US 20030069751A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2003/0069751 A1

Lichtenstein et al. (43) Pub. Date: Apr. 10, 2003

(54) AT-HOME HEALTH DATA MANAGEMENT METHOD AND APPARATUS

(76) Inventors: **Eric Lichtenstein**, Dexter, MI (US); **Vincent Cruz**, Ann Arbor, MI (US); **Joseph Long**, Ypsilanti, MI (US); **Gary Siebert**, Dexter, MI (US); **Charles J. Jacobus**, Ann Arbor, MI (US)

Correspondence Address:
John G. Posa
Gifford, Krass, Groh, Sprinkle, Anderson & Citkowski, PC
280 N. Old Woodward Ave., Suite 400
Birmingham, MI 48009 (US)

(21) Appl. No.: **10/059,514**

(22) Filed: **Jan. 29, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/264,739, filed on Jan. 29, 2001.

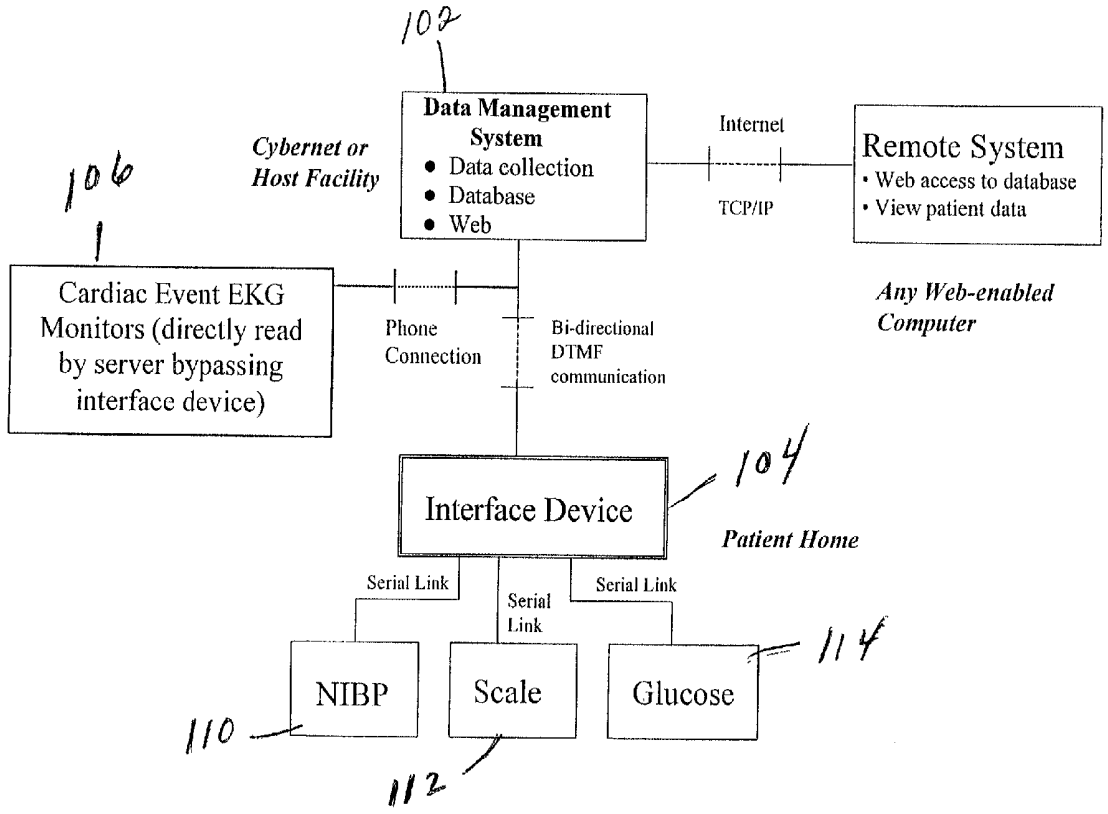
Publication Classification

(51) **Int. Cl.**[7] **G06F 17/60**

(52) **U.S. Cl.** **705/2**

(57) **ABSTRACT**

A system and methodology for the acquisition of medical data from multiple, at-home patient measurement devices transfers the data via telephone communications to a remotely accessed data management and display system such as a Web-based data management system. The measurement device, which supports two-way communications between the patient and the database system, is extensible to support multiple plug-in medical devices and devices for patient input or identification. Collection of data is mediated through an interface device that is connected via a digital link (serial, network, or digital RF link) to single or multiple patient measurement devices. This interface device is connected to a network via wide area network means including standard phone lines. In the preferred embodiment, data transfer is mediated through pervasive DTMF phone networks. Although DTMF is the preferred format, alternative analog or digital audio tone formats may be used. The device may therefore be equipped with auto-dialer, without necessarily requiring a full chipset modem, since the vast majority of home medical appliances are low data rate devices. In alternative embodiments, however, the connection may incorporate a modem for faster data transfer, modems for DSL, cable or RF network connections, and RF or various digital connections between the medical measurement devices and the communications device itself.



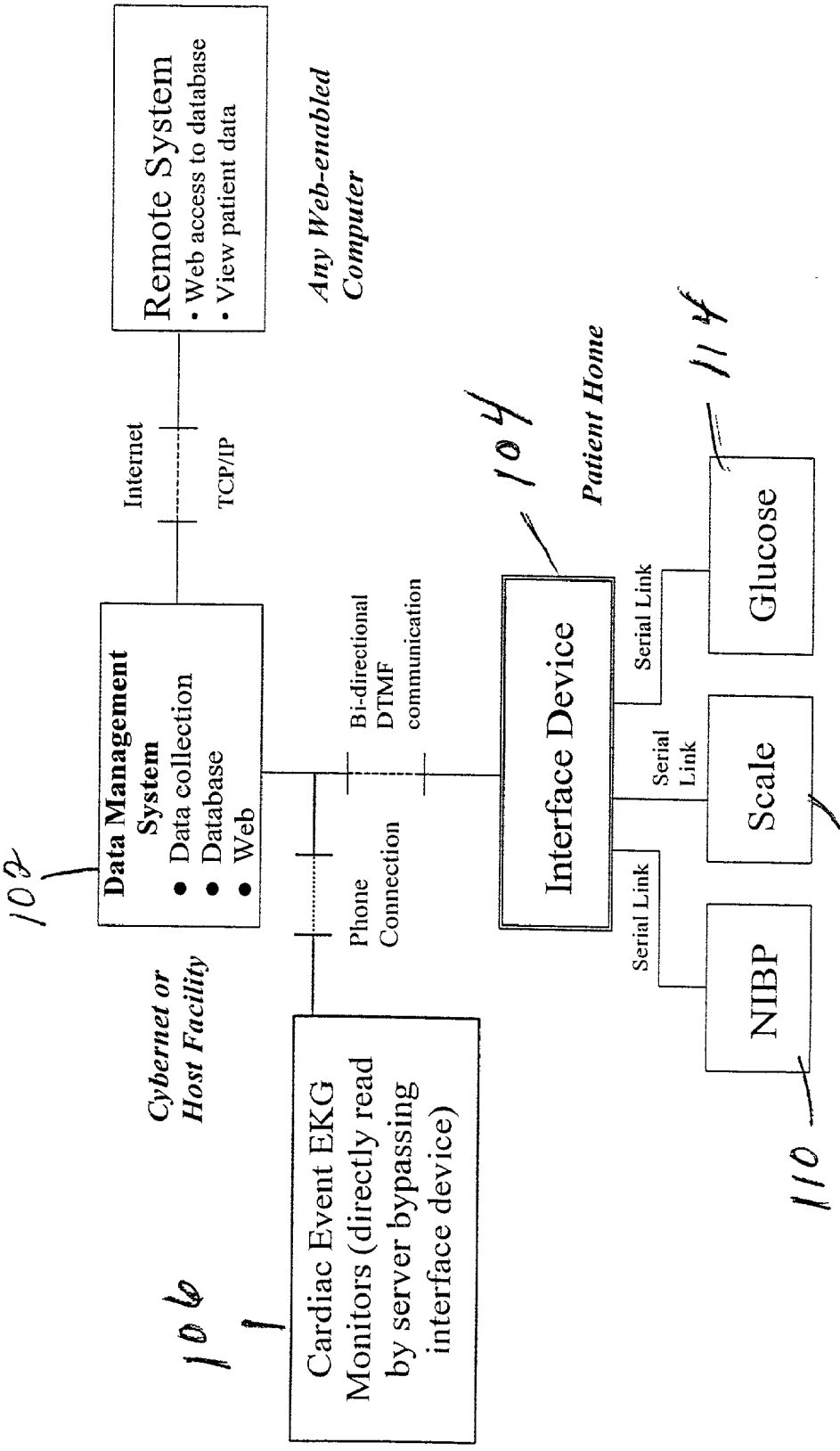

Remote System
• Web access to database
• View patient data
Any Web-enabled Computer
Internet
TCP/IP
Data Management System
• Data collection
• Database
• Web
Cybernet or Host Facility
Bi-directional DTMF communication
Phone Connection
Interface Device
Patient Home
Serial Link
Serial Link
Serial Link
Glucose
Scale
NIBP
Cardiac Event EKG Monitors (directly read by server bypassing interface device)
102
104
106
110
112
114

Figure 1

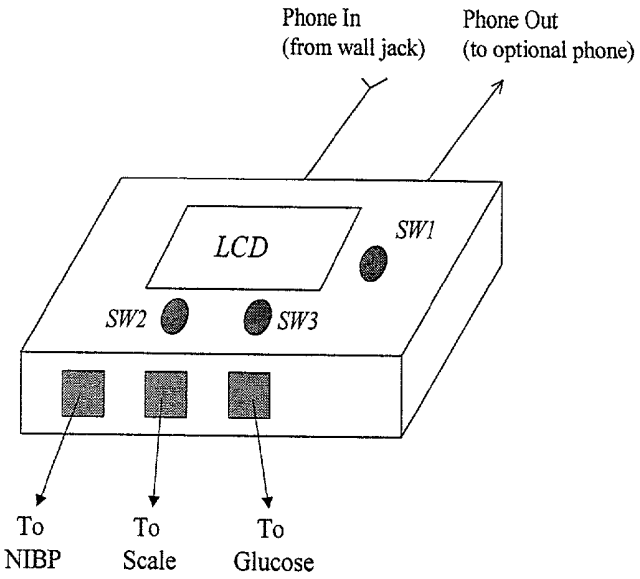


Figure 2

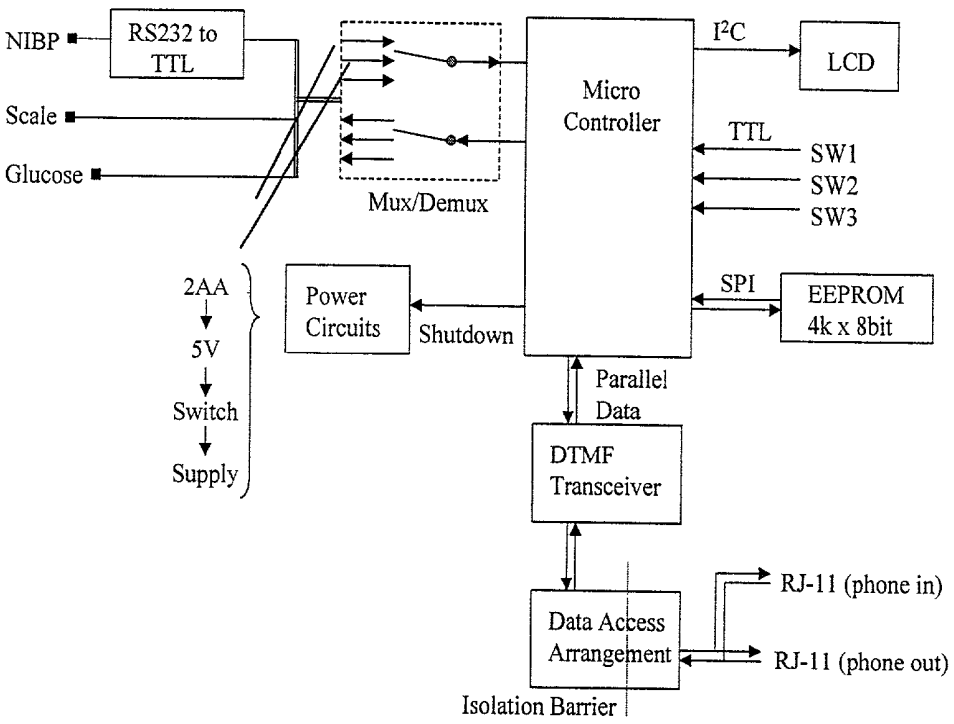


Figure 3

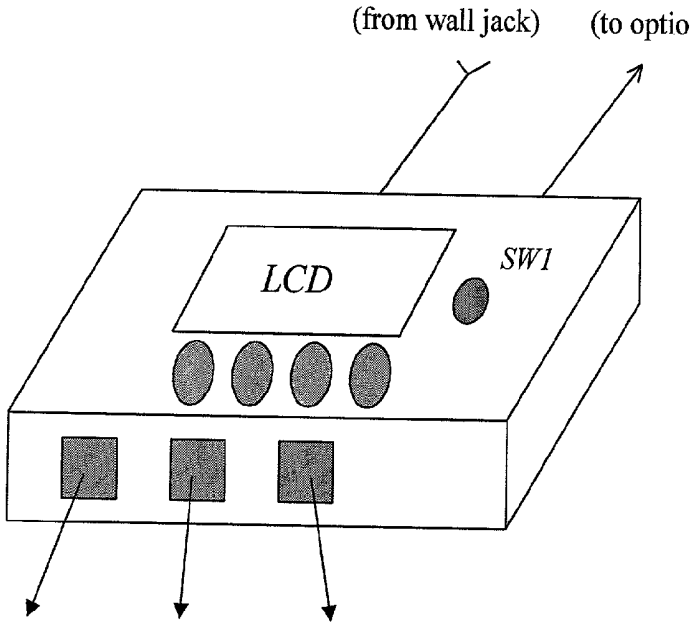


Figure 4

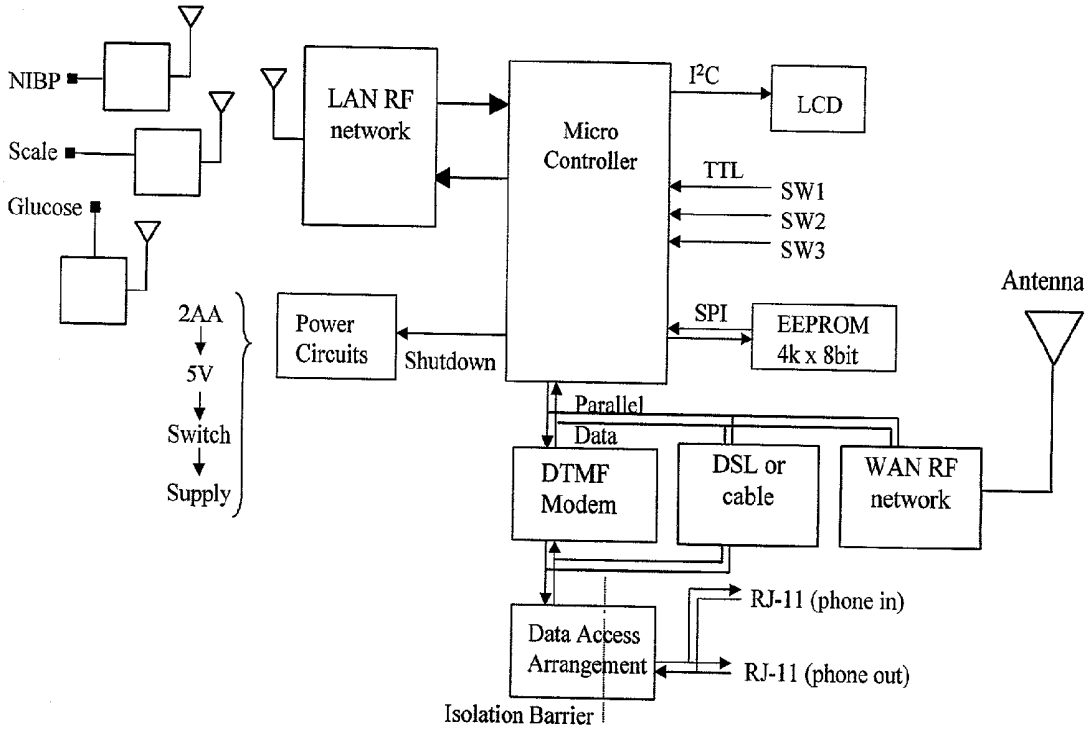


Figure 5

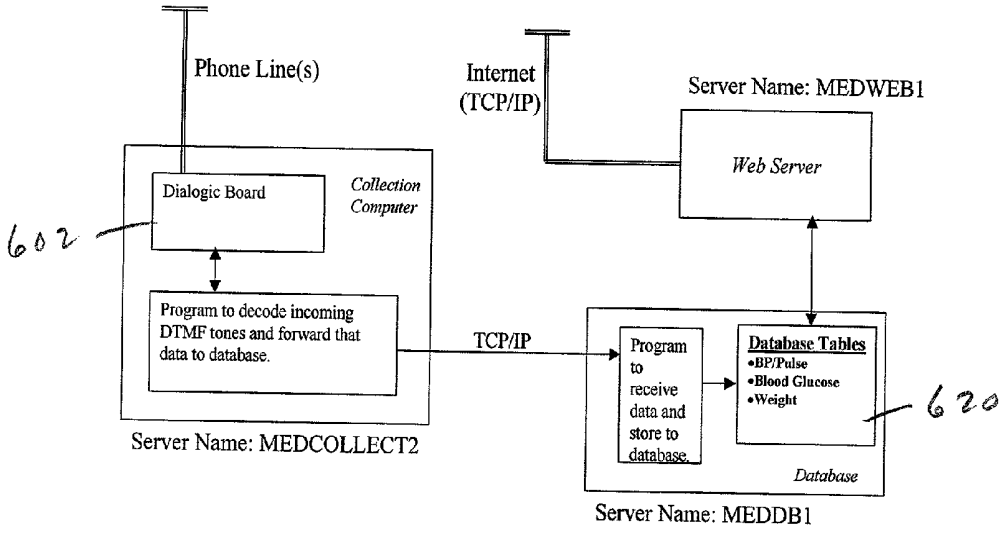

Phone Line(s)
Internet
(TCP/IP)
Server Name: MEDWEB1
Web Server
Dialogic Board
Collection
Computer
602
Program to decode incoming
DTMF tones and forward that
data to database.
TCP/IP
Program
to
receive
data and
store to
database.
Database Tables
•BP/Pulse
•Blood Glucose
•Weight
620
Database
Server Name: MEDCOLLECT2
Server Name: MEDDB1

Figure 6

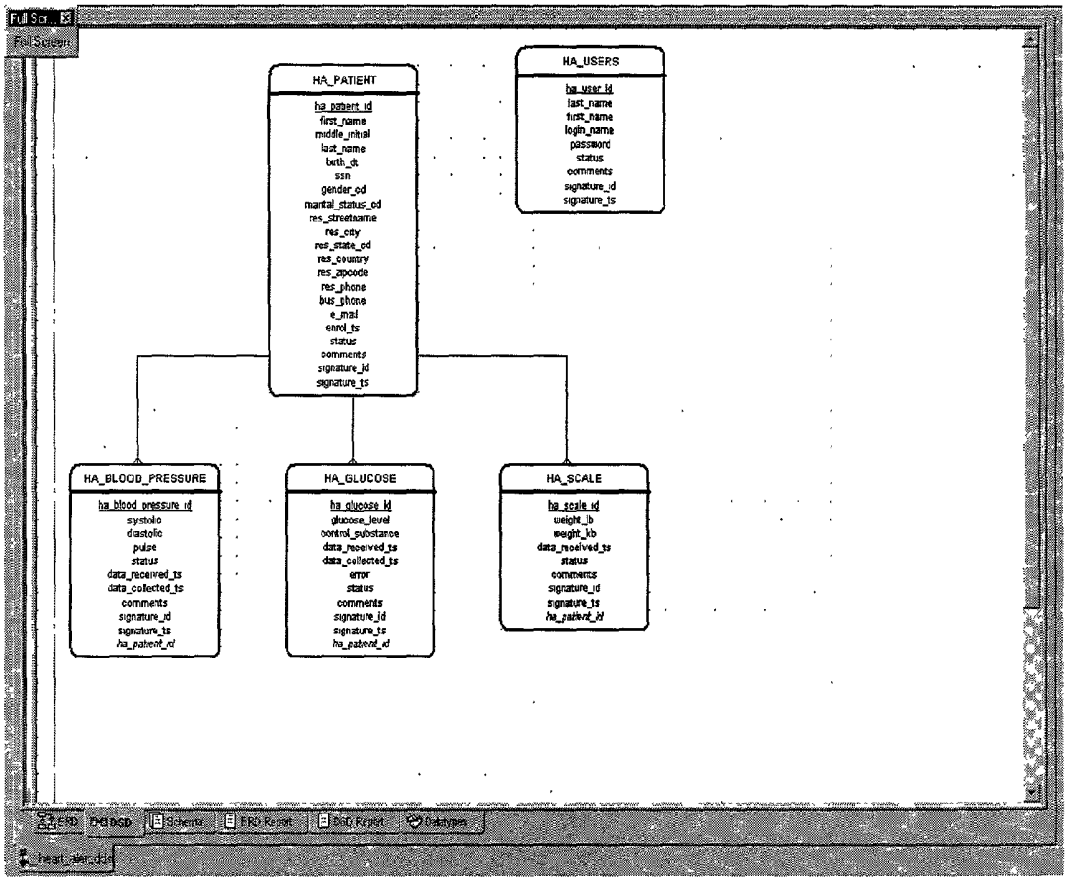

HA_PATIENT
ha_patient_id
first_name
middle_initial
last_name
birth_dt
ssn
gender_cd
marital_status_cd
res_streetname
res_city
res_state_cd
res_country
res_zipcode
res_phone
bus_phone
e_mail
enrol_ts
status
comments
signature_id
signature_ts
HA_USERS
ha_user_id
last_name
first_name
login_name
password
status
comments
signature_id
signature_ts
HA_BLOOD_PRESSURE
ha_blood_pressure_id
systolic
diastolic
pulse
status
data_received_ts
data_collected_ts
comments
signature_id
signature_ts
ha_patient_id
HA_GLUCOSE
ha_glucose_id
glucose_level
control_substance
data_received_ts
data_collected_ts
error
status
comments
signature_id
signature_ts
ha_patient_id
HA_SCALE
ha_scale_id
weight_lb
weight_kb
data_received_ts
status
comments
signature_id
signature_ts
ha_patient_id

Figure 7

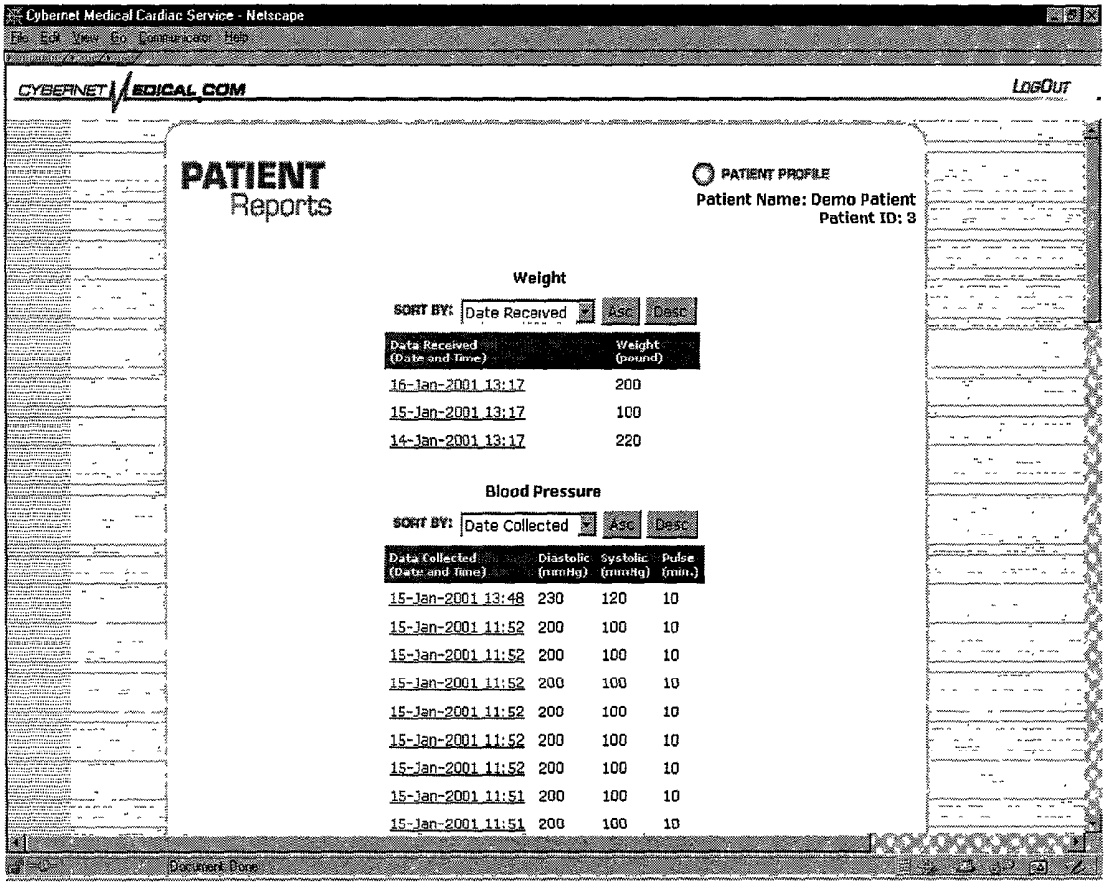

Cybernet Medical Cardiac Service - Netscape
File Edit View Go Communicator Help
CYBERNET MEDICAL.COM
LOGOUT
PATIENT
Reports
PATIENT PROFILE
Patient Name: Demo Patient
Patient ID: 3
Weight
SORT BY: Date Received Asc Desc
Data Received (Date and Time) Weight (pound)
16-Jan-2001 13:17 200
15-Jan-2001 13:17 100
14-Jan-2001 13:17 220
Blood Pressure
SORT BY: Date Collected Asc Desc
Data Collected (Date and Time) Diastolic (mmHg) Systolic (mmHg) Pulse (min.)
15-Jan-2001 13:48 230 120 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:51 200 100 10
15-Jan-2001 11:51 200 100 10
Document Done

Figure 8

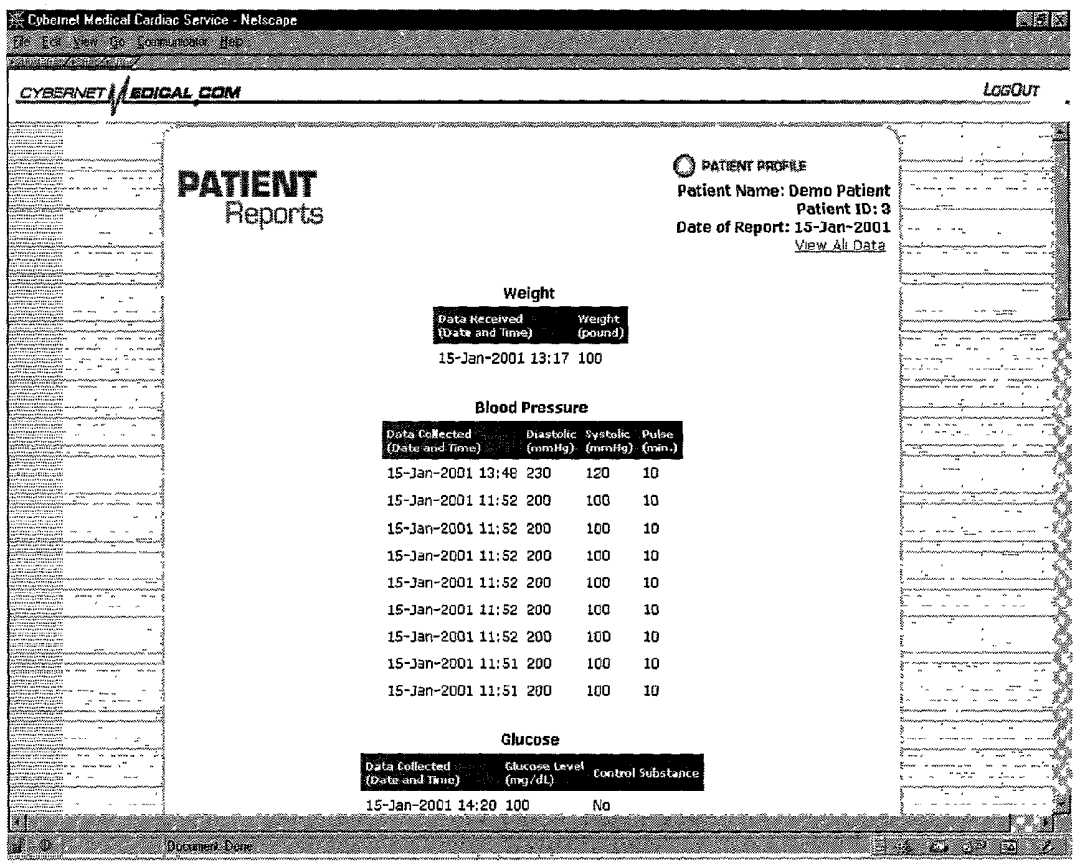

Cybernet Medical Cardiac Service - Netscape
File Edit View Go Communicator Help
CYBERNET MEDICAL.COM
LOGOUT
PATIENT
Reports
PATIENT PROFILE
Patient Name: Demo Patient
Patient ID: 3
Date of Report: 15-Jan-2001
View All Data
Weight
Data Received (Date and Time)
Weight (pound)
15-Jan-2001 13:17 100
Blood Pressure
Data Collected (Date and Time)
Diastolic (mmHg)
Systolic (mmHg)
Pulse (min.)
15-Jan-2001 13:48 230 120 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:52 200 100 10
15-Jan-2001 11:51 200 100 10
15-Jan-2001 11:51 200 100 10
Glucose
Data Collected (Date and Time)
Glucose Level (mg/dL)
Control Substance
15-Jan-2001 14:20 100 No
Document Done

Figure 9

AT-HOME HEALTH DATA MANAGEMENT METHOD AND APPARATUS

REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from U.S. Provisional Patent Application Serial No. 60/264,739, filed Jan. 29, 2001, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] This invention relates generally to medical data management and, in particular, to a system and methodology for the acquisition of medical data from multiple, at-home patient measurement devices, including the transfer of such data via standard telephone or wired/wireless network communications to a remotely accessed data management and display system accessible via a global computer network.

BACKGROUND OF THE INVENTION

[0003] There are numerous medical devices that afford patients the ability to take physiological measurements in the home. Patients with certain disease states, such as heart failure, diabetes, etc., are likely to own and use more than one of these medical appliances. These appliances include, home blood pressure cuffs, blood glucose monitors, and weight scales. The devices provide information such as systolic and diastolic pressure, pulse rate, blood glucose levels, and patient weight.

[0004] The consumer market and associated technologies associated with such devices have been maturing steadily for the past several years, and now many of these appliances include communication ports and software to connect them to a personal computer. As a result, there is now an opportunity to collect information from multiple home medical devices, and then present that information to both the patients and their health care providers via the World Wide Web (WWW). However, this cannot be easily carried out with current technologies for several reasons.

[0005] 1. There is currently no standard for home medical appliance data and communication protocols. Individual appliances vary greatly in this respect, even appliances produced by the same manufacturer. Without a standard, it is very difficult to unify the information. A patient may have to have several different cables to connect to his or her PC to each appliance, and must run completely different software to communicate with each.

[0006] 2. For many patients, there is a cost barrier to set up such a system. Many elderly and low-income patients cannot afford the purchase of a PC to download and store the information from these appliances. However, healthcare providers are beginning to recognize the potential benefit of this technology for preventative medicine that can ultimately reduce healthcare costs.

[0007] 3. Even if the information is successfully gathered by the patient, it currently cannot made available to their healthcare providers in a clear, concise format.

[0008] Thus, there remains a need for an interface device to directly connect at home medical appliances to a telephone line, without a PC, for transfer to a Web-based data management system.

SUMMARY OF THE INVENTION

[0009] This invention presents a device, system, and methodology for the acquisition of data from multiple at-home patient measurement devices, and the transfer of this data via telephone or alternative digital network communications to a remotely accessed data management and display system which is preferably Web-based. Collection of data is mediated through an interface device connected via a digital link (serial, network, or digital RF link) to single or multiple patient measurement devices. For data transfer, this interface device is connected to a network via wide-area network over standard phone lines, modem or DSL.

[0010] In the preferred embodiment, the interface device automatically dials directly into a data collection server at a data management site. The data management site possesses both Database and Remote Display Server (which include Web-based) systems that provide for storage of patient records and data, and allow for access to the data by authorized users through any Web or Viewer-enabled computer. The interface device includes support for two-way communications between the patient and the database system and is extensible to support multiple plug-in medical devices and devices for patient input or identification.

[0011] Also in the preferred embodiment, data transfer is mediated through pervasive DTMF phone networks. Although DTMF is the preferred format, alternative analog or digital audio tone formats may be used. The device may therefore be equipped with auto-dialer, without necessarily requiring a full chipset modem, since the vast majority of home medical appliances are low data rate devices. In alternative embodiments, however, the connection may incorporate a modem for faster data transfer, modems for DSL, cable or RF network connections, and RF or various digital connections between the medical measurement devices and the communications device itself.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] **FIG. 1** illustrates an application according to the invention involving non-invasive blood pressure (NIBP), weight measurement, and glucose measurement as the patient measurements;

[0013] **FIG. 2** illustrates an external form for the interface device;

[0014] **FIG. 3** is a functional block diagram for the interface device electronics;

[0015] **FIG. 4** depicts a unit having a larger screen and additional keys for two-way patient communications;

[0016] **FIG. 5** shows an embodiment incorporating wireless access to measurement devices and multiple WAN network access;

[0017] **FIG. 6** illustrates a server system for acquisition and data management;

[0018] **FIG. 7** illustrates a database model of new tables required;

[0019] **FIG. 8** illustrates a web interface full report; and

[0020] **FIG. 9** illustrates a web interface daily report.

DETAILED DESCRIPTION OF THE INVENTION

[0021] **FIG. 1** illustrates in block-diagram form a preferred embodiment of the invention. Note that the data management system **102** can support other devices which do not require the Interface Device **104**, such as EKG unit **106**.

In addition, different configurations can support medical measurements other than Non-Invasive Blood Pressure (NIBP) **110**, Scale **112**, and Glucose Measurement Unit **114**.

[**0022**] Also, the connection between the Interface Device **104** and the Data Management System **102** can be through other means, such as DSL, cable modem, T1, RF wireless network, and the connection from the measurement units may be also through alternative digital connections such as 802.11b (RF network), USB (alternative wired digital connections), and so forth.

[**0023**] The following outlines the preferred requirements for the device and system operation:

[**0024**] The device interface should be designed to connect to multiple low-data-rate at-home medical devices.

[**0025**] The architecture should be configurable to allow for the use of different manufactures medical devices.

[**0026**] The system must provide an easy-to-use interface for the patient.

[**0027**] The cables that connect it to the devices should to be color-coded and/or use dissimilar connectors to prevent improper connections.

[**0028**] Each Interface Device should have an electronic serial number for identification of the patient. To support multiple patients, this might include connection to a patient input or ID system.

[**0029**] At least the Interface Device should be relatively small in physical size (suitable for unobtrusive desktop placement).

[**0030**] Each Interface Device should have independent battery power.

[**0031**] The phone interface should connect to any standard network connection supported (such as RJ-11 phone connector for phone connection).

[**0032**] The system needs to operate in any time zone.

[**0033**] The system should accommodate network address programming (such as prefix (or other custom) dialing requirements for phone).

[**0034**] The physical packaging of the Interface Device should be durable and water resistant.

[**0035**] The Interface Device should be inexpensive enough for general consumer use.

[**0036**] The patient should not be required to do any configuring or programming.

[**0037**] The Interface Device may incorporate a means for patient self-reporting of information through keys or other means.

[**0038**] Any text displayed must be of large enough size for elderly patients viewing.

[**0039**] The Interface Device should store data from the device readings until successfully transferred.

[**0040**] The system should report the time and date of the data measurements.

[**0041**] The system should receive the necessary regulatory approvals and meet relevant industry standards.

[**0042**] Each Interface Device should be able to communicate with a remote data storage and management system.

[**0043**] An effective remote viewing interface (such as Web interface) should be available for display of the measured data.

[**0044**] Measurement Devices

[**0045**] Following are three examples of at-home measurement devices that possess serial communications ports for interface to the Interface Device. Any other device, preferably with serial output, may similarly be used.

1. Non-Invasive Blood Pressure (NIBP)

Manufacturer:	A&D Medical
Model:	UA-767PC
Outputs:	Systolic Pressure (mmHg) Diastolic Pressure (mmHg) Pulse Rate (per minute) Measurement Time and Date

2. Weight Scale

Manufacturer:	A&D Medical
Model:	UC300
Outputs:	Weight (lbs. or kg. depending on specific device purchased)

3. Glucose Measurement

Manufacturer:	Lifescan
Model:	Surestep RS232
Outputs:	Glucose (mg/dL or mmol/L, selectable) Measurement Time and Date

[**0046**] The following tables summarize the characteristics of each measurement device, as relevant to performing and transferring measurements to our interface device:

	Data requested from device?	Data pushed from device?	Remote power-up?	Start collection remotely?	Has Device ID?	Data format	Different data forms	Has time stamp?	Serial Protocol	Baud Rate
NIBP	Y	N	Y	Y	Y/N[1]	ascii/hex	N	Y	RS232	9600
Scale	N	Y	Y	Y	N	ascii	Y/N[3]	N	TTL	2400
Glucose	Y	N	N	Y[2]	Y	ascii	Y[4]	Y	TTL	9600

[1]Device is not preprogrammed with ID, but an ID may be written to the device and later retrieved.
[2]Device must be already powered-up (cannot remote power-up)
[3]Two different models of the device exist: one that outputs results in pounds, the other in kilograms
[4]The device may be configured for different data and time formats, as well as glucose result in mg/dL or mmol/L

[0047] The Interface Device

[0048] **FIG. 2** is a simplified drawing of an Interface Device according to the invention. The preferred characteristics are as follows:

Approximate/Target Specifications:	
Size:	2¾" × 3½" × ¾"
Weight:	0.25 lbs.
Battery:	2 AA
Power Duration:	100–200 hours
LCD Display:	
Text:	2 lines × 12 characters
Symbols:	Low battery Phone Connect Data Transfer in progress Recording Data

[0049] Alarm/Error

[0050] Phone Interface:

[0051] Two RJ-11 connectors (for feedthrough)

[0052] Auto-dial operation

[0053] Bi-directional DTMF communication

[0054] **FIG. 3** is a functional block diagram depicting Interface Device electronics. In terms of alternative embodiments, **FIG. 4** shows a unit that has a larger screen and additional input buttons to support two-way question and symptom reporting by the patient. **FIG. 5** shows a unit that uses wireless means to communicate with each medical device and multiple means for connecting to a network that provides access to the database and web server plant.

[0055] Operational Overview

[0056] The following description outlines how the device is used by the patient and the process for measurement and transfer of data:

[0057] Patient receives devices from their healthcare provider(s) including:

[0058] One Data Interface device

[0059] One or more of: NIBP, Scale and Glucose Measurement.

[0060] The Interface Device and remain in the home with the scale device attached thereto. The Glucose and NIBP devices, on the other hand, may be disconnected from the Interface Device, with measurements being taken throughout the day in the patient's normal environment.

[0061] 1. At (roughly) the same time each day, the patient connects all devices to the Cybernet device initiates the transfer process using interface buttons on the Cybernet device.

[0062] 2. Directions on the Cybernet device guide the patient through the transfer process, as follows:

[0063] a. If a scale device is present, the patient steps on the scale for a measurement. The scale output is transferred to the Interface Device.

[0064] b. If a NIBP device is present, the patient may take a measurement, if desired. All stored measurements on the NIBP device are then transferred to the Interface device. Data is preferably erased on the NIBP device once successful transfer is confirmed.

[0065] c. If a glucose device is present, the patient powers up the glucose device and may take a measurement if desired. All stored measurements on the glucose device are then transferred to the Interface Device. Again, data is preferably erased on the glucose device once successful transfer is confirmed.

[0066] 3. After receipt of data from each measurement device, the Interface Device automatically dials the number of the Data Management System (**102** in **FIG. 1**).

[0067] 4. If connection cannot be made, the Interface Device will wait for a predetermined period of time and then try to connect again. The device will attempt a number of times and then give up until the next day when the patient initiates transfer again.

[0068] 5. Once phone connection to the Data Management System is established, the Interface Device transfers all collected data via DTMF tone communication.

[0069] 6. If an error occurs during transmission of the data the Interface Device will reconnect (if required) and send the data again. Methods employed to account for continued errors will include reduction of the DTMF data rate, and phone line connection.

[0070] 7. Once successful transfer of the data has been confirmed, the Interface Device will delete the data and return to power-down mode.

[0071] Data Acquisition and Management Processes

[0072] **FIG. 6** presents preferred server system requirements for acquisition and management of the patient data.

[0073] Outline of the Data Collection Process:

[0074] 1. Incoming phone call is received by phone interface card.

[0075] 2. Phone interface card sends tone to calling system (the interface device) to let it know that we're ready to receive incoming data.

[0076] 3. Data is sent via DTMF decoding of HEX values.

[0077] • Two DTMF tones will represent one byte of data.

[0078] ○ Tone 1

[0079] ■ Upper 4 bits.

[0080] ○ Tone 2

[0081] ■ Lower 4 bits.

[0082] • See packet and communication descriptions that follow this outline

[0083] • receipt of each packet verification of correct receipt will be done via DTMF tone back to serial-to-DTMF translation device.

[0084] ○ 0—Check sum invalid. Resend data.

[0085] ○ 1—Check sum verified.

[0086] 4. Once data transfer has been verified the data is then decoded and sent to the database **620** where it is stored in the appropriate table based on the type of data that it is. Each device type will send data to a different table.

[0087] 5. After confirmation that data has been stored in the database, a confirmation message is sent to the Interface Device which results in deletion of the data on the device

Packet Description:

Disc.	Packet Version	Device Type	Data	Check Sum
Size[5]	1	1	N	2

- Packet Version-1 Nibble
  - The first nibble sent describes the packet type to follow. It may have the following values:
    - 1 -Version 1 data packets.
    - 2-F -Future Use
- Device Type-1 Nibble
  - This is used to describe the data type to follow. The originating device is used to determine what information is contained and how big the data packet is going to be. All packet sizes are preferably fixed.
    - 0 -Device Information
    - 1 -UA-767PC A&D Medical Blood Pressure Cuff
    - 2 -Lifescan Sure Step Blood Glucose Monitor
    - 3 -UC-300 A&D Medical Scale
    - 4-F -Future use by other measurement or patient ID/input devices
- Data-n Bytes
  - This part of the packet contains the data that's being transferred. Its size varies with the different data types. The packet descriptions are described in further detail below.
- Check Sum-1 Byte
  - The check sum is the summation of all nibbles in the packet. It is a one byte HEX value representing the lower byte of the summation and used for error checking on the server side to verify that the entire packet was received correctly over the telephone line.

Data Packet Specifications:

Disc.	P	T	Model Number	Serial Number	Check Sum
Size	1	1	4	12	2
Sample[6]	1	0	0x0001	123456789012	0x32

- 0-Device Information
  - 8 Bytes-Hex Values
    - 4 Nibbles -Model Number (HEX)
    - 12 Nibbles -Serial Number (BCD)

Disc.	P	T	Year	Month	Day	Hour	Min.	Sy-Di	Dia	Pulse	Check Sum
Size	1	1	2	2	2	2	2	2	2	2	2
Sample	1	1	01	01	16	15	35	0x12	0x34	0x45	0xCC

- 1-UA-767PC A&D Medical Blood Pressure Cuff
  - 8 Bytes-Hex Values
    - 2 Nibbles -Year (BCD) (Years since 1900)
    - 2 Nibbles -Month (BCD)
    - 2 Nibbles -Day (BCD)
    - 2 Nibbles -Hour (BCD) (24 Hour Clock)
    - 2 Nibbles -Minute (BCD)
    - 2 Nibbles -Systolic less Diastolic (HEX)
    - 2 Nibbles -Diastolic (HEX)
    - 2 Nibbles -Pulse (HEX)

Disc.	P	T	Year	Month	Day	Hour	Min.	State	Reading	Check Sum
Size	1	1	2	2	2	2	2	1	3	2
Sample	1	2	01	01	16	15	35	0000b	500	0xCC

- 2-Lifescan Sure Step Blood Glucose Monitor
  - 7 Bytes-
    - 2 Nibble -Year (BCD) (2 digit value)
    - 2 Nibble -Month (BCD)

-continued

■ 2 Nibble -Day (BCD)
■ 2 Nibble -Hour (BCD)
■ 2 Nibble -Minute (BCD)
■ 1 Nibble -State (BIT)
● Bit 3-Calibration (1-Yes, 0-No)
● Bit 2-Error (1-Yes, 0-No)
● Bit 1-Check sum error (1-Yes, 0-No)
● Bit 0-HIGH (1-Yes, 0-No)
■ 3 Nibble -Reading (HEX)

Disc.	P	T	Year	Month	Day	Hour	Min.	Param	Weight	Check Sum
Size	1	1	2	2	2	2	2	1	5	2
Sample	1	3	01	01	16	15	35	0000b	01250	0xCC

○ 3-UC-300 A&D Medical Scale
○ 8 Bytes-
■ 2 Nibble -Year (BCD) (2 digit value)
■ 2 Nibble -Month (BCD)
■ 2 Nibble -Day (BCD)
■ 2 Nibble -Hour (BCD)
■ 2 Nibble -Minute (BCD)
■ 1 Nibble -Reading Parameters
● Bit 3-Future Use
● Bit 2-Weight Type (1-OL, 0-ST)
● Bit 1-Sign of Reading (1-"−", 0-"+")
● Bit 0-Weight Unit (1-kg, 0-lb)
■ 5 Nibbles -Weight Value (BCD)

[5]Sizes = Number of Nibbles (4 bits)
[6]Samples have the following format. #-BGD, 0xXX-Hex value, XXXXb-Binary nibble

[0088] Communication Specifications:

DTMF Tones Conversion Chart for Incoming Server Messages

PIC Value			Register	Incoming Tone	Actual Value
0	0	0	0	D	0
0	0	0	1	1	1
0	0	1	0	2	2
0	0	1	1	3	3
0	1	0	0	4	4
0	1	0	1	5	5
0	1	1	0	6	6
0	1	1	1	7	7
1	0	0	0	8	8
1	0	0	1	9	9
1	0	1	0	0	A
1	0	1	1	*	B
1	1	0	0	#	C
1	1	0	1	A	D
1	1	1	0	B	E
1	1	1	1	C	F

[0089] • Server Handshaking Protocols—

[0090] ○½ second wait after each response before device starts continues.

[0091] ■ Ready to Receive—"AB"

[0092] ■ Packet ACK (Acknowledge)—"AB"

[0093] Packet NACK (No Acknowledge—Error checksum etc.)—"CD"

[0094] • After initial connection Client waits up to 3 sec for server to send Ready to Receive. Client then sends a Device Information Packet. Waits 1 second for Packet ACK or NACK. If no ACK or NACK then client hangs up and tries dials again. If ACK received client begins sending data packets. If NACK client sends Device Information Packet again. If NACK again client increases inter digit delay and retransmits Device Information Packet. Continue to increase inter-digit delay until ACK or max delay limit is reached.

[0095] Estimate of Data Transfer Time (Phone DTMF Messaging):

[0096] Data Collection Assumptions:

[0097] 1 NIBP reading per day

[0098] 1 Scale reading per day

[0099] 5 glucose readings per day

[0100] Data is preferably transferred once per day

[0101] Approximate Data Sizes (# of ASCII Words) for Each Data Component:

Header:	10 =	10 words
NIBP:	10 =	10 words
Scale:	10 =	10 words
Glucose:	7 / reading + 2 =	45 words
Words to be transferred for acquired data =		75 words

[0102] Given DTMF Transfer rate=200 mSec for Each Word:

= 15 seconds for data
+ 5 seconds for handshaking responses (Five 1-second responses)
⇒20 seconds total transfer time

*excludes dialing and connection time, and assumes no errors/retry

[0103] Other Transmission Interfaces

[0104] Communications through other digital transmission interfaces like DSL, wireless network, or Ethernet will code data packets in format comparable to those described in the last section; however, the packet transmission means used for Internet-compatible networks includes its own packet timing, sequencing, and acknowledgement procedures which are documented in the various RFIs describing Internet and Internet protocol operations.

[0105] Database Requirements

[0106] Initially an existing SQL database will be implemented along with additional tables to manage the data from the new device. **FIG. 7** presents additional tables that may be required. Storage means through flat files or other databases is an alternative.

[0107] Web Interface

[0108] In the preferred embodiment, a simple web interface has been developed that allows a user to logon and view all data (NIBP, weight, and glucose) that has been transferred from the interface device. Viewing systems which provide remote access to the data but which are not strictly connectionless or Web-based can be alternative implementations. **FIGS. 8 and 9** illustrate the envisioned form for these pages.

We claim:

1. A medical data collection and management system, comprising:

a) one or more physiological measurement units, each outputting medical data;

b) an electronic interface device, including:

one or more inputs, each operative to receive medical data from a respective one of the physiological measurement units, and

an interface for transferring the medical data over a telephone or digital network; and

c) a data management system, including:

an input for receiving the medical data from the electronic interface device,

a database for storing the medical data, and

an interface enabling the medical data to be viewed over a wide-area network.

2. The medical data collection and management system of claim 1, wherein the medical data is transferred via a dual-tone, multi-frequency (DTMF) format.

3. The medical data collection and management system of claim 1, wherein the digital network, the wide-area network, or both, comprise the Internet.

4. The medical data collection and management system of claim 1, including physiological measurement units associated with one or more of the following:

non-invasive blood pressure (NIBP),

weight measurement, and

glucose measurement.

5. The medical data collection and management system of claim 1, wherein the medical data are accessed from the database using an Internet protocol.

6. The medical data collection and management system of claim 1, wherein at least the electronic interface device is a portable unit adapted for in-home use.

7. The medical data collection and management system of claim 1, further including a monitor operative to collect and route medical data directly to the data management system, effectively bypassing the electronic interface device.

8. The medical data collection and management system of claim 1, further including a wireless interface between the electronic interface device and the telephone or digital network.

9. The medical data collection and management system of claim 1, further including a wireless interface between at least one of the physiological measurement units and the electronic interface device.

10. The medical data collection and management system of claim 1, further including a color-coded or physically different hardwired interface between at least one of the physiological measurement units and the electronic interface device to prevent misconnection.

11. A method of gathering and managing medical data, comprising the steps of:

receiving medical data at an electronic interface device from one or more physiological measurement units;

transferring the medical data to a data management system over a telephone or digital network; and

formatting the data at the data management system for viewing over a wide-area network.

12. The method of claim 11, wherein the step of transferring the medical data includes the use of a dual-tome, multi-frequency format.

13. The method of claim 11, wherein the digital network, the wide-area network, or both, comprise the Internet.

14. The method of claim 11, wherein the medical data includes one or more of the following:

non-invasive blood pressure (NIBP),

weight measurement, and

glucose measurement.

15. The method of claim 11, further including the step of storing the medical data in a database which is accessed for viewing.

16. The method of claim 11, further including the step of collecting and routing the medical data directly to the data management system, thereby bypassing the electronic interface device.

17. The method of claim 16, wherein the medical data bypassing the electronic interface device comprises EKG data.

18. The method of claim 16, wherein the medical data bypassing the electronic interface device originates from a medical practice, laboratory, or hospital.

19. A medical data collection and management system, comprising:

a) a plurality of physiological measurement units, each outputting a different form of medical data;

b) a plurality of portable, electronic interface devices, each adapted for in-home use, each device including:

a plurality of inputs, each operative to receive medical data from a respective one of the physiological measurement units, and

an interface for communicating the medical data in audio tone form over a standard telephone network; and

c) a data management system, including:

an input for receiving the audio tones from the various electronic interface devices,

a database for storing the medical data received from the electronic interface devices, and

an interface enabling the medical data to be viewed over a wide-area network.

20. The medical data collection and management system of claim 19, wherein the audio tones generated by the interface devices conform to a dual-tone, multi-frequency (DTMF) format.

21. The medical data collection and management system of claim 19, wherein the wide-area network is the Internet.

22. The medical data collection and management system of claim 19, including physiological measurement units associated with one or more of the following:

non-invasive blood pressure (NIBP),

weight measurement, and

glucose measurement.

23. The medical data collection and management system of claim 19, wherein the medical data are stored in the database using an Internet protocol.

24. The medical data collection and management system of claim 19, wherein at least the electronic interface device is a portable unit adapted for in-home use.

25. The medical data collection and management system of claim 19, further including one or more monitors operative to collect and route medical data directly to the data management system, bypassing the electronic interface device.

26. The medical data collection and management system of claim 19, further including a wireless interface between the electronic interface device and the standard telephone network.

27. The medical data collection and management system of claim 19, further including a wireless interface between at least one of the physiological measurement units and the electronic interface device.

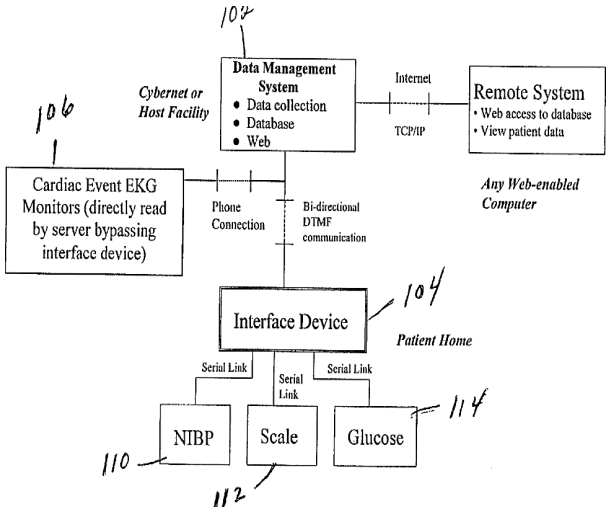
28. The medical data collection and management system of claim 19, further including a color-coded or physically different hardwired interface between at least one of the physiological measurement units and the electronic interface device to prevent misconnection.

* * * * *

专利名称(译)	家庭健康数据管理方法和装置		
公开(公告)号	US20030069751A1	公开(公告)日	2003-04-10
申请号	US10/059514	申请日	2002-01-29
[标]申请(专利权)人(译)	LICHTENSTEIN ERIC CRUZ VINCENT 长约瑟夫 SIEBERT GARY 雅克布斯CHARLESĴ		
申请(专利权)人(译)	LICHTENSTEIN ERIC CRUZ VINCENT 长约瑟夫 SIEBERT GARY 雅各布斯·查尔斯J.		
当前申请(专利权)人(译)	LICHTENSTEIN ERIC CRUZ VINCENT 长约瑟夫 SIEBERT GARY 雅各布斯·查尔斯J.		
[标]发明人	LICHTENSTEIN ERIC CRUZ VINCENT LONG JOSEPH SIEBERT GARY JACOBUS CHARLES J		
发明人	LICHTENSTEIN, ERIC CRUZ, VINCENT LONG, JOSEPH SIEBERT, GARY JACOBUS, CHARLES J.		
IPC分类号	A61B5/00 G06F19/00 G06F17/60		
CPC分类号	A61B5/0006 G06F19/322 G06F19/3406 Y10S128/904 G06Q50/22 Y10S128/92 Y10S128/903 G06F19/3418 G16H10/60 G16H40/63 G16H40/67		
优先权	60/264739 2001-01-29 US		
其他公开文献	US6723046		
外部链接	Espacenet USPTO		

摘要(译)

用于从多个家庭中的患者测量装置获取医疗数据的系统和方法通过电话通信将数据传送到远程访问的数据管理和显示系统，例如基于Web的数据管理系统。支持患者和数据库系统之间的双向通信的测量设备是可扩展的，以支持多个插入式医疗设备和用于患者输入或识别的设备。数据收集通过接口设备调解，该接口设备通过数字链路（串行，网络或数字RF链路）连接到单个或多个患者测量设备。该接口设备通过包括标准电话线的广域网装置连接到网络。在优选实施例中，数据传输是通过普遍的DTMF电话网络来调节的。虽然DTMF是首选格式，但可以使用替代的模拟或数字音频格式。因此，该设备可以配备自动拨号器，而不需要全芯片组调制解调器，因为绝大多数家用医疗设备是低数据速率设备。然而，在替换实施例中，连接可以包括用于更快数据传输的调制解调器，用于DSL的调制解调器，电缆或RF网络连接，以及医疗测量设备和通信设备本身之间的RF或各种数字连接。


102
Data Management System
• Data collection
• Database
• Web
Cybernet or Host Facility
Internet
TCP/IP
Remote System
• Web access to database
• View patient data
Any Web-enabled Computer
106
Cardiac Event EKG Monitors (directly read by server bypassing interface device)
Phone Connection
Bi-directional DTMF communication
Interface Device
104
Patient Home
Serial Link
Serial Link
Serial Link
NIBP
Scale
Glucose
110
112
114