Chapter III

Background 2: Telemedical Solutions in Cardiac Diagnostics: Current Issues

This chapter presents basic facts about the social impact and frequency of cardiovascular diseases in aging societies. Being the primary cause of mortality in developed countries, cardiovascular abnormalities receive the most of the attention in the medical world. The problem is particularly observed in developed countries with a significantly longer life expectancy (Japan, Canada) and leading in healthcare organization and research. Also considering the acuteness of a typical cardiac failure gives proper attention to why cardiology is given so much importance in the treatment of life-threatening situations. Making progress in cardiac diagnosis and treatment, including modern and wide-range surveillance, is potentially beneficial to whole societies and countries. It also influences both life length and comfort, which are today among the most appreciated of human values.

In the context of improving everyday life, the Holter technique is introduced, highlighting the extended features resulting from a continuous recording of patients’ ECGs in true to life conditions. These benefits include the opportunity for risk stratification in the real patient’s environment, much more reliable than laboratory examinations. The Holter technique, although invented 50 years ago (Holter, 1961), is from its beginning and still today a source of new inspiration for both medical and technical research. Medical science has discovered new aspects and diagnostic possibilities based on the cooperation of the cardiovascular, nervous, endocrine, and...
respiratory systems in the organism, represented by a correlation of representative vital signs. This research broadens the insight of the doctor to a patient and the healthcare manager with regard to aging populations. At the same time the quality of diagnostics improves and the diagnostic itself becomes less invasive and more accepted as an element of everyday life.

The progress would not be possible without the parallel development of healthcare technology. The traditional recording tape has been replaced by digital storage media or digital data transmission, removing technological frontiers (e.g., the maximum examination duration), improving data quality, and presenting the opportunity of seamless surveillance for the outpatient. The term “technology” also includes an emerging and rapidly developing domain of medical signal processing aimed at sustained assistance of a problem-oriented automat in the interpretation of biological signs. The advantages of this approach include easier management of the rapidly increasing data flow, pre-selection and highlighting of abnormalities, and standardization of diagnostic procedures worldwide. Cardiology is here again a leading application of biomedical signal processing, because of the number of automatically recognizable diseases and the number of scientists involved in relation to the number of people benefiting in their everyday lives.

The achievements of contemporary digital wireless transmission are presented in the context of continuous cardiac surveillance. The opportunity for immediate interaction with the patient with heart failure adds value, compared with regular long-term recording. Various aspects of interaction, including distant drug and activity messages, are discussed. The concept of interaction is further exploited and extended to the interaction of distant cooperating software.

**CARDIOVASCULAR DISEASES AS A CIVILIZATION ISSUE**

As is commonly known, cardiovascular diseases are life-threatening. Virtually all diseases could be life-threatening, but analyzing the background of that belief, we found two major foundations:

- Cardiovascular diseases are very common in our society. Everyday life brings us into contact with cardiac-disabled people, and the common awareness about the importance of cardiac failure is fairly high. Unfortunately this awareness does not influence the lifestyle of the people potentially exposed to danger (e.g., genetic preconditions, diet, stress).
- Cardiovascular diseases may develop silently and manifest their symptoms as an emergency. The sudden cardiac arrest and consequent complete impairment of blood transportation function causes irreversible mortal changes in cells.
The Hidden Markov Brains


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