

Cybernet Web-Based Medical Data Management System

The Cybernet Web-Based Medical Data Management System is a comprehensive tool for Internet-based patient data management and reporting services. This system allows physicians to access patient demographic information, summary data reports, and raw signal data through the Web.

The initial demonstration system has targeted outpatient cardiac monitoring applications, specifically addressing the needs of arrhythmia and pacemaker follow-up monitoring procedures. This includes the collection, evaluation, reporting, and archival of data from cardiac event monitors, Holter monitors, and pacemaker devices. Cardiologists, general practitioners, family practitioners, and internal medicine physicians routinely prescribe such outpatient ECG monitoring procedures. The primary users of the developed demonstration system are 3rd party service companies and physicians (see Figure 1).

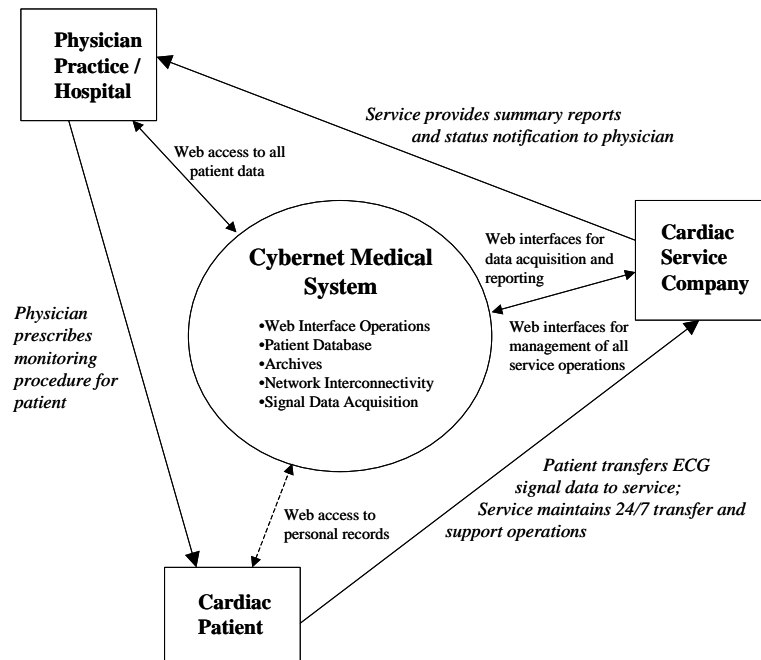


Figure 1: Illustration of the Cybernet Medical System operation, as applied to the initial cardiac data management application

Using the Cybernet Medical System, all operations are conducted through easy-to-use Web browser interfaces. The service company receives data from the patient, generates reports, notifies the physician, and stores all data and transactions for future reference. Physicians are then able to use the Web-based interfaces to access additional information, view raw signal data, or compare historical data and trends, if desired.

The developed system framework also allows for expansion to accommodate additional medical data management and telemedicine applications that extend beyond these initial cardiac procedures.

Benefits of this system and approach include the following:

- Convenience for the physician
- Convenience for the patient
- Cost reduction
- Improved data turnaround and access time
- Improved ease of operation
- Improved patient care
- More secure maintenance and transfer of data

The fundamental technical components of the system are:

1. Server System

The server system is a reliable TCP/IP network-based system that provides for the transfer and management of information to and from the database, and among the various users and Web interfaces of the service. Its primary components include a Web server, database server, data acquisition server(s), backup/redundancy servers, and other associated components. A digital phone/voicemail system, for management incoming voice and data transmissions, is also part of this server system. All network data transfers are made through secure connections, with encryption, and accessed only by authorized personnel through a user login. Operations may also be conducted over a VPN (Virtual Private Network).

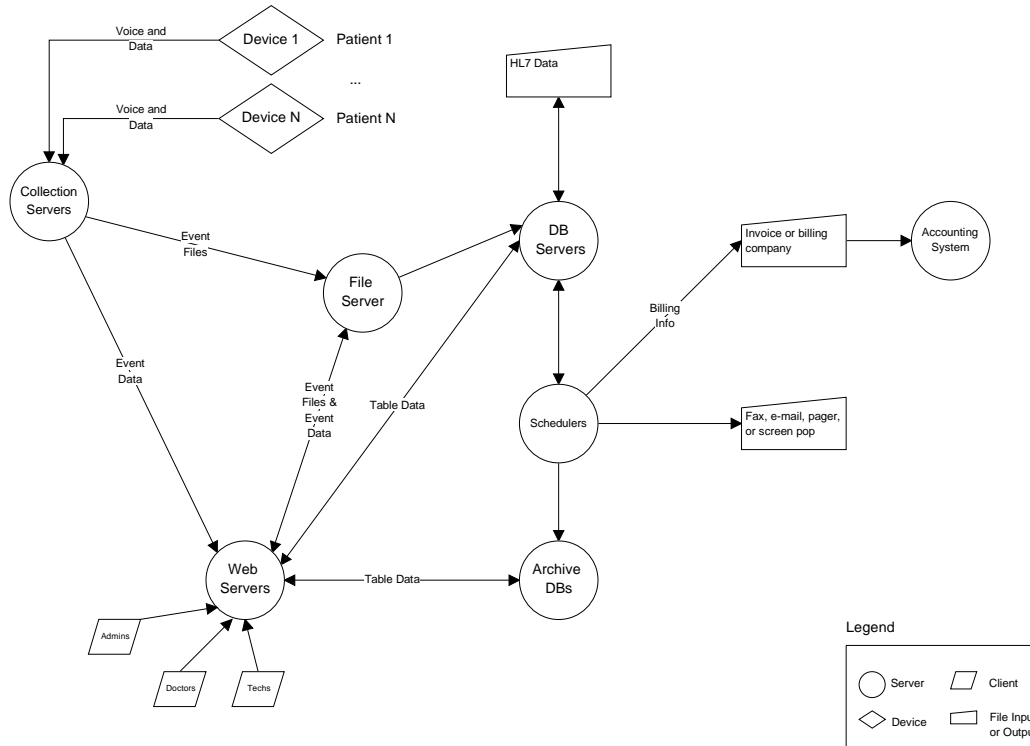


Figure 2: Illustration of the Server System

2. Database

The database contains all patient information, signal data, activity records, and other information associated with operation of a cardiac data management service (such as device inventory, billing status, scheduling, etc.). The system uses an Oracle database that allows for unlimited expansion as the number of users, types of data, and new clinical applications increases. Standard interfaces, including HL7, for the transfer of data to/from other information systems will be available.

3. Web Interface

The Web interface consists of all application Web pages through which users will interact with the system. It includes components to address the needs of all systems users – including physicians, service technicians and managers, patients, and technical support administrators. All users have a set of pages that are customized to their specific operational needs and access privileges. The Web interface was constructed using ColdFusion as a highly effective means to produce the dynamic, database-enabled Web application.

The Web interface also includes features for the display, viewing, and manipulation of patient signal data. Display of signal data through the Web browser was accomplished through the development of a JAVA applet that runs within the browser interface. This software is compatible with all up-to-date versions of standard Web-browsers.

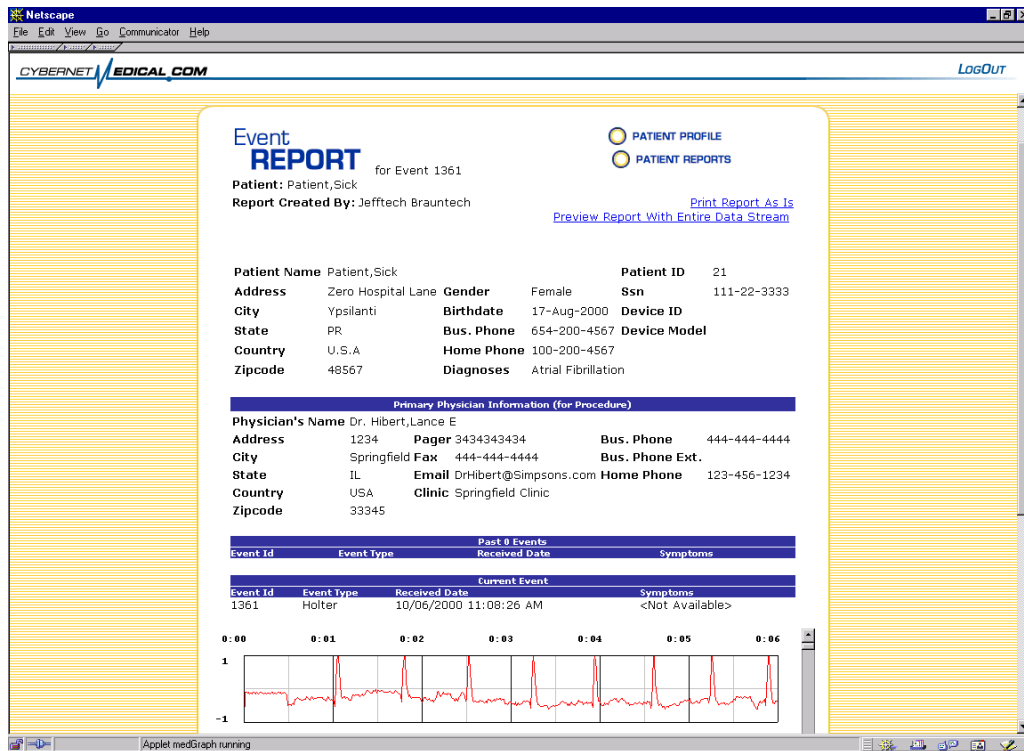


Figure 3: Web interface page, illustrating a sample patient report and signal data

4. Data Acquisition System

The data acquisition system includes one or more servers and the associated software for acquisition and decoding of cardiac data transferred from the patient. Currently this system supports acquisition of data over the phone from industry standard cardiac event recorders and pacemaker monitoring devices. It also supports acquisition of cardiac data from Cybernet Medical's wireless (cellular CDPD-based) event recorder device currently in pre-production development and evaluation. This system is readily expandable for the acquisition of additional signal types, through the development of additional software drivers that perform the required signal decoding.

The technology behind the Cybernet Medical System evolved from several years of research and development work that was focused on the design and implementation of distributed-network data collection systems. This work includes development of Cybernet's portable physiological measurement systems and Data Collection and Analysis Environment (DCAE) software, which were produced through government sponsored research and development contracts. The proprietary technology and knowledge gained through this work provides a strong technical foundation upon which to construct a more global medical data management system.