

A WEB SITE FOR AN INTEGRATED HOMECARE SERVICE*

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Abstract: Telemedicine is growing up in its utilization. The homecare is a very important application of Telemedicine for improving the quality of life patients and their relatives. The present paper describes a project of Homecare, financially supported by Region Campania, which is based on WEB SITE FOR AN INTEGRATED HOMECARE SERVICE, characterized by the possibility of many applications. The aim of this research project is to develop an integrated telematic solution for the ambulatory and homecare assistance for chronic patients (cardiology and oncology pathologies and pacemakers patients); special attention must be reserved to organizational problems. A close cooperation with the GP and special nurse is also planned.

Introduction

Italy has a public financed health care system quite similar to the United Kingdom and to the Canada, where the access to the homecare services are addressed to population that satisfies particular criteria reported to pathology and the social condition. The main goal of the homecare is the improvement of the quality of life of the patients and their relatives. A revolution is underway in healthcare. Face with an ageing population and rapid innovation in medical treatments, healthcare providers are looking for cheaper and more responsive ways of delivering services than through large, centralized institution. After four centuries of delivering healthcare in hospitals, industrialized countries are now shifting towards treating patients at the point of need. Healthcare services have to be accessible to everyone, wherever and whenever they need them. In many cases this is best achieved through home-based healthcare, which can be both more comfortable and convenient for patients and less costly for healthcare providers [1-2]. Homecare can be defined as a component of medical care, where patients unable to reach physically and healthcare provider receive evaluation and treatment in their homes or, more extensively, at the point of their need. Homecare telemedicine solutions can also give benefits for continuity of the care and, in principle, for possible reduction of the costs, mainly by shortening hospitalization. In order to catch up this goal it is necessary to use technologies which are able to realize the integration and the interaction of the healthcare professional competences with those social ones. At a technological level, homecare requires new telematic

environments for monitoring and exchanging information. Personal health systems are also an important feature. These include systems for personal health monitoring, and fixed or portable prevention systems (such as advanced sensors, transducers and microsystems). Other possibilities are personal medical advisors able to supervise prevention and treatment, and certified information systems to support health education and awareness [1]. Italian Government is largely involved in stimulating and supporting activities of Health Telematics and Telemedicine as reported in the "National Health Plan 2003 – 2005" and in some guidelines titled "Health Care Services supported by Telemedicine in the minor islands and in the remote mountain lands".

In these area the problem concerning the health care assistance is very important and also particularly heavy for the tourist islands, during the summertime, when the population is rapidly increased for the tourist presences not only national, but mainly foreign.

It is necessary to keep in mind that in this remote areas are not existing general regional hospitals, but only infirmaries and some small primary care unities

The situation could be particularly severe, due to the time of transportation by overcrafts or ferryboats, especially when the atmospheric conditions are bad [3].

Italian guidelines recommend a strong integration between the general organization of the health care systems and the operators involved in the services, supported by an appropriate technological environment to ensure the minimum levels of health assistance. At present Italian Health Care Authorities defined the role of the Homecare Assistance as A.D.I (Assistenza Domiciliare Integrata) indicating the integration of the different activities carried by GP, medical doctors, nurses, technical operators, patients and relatives for improving the assistance and reducing the duration of the hospitalization [4].

The diagnostic basic telematic instrumentation must be also linked with a center for the transmission and the collection of the personal data and the results of the examinations jointly with some vital parameters (ECG, external vascular pressure, glycemia, etc.) Homecare is also particular important for not self-sufficient or risked persons, considering the following priorities: pathologies referred to terminally-ill patients, which do not answer more to the specific treatments; patients of whichever age, with particular attention to the old ones with chronic pathologies or in particular constrains of social

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uneasiness; critical levels of inability. The priorities indicated by Italian Ministry of Health are:

- Cardiovascular diseases and hypertension;
- Post heart stroke;
- Nephropath patients;
- Post cerebral vascular stroke;
- Rehabilitation for neuromuscular pathologies;
- Degenerative diseases of the nervous system;
- Psychological diseases.

An Italian study of the Health Ministry has put in evidence that approximately 14% of the admissions, which correspond approximately to 24% of the national hospital days, depends mainly by patients over 65 with the above mentioned pathologies. This may be the target of the treatment with homecare assistance.

Homecare can offer new solutions for the management of high incidence chronic diseases, which cause long time of hospitalisation and remarkable social costs. In particular, congestive heart failure is a relevant problem for citizens health, especially elderly, for its high incidence, morbidity and the need of repetitive patient hospitalisation.

In European Union, 2 patients on 1000 suffer by congestive heart failure, but the prevalence dramatically increases with age (over 65 years prevalence rise up to 10%). Also people with implanted pacemaker could take advantage from a service for home-care assistance (for example patients who are not able to easily walk).

In 2004 Region Campania with the local Ministry of the University and Research Affairs started, financially supporting, a regional project of Telemedicine. This paper is a presentation of the part of Homecare application commissioned to our Biomedical Engineering Unity.

Materials and methods

This service is especially planned for patients with chronic hearth pathologies and for implanted pacemaker patients. In fact these cases of embitterment are indicate in Italian guidelines literature as target of ADI program. In our system we developed many services to facilitate the integration and the interaction of the health professional competences with those social ones. The designed system consists of in the main following parts:

- Central archives to store information;
- Mobile or fixed stations connected by telecommunication network;
- Dedicated instrumentation to monitor the vital signals as ECG, external vascular pressure, glycemia, SpO2, temperature.

The components of the system are reported in figure 1. These instrumentations are transportable to support the health personal when must go to the patients sites.

In our prototype we used a commercial Patient Monitor manufactured by Welch Allyn. Similar instrumentations may be placed in the pharmacy or in GP' office, if is requested by the local general health care organizations.

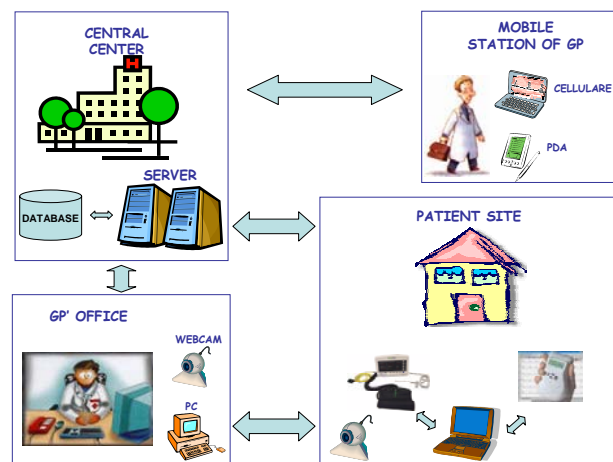


Figure 1: The components of the system

The architecture of the site for the designed Integrated Homecare Service (IHS) is reported in figure 2:

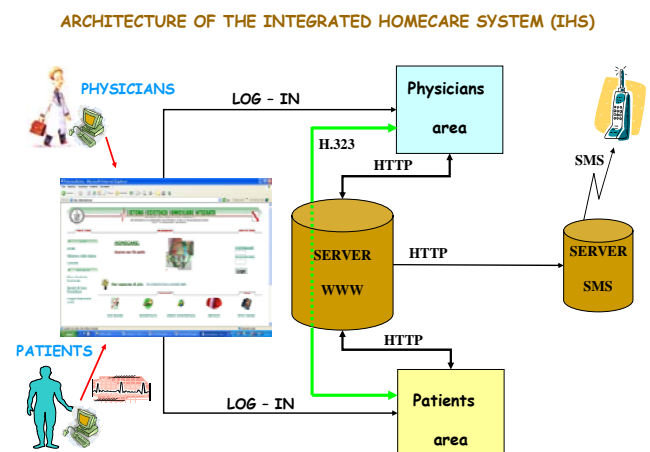


Figure 2: Architecture of the site for the IHS

All the system has been implemented to be also used on a normal telephonic network (PSTN) for giving the possibility of access also from the remote area or everywhere, also in developing countries. By using the web technology, based on TCP/IP protocol, we have a scalable system which will be more efficient when the large band will be present every where, without any modifications of the architecture.

The web site has been implemented using the following Open Source software:

- WEB SERVER APACHE 1.3.27
- PHP 4.2.3
- MYSQL 3.23.49

This choice offers the possibility to have a system which, at the present time, has the highest reliability.

The designed database is based on the idea that at the center of the system is the patient and the coordinator of the entire Health Care Service (H.C.S.) is the GP. These hypotheses are indicated in the guideline of the Italian Health Ministry [4].

The most important entities of the system are the administrator, the physicians and the patients. In the web site there is a different access for everyone of these profiles with different privileges. In the following figures (3, 4, 5) there are some screenshots of the designed web site:



Figure 3: Homepage of the web site for the IHS



Figure 4: Patient' area of the designed web site



Figure 5: Video communications area

Administrator is the supervisor of the full system also for the maintenance and for next future other adjustments.

Particular attention has to be devoted to the visual communication by commercial web camera to offer the possibility to the patients and all the operators to be linked in video communications. The images of two participants appears on the same screen as showed in figure 5.

We have designed a software function to have the list of the on line users available to video communicate each other. It is really user friendly because it is necessary only to click on a button in which is reported the name and the surname of the available user to activate the video communication session. We used Microsoft NetMeeting because it is based on H.323 protocol and also because it is included in Microsoft Windows since the '98 version. So it is not necessary to install any dedicated software to video communication on the users' system. Particular attention has been devoted to software interface for the acquisition and the presentation of the vital signals from the patient monitor. In the figure 6 is reported a screenshot of the software interface and in figure 7 is reported an image of the patient monitor by Welch Allyn.

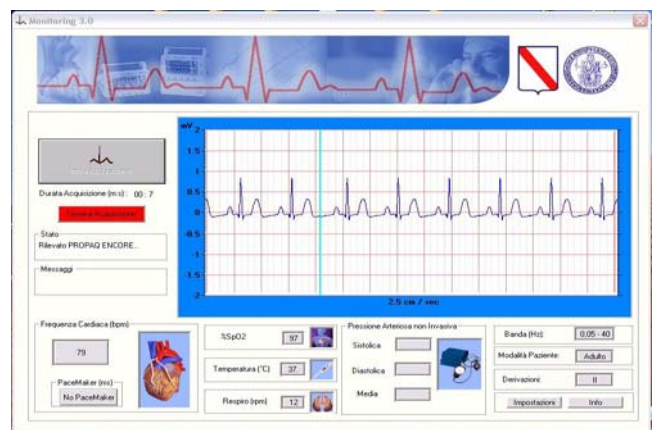


Figure 6: Software interface to acquisition the data from the Patient Monitor Welch Allyn



Figure 7: Patient Monitor by Wech Allyn

In figure 8 is reported an example of some records from an implanted pacemakers patient.

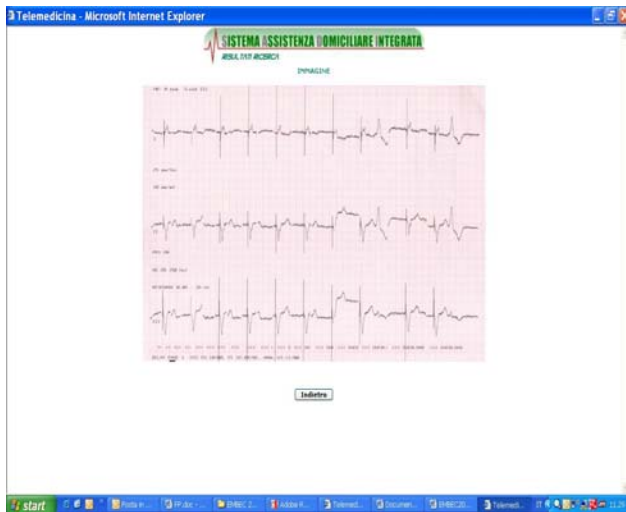


Figure 8: Presentation on the site of some records from an implanted pacemaker patient

Results

The main services offered by the system are the videoconference, the monitoring of the vital parameters and the integrated management of all patients' information. Using an user friendly interfaces, the web site for an integrated homecare service becomes an efficient instrument that is able to have a strongly interaction among doctors, patients and relatives.

To validate the designed system it is started a clinical applications to follow up implanted pacemaker patients. By using this system it is possible to increase the number of routine control in the hospital (typically 3 or 4 in the year). In our validation of the system we have offered to the selected patients a check of their status every month. In fact by the service of the designed web site we are be able to acquire the ECG signal from the patient' site and also to present it to the cardiologist to the clinical reporting.

Conclusions

The web-based system that we have carried out offers a large easy to access and it is scalable in function of the physical lines for the connection.

The implementation of a SMS service will increase the possibilities of interaction among several actors involved in the IHS.

In the next future a Technology Assessment survey will establish healthcare delivering quality, clinical results, access to therapy, cost-effectiveness ratios, healthcare actors and patients perceptions.

These results may confirm that the daily tele-monitoring is reducing the number of re-hospitalisations and diagnostic testing requests by optimizing the contact with clinicians.

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