Decentralization of the Greek National Telemedicine System

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Abstract
The demographic and geographic dispersion of Greece necessitates the adoption of telemedicine solutions in order to reduce patient transportation and waiting time. A centralized Telemedicine model proves insufficient to support the multitude of islands and other isolated areas of Greek mainland. This work records and analyzes the shortcomings and difficulties of the existing Greek Telemedicine system and suggests a more flexible, decentralized model, which upgrades the Regional Telemedicine Centers into mid-range providers of Telemedicine services. This reduces the burden of the central telemedicine unit, reduces reaction time in the offering of primary care without loosing in efficiency in more serious incidents. In this context, we list the necessary actions at technical, operational and organizational level for the smooth transition to a new system, as well as the advantages of this new structure. The binding of the new Regional Telemedicine Centers with the existing telemedicine system must be performed with the minimum cost. This presumes recording and reuse of the existing infrastructure, training of personnel and smooth transition to the new telemedicine structure. Based on the existing experiences, the specialized needs of the Greek National Healthcare System as well as the modern scientific developments we present an action plan that covers technical and organizational aspects for the development and successful incorporation and management of the Regional Telemedicine Centers in the Greek National Telemedicine System.

Key Words: Telemedicine, Health Information Networks, Healthcare Reengineering, Healthcare Redesign, Distributed Healthcare Environment, Medical Equipment, Healthcare Resource Access Control, Health Care Communications

INTRODUCTION

The combined utilization of the information and telecommunication technologies for the provision of distant health and education services, in the context of telemedicine, offers important advantages in health systems and respectively in patients (Linkous 2002). The most important are: a) immediate access to scarce human and material resources (specialized doctors and expensive biomedical equipment) from remote primary care units, which lack of such resources, b) reduction of medical errors, c) improvement of provided health services at local level, d) reduction of costs and unnecessary patient transports, e) offer of primary medical support to transport units f) facilitation of distant education and training programs (Apostolakis & Kastania, 2000), g) large-scale review and analysis of medical data (i.e. by geographical region), g) support of health advising briefings etc. (Wootton, 1996 & Wootton, 2001).

Telemedicine is ideal for offering distant healthcare and medical consulting but it proves insufficient when advanced healthcare issues must be solved. Primary diagnosis of common incidents can be easily performed from distance, while other more complex incidents demand detailed examination, medical tests and specialized doctors. Common incidents are more frequent than complex ones. As a result a specialized practitioner is usually less busy than a general practitioner and intervenes less frequently to provide medical advices or diagnosis. A centralized telemedicine system usually has to deal with lack of general doctors or wrong utilization of specialized doctors for trivial incidents. In addition to this, such architectures result in increased information traffic between the dispersed medical units and the single telemedicine central.

This work suggests a dispersed telemedicine architecture with more than one nucleus that hierarchically serve medical requests, starting from local medical units that handle common incidents and delegate complex issues to higher levels. We consider that this approach is more flexible and efficient than the centralized equivalent and use the Greek Telemedicine System as a test bed. The demographic and geographic dispersion of Greece (multitude of islands, isolated highland regions, and unbalanced distribution of population) and the shortage of specialized resources (human and material) turn the existence of a telemedicine system, to a high priority issue. The suggested procedure can be easily applied to all countries that combine isolated mainland and island regions, as well as to countries with more than one population centers. In all cases the decentralized architecture is preferable, since it reduces reaction time for simple cases, fully exploits specialized practitioners and reduces network traffic to the minimum.

The following section defines the scope of Telemedicine and presents the basic Telemedicine models. Telemedicine applications in Greece and world-wide are enlisted and the shortcomings and inefficiencies observed in the delivery of services so far are mentioned. Section 3 details the factors which suggest the evolution of the existing system, the development and incorporation of the Regional Telemedicine Centers to the new Telemedicine System. More specific, we illustrate the steps towards the effective embedment of the Regional Telemedicine Centers to the existing structure, in an attempt to minimize the cost for equipment and training and guarantee the smooth transition to an integrated telemedicine system. Based on the existing experiences, the specialized needs of the Greek National Healthcare System and the modern scientific developments we evaluate

the feasibilty of this attempt (section 4). In section 5, we present the technical and organizational aspects of a proposed action plan for the development, introduction and management of the Regional Telemedicine Centers at the Greek National Healthcare System. Finally, section 6, contains the conclusions of our work.

TELEMEDICINE: MODELS AND PRACTICES

Telemedicine refers to the use of telecommunications and information technologies for the delivery of medical services to the point of need. There are several definitions of telemedicine (Bashshur 1996). Some of them are "narrower" covering only clinical services, while others have broader scope using telemedicine as an umbrella term covering clinical and non-clinical services (medical education, information and administrative services) (Lipson & Henderson, 1995). After the examination of several definitions Institute of medicine has defined telemedicine as "the use of electronic information and communications technologies to provide and support health care when distance separates the participants" (Field, 1996). In this paper we use the broader definition of telemedicine.

Telemedicine is mainly used for the support of populations living in remote regions. It has mainly a supporting role, meaning that a general practitioner consulting a medical specialist or a medical specialist consulting another specialist. Remote monitoring of patients from their homes using devices like blood pressure monitors is a fast emerging service. Remote monitoring solutions that focus on chronic diseases are a new way of practicing telemedicine, usually referred by the term tele-homecare.

Telemedicine models

According to the factor of time, telemedicine can be separated to real-time (synchronous) or asynchronous (store-and forward) telemedicine (Table 1)Real time (synchronous) telemedicine can be as simple as a telephone call or as complex as a robotic surgery. In order to take place it requires the physical presence of both parties at the same time and a communication medium between them.

Store-and-forward telemedicine involves acquiring medical data (medical images, biosignals etc) and then transmitting them to a doctor/medical specialist for offline assessment. It doesn't require the physical presence of both parties at the same time.

Furthermore telemedicine can follow a centralized or distributed model (Vargas 2002). In a centralized model all regional telemedicine centers are connected to a secondary healthcare provider. Thus, it is not possible for them to communicate. On the contrary in a distributed model regional telemedicine centers have the ability to communicate between them as well. Obviously in both models (centralized and distributed) telemedicine can be conducted in a synchronous as well as a asynchronous manner.

	CENTRALIZED	DISTRIBUTED
Communication of Regional Telemedicine Centers	Only, indirectly, through a central server	Directly.
Ways of conducting telemedicine	Both synchronous and asynchronous	Both synchronous and asynchronous

Table 1 The basic telemedicine models

Telemedicine applications for regional medical care

Telemedicine applications cover medical consultation, patient monitoring and counseling, treatment and therapy such as radiology, surgery, cardiology, etc (Roine et al 2001) and the merits for doctors are numerous (cost cut, better treatment, faster response etc.)

The concept of regionalization of medical care has been implemented in many countries since the 1940s and has been re-appeared together with telemedicine in the 1990s. One ideology of regionalization appears to focus on the rationalization of service distribution and costs saving. Networks underlie virtual regions of telemedicine which must be integrated with real geographical regions. The choice between a centralized medical care unit and a distributed (hierarchical or not) network of telemedicine centers is affected by economical, political and strategic decisions (Cutchin, 2002).

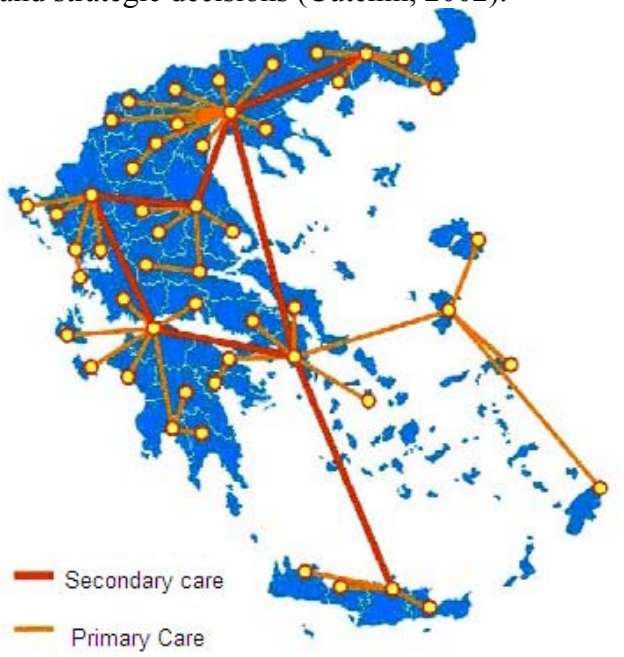

Figure 1. A distributed telemedicine network for Greece

Independently of the selected model we must evaluate results based on the following three factors, according to the bibliography (Coughlan et al, 2006): a) Diagnostic accuracy, b) Cost (and its associated variables, e.g., benefit, utility, and so on), c) Patient satisfaction and use of services

International telemedicine efforts

Although the implementation of telemedicine is still in progress, its role in the Healthcare Delivery System has been upgraded recently. In the USA, a great number of private health centers provide telemedicine services to their patients and most of the hospitals provide telemedicine services at home (*tele homecare*). In an attempt to standardize the delivery of care, the American Telemedicine Association (http://www.atmeda.org/) has defined specific requirements for the provision of telemedicine services. The general goal is the provision of nursing services at home and the development of self-care technology, in order to minimize the patient-doctor direct contact. Currently, services are designed for the

chronic diseases, the urgent health incidents and the supervision and consultation of elderly people (ATA, 2006).

In Canada, emphasis is given mainly in the following areas of tele-health: a) in telemedicine b) in distant continuous medical education c) in tele-homecare and the utilization of telephone centers for the provision of remote medical consultation (Picot & Cradduck, 2000).

Telemedicine has been advanced in European countries as well. For example, Finland has an extended telemedicine network interconnecting health centers and hospitals over an ATM backbone. Arctic countries capitalize on the coverage of all regions and the equality in accessibility opportunities for urban and rural medical units (Arctic, 2003). Emphasis is given to the education of medical staff in distant regions, to the cooperation with adjacent networks and the distributed processing of medical incidents. Swedish project SJUNET provides an infrastructure for tele-healthcare by connecting all Swedish hospitals and primary care centers as well as some national authorities and vendors (Larson 2003). Similar opportunities are developed in Central and South European countries, as part of a long-term plan for healthcare, for example in the national telemedicine center's of Portugal and England.

In most European countries there is a tendency to increase the telemedicine services offered at home. Primary health units offer services to the citizen, whilst, secondary health services (general hospitals) offer telemedicine services to the primary health units or directly to the citizens. In a broader planning of telemedicine services, specialized or university hospitals offer medical advices and exercise tele-consulting.

The developments in telecommunications are expected to boost telemedicine. The increase in network capacity and the ability to transfer huge data volumes in short time combined with the progress made in telemetry equipment, allowed the delivery of new telemedicine services (e.g. services that require real-time image, audio, video or data transmission, tele-homecare services etc. The evolution of wireless technologies, removes space and time barriers and makes the direct contact and communication between patient and doctor feasible (Laxminarayan, & Istepanian, 2000).

Finally, the evolution of information systems is expected to improve significantly the architecture of telemedicine services, increase re-usability and promote interoperability (Valsamos, & Apostolakis, 2005). The recent trend in this era is the transition from "closed architecture" systems to open protocols based systems, which use the web for information exchange and services provision (web-based information systems) (Bellazzi et. al, 2001, Varlamis 2007).

It is undeniable that technological evolution creates better conditions for the development of telemedicine. However, the critical factor for the success of such programs is the coordination, support and continuity of all efforts.

Country	**Action - Services**	**Model**
USA	tele homecare, self-care	Centralized
Canada	Medical education, home care	Centralized
Finland (arctic countries)	Medical education, health-care	Distributed
Sweden	integrated health-care services	Distributed

Table 2 Summary of Telemedicine approaches world-wide

Telemedicine projects in Greece

Several telemedicine applications have been developed in Greece since 1950, when Professor Skevos Zervos examined his first patient from distance (Sotiriou, 1998). Efforts (Apostolakis, 2007) have been made from both public and private organizations in projects such as MERMAID (Anogianakis et al 1998), AMBULANCE (Kyriacou et al 2003), even with a European scope (i.e. NIVEMES 1998). In a Greek Telemedicine Program, a joint work of "Sismanogleio" Hospital and the Medical Physics laboratory, an extended telemedicine network has been developed, comprising of about 40 interconnected Health Centers and community clinics with tele-consulting rooms for pneumonic, cardiac, urological, pathological and consular diseases. Educational programs for healthcare prevention and continuing medical education are also conducted. During VSAT and TALOS projects, Onassion Cardiac Surgery Center provided tele-cardiology services in North Aegean region. The HYGEIANET network allows the interconnection of the Health Centers with the University Hospital of Crete and offers integrated health services to the region of Crete. The NIKA project connects Kimi hospital and Istiaia Health Center to the Hospital of Halkida and delivers tele-dermatology and tele-cardiology services. The Regional Healthcare Network of Central Macedonia participates in RESHEN (www.biomed.ntua.gr/reshen) project, which improves secure communication and information exchange between all levels of healthcare service providers - within the regional networks and between different regional networks in Europe (pilot implementation in Germany, Greece and Finland).

Name	**Service**	**Area**
MERMAID	Medical emergencies	Maritime in general
NIVEMES	health provision, telemedicine, tele-consultation, videoconferencing	Ship vessels in Europe
AMBULANCE	telemedicine, home monitoring, vital signs and images transmission	Athens Greece, Nicosia Cyprus, Pisa Italy and Malmo Sweeden
Sismanogleio	pneumonic, cardiac, urological, pathological and consular diseases	Northern Greece and North Aegean
VSAT, TALOS	tele-cardiology	North Aegean
HYGEIANET	general	Crete
NIKA	tele-dermatology and tele-cardiology	Chalkis

Table 3 Summary of Telemedicine approaches in Greece

Current state of Telemedicine in Greece

Despite the encouraging results of the previous efforts, the progress of telemedicine in Greece was not comparable to the initial expectations. The delay is due many reasons:

- The lack of proper education in information and telecommunication technologies of medical and non-medical staff of the telemedicine centers and hospitals imposed tremendous difficulties in the effective operation of the system.

- The shortage of hospitals and telemedicine centers in expert staff constrained significantly the system's working hours.
- The inability to allocate permanent staff for the operation of the system in a 24/7 basis, hindered its real time usage. The system failed to support urgent health incidents (synchronous operation mode) and was limited to asynchronous mode only (store and forward telemedicine) which is suitable for confronting chronic problems or offering distant education programs.
- The shortage in telecommunication and other facilities resulted in slow-operating systems. Telecommunications breakdown incidents were also increased.
- The lack of information technology protocols and standards resulted in "closed architecture" systems, with serious data exchange limitations (Valsamos & Apostolakis, 2005).
- The absence of a distributed, virtual electronic health record, which would permit the remote access to patient health data and history from any telemedicine system, also hindered the delivery of effective telemedicine services.

Additionally, several legal issues have been arisen that need be solved for effectively deliver healthcare services. As far as it concerns the electronic health record, security and privacy issues relate to the visibility of health data and their secure transfer over telecommunication networks. As far as it concerns the medical diagnosis and the doctor's intervention in a distant incident, the problem of legal responsibility should be defined as prior to the practice of telemedicine (i.e. who is responsible for a therapy and how is this proven). Last, but not least, is the issue of decentralization of the existing telemedicine system, which is operated, controlled and supported by the university hospitals and specialized hospitals only. In order to distribute the load, we should exploit the medical equipment and staff of primary health care units and offer medical care on demand to isolated and distant areas. We should make use of general or specialized hospitals only when primary care is insufficient. The redistribution of tasks and responsibilities is expected to increase the efficiency of the National Telemedicine System.

The most important issue that must be considered for the successful operation of a Telemedicine System is the coordination of services and staff over a long-term action plan.

TECHNICAL, ORGANIZATIONAL AND FUNCTIONAL FEATURES OF THE DECENTRALIZED MODEL

The suggested model

The backbone of the suggested model is the hierarchical structure of the existing telemedicine system with the primary, secondary and tertiary health care providers operating harmonically for the efficient patient service. The suggested modifications are expected to reduce the workload of the secondary and tertiary health providers in urban areas and to enforce the role of the primary health providers in rural and isolated areas. The decentralized Regional Telemedicine centers will be the connecting node between primary health care and specialized care. Equipped with the necessary telemedicine equipment, they will be able to monitor, co-ordinate and support all regional health care units, provide diagnoses, advices and education where this is needed, and lighten the workload of general

hospitals and specialized clinics. In this way, the provision of immediate medical care to the citizen is succeeded and the quality of diagnosis and consulting services is improved.

At the same time, the process of diagnosis and consulting provision is accelerated. In common medical incidents, assistance is delivered from the Regional Centers, using telemedicine services. As a result, general hospitals have less workload and more time to focus on the most difficult/demanding cases.
Another advantage of the suggested system is that tertiary healthcare providers (University and General Hospitals) have more time to invest in the planning a tele-health strategy and the provision of new prevention and briefing acts.
A crucial factor for the smooth transition to the suggested structure is the detailed listing of all technical, organizational and functional reformations that should be implemented. The examination of all factors and the estimation of costs and benefits from this reformation will show if the suggestion is eligible for the Greek Telemedicine System.

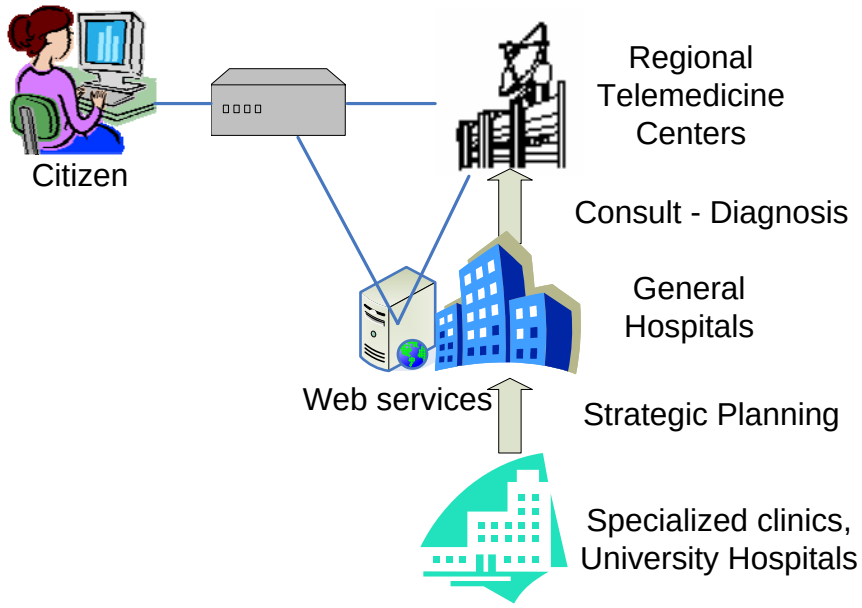

Figure 2: The suggested model's structure

Technical Characteristics

A critical factor for the effective operation of the new structure is the distribution of the workload between all involved parties. A first step is to define the responsibilities and authorizations of each involved party and to enumerate the required technical equipment for the diagnosis and examination processes. The first pre-requisite for a flexible and distributed telemedicine system is the existence of well-equipped regional centers. The second requirement is those centers to be interconnected effectively to the central coordinator and to consulting units. The last requirement is the digitization of medical information in accordance to broadly accepted standards.

A high-speed network connection paired with cable and satellite links (Clarke et al, 2001) will allow the immediate and uninterruptible transfer of medical data and diagnoses even in the most far-away/unreachable regions. The technical characteristics are synopsized to:

- Basic equipment of the local and home-based health units and connection of them with the fully equipped Regional Telemedicine Centers. Analytically:
    - Based on the needs, home telemetry devices for the supervision of patients and the transfer of medical data to the Regional Telemedicine Centers.
    - Primary Health Units in faraway regions with the essential medical equipment for conducting routine medical examinations and sending the results to the Regional Telemedicine Centers.
    - Fully equipped and staffed Regional Telemedicine Centers.
    - Connection of the home telemetry devices and the health units with the Regional Telemedicine Centers. The connection will be made in local scale (prefecture, group of island) and must have above average data transfer rates due to the fact that it will carry the measures of the medical devices (picture, sound video) to the Regional Telemedicine Centers where supervision and diagnosis will be conducted. In order to have continuous patient supervision, communication must be incessant. Therefore we suggested the combined use of satellite and cable data telecommunications.
- Setup of the appropriate hardware and software at the Regional Health Units allowing conducting diagnosis from distance. In order to support such services high-speed and high-availability network connection between Regional Telemedicine Centers and Hospital is demanded. In this way, the experience of secondary and tertiary staff will be utilized, without the need for patient transfer.
- Usage of high-end equipment and high skilled staff in secondary and tertiary health units in order to be capable to face complex incidents.
- Tertiary health units must be equipped with information Systems which will collect, store, index and process medical data transferred form the Regional Telemedicine Centers. These data can be used for the diagnosis and prevention of epidemic effects. Moreover, the concentration and process of statistical data allows the tertiary health units to check the new system's effective operation and schedule new tele-health acts.

The most important factors that should be considered in the process of medical information transfer are security and privacy. Patient data transferred over cable and wireless networks must be properly encrypted, in order to avoid unauthorized disclosure. Since primary diagnosis and examination results are collected in a central repository for further statistical analysis, extra care should be taken to remove any identification information.

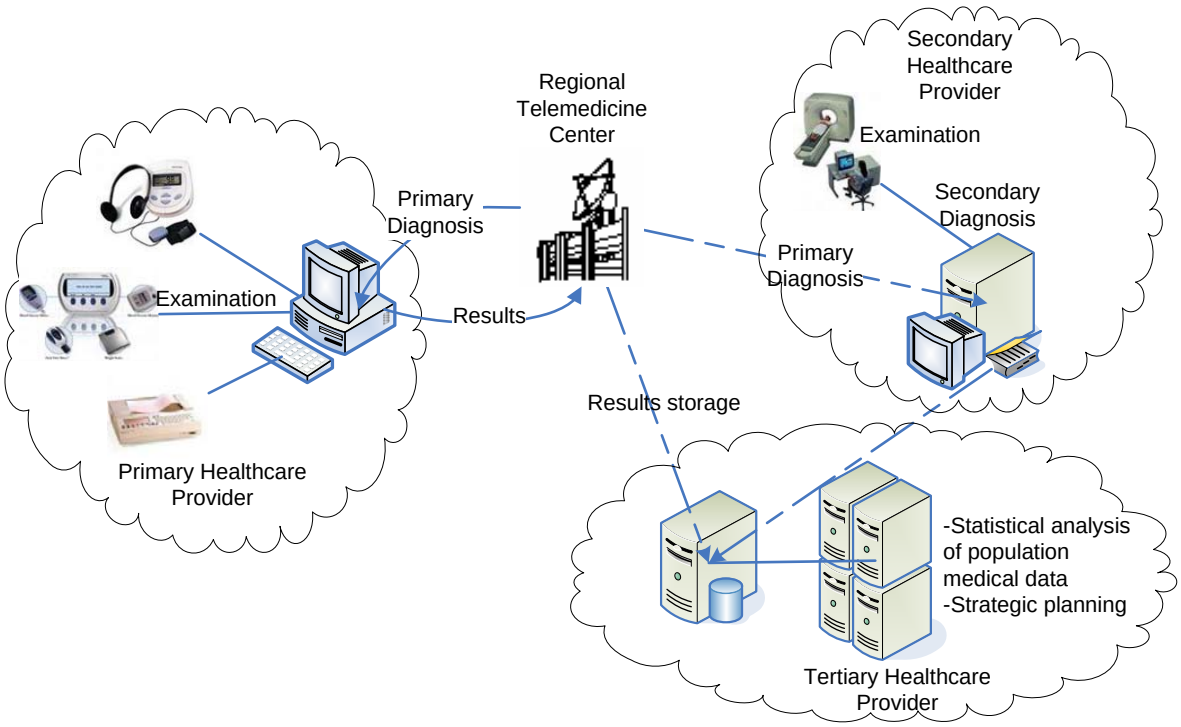

Figure 3: Technical characteristics and functions per level

Organizational Characteristics

The successful introduction of the Regional Telemedicine Centers to the National Health System is an extremely complex process. The success of the whole project depends mainly on the effective organization and management of the distributed system in local and central level.

Regional Telemedicine Centers stand between primary healthcare units and hospitals. They serve local requests and act as a mediator to the central hospitals when it is needed. Telemedicine centers should have the appropriate coverage and responsiveness to telemedicine requests. An analysis of the medical profile of each region's population is required, in order to decide the appropriate location for each center.

Reformation in organizational level will indirectly affect the technical and human dimensions of the system. A strategic plan that defines the staff to be recruited, the equipments to be purchased and the redistribution in large scale is necessary. It is critical to develop a plan for continuous upgrade of existing equipment, continuous supervision and support of all regional centers (*on line monitoring and support*) and also an action plan for the periodic maintenance and support of system's hardware and software.

The training of medical staff, practitioners and nurses of primary health care units and telemedicine centers in regions should be provisioned. The arrangement of briefing conferences that will disseminate the advantages of telemedicine and will guide individuals on its usage will be valuable for both the employees of the National Health System and the local communities.

Among other responsibilities, practitioners in regional telemedicine centers should take decisions, make diagnoses, consult and cure patients from distance. As a result, responsibilities now delegate from the hospital doctors to the general doctors. A delegation plan for the distribution of responsibilities and authorizations of employees –based on the needs and according to their skills- must be created, in order to assure the continuous and uninterrupted operation of telemedicine centers and the confrontation of urgent situations (i.e. illness of operators).

Finally, the development of a mechanism for the thorough supervision and evaluation of the Regional Telemedicine Centers in management level is necessary. This mechanism will provide the Ministry of Health with useful information on the performance of each system node resulting in the improvement of the National Telemedicine System.

Operational features – Telemedicine and Tele-Health services

Telemedicine services are directly involved with medical applications and procedures of nursing, prevention and health education. Tele-Health services have a broader application context, refer to health and nursing plans and are defined form doctors and medical experts. Both categories of services are based in great level to the usage of distance education and learning technologies

Telemedicine applications process and transfer sound, text, image and video through computers, faxes, scanners, e-mail and teleconference systems. Digitization and exchange of medical data aims to supply the medical experts –irrelevant to their position- with the highest possible level of information. Ulterior aim is the provision of same quality services at both central and far-away regions.

The medical and supporting services which can be offered to remote patients through the usage of computers and telecommunication networks are focusing in three main categories:

- Supervision-Diagnosis-Consultation: transmission and interpretation of tomographies, radiograms, cardiograms, encephalogram, tele-dermatology, tele-radiology, virtual patient examination, tele-surgery etc.
- Data/Information Processing: Transfer of patent medical files, transmission of doctor's transcriptions and medical guidelines, access to medical databases centralization and organization of medical data.
- Education: Connection with research centers, retrieval of medical bibliography, continuing education of doctors, nurses and other staff.

Tele-Health is complementary to telemedicine and aims to a holistic confrontation of health subjects. It faces health and medical care problems in a broader context. Applications supported from computer science and telecommunication technologies:

- Prevention planning: education in subjects like water clearness and basic hygiene, face of common health problems, promotion of prevention and check-ups, planned parenthood, care for pregnant woomen and newborns, safekeeping of personal hygiene and suitable nutrition.
- Education and training of healthcare service providers, medical staff and patients: prevention of diseases, infections and accidents, education on the provision of first aids.
- The general management of the tele-health system.

Use Cases

We will try to give a snapshot of the way the new model works with the help of two use cases.

A) For a *routine examination* to a remote village, the citizen goes to the local health unit, where the first examinations are performed (temperature, pressure, cardiogram) and symptoms are written down. All information is forwarded to the Regional Telemedicine Center. The doctor retrieves patient's medical history (using the electronic medical record), examines the recorded symptoms and issues a diagnosis. The latter, paired with any notes and advices are sent back to the remote health unit. Finally examinations results and notes are recorded to the patient's electronic health record for future use, and anonymously collected in a central repository for statistical reasons.

B) In a more *complex incident,* in which the initial exams do not lead in a straight diagnosis, the patient must be transferred to the closest Regional Center. Additional examinations and the consult of a general doctor are incorporated to the second diagnosis. The doctor can have a teleconference with a specialized doctor in a general hospital, if needed. In the case of emergency, the incident is treated inside the regional center with the distant support of the hospital. Else, the patient is transferred to the general hospital. All medical exams and diagnosis are transferred electronically to the hospital so that the specialized doctor has a clear view on the case before the patient's arrival.

C) In the case of continuous *tele-homecare.* the patient uses the appropriate telemetry equipment and sends the results directly to the regional telemedicine center. Decision-support software, processes input data and patient's history and generates alerts to doctors who are responsible for the case. Doctors are able to monitor the patient status at any moment.

D) In the case of *continuous medical training* the tutor presents a medical case and the respective history and symptoms. The doctors' who are trained from distance must issue a diagnosis on this medical incident. The decisions and results are discussed in the teleconference that follows the course.

FEASIBILITY STUDY

The eligibility and feasibility of the suggested solution should be measured in terms of ***cost*** and ***gain*** across all aforementioned axes: technical, organizational and functional.

Reformations in technical level include the re-distribution of existing medical staff and devices and possibly the de-centralization of general doctors towards the regional telemedicine centers and the primary healthcare units. The cost for this re-distribution is reasonable and permits the purchase of additional medical devices or the upgrade of existing ones. The transition to the new system does not require the engagement of more specialized doctors or the release from duty for other practitioners or nurses. So the personnel costs should remain stable. The adoption of cryptography techniques for the protection of personal medical data is of low cost, since these techniques have been extensively applied in other cases of sensitive data.

Reformations in organizational level can be summarized: in the definition of roles and responsibilities of nurses, general doctors and specialized doctors, the definition of data flow among the different healthcare providers. The most critical point in these reformations is the agreement on the legal responsibility regarding medical mistakes. Every one who is behind a medical mistake should undertake his/her responsibilities against the physical, financial or moral damage to the patient. This legal issue (Squifflet, 2003) is a matter of agreement between hospitals, doctors, nurses and patients and is outside the scope of this paper.

As far as it concerns the functional dimension of the suggested system, it is expected that the new structure will bring many gains for patients and healthcare professionals. The delegation of responsibilities, the transfer of workload towards the regions and the reformation of the telemedicine services delivery will give more space and time to healthcare experts to design the strategic plan for tele-health. The money and time spend for the restructuring of the existing system and the re-distribution of its sources will be returned to the government and the citizens in the form of a National Telemedicine System with fast response and a long-term National Tele-health provision.

ACTION PLAN

Based on the analysis above, it is obvious that the development and successful operation of Regional Telemedicine Centers is a multi-facet effort. The complexity of this effort and the weaknesses of the existing structures make necessary the creation of a transition plan. The plan should comprise:

- The recording of existing situation (structures, personnel, equipment etc).
- The reformation and re-distribution of existing infrastructure. The extension of the current system where it is absolute necessary.
- The pilot operation of a small number of Regional Telemedicine Centers that will comply to the aforementioned specifications (technical, organizational and functional).
- Gradient extension of the network based on the pilot results.
- Continuous monitoring of the Telemedicine network operation and results feedback.

The establishment of a coordinating group is necessary for the efficient transition to the new system. The group will comprise healthcare and technology experts, will be

responsible for the monitoring of the transition and for the corroboration of all transformations. The group should be supervised by the ministry of Health.

CONCLUSIONS

This paper presented some of the approaches in national and international level in the field of telemedicine. The analysis of the existing system uncovered its shortcomings and indicated the transition to a new National Telemedicine System. The feasibility study proved that the creation of a new system from zero should be avoided, whereas a recording and redistribution of the existing infrastructure is advisable. The new model is expected to help us overcome existing problems and improve the quality of telemedicine services.

The coordinated effort in terms of an action plan and under the close supervision of the ministry and a group of specialists will help us cover all organizational, functional and technical aspects of this multi-facet problem. Telemedicine as a whole offers a great possibility for distant and low cost services in high quality, given that several security, privacy and legal issues are solved.

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