FREE SOFTWARE TO MAKE THE TELEMATIC ECG EXCHANGE POPULAR AMONG PHYSICIANS

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Abstract: Interchange of clinical data, including signals and images, is a well established practice inside the hospital and between general practitioners (GPs) and specialists in healthcare centres. Electrocardiography is one of the most common diagnostic procedures which takes advantage from digitised signal processing and communication. However, this use is not so popular among GPs and can due, in addition to political, ergonomic or technical reasons, also to the lack of tools for an easy management of ECG signals and patient data. According to the findings and recommendations of the OpenECG European project, an experimental test was defined and implemented involving a selected group of GPs, cardiologists and outpatient hospital structure. The goal was to offer the users a friendly network-integrated ECG test procedure based on standard devices and services, like SCP_ECG compliant electrocardiograph and e-mail, plus free downloadable software for ECG signals acquisition, presentation and transmission.

Introduction

The information and communication technology (ICT) is now part of daily life; computers and networks are commonly used in many private/public companies and government services. Among others, the health care system gained from this new technological trend as applied in the general management of administrative and insurance data. However, the impact of ICT to diagnostic and therapeutic processes is far to be significant. It is widely accepted that ICT can give a useful support to health care delivery; this is testified by the great amount of research projects approved and tested in different fields of health care, from home care telemedicine to specialist call centres for emergency, from second opinions to tele-consultation. Many of these applications were fruitfully installed and used but it is the authors' opinion that ICT should become more popular among physicians in order to provide its benefits to all the health care actors in their daily activity.

OpenECG project

Especially in the domain of cardiology, with an increasing number of citizens suffering from cardiac problems, medical devices are an essential part in the process of acquiring, storing and communicating accurately the current health status of a citizen. Thus, it is increasingly important to promote and disseminate standards for storage and data exchange between medical devices. Traditional proprietary solutions that do not make use of standards do not provide an acceptable solution in the era of regional health care networks and the Internet. The expected approval from ISO of the AAMI revision of the SCP-ECG standard [1, 2] will establish it as an international standard. However, SCP-ECG has not been successfully used in the large-scale provision of interoperable services.

The main mission of the OpenECG project [3] is the promotion of the consistent use of format and communication standards for computerized ECG. The OpenECG Consortium is an interdisciplinary board that wants to attract contributions from healthcare authorities, physicians, engineers, standardisation bodies, manufacturers and the public. Its primary goals are:

- to raise the level of awareness on Computerized ECG standards;
- to promote the use of computerized ECG;
- to consolidate expertise, assist integration and support correct implementations;
- to foster interoperability between medical devices and systems;
- to pave the path towards the use of standards in other cardiology examinations.

Open Source Software strategy

For what concerns the limited deployment of the acquisition, storage, and communication of computerized ECGs a common opinion of the OpenECG consortium is that one of the reasons is the lack of freely available viewers and tools.

In order to cope with this problem the consortium decided to adopt and promote, even beyond the project partners, the "open-source/free-software" strategy [4].

The "free-software" is a recent approach to the distribution of software which finds both appraisals and criticisms. Detractors point to the lack of "reliability", "warranty" or "user's acceptance", and to "management costs" while supporters claim the exact contrary [5].

In our opinion free software distribution politics offers to end-users two advantages, at least:

- higher degree of independence from the software supply companies,
- absolute warranty of data format accessibility;

According to this approach, the OpenECG Consortium decided to create a repository of software available to any kind of users, both for clinical practice and for research purpose or for biomedical instrument testing. These software modules, available for free download and use, should be viewed as bricks of new assembled and personalised procedure for ECG processing and display, according to SCP-ECG standard.

By using these basic software modules, the authors want to promote the use of the digital ECG exchange among physicians and with health care structures; the final goal is to have the digital ECG exchange as popular as 'office' applications, Internet navigation or eMail services.

Potential clients of such new system include GPs, cardiologists, patients. It should be noted that possible scenarios are not dealing with real time and emergency situations, but are related to clinical consultations and medical advices which do not require synchronous communication and instantaneous answer.

Materials and Methods

A procedure for the management of standard ECG recordings was studied and developed. Different reference scenarios were considered and the procedure was evaluated in order to satisfy the users' expectations and the device settings. Scenarios include: ECG acquisition and reporting at GP room, GP consultation with remote cardiologist, remote outpatient lab ECG acquisition and transferring to hospital cardiac centre for analysis, in house ECG test for patient monitoring and signal transmission to GP or cardiologist.

Minimum ECG device features and PC/ peripheral requirements were set; system software packages and specific software applications were defined too. A standard procedure was created to allow the friendly use of MailECG system.

The MailECG requires an SCP-ECG compliant device with a digital output for communication with a personal computer; moreover the PC has to be connected to Internet, directly or via modem. The PC system can run any common operating systems (Windows, Apple, Linux) and the eMail service has to be installed. Specific ECG processing software has to be installed into the computer to allow the management of the ECG signals.

In order to facilitate the configuration of the PC setting with the specific ECGMail system, a Web site, host in the Web server of our institution, was prepared to allow the download of the software programs and of the installation procedure. After the download, the user has to start the installation batch file which tests the host system configuration, creates the directories for SCP files archiving, install the runtime Java ECGbrowser program and builds the links between ECGbrowser program and the computer eMail service.

Different functionalities are available from the system: on-line download and local archiving of SCP files from the ECG device, off-line signal analysis and reporting (Figure 1), eMail sending and receiving with ECG signals and report included.

It should be noted that all the electronic communications are encrypted (by properly setting the mail service) and certified by using a personal smart card.

At present a protocol has been developed to test this system in a selected area in collaboration with the local health Authorities (ASL6-Livorno) of the National Health Ministry. This protocol will involve a number of end-users which will include five GPs, two cardiologists and a hospital outpatient clinic. All users will undergo a short course for learning the system functionality.
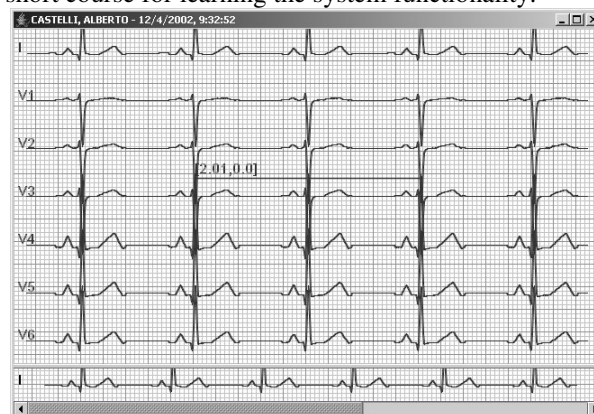

Figure 1: Screenshot of the ECG viewer

Conclusions

Applications for the management of ECG recordings were developed to allow interoperability between patients, GPs and cardiologists. The system is about to be tested in a selected area in collaboration with the local health agency. Interoperability and data format accessibility are granted by "Free Software" licensing which also grant the complete freedom of use of the released applications.

References

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