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A Strategy for System Improvement and Data Processing in a National GP Sentinel Network

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Abstract

This paper presents the results and strategies concerning the running of MediNET sentinel dispensaries network in Romania. MediNET stations network consists in 100 computerized dispensaries all around the country, where doctors collect data from primary care and send it to a central server through Internet. The network is fully functional and the collection of data started. We present a low-cost solution for developing the system, the preliminary results of collected data, the strategy for improving and developing the system and the strategy for future data processing.

Keywords:
Health information systems, GP, medical informatics, software development, Electronic Healthcare Records

1. Background. A low-cost solution, *MediNET*, a Romanian GP Sentinel Network

Due to the specificity of their speciality, the GPs could be considered as managers of the patient's information. GPs provide healthcare through all the patient's life. The sentinel network program aims to a continuous morbidity registration in general practice in Romania in order to collect representative data about the existing illness pattern and about the diagnostic, therapeutic, and preventive procedures in family medicine. These data are important for research, for the development of continuing medical education and for health management. The Romanian Society of Family Medicine had the initiative of this program, after the model of several Dutch morbidity registration systems, including the Dutch sentinel network. At present, the Romanian National Centre for Studies in Family Medicine coordinates the network.

MediNET network ([1],[2],[3]) is a national network of about 100 general practices, the sentinel stations, which cover about 1% of the Romanian population (around 200.000 individuals).

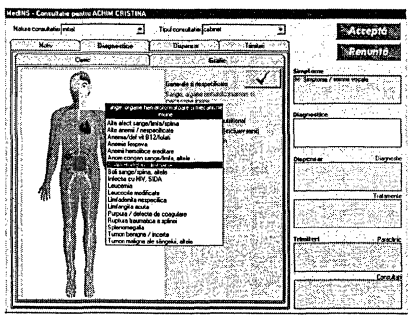

Fig. 1 . The Consultations interface

The hardware for the network consists of 100 PCs with modem, and was made available through a grant from a Netherlands foundation.

The software, called *MedINS*, which *Consultations* interface can be seen in Fig.1, was developed by a team of software engineers from the Faculty of Automation and Computers of Timisoara and GPs from the Romanian Society of Family Medicine.

The network, which includes services as a Data Collecting Server, with two alternative ways to send data, and also an Administrative application, is presented in Fig. 2. This network was developed as a low-cost solution, by a team that included academic staff, a small software company, and GPs. The confidentiality of the

data is ensured by a codification and ensuring anonymousness scheme developed during the project [2].

The development process was based on incremental development, use of alternative and complementary financing schemes, and establishing consortiums (not necessarily formal ones) [6].

The objective of the developed information system is to ensure information storing/retrieving and exchange in a GP network and the related entities (County Health Insurance Houses - CHIH, hospitals laboratories, pharmacies, etc.). The development of the system followed the next steps:

- find the GPs willing to participate in such a project;
- form the team that will develop the tools to be used by the GPs;
- find the financial support;
- develop the first software application, *MedINS* [1],[2], [3];
- train the GPs to work with MedINS;
- develop a new solution for *MedINS* ;
- develop new administrative & server components [3],[6].

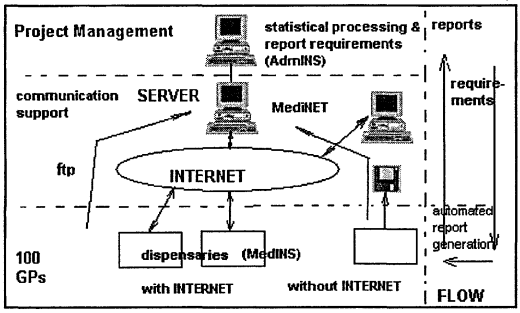

Figure 2. Information flow in MedINS / MediNET System

The next step will be to obtain new financing, based on European and/or National Academic Research funding schemes, in order to implement new components as: interconnecting with the CHIH, with the clinical laboratories, with pharmacies, county hospital, mobile components, secure link with RSA-coding etc. Parts of them are already developed with the support of two academic grants from the World Bank and form Romanian Ministry of Education and Research. We can conclude that:

- is possible to develop a large-scale and relative ambitious project in the academic environment
- the combination of many financing schemes is required
- a very strong determination of finalizing the project from the part of all members of the team involved is a condition
- excellent communication skills are also needed
- the personal, direct relations are very important
- the forming of consortiums (formal or not formal) is a must
- the technical solutions must be appropriate for low-cost and rapid solutions (this explains the use of Visual Basic, Access, ActiveX-exe solutions)
- the development process uses rapid prototyping, W-Cycle model for the components and a „meta-incremental" approach in order to introduce new components in the system

2. Preliminary Results

In the following, the results of the pilot study for the initial six month of full running activity are presented. For the partial statistical analysis of the data collected from *MediNET* network it was established the next plan [5]:

1) *Establishing the set on which the study will be performed.* There were eliminated from the analysis the records from 48 GPs that have not succeeded to send all the data due to technical problems.
2) *Concatenating received databases.* After each database was received, it was verified, and all the databases were concatenated resulting one unique database having 11 tables containing registered data regarding reasons for encounter, symptoms, diagnostics, dispensary procedures, referrals, episodes, etc.

3) *Selecting the consultations and the patients matching established time span for the statistical study.* There were selected all the consultations registered between November 1st 2001 and April 30th 2002 and all the patients on the GPs lists from this period.
4) *The clean up of the database was performed to remove records that cannot be analyzed due to lack of some important information (lack of the date of birth of a patient, lack of identification code of a patient etc.).*
5) *Summary statistical analysis.* There were analyzed demographical indexes: the structure of the set grouped by age, sex, urban/rural repartition, patients' repartition to GPs, etc.
6) *Descriptive analysis of the principal components of the consultations.*

There were performed statistical analysis regarding:

- reasons for encounter;
- diagnostics: the top of all diagnostics, the top of the first contact diagnostics (beginning of an episode), the top of the final diagnostics (the last consultation from an episode), incidence and prevalence;
- the procedures performed in the office with the diagnostic and therapeutic reason;
- referrals to other healthcare providers with investigation and treatment reasons;
- the structure of the episodes of care.

Several complex statistical analyses was done, including:

- detailed statistical analysis of the episodes;
- correlations between reasons for encounter and diagnostics (at the beginning of an episode and at the following consultations);
- correlations between diagnostics and dispensary procedures;
- analysis of the episodes in which the diagnostic was changed;
- correlations between diagnostics and referrals to a specialist.

Complex SQL queries were used, and the resulted tables were analyzed with *Microsoft Excel 2000, Microsoft Access 2000* or *EPI Info 6*. Sometimes, these applications were inadequate, so we have developed a *Microsoft Visual Basic 6* application for additional database processing.

During a six-month interval, 52 GPs have registered 26.081 consultations, related to 23.654 new episodes of care and 9.435 old episodes of care. In the framework of these episodes, there were registered 38.786 reasons for encounter, 41.409 diagnostics and 58.838 dispensary procedures.

Several results are presented in Figure 3 and in Tables 1-4:

Table 1. The most 10 frequent reasons for encounter

Code	No	%	RFE
R05	3550	9,15	Cough
A03	2080	5,36	Fever
319	1372	3,54	Results exam/test/letters from other provider
359	1271	3,28	Blood pressure measure
N17	1046	2,70	Fainting/syncope
R21.6	858	2,21	Pharynx pain
N01	840	2,17	Headache
R07.2	674	1,74	Rhinorrhoea
K01	618	1,59	Heart pain
108	540	1,39	Following consultation / control

Table 2. The most 10 frequent diagnostics registered by family doctors

No	ICPC code	%	Diagnostics
6619	K86	15,98	Uncomplicated hypertension
2805	A97	6,77	No disease
1833	K76	4,43	Arteriosclerosis / peripheral vascular disease
1815	R74	4,38	Acute upper respiratory tract infection
1304	K74	3,15	Ischaemic heart disease with angina
1080	R78	2,61	Acute bronchitis / bronchiolitis
852	R81	2,06	Pneumonia
832	R76	2,01	Acute tonsillitis
755	L86	1,82	Back syndrome with radiating pain
718	T90	1,73	Non-insulin dependent diabetes

Table 3. The most 10 frequent changed diagnostics during episodes of care (for 361 cases when the initial diagnostic was changed)

No	%	Procedure internal code	Procedure
17782	15,45	359	Measuring of blood pressure
10107	8,78	205	Heart examination
9869	8,57	357	Pulse measure
8028	6,97	209	Routine physical exam
7305	6,35	193	Complete clinical exam
5865	5,09	218	Pulmonary exam
4610	4,00	203	Pharynx exam
4266	3,71	319	Interpretation of results from tests/investigation made by others
4044	3,51	190	Risk/life habits assessment
3328	2,89	360	Temperature measurement

Table 4. The most 10 frequent procedures

ICPC code	No	%	Diagnostics
W78	26	7,18	Pregnancy
R74	25	6,91	Acute upper respiratory tract infection
A97	19	5,25	No disease
R78	18	4,97	Acute bronchitis / bronchiolitis
R81	13	3,59	Pneumonia
W79	12	3,31	Unwanted pregnancy
R80	10	2,76	Influenza
R72	10	2,76	Strep throat
R76	8	2,21	Acute tonsillitis
D96	8	2,21	Worms / other parasites

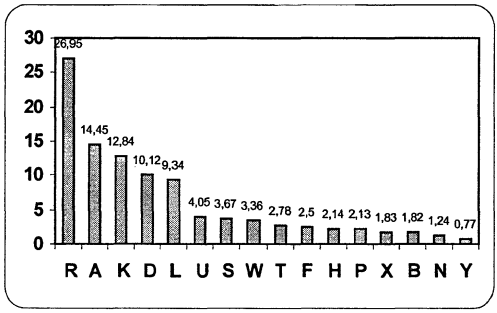

Fig. 3. Percent from total number of episodes by ICPC chapters

3. A strategy for improving the system

As presented above, we already developed several of the future components of an enlarged version of the system, but we still need to improve the current one, so we intend to reach new projects and research grants. The actual status of our system is presented in Fig. 4.

Our strategy for improving the system consists of :

- increase the complexity, adding new functionalities (see Figure 2 vs. Figure 4);
- include in our Consortium new partners as CHIH, County Hospital, laboratories, pharmacies, etc.;
- have access to new financing schemes and grants participating in enlarged Consortiums;
- join international research groups and grants, as FP 6;
- investigate the possibilities to develop the present functionalities, as seen in the improvement of the interface in *MedINS* [4];
- implement European Standards in our structures and components;
- develop new and improved versions of the components (especially *MedINS*- the basic component).

4. A general strategy for data processing

Regarding the data processing we have in mind short term and long-term strategies. We have to fulfil our objectives stated at the start of the project and also the other ones that appeared as necessary during the work in the project.

As strategies on short term we state the followings:

- Publish a yearbook with final results from one year data recording, where to present the current situation regarding the family doctors activities, including reasons for encounter, diagnosis, procedures in dispensaries, referrals, and treatments.

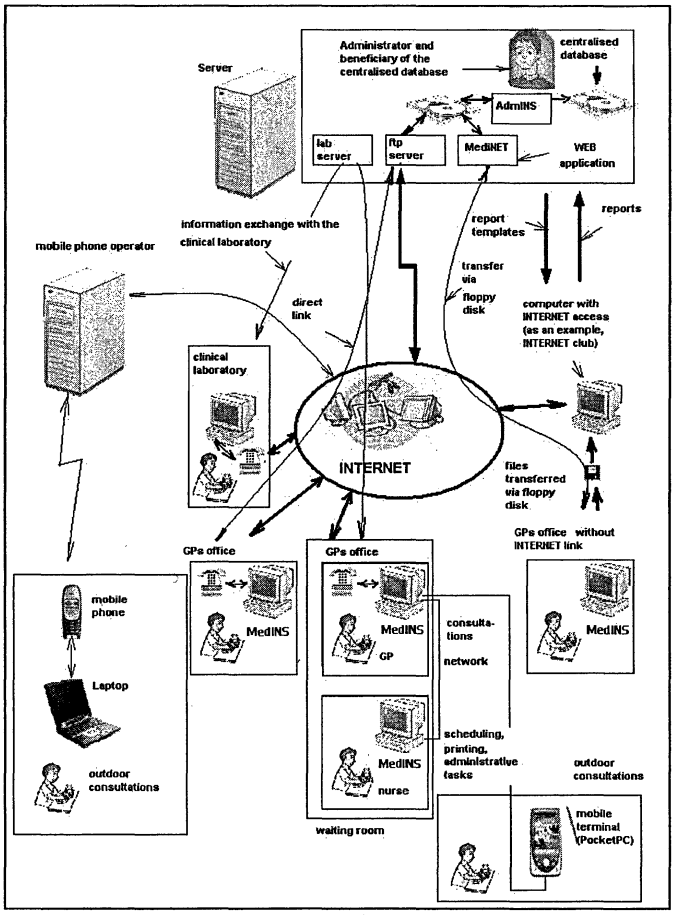

Fig. 4 . The actual status of the system

This book will be useful for health care providers and especially for the CHIH. Also, the Ministry of Health will have access to real data concerning the activity of family doctors.

- Make an international data/results comparison - The comparison of results with the ones from several other European countries will be useful in order to assess the actual development of primary care in Romania and to define the priorities for the necessary changes for European integration.
- Develop a research related to the drug consumption in primary care. This is a real problem in Romania because of the high costs, so we need to know which is the real situation

As long-term strategies we have in mind the following:

- Create a basis for assessing the activity from primary care during a long period of time. These databases could be used to compare the activity from primary care between regions, different groups or the changes related to the modifications issued in the healthcare system in Romania.
- Support communication among healthcare providers; one of the most important goals is to improve the communication and collaboration between family doctors.
- Anticipate present and future health problems. Using the data dynamically we could anticipate some interventions in primary healthcare activity at regional or national level.
- Record standard preventive measures that could be used in national health programmes, in planning of activities related to the prevention of transmission of diseases (especially those with seasonal incidence).
- Identify biases from expected trends. When there will be possible to anticipate trends related to some medical aspects, it would be easy to identify the biases from these trends. This will be possible for the medical aspects (evolution of some incidence or prevalence) but also for some aspects related to medical costs.
- Provide a legal basis for all the negotiations with other health care providers or institutions, based on valid data from current activity.
- Support clinical research. The database from the sentinel network will be an incubator for the development of the research in family medicine.

5. Conclusions

The system *MedINS/MediNET* is singular, distributed statistically at the national level, functional and facilitates on-line communication with a great number of GPs. *MedINS* makes GP's activity efficient and pleasant through the transfer from paper patient record to Electronic Patient Record. The Sentinel stations project will increase the quality of health care activity in Romania, being a starting point for a complex study over the primary care activity in Romania based on real facts and real information from current practice. Being in the same network the GPs will improve through communication their professional skills that will be reflected in a better treatment of the patients. From a recent survey results that 85% of the GPs in the network are interested by the results of their colleagues in order to improve their practice. The data from 80% of the GPs in the network is collected each month at the central database at the Family Medicine Department of the *Institute of Public Health* in Timisoara. The data is already currently analysed.

We intend to continuously improve our system by improving the components and by adding new ones. In order to reach this objective, we enlarge our Consortium and we try to obtain new financing schemes. The data will be used accordingly to the objectives of our central project, in statistics useful for a common understanding of the professional problems of the GPs from Romania. Data Mining will be another issue for the future research related to our project and our network activity.

The approach presented above is useful for developing of low-cost health information systems in the emerging countries from Eastern Europe.

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