

## **Telemedicine in Bulgaria**

Polina Mihova, PhD,

Department of Biomedical sciences, NBU

[pmihova@nbu.bg](mailto:pmihova@nbu.bg), +359889706227, Montevideo 21 str., 1618, Sofia, Bulgaria

Nothing to declare

**Abstract:** This article is focused on the Bulgarian tendencies and initiatives in the development and application of the telemedicine and the importance of the evidence-based telemedicine. The paper presents separate modules, including Education in telemedicine, where are introduced telemedical systems, the healthcare system in BG itself, magazines, journals and conferences, and finally – the authors experience in telemedical solutions and implementations.

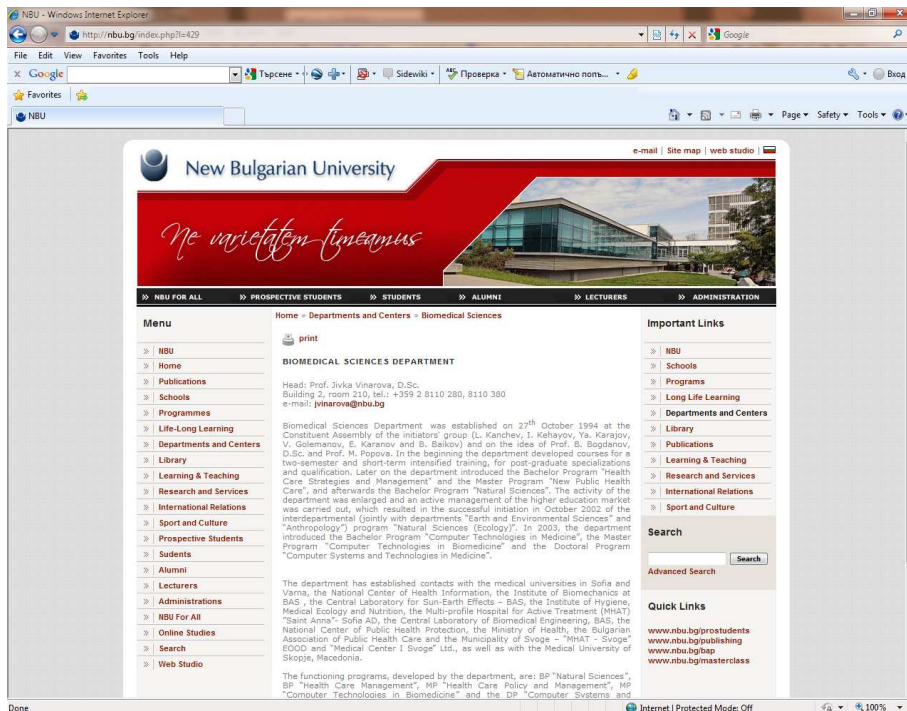
**Key words:** telemedicine, e-health, ICT (information and communication technologies).

### **Introduction**

In Bulgaria – a small country with population about 7,000,000 people, located mainly in the capital Sofia – 2,000,000 and in several other big cities, it is absolutely necessary to perform and ensure patients in remote villages with a kind of constant and immediate medical services. Bulgaria has two mountain-chains; the Balkans, which run east and west through the heart of the country; and Rhodope, which, for a considerable distance, forms its southern boundary. These are hard to reach and travel regions with lots of small towns.

### **Education in BG in telemedicine**

Telemedicine and e-health are not popular and widely spread specialties in Bulgaria. In fact the only place that educates bachelors and masters in ICT in medicine is New Bulgarian University in Department of Biomedical sciences.



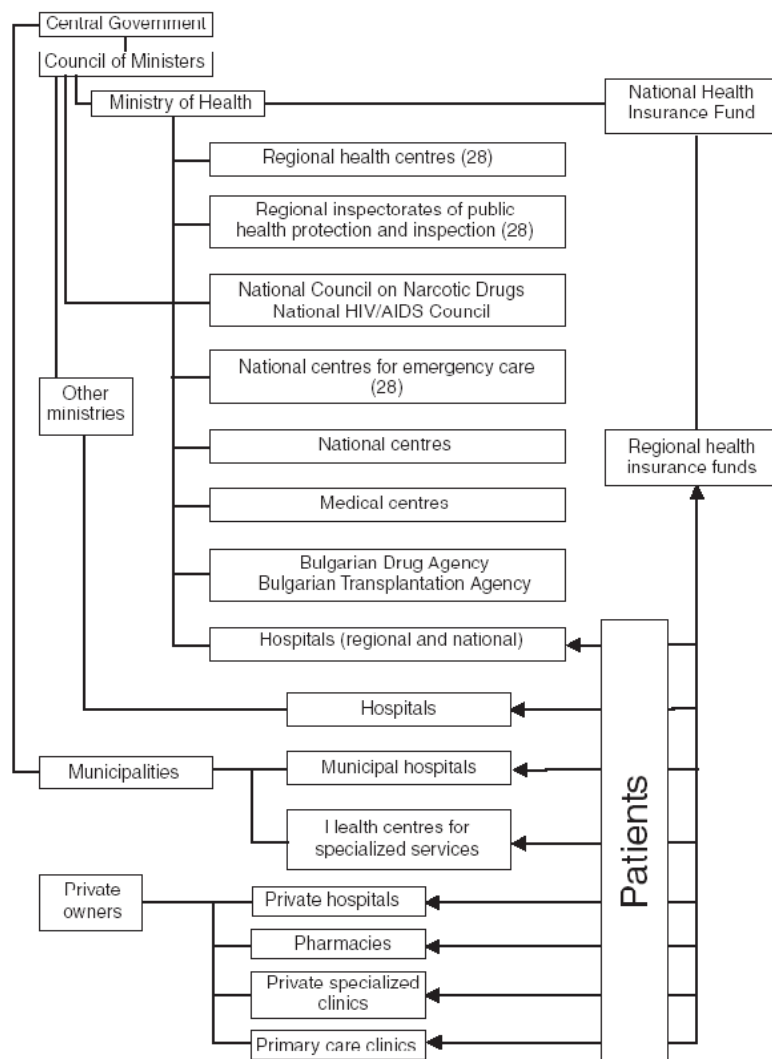
For what kind of users and experts is offered this education in telemedicine?

1. For all physicians as participants in diagnostic, consulting and all other kinds of specialized tasks (like reporting, analysis, planning and documentation).
2. Nurses / bachelors in health care, which can take up a large part of their tasks indirectly - especially teleprisastvie, teleassistance, regulation schemes and medicated control the behavior of the patient in timing.
3. For medical and other professionals in training and retraining in different time regimes and on different occasions.
4. For patients / health insurance - as promoters of self-control procedures.
5. For "scaling system" - the natural evolution of information systems in the direction of a doctor - very patient and one patient - a CIS with telemedicine applications.

**Practice – where are introduced separate systems**

In Bulgarian medical hospitals, clinics and other private institutions have particular projects and implementations, which are not sponsored by the government. We have Leonardo Da Vinci in Pleven city, several solutions for the Military academy and medical hospital. There are different solutions in separate wards and departments, which often even are not popularized and published in the press and special journals.

### Healthcare system in BG



The main stakeholders in Bulgarian health system are the Parliament, the Ministry of Health, the NHIF and the Higher Medical Council. A number of other ministries own manage and finance their own health care facilities, including the Ministry of Defense, the Ministry of Internal Affairs and the Ministry of Transport. Private practice has expanded significantly, now including dental practices, pharmacies, physicians' surgeries, laboratories and outpatient clinics and polyclinics.

There have been advances in overall investment for the IT sector in Bulgaria as well as for IT in the health system. In 2008, information and communication technology expenditure accounted for .77% of GDP and there were 9 personal computers (PCs) per 000 inhabitants in 200 , compared to 7 in 200 (4). Use of the Internet is also increasing. A recent survey conducted by the Alpha Research Agency found that 2 % of adult Bulgarians used the Internet in 200 IT enjoys an ever-expanding application in outpatient care medical centers and in hospitals. Thanks to a financial donation from the World Bank, every GP now has a PC workstation and all PCs

report in a digitalized format. In 200 the Ministry of Health together with the Ministry of Finance and the NHIF countersigned the so-called “road map” setting forth the particulars of the coming incorporation of a diagnosis-related group (DRG) system within the reporting processes of hospitals.

According to the “road map”, and with the support of USAID and M Health Information Systems, a pilot project with hospital beneficiaries was developed and implemented. 200 marked the second year in which the relevant data necessary to calculate relative weights were collected. The National Centre for Health Informatics is also currently working on a project related to the introduction of uniform information standards within the health system under which in 200 –200 all regional health care centers were updated with modern IT equipment.

The Health Card is one of the key technologies currently being developed and introduced in Bulgaria for health sector optimization, more efficient transactions between the health care institutions, more secure, flexible and transparent exchange of information, standardization of services and activities, and ensuring future interoperability with other European countries and health systems. At the time of writing, there is no exact information about the dates for the launch of the system.

### **Magazines**

In Bulgarian publishing sphere there are several magazines that often publish issues in medical informatics and telemedicine:

1. Social Medicine magazine - a magazine for informatics, health management, social epidemiology, economics, health law, (a quarterly Association Scientific Society of Social Medicine, Informatics and Health Management)
2. Military Medicine magazine, ISSN: 1312-2746

3. healthcare Management, ISSN 1311 - 9982 Edition of the Faculty of Public Health --  
MU Sofia

4. Health Economics and Management journal, ISSN 1311-9729

5. Medical Review magazine, ISSN 1312-2193

### **Conferences, meetings, societies**

1. National Conference "Connectivity in the healthcare system. Building the ICT infrastructure. Improving patient care through optimized access to personal data. Improved prophylaxis and prevention through the ICT sector. Telemedicine. Security."

2. Annual National Conference on ICT for Health

3. International Conference "Enforcement of standards in eHealth. Integration of information systems interoperability, Privacy in the eHealth"

4. Workshop on eHealth in Bulgaria

5. National Conference on Hospital Information Systems and connectivity

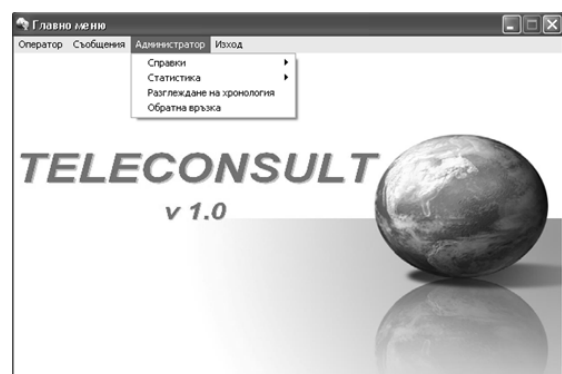
### **Specialized foundations**

1. EHealth Foundation BULGARIA ", <http://www.ehealth-bg.org/>

2. Bulgarian Society of Social Medicine, Health Management and Informatics,  
<http://www.medunion-bg.org/drujestva.aspx>

### **Our experience**

After detailed research work in the web for software solutions for distance consultations we have reached to the conclusion that adaptation of foreign development would be harder and maybe even unsuccessful. For the Bulgarian healthcare



**Fig.3 Entrance screen**

system as every other there are strict requirements for healthcare delivery and payment organization. Before starting the practical work for development of the software we have analyzed the hospital structure, working personnel, technology infrastructure – both PC periphery and specialized medical apparatuses, and etc. We have developed special Questionnaires for every type of users that are expected to work with the software.

After processing the inquiry results, our working team had the following tasks:

- development of software for telemedicine purposes, where the user should identify his/her single and every single step with digital signature – requirement from Ministry of Health
- development of web portal for popularization of the project
- assurance of the required technologies:
  - o Laptop with camera, microphone and audio system for every General Practitioner (GP) in the municipalities
  - o Digital stethoscope and digital ECG apparatus for distance transmission of data
  - o Specialized videoconference software for communication between the users
  - o Professional hardware for videoconference rooms

The software solution has additional functions for operators and administrator. Each of them has specific functionality and duties but the interface is only one.

For the doctors there are four types of forms – consulted, not checked, consulted but with necessity for more information and returned forms with additional information. After starting a request for consultation there are the following types of fields:

✚ Paraclinic examinations - Identical with the paper original:

✚ Blood tests

✚ Patomorphologic

✚ Urine tests



✚ Image examinations:

✚ ECG, X-ray, Echocardiography, Velotest, Holter, Scanner, Mamography and Others.

These examinations allow upload of unlimited number of images, text description fields – both for the consulting and giving consultations experts, also zoom of the image to the original size.

User parameters, that the system register are name, action, host, ip address, day, month, year, hour, minutes and seconds.

The system allows filtering of any of the above mentioned parameters, Excel export of the references, chronology control.

The Administrator performs and connection between users and software developers, which can be realized as an e-mail box with all the standard parameters.

System statistics

#### *1. Doctor statistics*

- From date to date
- Number of required consultations
- Number of accomplished consultations

#### *2. Hospital statistics*

- From date to date
- Number of required consultations
- Number of accomplished consultations

#### *3. References with export to Word, Excel and with graphical visualization:*

- Number of consultations per period
  - Filtering through starting and ending date, level of consultation
- Number of consultations with result - hospitalization
  - Filtering through starting and ending date, level of consultation

- Percentage distribution according specialists
    - Filtering through starting and ending date, level of consultation and specialty
  - Number of consultations with second consultation
    - Filtering through starting and ending date, level of consultation
  - Percentage distribution of correspondence between working and final diagnoses
    - Filtering through starting and ending date, level of consultation
  - Percentage distribution of final diagnoses according disease types
    - Filtering through starting and ending date, level of consultation
4. One of the most important statistics is actually the chronology of the system and control of each activity of every person

We have accomplished 150 consultations and 2000 registered activities. Our purposes are to adopt the model and to implement in 5 municipalities at first and afterwards in every municipality on Bulgarian territory.

For what types of patients it is intended this method of health care?

1. For patients with "no time" - particularly active and financially supported to seek maximum quality of service they want to vote and to participate in making "the second / other opinions.
2. For patients with "no option" - single adults and people with a bunch of diseases that are physically difficult to contact a doctor.
3. For patients with "no contact conditions" - those who can not receive direct medical services due to any unique circumstances affecting and large contingents of people (from living in remote locations to space flight and military operations).

4. For patients like "I have the right of consultation" - prompted by the Constitution to regulate access to health care with appropriate quality and prices should be clearly defined by the authors and affordable for consumers.

Our software solution is implemented in 2 remote hospitals – Areoclinic in Sofia and Municipal Hospital in Svoge city that is about 50 km. far from the Capital. is organized as it follows:

- Main software desktop solution, divided according to the operational level into three main parts (Fig.3.) – three different management modules that are developed according to the requirements and necessary functions for each participant in the telemedical process.
- Audio and video streaming through specialized software.
- Video communication through newly developed application with individual virtual rooms, locked and password protected meetings.

With this integral solution is performed the ability to verify whether a receiving physician is present, whether the receiving system can receive the transmitted files, whether the receiving system has received all prior files, and to otherwise ensure continuity of the medical record. Each patient is identified only with age, sex and physical conditions, in order to keep the patients privacy and confidentiality.

Expert's module is designed and conformable to the specific telemedical consultation characteristics – each variant of consultation: required, consulted, not checked and with request for more information, is differentiate with its own color. The system checks every 30 seconds about newly arrived requests for consultations, and ensures sound and visual signalization to attract the expert's attention.

The operator's module is the main coordinator in the system, where the Operator manages the expeditiousness of the process of giving consultation, and in case delay of 24 hours, the system allows redirecting the form according to the available specialists. In case of few

requirements for the same specific condition consultations arrive at the same moment, the system distributes through the available specialists in the corresponding specialty.

He also has the rights to edit, save and delete the following participants: Medical experts; Hospitals; Municipalities; Graphics and Prices.

The Administrator performs functional connection between users and software developers, which is realized with system mailbox. He has the authorization to make any kind of statistics for anybody at any time.

Administrator's panel is developed in order to assure the correct performance of the processes, committing full access to every single user parameter that the system registers: name, activity, host, ip address, day, month, year, hour, minutes and seconds. The system allows filtering of any of the above mentioned parameters, Word & Excel export of the references, chronology control, and graphical representations in bars. Statistical basis is organized in 69 different sections. In order to prove the usability and benefits from telemedical investments, there are two statistics about percentage of application for a medical expert and for a hospital.

### **Conclusion**

With this project we plan to investigate and explore each factor that have an influence over the solution, to explore the healthcare system in Bulgaria in the necessary depth thus to eliminate possible shortages. Planned teleconsultations in the standard software form, in accompaniment with videoconference dialog with parallel transmission of specific medical data and images, represent a highly effective diagnostic tool. Telemedical consultations bring about less mistakes and better care through reducing information misunderstandings.

The users' opinion up to the current moment of 9 months exploitation is with high approval and satisfaction.

It's not too much of a stretch of the imagination to realize that telemedicine will soon be just another way to see a health professional, just as seeing friends and family while talking to

them on the phone is becoming commonplace. This system would monitor daily health status and automatically notify a health professional if we become ill.

Fifteen or twenty years ago we had no idea we would rely heavily on faxes, answering machines and e-mail, tools which are now low-tech and taken for granted. In 2008, telemedicine still has not reached its potential in countries like Bulgaria. With this mass project we plan to implement and investigate every single positive and negative factor of the solution, to explore the system and to eliminate possible shortages.

### **Literary sources, tools and publications**

[1.] Vinarova J., M. Vukov, Information Systems in Medicine and Healthcare - textbook, ISBN 954-535-392-9, ed. NBU, Sofia, 2005

[2.] Vinarova J., M. Vukov, Glossary of Telemedicine, translation from English into "European Telemedicine Glossary", Glossary of standards, concepts, technologies and users, edited by DG INFSO, May 2001, editor prof. Luciano Beolchi, ISBN954-535-269-8 ed. NBU, Sofia, 2002

[3.] Vinarova J., M. Vukov, Textbook Telemedicine, ISBN 954-535-269-8, ed. NBU, Sofia, 2002

[4.] Vinarova J., P. Mihova St.Tonev, A. Petkov, Textbook "eHealth", ISBN 13: 978-954-516-910-6, ed. Letera, Sofia, 2009

[5.] Vladzimirskiy A. C., Rating эффективности телемедицины, ISVN 978-966-335-031-8, Donetsk 2007

[6.] Vladzimirskiy A. C., Glosarii Telemedicine, ISSN 1728-936X 2007

[7.] Vladzimirskiy A.V, A.N.Chelnokov, "Relevantnosty teleditsinskoy konsul'tatsii", II Int. School-Workshop "Telemedicine and перспективы-опыт, Donetsk, 2006

[8.] Georgieva L., P. Salchev, R. Dimitrova, A. Dimova Bulgaria - Health system review, Health Systems in Transition, Vol. 9 No. 1, ISSN 1817-6127