general registration system able to collect health information about consultations given by OOH GP's.

This situation led the members of the Flemish GP Society (Domus Medica, the former WVVH) to design an application based on Microsoft Access 2000 Runtime Environment[2]. It was the first large-scale application made by GP's for GP's without funding. Since mid-2003 it has been made available as Freeware and since then it has been continuously improved on the basis of feedback from GP's.

The common SOEP (Subjective, Objective, Evaluation, Planning) approach was used. This application can give one ICPC2 and one ICD10 code (coupled) for the Subjective part, one ICPC2 and one ICD10 code (coupled) for the Objective part and one code for each medication prescribed. Reports are sent through external applications (MediBridge[3]/MediRing) to the patient's GP using a secure encrypted connection. The report is integrated in the Electronic Health Record (EHR) of the patient's GP in plain text format only, due to the lack of EHR XML importation tools. Moreover an anonymous structured copy in XML (Kmehr-Bis[4]) coded information is collected by the person responsible for the OOH area and can be used for annual reports or scientific research.

Unfortunately, this useful application has some design problems. First of all, installation on the local PC is not easy, especially the configuration with the external application MediBridge due to the conflicting requirements of each EHR. Secondly, the application updates have to be done manually on each user PC. These updates consist of application fixes and upgrades but also include revised medication lists, corrected codes, renewed regional GP-listings, etc. Finally, compatibility issues with the operating system and MS Office can be mentioned. The application can hardly be used with non-Microsoft operating systems, like Mac-OS and Linux.

This paper describes the making of a new web application that could respond to the difficulties experienced with the present MS Access based application. The first part describes the development of the application, the second part describes its evaluation by a (small) number of GP's.

Material and methods

1. Developing a new web application

    1.1. Aims of the web application

    The main tasks of the web application are:

    - to record the patient's visit to an OOH GP and send a record of the visit electronically to the patient's

own GP
- to enable the OOH GP to assign codes to different elements of the report
- to store this coded data on the server for further analysis

1.2. Basic or fundamental concepts

a) We have opted for a **web-based system** for several reasons:

- A web-based system does not give rise to installation or configuration issues for the client: it is "out of the box" and works directly. The GP doesn't even have to bother about updates (bug fixes, corrections of coding lists, updates to the lists of OOH GP's working in the area, ...). Moreover it provides other opportunities: e.g. the OOH GP on duty the day before can post a general warning on the blackboard about a crime issue; it's much easier to collect data for research projects, etc.

- The web is platform independent. It can be accessed by every web browser (e.g. Mozilla Firefox, Safari, MS Internet Explorer, ...) on every Operating System without concern for security or compatibility issues.

- Web Pages have a certain usability concept (like working with Google, Yahoo!, Internet Banking, ...) with which computer users have gained a certain familiarity. The idea then is that working with a new web application should not represent a big learning investment for the user.

b) Secondly we have chosen to apply the **Open Source concept** in two ways.

- The first is to **use** Open Source programs as much as possible.
- The second is to **make** the web application itself **public**.

This approach leads to some practical advantages: you can freely use the application, you can see the source code and propose fixes and new functionalities, you are not dependent on software companies for updates and bug fixes[5] and there is a community behind the open source projects which is eager to help you with problems. Also, Linux, a complete Open Source Operating System, is known as the most secure and stable server environment.[6] [7] What's more, Linux is more frugal in consuming processor time and memory, which makes is possible to use cheap (or second-hand) hardware for the same functionalities.

c) Thirdly, we have chosen to provide a **'Keep It Simple' interface**. This means that the functionalities are logical and intuitive and that the GP can master them easily.

d) Fourthly, it was decided to provide the possibility of **coding** several elements of the visit: the Subjective complaint(s) from the patient, the Evaluation(s) made by the GP (Diagnosis), the Drug(s) prescribed by the GP and the Action(s) performed by the GP (referral to hospital, vaccination, ...).

e) Fifthly, we opted for a **highly secure environment**, especially because the application is located on the Internet. This means that there has to be a reliable authentication procedure with an encrypted communication protocol coupled with a logging mechanism in the background.

1.3. Elaboration of the concept (Fig 1)

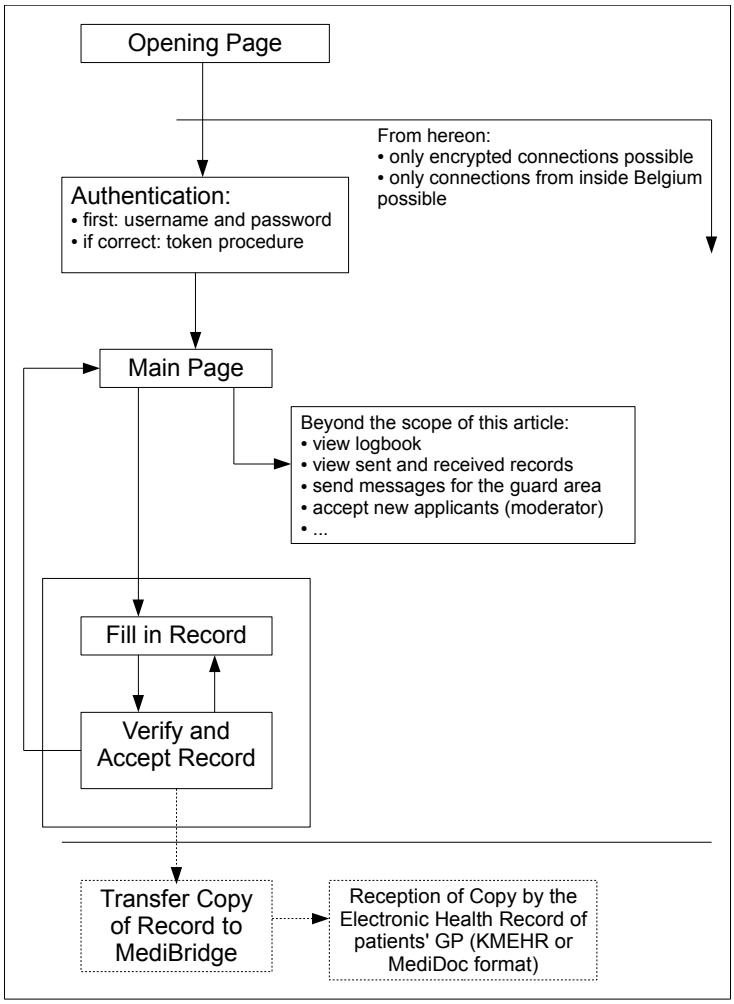

Fig 1: Main Application

a) Opening Page

The opening page includes the following features:

- a link to a registration form to use the web application
- a flash demonstration on how to install the Root Certificate
- a link to install the Root Certificate (temporary test certificate)
- a link to enter the web application

The opening page itself is not secured: everyone can access it.

b) Authentication

In the first step the user has to introduce his login and password. These are filled in by the user via the registration. The password in the database is kept in SHA1 format. If it is correct the user goes on to the second authentication step.

In the second step (Fig 2) the user has to insert the 'paper token' that he received after registering. (During the test period, it was by e-mail (PDF attachment). The normal procedure will be by postal mail.) The web application displays a random number between 1 and 20 and the user has to introduce the letters that are listed after this number on his 'paper token'. E.g. Fig 3: when the web application displays the number 13, the user has to introduce HOGEN.

The user has only 6 tries to complete a correct authentication. If he does not succeed, the account will automatically be blocked. If he succeeds, the counter will be reset.

Fig 2: Authentication Step 2 (Token)

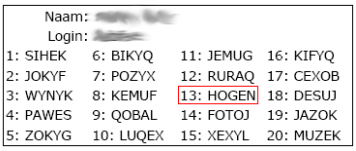

Fig 3: Paper Token

This web page, and the following web pages are secured in three ways:

- there is only the possibility of using:
  - an encrypted connection
  - with strong ciphers
- only connections from Belgium are accepted with the Apache GeoIP module created by MaxMind under the GPL/LGPL license for the software and a specific Open Data License for the GeoLite country database[8].
- every action (authentication, viewing records, sending records, ...) will be logged. The user knows this, he can check his own logbook and acknowledge that he can be sanctioned for misuse.

c) Main page (Fig 4)

Fig 4: Main Page

This is the central page of the web application. From here on there are several possibilities:

- creating a new record
- viewing the sent and received records
- viewing the user's own logbook
- possibility to change personal settings (address, receiving format of records, ...)
- possibility to have an electronic notice board (crime notice, ...)
- moderator tasks
  - accepting new applicants for his OOH area
  - viewing the OOH area logbook
- administrator tasks
  - setting up moderators and administrators
  - viewing the whole logbook

For the scope of this article, only the functionality 'creating a new record' will be evaluated.

d) Fill in Record (Fig 5)

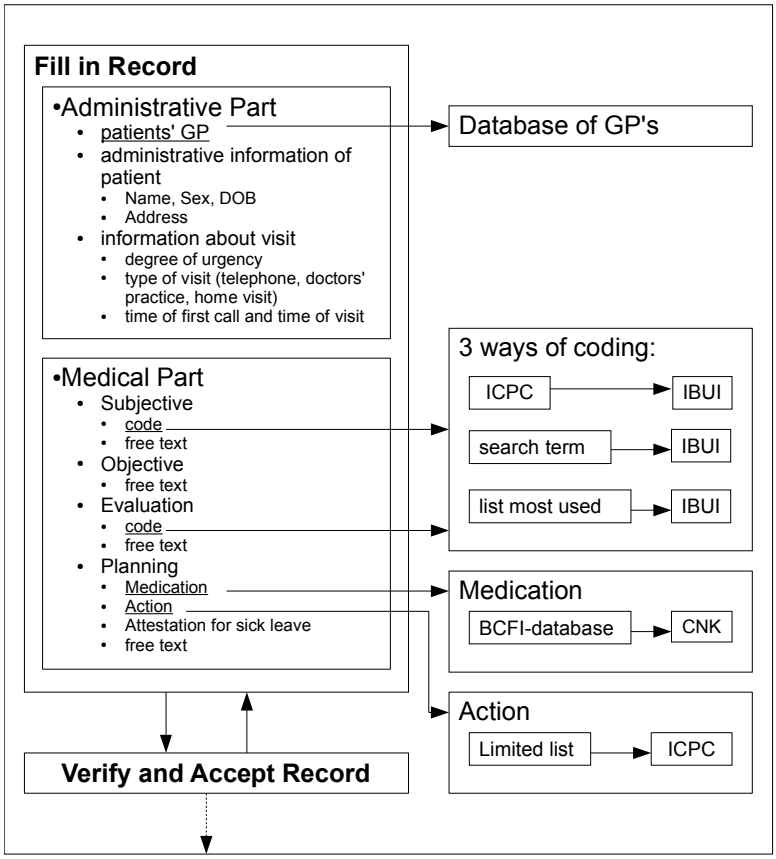

Fig 5: Fill in Record

- Administrative Part (Fig 6)

  - Patient's GP
    This is needed in order to know to whom the record has to be sent. It is possible to indicate that the GP is not on the list. The record can then be printed out by the OOH GP (and can be given to the patient). It is also possible to indicate that the patient has no GP. The record will then not be sent. At the moment the database contains only GP's who are registered to use the web application.

  - Administrative information about the patient (Name, Address, DOB, ...)
    Also needed for the EHR of the patient's GP to import the record automatically.

  - Information about the visit (time of visit, urgency of visit, ...)
    Needed for statistical analyses.

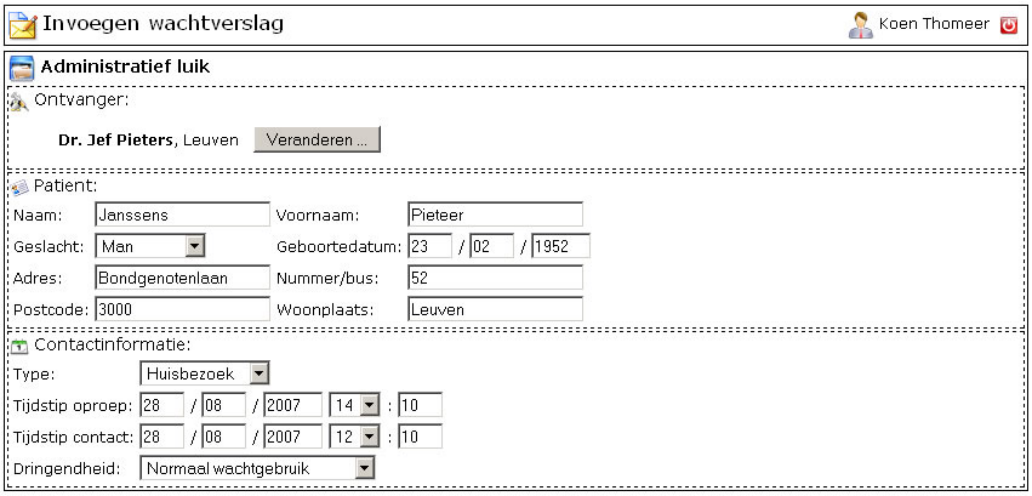

Fig 6: Administrative Part (Fill in Record)

- Medical Part (Fig 8)

  - Ideally the Record consists of what clinicians have heard, seen, thought and done[9]. So we did implement the SOEP system[10]: Subjective (heard: patient complaint), Objective (seen: clinical/technical examination), Evaluation (thought: possible diagnosis), Planning (done: medication, sending to hospital, prescribing physiotherapy, ...)

  - For each of these subparts, we provided the possibility to write in 'free text' for the following reasons:
    - it is not possible to code everything (nuances, descriptions, ...)
    - it is possible that the GP does not find the right code

  - For the Subjective and Evaluation part, we have selected the IBUI thesaurus[11] as the final code. (IBUI: Identificateur Belge Unique – Belgische Unieke Identificator.) This thesaurus is a collection of terms, jargon, idiomatic expressions, etc. that are used in the medical world. The synonyms and metalevels are also included. The original purpose of this thesaurus was to have it implemented in the EHR's. It has been developed by the University of Ghent and the Université Libre de Bruxelles at the request of and funded by the Department of Health.

    The reasons why we have selected the IBUI-thesaurus:
    - we think it is much easier for the user to find the correct term because the thesaurus includes jargon, idiomatic expressions, synonyms, etc.
    - each IBUI term is linked with one ICPC-2 code and one ICD-10 code: this facilitates scientific research afterwards.

    In the web application there are three ways to find the correct IBUI code: (Fig 7)
    - ICPC -> IBUI: first, the user has to click on the right ICPC-code in the ICPC-tree: he gets a list of IBUI terms which are related to this ICPC-code. The user has then to select the right IBUI term. (If the list is too long, he can use a search term to narrow the search.)
    - search term -> IBUI: the user has to type in a search term. The web application will give a list of all the IBUI-terms which are related to the search term (synonyms are also accepted). The user has then to select the right IBUI term.
    - list of most used IBUI-terms: this list has been copied from the former web application of the Flemish GP Association (Domus Medica). (This list is said to contain 80% of the codes used during OOH visits.) The user has only to select the right IBUI term.

    In all three cases, when hovering with the mouse pointer over an IBUI-term, the user sees descriptions of the related ICPC and ICD codes.

Fig 7: Finding correct IBUI code

- For the Medication under the Planning part, we have linked the medication to a CNK code (Code Nationale – Nationale Kode). The CNK is a national code that refers to a drug package and it is provided by the Belgian Pharmaceutical Association (APB). The BCFI provides the updates to the medication database on its website[12].

  In the web application, the user types in a search term: he'll get a list of medications that are related to this search term where he can choose the correct one. After that he can fill in the dosage and the number of packages he wants to prescribe. The linking to the CNK code is done in the background.

- For the Actions under the Planning part, we have chosen to use only the ICPC-2 codes. Using the IBUI terms was not an option because each IBUI term is also linked to an ICD code, and this classification does not contain actions. The ICPC on the other hand does.

  In the web application, the user sees a list of possible actions (referral to hospital, administration of vaccination, application of pressure bandage, ...). After having made his choice, he can specify his Action:
    - for hospital referral: to which hospital (also coded)
    - for vaccination: which vaccination (linked to CNK)
    - other actions: free text

  The linking to the code, as in the Medication part, also takes place in the background.

- The user can also make an attestation for sick leave, with the choice to make a print-out of it.

Fig 8: Medical Part (Fill in Record)

e) Verify and Accept Record (Fig 9)

After the user acknowledges that the report is ready, he gets a final overview of its contents (without input fields or buttons). He can then choose to accept it as finalized.

It can not be accepted if:

- the name of the patient is not given
- the name of the patient's GP is not given and it is not marked that the patient does not have a GP

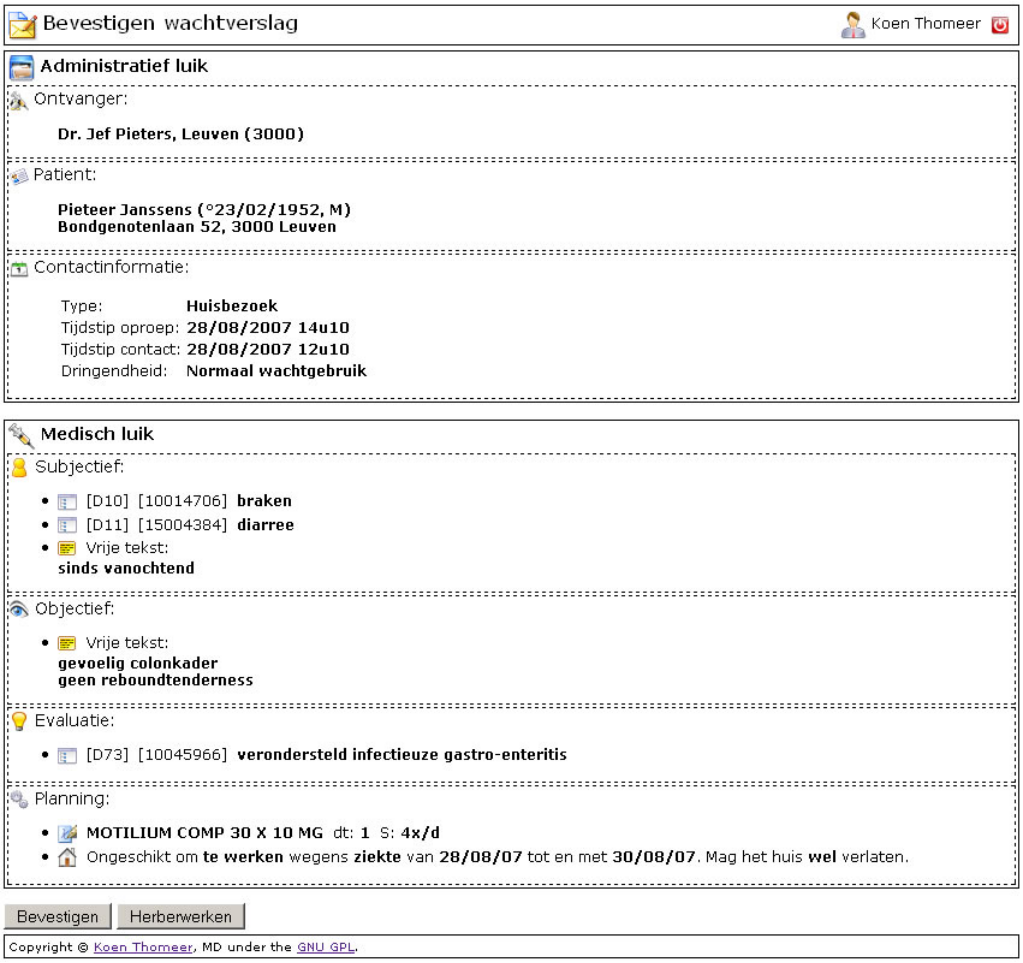

Fig 9: Verify and Accept Record

f) Transfer of Record to EHR of patient's GP (Fig 10)

The Record will be sent to the EHR of the patient's GP in MediDoc or Kmehr-Bis format (depending on the choice of the receiving GP). An external program (MediBridge) does the secured transfer from the server to the PC of the receiving GP. Because MediBridge is based on a MS Windows platform, we were forced to install a second server, with MS Windows 2000 as Operating System. The communication between the Linux server and MS Windows was done with Samba[13].

The Kmehr-Bis (Kind Messages for Electronic Healthcare Record - Belgian Implementation Standard) is an XML standard for exchange of healthcare data between actors in the healthcare domain[14]. It is based on other standards that are used on national and international levels (HL7, CEN, ...). With this standard it is possible for the receiving EHR to interpret the whole message.

The MediDoc format is also an exchange format developed by Corilus (former OmegaSoft). The medical report is mostly based on plain text, so it is not possible to interpret the codes used by the sender.

It is also possible for the GP (sender and receiver) to view records in the web application.

g) Storing the records on the server.

All the record fields are stored in the tables of the database server. In this way, it is possible:

- to make backups of the records (mysql dump)
- to resend a record to the patient's GP
- to analyze the data in the records afterwards

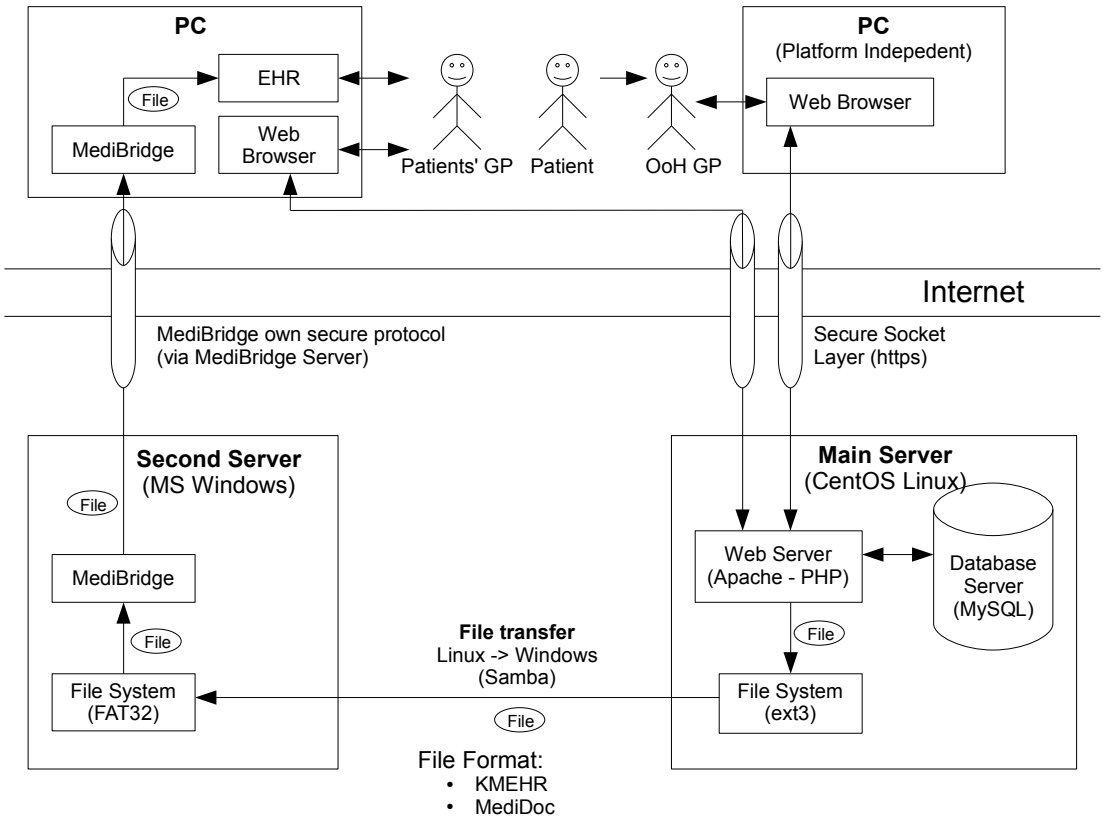

Fig 10: Transfer of Record

2. Evaluating the web application

2.1. Purpose and scope

We wanted to evaluate the web application to find out whether or not it meets externally validated usability criteria. If successful, we would have a valid base for offering this application to other users.

2.2. Participating GP's

We posted a message on the electronic mailing list of the Flemish GP Society (Domus Medica). Every GP interested in participating would be accepted. Because we were aiming for less than 30 participants we did not plan to perform analyses of the participants' profile.

2.3. The questionnaire

We did perform a search on Medline with the following MeSH-terms to find a model for evaluating the usability of the web application: `"Physicians, Family"[Mesh] AND ("Medical Records Systems, Computerized"[Mesh] OR "User-Computer Interface"[Mesh]) AND ("Evaluation Studies"[Mesh] OR "Evaluation Studies "[Publication Type] OR "Questionnaires"[Mesh]).`

We found one article[15] that used a validated questionnaire: "The Computer System Usability Questionnaire (CSUQ)[16]". We used the reference of this article to find the psychometric properties. Because there were no other validated questionnaires to compare, we asked the opinion of an external expert and he agreed that this should be used.

On the Question list (Appendix 1), we did append one question to evaluate the usability of coding the Subjective and Evaluation part (Q3) and another question to evaluate the Medication module (Q4). Question 17 of the CSUQ was not used in our questionnaire because the Dutch translation of this question leads to about the same formulation as question 16 in the CSUQ (Q18). The user could score from 1 (strongly disagree) to 7 (strongly agree) or say that the question was 'not applicable' to him.

2.4. Procedure

The study was conducted from the 15th of July to the 30th of August. The participants received a first mail with an explanation of how to install a new Root Certificate needed to make a secure connection with the server. This explanation was done by means of a Flash demonstration. The participants than had to register into the system with their Doctors Registration Number.

After the registration the participants received a web address containing the following items:

- Introductory text with a description of the project
- A Flash demonstration showing how to fill in the record with a hypothetical case.
- Two hypothetical cases had to be used to make two records in the web application. The participants also had to select codes for the Subjective and the Evaluation part of the consultation. The codings for the GP's Actions and for the Medication prescribed by the GP were automatically registered by the web application.
- An evaluation form:
  - to record the time they needed to fill in the patient record
  - to complete the usability questionnaire
  - to add a comment

2.5. Statistical Analysis

a) The evaluation form

For the interpretation of the evaluation form we did make a box plot of the responses and of the time used to complete the task. For the statistical analysis we used R version 2.5.1 (2007-06-27)[17].

b) The coding of the Subjective, Evaluation, Medication and Action parts.

For the Subjective and Evaluation part, it was possible to give more than one IBUI code. Because we wanted to have a minimum of one meaningful code, we asked two external experts to assign each code given by the participants to one of the following categories:

- valid and necessary
- valid, but not necessary
- wrong

The Medication part was considered to be correct if the principal substance of the medication was the same as in the patient case.

The Actions part was considered to be correct if the correct code was given (one possibility).

Results

1. Response Rate

   From the mailing list we received replies from 28 respondents who were interested in participating. Out of these, 23 completed Step 1 (Installing Root Certificate and registration into the web system) and 18 completed Step 2 (Patient Case and Evaluation Form). In all there was a response rate of 64%.

2. Problems encountered during evaluation

   The most frequent problem (5 occurrences) was that the participants forgot the password they had introduced in step 1. As the application did not yet include an automatic 'forgotten password' module, we had to provide support by mail and phone. One participant had a problem with installing the new Root Certificate in Windows Vista: after an intervention by mail, this problem was solved. We expect not to have this problem when using a commercial certificate. Another person could not access the secured environment because his IP-address wasn't included in the Geo-IP database. By updating the database, this problem was also solved.

3. Coding results of the Health Record

   First we analyzed the results of the experts (Appendix 2). This gave us a surprising result: on the Subjective and Evaluation part, there was only agreement on 8 of the 15 codes selected by the users.

   Because of this result, we did no further analysis of the codes selected by the users.

   On the other hand, the chosen action and prescribed medication codes were all correct.

4. Time needed to complete the two hypothetical cases (Fig 11)

   The time needed was the same for the two cases: about 5 minutes (median) each, with an interquartile range of 2 to 10 minutes. This is a good score, taking into consideration the fact that it was the first time the participants had used the web application. In the comments, some participants mentioned that the learning curve to use the application would be easy.

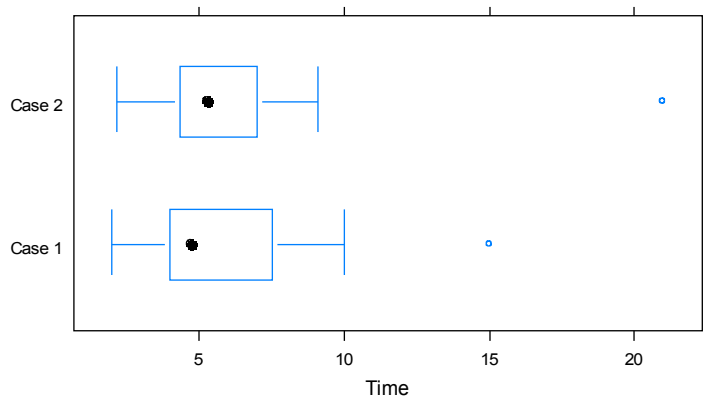

Fig 11: Time needed to complete the two hypothetical cases

5. Results from the questionnaire (Fig 12)

   The median of all the subscales (System Usefulness, Information Quality and Interface Quality) was 6, which means this is a good score. The Overall Score was also 6 with an interquartile range of 5 to 6.

   The special question about the usefulness of the Coding for the Subjective and Evaluation part (Q3) scored less, but was still acceptable: 5, with a interquartile range of 4 to 6.
   The special question about the usefulness of the Medication module (Q4) scored also well: 6, with a interquartile range of 4 to 7.

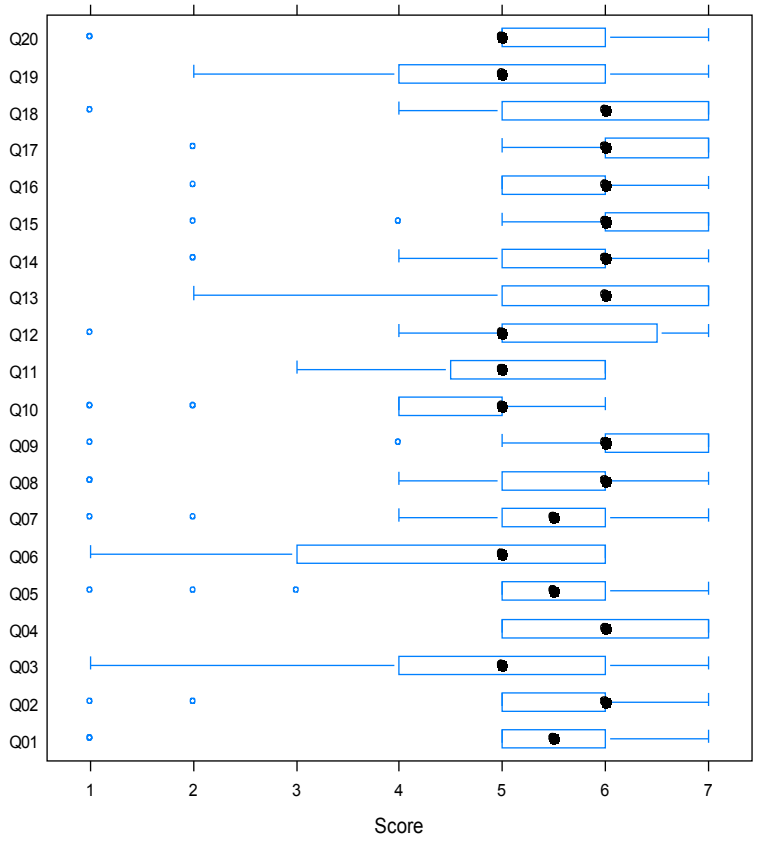

Fig 12: Results from the Questionnaire

6. Results from the Comments section in the questionnaire

   There were many comments but the following three were the most frequent:

   - the Flash demonstration was too slow
   - some participants explicitly mentioned that they liked this web application much more than the application developed by the Flemish GP Society (Domus Medica).
   - as already mentioned, some stated that the learning curve to use the web application would be easy.

Discussion

1. Usability testing

   We observed that there were few published studies which included an evaluation of a medical application. It could be that it is not customary to publish such evaluations in a journal, but it is also possible that software companies are simply neglecting to make evaluations. Moreover, a study made by the Flemish GP Society concludes that with the present EHRs in Belgium it is not possible to do quality promotion (checking the rate of vaccinated patients, of cervical smears, ...) for the GP's[18]although this was a compulsory function for obtaining a label from the Department of Health[19]. This supports the thesis that there is a lack of quality control in the software industry, keeping in mind that 'labeled' software gets a subsidy from the National Health Insurance (budget of 4.964.000 € for 2005[20]).

   Our web application obtained a rather good score for usability (median of 6 for System Usefulness, Information Quality and Interface Quality). This means that the 'Keep It Simple' concept has succeeded.

2. Coding Matters

   We could not evaluate the correctness of the codes selected by the participants, due to the fact that 46% of the experts who did evaluate their correctness were in disagreement. (Supposing, however, that agreement had been high and that the number of correct codes was also high, we could conclude that the web application helped the user to choose the correct code.)

   We surmise that the disagreement among the experts is the consequence of the absence of a National Coding Manual and of courses in coding. This paper does not wish to take a position as to whether or not coding is the tasks of the GP, but coding does provide a rich variety of possibilities for different stakeholders:

   - the GP
     - possibility to integrate Computerized Clinical Decision Support
       - showing guidelines about the coded disease/problem
       - warnings about drug incompatibilities between drug and disease
     - possibility to do quality promotion
       - e.g. overview of diabetic patients receiving the correct treatment
       - e.g. warning that a tetanus vaccination has expired
     - easier communication and integration between EHRs (also between hospitals)
   - researchers
     - data about the incidence of diseases
     - relations between complaints, diagnosis and treatments
     - ...
   - patient
     - easier exchange of health information in different languages, like SumEHR (classification codes are not language dependent)
   - government
     - collection of epidemiological data

   Because our web application does keep the inserted codes in the database, this provides a great opportunity to implement the above-mentioned possibilities.

3. Open Source

We almost succeeded in using only Open Source software to elaborate this concept. The only problem was the external web application MediBridge that performs the encrypted communication between the EHRs. This application needs a MS Windows platform to work, and due to the monopoly position occupied by MediBridge in Belgium, there was no possibility to avoid this. We regret that the MediBridge source code is closed, because we have no certitude about the encryption and the confidentiality of the medical data.

The following software was used:

- CentOS: Linux Distribution
- Apache: Web Server
- MySQL: Database Server
- PHP: Server-side Scripting Language
- GeoIP: Country IP Database
- OpenSSL: encrypted communication under Apache (SSL), Certificates
- Samba: file communication protocol, compatible with MS Windows

Because we want other people to benefit from this work, we published the source code on SourceForge.net[21], a repository of Open Source software. The software is published under the GPL v3 license[22]. The main difference with other Public Licenses (like Berkeley Software Distribution), is that if someone releases any derivative product (e.g., a modification to the source code) to the public, he has to share the source code with the original creators.

We hope that this project will contribute to the advancement of Medical Informatics. Willingness to share advances with others, who can then add their own unique contributions, furthering progress in the field, is critical to vitality and overall growth. This has largely occurred via scientific literature in past decades. Now, as computer technology and software become more critical, sharing computing methods becomes a parallel to academic journals[23].

4. The Future

4.1. Bilingual interface (French and Dutch)

With all the resources we used (program language, IBUI-thesaurus, BCFI-database, ...) it is perfectly possible to develop a bilingual interface. (At the moment our web application only exists in Dutch.) This would considerably enlarge the area of data collection.

4.2. Computerized Clinical Decision Support (CCDS)

Because the GP can code different parts of the visit, this makes it possible for the web application to notify the GP of the existence of a clinical guideline about the coded problem. At the moment there exists in Dutch different websites with good quality guidelines: Domus Medica[24], Folia Pharmacotherapeutica[25] and Nederlands Huisartsengenootschap[26], but somehow doctors do not implement them[27]. This notification component could provide a solution for this issue.

4.3. SumEHR

The Department of Health has started giving grants to pilot projects which make it possible for doctors who need information about an unknown patient to access the patient's Summarized Electronic Health Record (SumEHR[28]). We regret that the Department did not issue standards about the communication protocol for the transmission of these SumEHR's. We fear now that this will lead to a proliferation of incompatible protocols.

Nevertheless we believe that the SumEHR concept itself is an important benefit for healthcare: the doctor will be able to view important medical facts (medication lists, drug allergies, health antecedents, ...) of a visited patient he did not know before.

Integrating this component in our web application would be a normal consequence of both concepts (our

web application and SumEHR). This depends only on the result of the compatibility of the communication protocols which these pilot projects develop.

4.4. Electronic Identity Card (e-ID)

The Federal Ministry of Internal Affairs (Belgian Home Office) issues electronic identity cards to all Belgian civilians[29] and soon to all inhabitants of the country. With this e-ID, users can authenticate themselves on the web.

Because the e-ID middleware is compatible with different programs and operating systems, it is easy to implement it in our web application for user authentication. We think that this will give more security to the application, because it is not possible to copy this identity card. Also, we would not be responsible for issuing and revoking the authentication means, because this is the responsibility of the Federal Ministry of Internal Affairs. The only minus is that the e-ID is not linked with the Doctors Registration Number: therefore we have to do the linking ourselves.

The reason why we have not yet implemented the e-ID is that it is not yet available to non-Belgian residents. However, this is foreseen in the course of 2007[30].

4.5. Development of a Centralized Electronic Health Record

This web application has most of the components of an Electronic Health Record. We believe that with the appropriate funding it would be possible to develop a web-based EHR that complies with the recommendations of the EMDMI Working Group[31]. It would have the same advantages as this OOH web application, but to a greater extent.

Conclusion

We did succeed in creating a new Web-Based Out-of-Hours Health Record. The usability testing, relying on the responses of 18 GP's, scored very well. It did not lead to suggestions for major improvements. We could not score the correctness of the codification selected by the participants because there was no agreement between two external experts. We believe that this was due to the lack of a National Coding Manual. We nearly succeeded in using only Open Source Software to make this Health Record but we were limited by that fact that we could not avoid using a MS Windows based communication program. We believe that the Open Source concept will contribute to the advancement of Medical Informatics.

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Competing Interests

None declared.

Appendix

Q1	Overall, I am satisfied with how easy it is to use this system
Q2	It was simple to use this system
Q3	The coding of the Subjective and Evaluation part was simple
Q4	The prescribing of the medication was simple
Q5	I can effectively complete my work using this system
Q6	I am able to complete my work quickly using this system
Q7	I am able to efficiently complete my work using this system
Q8	I feel comfortable using this system
Q9	It was easy to learn to use this system
Q10	I believe I became productive quickly using this system
Q11	The system gives error messages that clearly tell me how to fix problems
Q12	Whenever I make a mistake using the system, I recover easily and quickly
Q13	The information (such as online help, on-screen messages, and other documentation) provided with this system is clear
Q14	It is easy to find the information I needed
Q15	The information provided for the system is easy to understand
Q16	The information is effective in helping me complete the tasks and scenarios
Q17	The organization of information on the system screens is clear
Q18	The interface of this system is pleasant
Q19	This system has all the functions and capabilities I expect it to have
Q20	Overall, I am satisfied with this system

Appendix 1: Questionnaire

ICPC-2	ICD-10	Expert Scoring		
Case 1		Valid and necessary	Valid, not necessary	Wrong
Subjective				
D01	**R10,4**	0	1	1
D02	**R10,1**	0	0	2
D09	**R11**	1	1	0
D10	**R11**	2	0	0
D11	K59,1	0	2	0
D73	A09	1	0	1
Evaluation				
D73	**A09**	2	0	0
Case 2				
Subjective				
D01	R10,0	1	1	0
D01	**R10,4**	1	1	0
D06	**R10,2**	0	1	1
D06	**R10.3**			
Evaluation				
A99	**R69**	0	0	2
D01	**R10,0**	2	0	0
D01	**R10,4**	0	1	1
D88	**K35,0**	0	0	2
D88	**K35,9**	0	2	0

Appendix 2: Expert scoring

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