Chapter VIII
Interpretation of the ECG as a Web-Based Subscriber Service

This chapter is about the idea of medical information interchange networks providing signal and possibly image interpretation services. Technically, the issue is similar to Web-accessible services: document conversion, searching the Web, photo development, video on demand, electronic booking of hotels or airline ticketing. Various services use state-of-the-art Internet technology for commerce and entertainment purposes. Unfortunately, medical applications are rarely represented in that form.

In the first part we present a software manufacturer viewpoint resulting from a typical consideration of costs vs. benefits. The important point here is that simple basic procedures are commonly and more frequently used than sophisticated and specialized subroutines. The development of newly introduced diagnostic procedures or calculations of diagnostic parameters recently proposed by cardiologists is very expensive, and the resultant products are unknown, so they are rarely purchased, which makes them more costly.

Such conclusion and past experience discourage manufacturers from implementing new methods in devices designated for average customers. These also discourage customers from paying for the potential, but rarely used possibility of performing very uncommon diagnoses. The alternative solution is limiting hardware-embedded procedures at a certain level and creating worldwide-accessible, highly specialized interpretation centers to deal with rare cases automatically or with occasional supervision from human experts.
The idea of distributed interpretation services challenges the current definition of telemedicine because the software, instead of the human, is supposed to be the main agent in the network. The doctor’s role is shifted to resolving uniquely unusual cases or to the occasional verification of system performance. His or her work will require greater expertise and responsibility. Clients of medical subscriber services will be human cardiologists, but also the software implemented in wearable devices. Such a multi-modal monitoring system is able to measure vital signs without the patient’s intervention, send the digital data for interpretation, and initiate emergency procedures when necessary.

The remote interpretation as a subscriber service needs two areas of data security to be considered: (1) patient privacy and the consistency of raw data and returned reports; and (2) server security and immunity to erroneous signals, network violation acts, or attempts at unauthorized access.

The prototype Internet service for diagnosis based on T wave dispersions was set up and provided the authors with an opportunity to meet several technical constraints for this idea. This chapter is about small-scale network experimental results. This experimental service is aimed at revealing and testing emerging problems, and is also a test bed for similar applications.

THE CONCEPT OF KNOWLEDGE SPACE

Introduction

The importance of recordings or sketches has never been neglected in the medical sciences, and even the oldest surgical manuals contain descriptions of reference cases. For many years collections of ECG recordings were only on paper, except for long-term recordings stored on magnetic tapes. Nowadays, digital storage remains the only practical data carrier, and we often wonder how we could ever manage without it.

Since the first issue of the American Heart Association Standard for the ECG (AHA, 1967), databases played several roles in electrocardiology, including these most important ones:

- as references for interpreting (manual or automatic) medical signals,
- to impose standards on data storage and transmission formats, and
- as starting points for new challenges in the of signal content exploration.

Databases have two principal aspects in cardiology: to provide specific raw records and an exemplary knowledge explaining the interpretation. Considering that
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