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(54) **METHOD AND SYSTEM FOR WIRELESS DEVICE COMMUNICATION**

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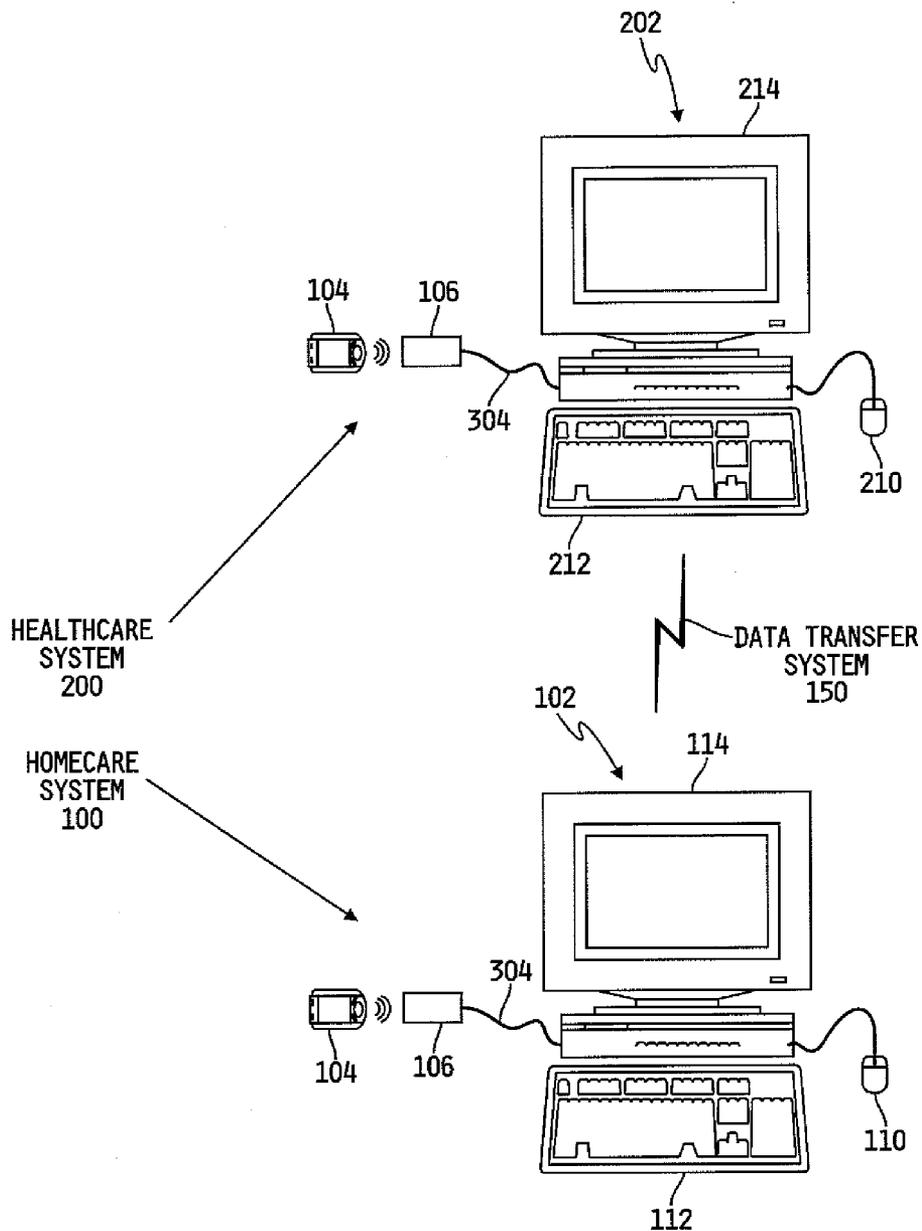
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(57) **ABSTRACT**

A medical data receiver configured to wirelessly receive medical data via a signal and having an externally perceptible indicator of signal reception.

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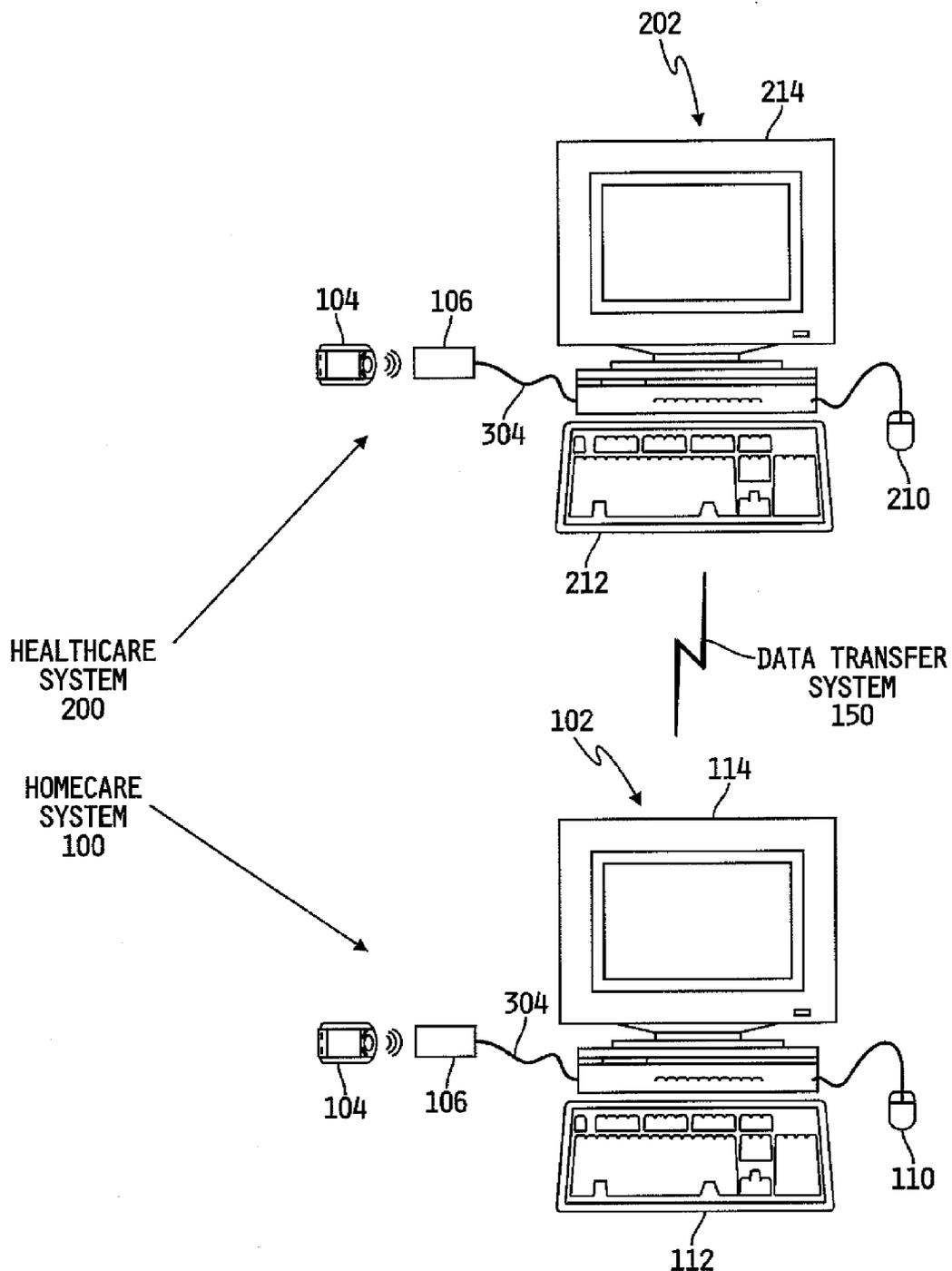
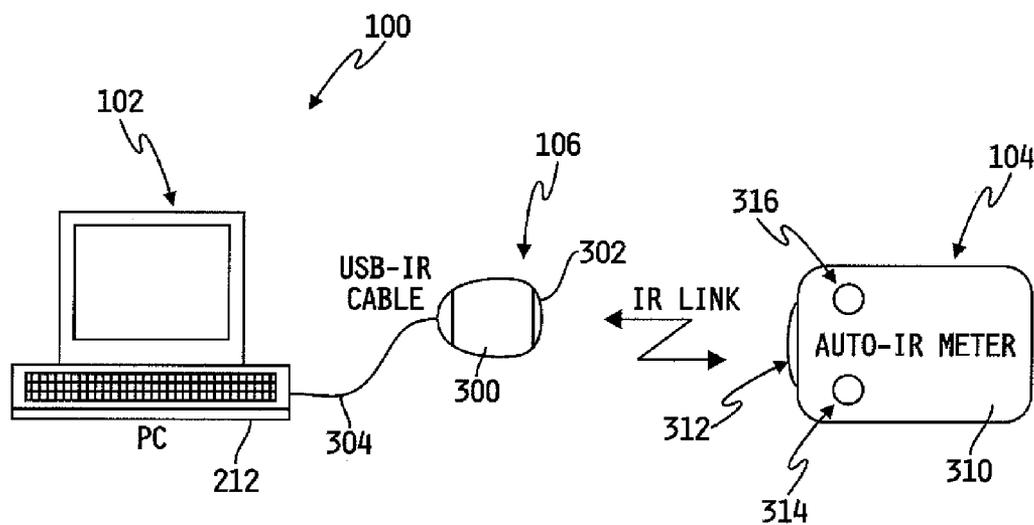
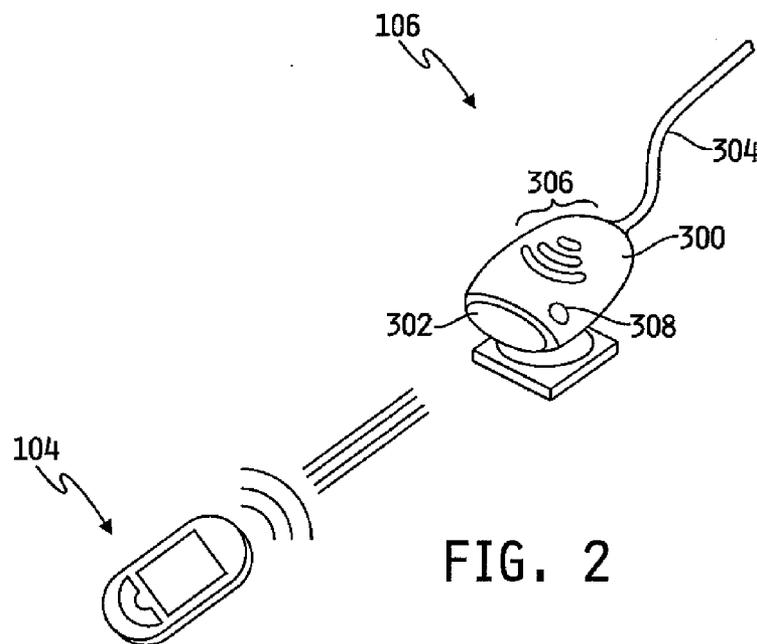


FIG. 1



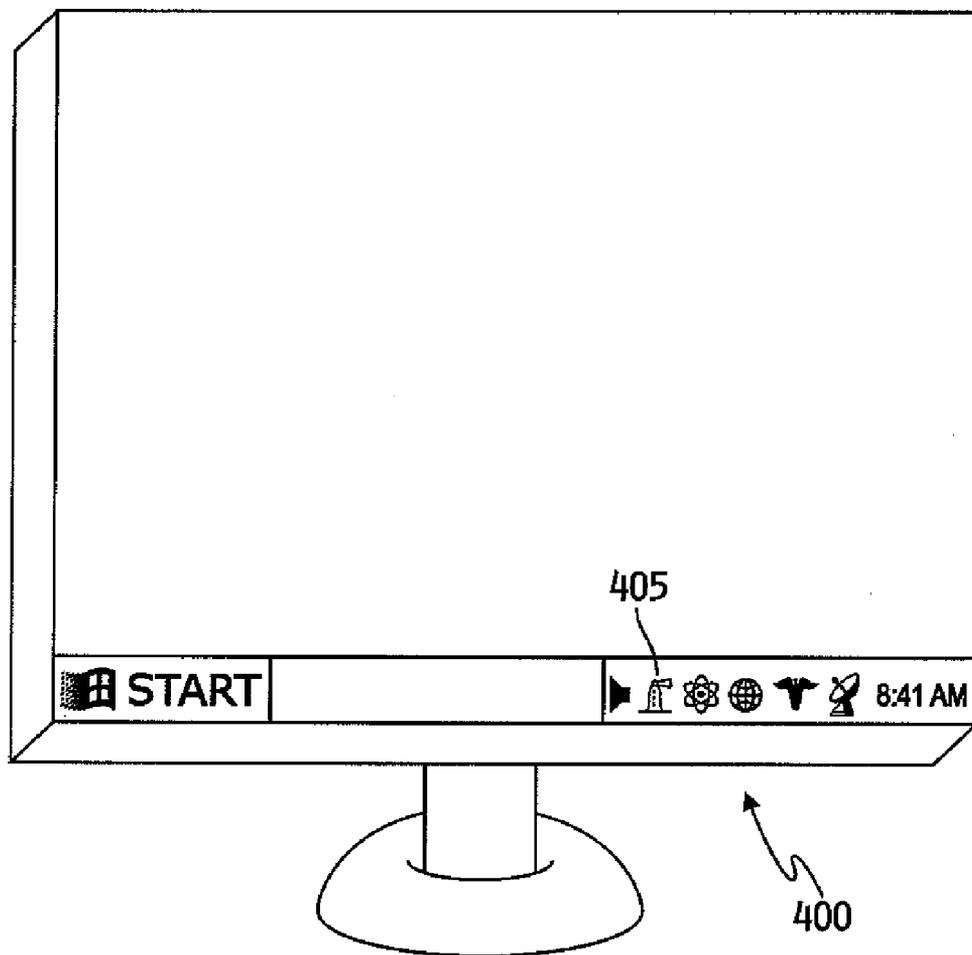
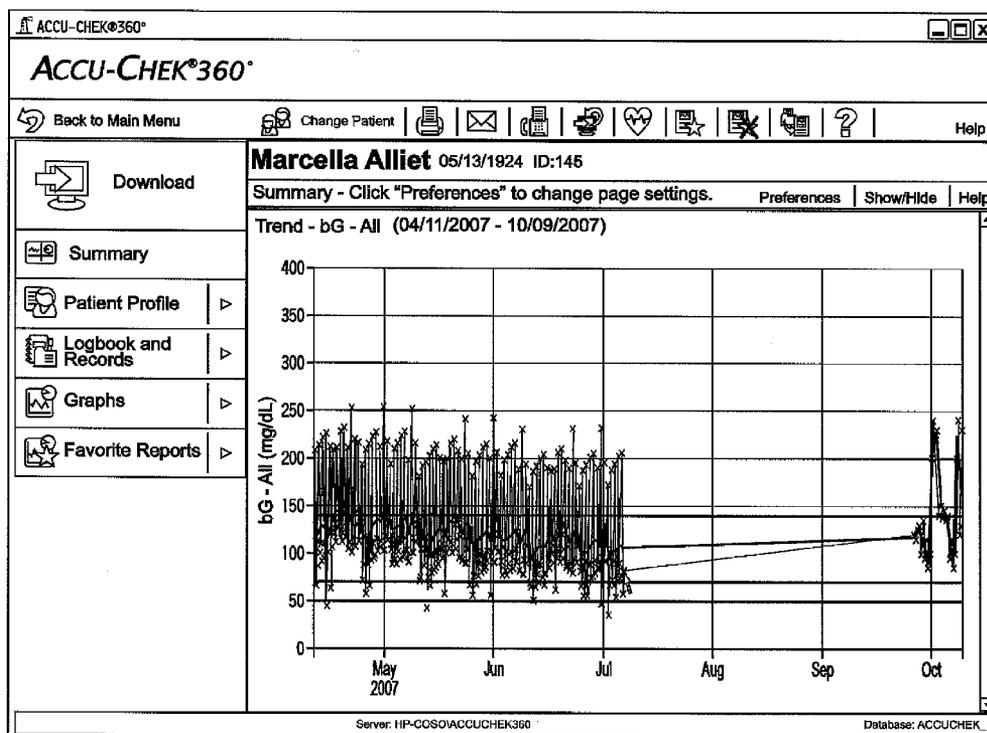


FIG. 4



410

FIG. 5

METHOD AND SYSTEM FOR WIRELESS DEVICE COMMUNICATION

FIELD OF THE INVENTION

[0001] The present disclosure relates to a method and system for managing health data. More particularly, the disclosure relates to a method and system for interfacing with a medical device.

BACKGROUND OF THE INVENTION

[0002] Many fields of medical treatment and healthcare require monitoring of certain body functions, physical states and conditions, and patient behaviors. Thus, e.g., for patients suffering from diabetes, a regular check of the blood glucose level forms an essential part of the daily routine. The blood glucose level has to be determined quickly and reliably, often several times per day. Medical devices are used to facilitate the collection of medical information without unduly disturbing the lifestyle of the patient. A large number of medical devices for monitoring various body functions are commercially available. Also, medical treatment and healthcare may require monitoring of exercise, diet, meal times, stress, work schedules and other activities and behaviors.

[0003] To reduce the frequency of necessary visits to doctors, the idea of home care gained popularity over the recent years. Technological advancements in medicine led to the increased use of medical devices. Many of these medical devices, such as meters and medicine delivery devices, are able to collect and store measurements and other data for long periods of time. Other devices, such as computers, portable digital assistants (PDAs), and cell phones, have been adapted to medical uses by the development of software directed to the collection of healthcare data. These advancements led to the development of health management systems that enable collection and use of large numbers of variables and large amounts of healthcare data. While systems were traditionally developed for use in healthcare facilities and health management organizations including insurance companies and governmental agencies (HCP systems), increased technological sophistication by the populous at large led to the increased use of health management systems by patients, care givers, and others (patient systems) in addition to increased use by HCP systems. U.S. Pat. No. 7,103,578 and U.S. Published Application No. 2004/0172284 disclose two such methods and systems. Many of these systems are able to transfer data between them. Patient healthcare data is often transferred from a patient system to an HCP system. HCP systems may transfer remarks and other data to patient systems or other HCP systems.

SUMMARY OF THE INVENTION

[0004] The disclosure relates to a method and system for interfacing between a healthcare management system and medical devices. One embodiment of the system includes a medical data transmission system. The system includes a dongle configured to wirelessly receive medical data via a signal and including an externally perceptible indicator of the strength of signal reception, and a medical device configured to generate data indicative of a health condition and being capable of generating the signal.

[0005] In another embodiment, a computer readable medium is provided. The computer readable medium including operating instructions thereon such that when interpreted

by a processor cause the processor to perform the step of automatically loading interface instructions upon startup of the processor. The interface instructions, when interpreted by the processor cause the processor to perform the steps of: automatically wirelessly downloading medical information from a medical data device; and storing the medical information in a database.

[0006] In yet another embodiment, a medical data transmission system is provided including: a transceiver configured to wirelessly receive medical data from a medical device via a data signal; the transceiver emitting a beacon signal detectable by the medical device.

[0007] In still another embodiment, a medical data transmission system is provided including a medical data device configured to wirelessly communicate medical data to a receiver via a data signal in an active state; the medical device having a listening mode in which the device monitors for a beacon signal emitted by the receiver.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] For more complete understanding of the present disclosure, reference is established to the following drawings in which:

[0009] FIG. 1 shows an embodiment of a health management system comprising a healthcare system and a homecare system;

[0010] FIG. 2 is a perspective view of a dongle that is part of the systems of FIG. 1;

[0011] FIG. 3 is a perspective view of a medical device that is part of the systems of FIG. 1;

[0012] FIG. 4 is a screenshot showing a system tray having an icon for a first piece of software running on the system of FIG. 1; and

[0013] FIG. 5 is a screenshot of a second piece of software running on the system of FIG. 1.

[0014] Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent embodiments of various features and components according to the present invention, the drawings are not necessarily to scale and certain features may be exaggerated in order to better illustrate and explain the present invention. The exemplification set out herein illustrates embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0015] For the purposes of promoting an understanding of the principles of the disclosure, reference will now be made to the embodiments illustrated in the drawings, which are described below. The embodiments disclosed below are not intended to be exhaustive or limit the disclosure to the precise form disclosed in the following detailed description. Rather, the embodiments are chosen and described so that others skilled in the art may utilize their teachings. It will be understood that no limitation of the scope of the invention is thereby intended. The disclosure includes any alterations and further modifications in the illustrated devices and described methods and further applications of the principles of the disclosure which would normally occur to one skilled in the art to which the disclosure relates.

[0016] The terms “network,” “local area network,” “LAN,” “wide area network,” or “WAN” mean two or more computers which are connected in such a manner that messages may be transmitted between the computers. In such computer networks, typically one or more computers operate as a “server”, a computer with large storage devices such as hard disk drives and communication hardware to operate peripheral devices such as printers or modems. Other computers, termed “workstations”, provide a user interface so that users of computer networks can access the network resources, such as shared data files, common peripheral devices, and inter-workstation communication. The computers have at least one processor for executing machine instructions, and memory for storing instructions and other information. Many combinations of processing circuitry and information storing equipment are known by those of ordinary skill in these arts. A processor may be a microprocessor, a digital signal processor (“DSP”), a central processing unit (“CPU”), or other circuit or equivalent capable of interpreting instructions or performing logical actions on information. Memory includes both volatile and non-volatile memory, including temporary and cache, in electronic, magnetic, optical, printed, or other format used to store information. Users activate computer programs or network resources to create “processes” which include both the general operation of the computer program along with specific operating characteristics determined by input variables and its environment.

[0017] Concepts described below may be further explained in one of more of the co-filed patent applications entitled HELP UTILITY FUNCTIONALITY AND ARCHITECTURE (Atty Docket: ROCHE-P0033), METHOD AND SYSTEM FOR GRAPHICALLY INDICATING MULTIPLE DATA VALUES (Atty Docket: ROCHE-P0039), SYSTEM AND METHOD FOR DATABASE INTEGRITY CHECKING (Atty Docket: ROCHE-P0056), METHOD AND SYSTEM FOR DATA SOURCE AND MODIFICATION TRACKING (Atty Docket: ROCHE-P0037), PATIENT-CENTRIC HEALTHCARE INFORMATION MAINTENANCE (Atty Docket: ROCHE-P0043), EXPORT FILE FORMAT WITH MANIFEST FOR ENHANCED DATA TRANSFER (Atty Docket: ROCHE-P0044), GRAPHIC ZOOM FUNCTIONALITY FOR A CUSTOM REPORT (Atty Docket: ROCHE-P0048), METHOD AND SYSTEM FOR SELECTIVE MERGING OF PATIENT DATA (Atty Docket: ROCHE-P0065), METHOD AND SYSTEM FOR PERSONAL MEDICAL DATA DATABASE MERGING (Atty Docket: ROCHE-P0066), METHOD AND SYSTEM FOR SETTING TIME BLOCKS (Atty Docket: ROCHE-P0054), METHOD AND SYSTEM FOR ENHANCED DATA TRANSFER (Atty Docket: ROCHE-P0042), COMMON EXTENSIBLE DATA EXCHANGE FORMAT (Atty Docket: ROCHE-P0036), METHOD OF CLONING SERVER INSTALLATION TO A NETWORK CLIENT (Atty Docket: ROCHE-P0035), METHOD AND SYSTEM FOR QUERYING A DATABASE (Atty Docket: ROCHE-P0049), METHOD AND SYSTEM FOR EVENT BASED DATA COMPARISON (Atty Docket: ROCHE-P0050), DYNAMIC COMMUNICATION STACK (Atty Docket: ROCHE-P0051), SYSTEM AND METHOD FOR REPORTING MEDICAL INFORMATION (Atty Docket: ROCHE-P0045), METHOD AND SYSTEM FOR MERGING EXTENSIBLE DATA INTO A DATABASE USING GLOBALLY UNIQUE IDENTIFIERS (Atty Docket: ROCHE-P0052), METHOD AND SYSTEM FOR ACTI-

VATING FEATURES AND FUNCTIONS OF A CONSOLIDATED SOFTWARE APPLICATION (Atty Docket: ROCHE-P0057), METHOD AND SYSTEM FOR CONFIGURING A CONSOLIDATED SOFTWARE APPLICATION (Atty Docket: ROCHE-P0058), METHOD AND SYSTEM FOR DATA SELECTION AND DISPLAY (Atty Docket: ROCHE-P0011), METHOD AND SYSTEM FOR ASSOCIATING DATABASE CONTENT FOR SECURITY ENHANCEMENT (Atty Docket: ROCHE-P0041), METHOD AND SYSTEM FOR CREATING REPORTS (Atty Docket: ROCHE-P0046), METHOD AND SYSTEM FOR CREATING USER-DEFINED OUTPUTS (Atty Docket: ROCHE-P0047), DATA DRIVEN COMMUNICATION PROTOCOL GRAMMAR (Atty Docket: ROCHE-P0055), HEALTHCARE MANAGEMENT SYSTEM HAVING IMPROVED PRINTING OF DISPLAY SCREEN INFORMATION (Atty Docket: ROCHE-P0031), and METHOD AND SYSTEM FOR MULTI-DEVICE COMMUNICATION (Atty Docket: ROCHE-P0064), the entire disclosures of which are hereby expressly incorporated herein by reference. It should be understood that the concepts described below may relate to diabetes management software systems for tracking and analyzing health data, such as, for example, the Accu-Chek® 360° product provided by Roche Diagnostics. However, the concepts described herein may also have applicability to apparatuses, methods, systems, and software in fields that are unrelated to healthcare. Furthermore, it should be understood that references in this patent application to devices, meters, monitors, pumps, or related terms are intended to encompass any currently existing or later developed apparatus that includes some or all of the features attributed to the referred to apparatus, including but not limited to the Accu-Chek® Active, Accu-Chek® Aviva, Accu-Chek® Compact, Accu-Chek® Compact Plus, Accu-Chek® Integra, Accu-Chek® Go, Accu-Chek® Performa, Accu-Chek® Spirit, Accu-Chek® D-Tron Plus, and Accu-Chek® Voicemate Plus, all provided by Roche Diagnostics or divisions thereof.

[0018] Turning now to the figures, FIG. 1 depicts an exemplary embodiment of a homecare system **100** and healthcare system **200** connected via a WAN **150** for monitoring data. Systems **100**, **200** each comprise a computing device, shown here in the form of computers **102**, **202** having processing units, system memory, display devices **114**, **214**, and input devices **112**, **212**, **110**, **210**, **106**. Healthcare computer **202** may be, but is not necessarily, acting as a server. Furthermore, while only two computers **102**, **202** are shown, many more computers may be part of the overall system.

[0019] While standard input devices such as mice **110**, **210** and keyboards **112**, **212** are shown, systems **100**, **200** may comprise any user input device. By example, infrared (IR) dongle **106** is coupled to each of computers **102**, **202**. IR dongle **106** is configured to send and receive IR transmissions from health management device **104**. Computers **102**, **202** include software applications configured to receive data from health management device **104** via IR dongle **106** or otherwise. While the use of IR and IR dongles is disclosed herein for the transmission of data between health management device **104** and computers **102**, **202**, any other method of wireless transmission is also envisioned, including but not limited to RF. While communications are discussed that make use of dongle **106**, the present disclosure is intended to cover internal device hardware having the functionality attributed to dongle **106**. Systems **100**, **200** include health management

software (not shown) configured to receive medical information from one or more of input devices **112**, **212**, **110**, **210**, **106**. Health management devices **104** are described herein as meters, but could also be a PDA, therapeutic pump, combinations thereof, or other devices that store medical data thereon. Medical information may include blood glucose values, A1c values, Albumin values, Albumin excretion values, body mass index values, blood pressure values, carbohydrate values, cholesterol values (total, HDL, LDL, ratio) creatinine values, fructosamine values, HbA1 values, height values, insulin dose values, insulin rate values, total daily insulin values, ketone values, microalbumin values, proteinuria values, heart rate values, temperature values, triglyceride values, weight values, and any other medical information that is desired to be known.

[0020] IR dongle **106**, shown in FIG. 2, includes housing **300**, IR transmission window **302**, and interface cable **304**. Housing **300** is sized and shaped to contain IR producing and receiving circuitry therein. IR transmission window **302** is disposed on one side of housing **300** and allows the transmission of IR signals therethrough. Interface cable **304**, shown as a USB cable, allows IR dongle **106** to functionally couple to computers **102**, **202**. Housing **300** also includes reception indicator **306** and communication indicator **308** thereon. Reception indicator **306** provides an indication of reception and the strength of the signal being received from any health management device **104** within range. Reception indicator **306** further allows a user to adjust the positioning of health management device **104** and receive feedback, such as, for example, the display of more or fewer reception “bars,” to effect suitable positioning for data transfer. Communication indicator **308** provides an indication of when data is being transmitted between IR dongle **106** and health management device **104**.

[0021] Health management device **104** may include a housing **310** having an IR window **312**, an “IR detected” LED **314**, and a “good link” LED **316**. IR window **312** is similar to IR transmission window **302** and permits transmission of IR signals therethrough. “IR detected” LED **314** is similar to reception indicator **306** and provides an indication of whether a compatible dongle **106** is detected within range. “Good link” LED **316** is similar to communication indicator **308** and indicates that the IR signal from dongle **106** is suitable for sustaining or is transacting data transfer. While indicators **316**, **314**, **306**, **308** are described as being present on both dongle **106** and health management device **104**, embodiments are envisioned wherein indicators would only be present on one of dongle **106** and health management device **104**.

[0022] In use, dongle **106**, when not transmitting data, emits a beacon. The beacon is a repetitive link command that is sent out until either a successful IR link is established with health management device **104** or the software running on computer **102**, **202** is shut down. Although the software is described herein for operation on a computer (e.g., desktop, laptop or tablet), it should be understood that the principles of the invention may be embodied in software for operation on various devices, including but not limited to personal digital assistants (“PDAs”), infusion pumps, blood glucose meters, cellular phones, or integrated devices including a glucose measurement engine and a PDA or cellular device. Furthermore, dongle **106** may have an instance of the software running on itself.

[0023] Whenever health management device **104** is turned on and not transmitting with dongle **106**, the IR communica-

tion portion of health management device **104** is in a listening mode. Health management device **104** is listening for the beacon from dongle **106**. Listening mode is a mode of reduced power draw relative to a data transmission mode to prolong battery life while still being able to detect dongle **106**. Listening involves periodic scanning for or otherwise attempting to sense the presence of the beacon. Upon “hearing” the beacon, health management device **104** recognizes the beacon and wakes up to an active state. Transition from listening mode to the active state in one present embodiment of the invention takes less than five seconds. Health management device **104** then emits data necessary for a handshaking protocol in which health management device **104** and dongle **106** exchange data to ensure that a proper device **104**, **106** is on the receiving end of their respective transmissions, to ensure that the other device is prepared to communicate, and to coordinate the start of data transfer.

[0024] Once handshaking indicates that proper devices are present, health management device **104** commences sharing any information that is desired to be shared with dongle **106**. When the data exchange is being effected, communication indicator **308** and “good link” LED **316** are illuminated to indicate that a proper link has been established. Accordingly, a user is provided with visual feedback that health management device **104** is suitably positioned and that data transfer is occurring. When a user sees communication indicator **308** and/or “good link” LED **316** turn off, the user knows that communication has completed and that health management device **104** can be moved away from dongle **106** without fear that such moving will negatively impact data transmission. Embodiments are envisioned where communication indicator **308** and “good link” LED **316** flash as data is exchanged.

[0025] During all times that the beacon is received by health management device **104**, “IR detected” LED **314** is illuminated. During all times that dongle **106** detects health management device **104**, reception indicator **306** is illuminated. Reception indicator **306** includes the illumination of one or more “bars” or other intensity indicators to indicate the strength of the received signal. A greater number of illuminated bars indicates a stronger signal. Similarly, “IR detected” LED **314** can illuminate in more than one color. Red illumination of “IR detected” LED **314** indicates a poor signal. Yellow illumination of LED **314** indicates a medium strength signal. Green illumination of LED **314** indicates a high strength signal. Alternatively, LED **314** may be binary such that there is only one illumination color. In such embodiments, illumination indicates a satisfactory signal and a lack of illumination indicates a lack of a satisfactory signal. Suitable location of health management device **104** in the present embodiment includes line of sight positioning such that IR signals can travel between health management device **104** and dongle **106** via IR transmission window **302** and IR window **312**. Embodiments are also envisioned where instead of, or along with, visual indices **308**, **316**, **306**, **314**, audio indices are provided. Such audio indices could be, for example, a first beep to indicate the start of data transmission, multiple beeps to indicate completion of data transmission, and multiple beeps that change in frequency to indicate the strength of signal being received. Such audio indices provide the functionality of visual indices **308**, **316**, **306**, **314** to visually impaired users. Similarly, other sensory indicators (e.g., vibration) are envisioned.

[0026] Software **400** runs on computers **102**, **202** and waits for detection of health management device **104** via dongle

106. Software **400**, represented by icon **405**, FIG. 4, in the system tray of computers **102**, **202**, is loaded automatically on startup and runs in the background to operate dongle **106** and receive indications of the presence of health management device **104**. Upon detection of health management device **104**, software **400** invokes a related piece of software **410**, FIG. 5, that is suitable for receiving and displaying data therefrom. Software **410** either automatically accepts and downloads data from health management device **104**, optionally storing the data in a database in association with the patient, or it prompts a user to ask if data from health management device **104** should be downloaded. In embodiments where the data is automatically downloaded, it should be appreciated that such downloading occurs without any user interaction with computers **102**, **202**. In this automatic embodiment, software **400** is loaded automatically on startup of computers **102**, **202** and downloading occurs upon detection of health management device **104**. Thus, downloading from health management device **104** is effected with zero manipulation of and zero input to (e.g., zero “clicks” of a mouse) computers **102**, **202**, provided they are running. In another embodiment, software **400** may be configured to request user authorization/verification of the pending download of data (e.g., via a single “click” of a mouse). Software **410** can also be configured such that reports of the newly downloaded data are presented automatically. Accordingly, computers **102**, **202** are able to produce reports with zero clicks and zero interaction with input devices **110**, **112**, **210**, **212**. In addition to zero-click downloads to computers **102**, **202**, downloads may be similarly performed to produce output reports via other devices such as printers, faxes, or e-mail messages. Output devices such as printers and faxes may be configured to automatically produce a hardcopy or report of the downloaded data. Further description of this reporting function for use with the concepts of the present invention is disclosed in the co-filed patent application entitled SYSTEM AND METHOD FOR REPORTING MEDICAL INFORMATION (Roche-P0045) which was previously incorporated herein.

[0027] Automatic downloading from health management device **104** is also accomplished in that a device identifier is transmitted with medical data from health management device **104** to dongle **106**. The device identifier allows software **410** to determine the individual with whom the incoming data is to be associated. The data may then automatically be downloaded and stored in an appropriate database in association with the corresponding patient. Accordingly, software **410** does not need to be told with which patient to associate the data in systems **100**, **200** that service multiple users. The association of a patient to a particular health management device **104** and device identifier is performed the first time that the device interfaces with the installation instance of software **410**. It should be appreciated that a particular health management device **104** may not have interfaced with a particular computer **102**, **202** and yet the health management device **104** may be recognized thereby. If health management device **104** has previously interfaced with a computer **102**, **202** that is networked and/or shares database information with the computer **102**, **202** now being used, the information sharing over the network allows recognizing of health management device **104**. The device identifier can also identify the type of device that is to be sending the data. Accordingly, differences in device data structures can be known, detected, and compensated for.

[0028] While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.

1. A medical data transmission system including:
 - a dongle configured to wirelessly receive medical data via a signal; the dongle including an externally perceptible indicator of the strength of signal reception; and
 - a device configured to generate health data; the device being capable of generating the signal.
2. The system of claim 1, wherein the dongle further includes an externally perceptible indicator of data transmission.
3. The system of claim 1, wherein the device is a medical device.
4. The system of claim 1, further including a processor configured to execute instructions to effect automatic data transfer upon detection of a signal of sufficient strength for data transfer.
5. The system of claim 1, wherein the indicator includes a set of selectively illuminated lights.
6. The system of claim 5, wherein the indicator includes a set of intensity indicators such that a greater number of activated intensity indicators indicates a greater signal strength than a signal strength indicated by a smaller number of activated intensity indicators.
7. The system of claim 1, wherein the dongle includes an emitter that emits a beacon to be detected by the medical device.
8. The system of claim 7, wherein the beacon, when detected by the medical device causes the device to attempt to engage in a handshaking operation with the dongle.
9. The system of claim 1, wherein the dongle is integrated into the medical device, the medical device having a glucose measurement engine therein.
10. A computer readable medium, including operating instructions thereon such that when interpreted by a processor cause the processor to perform the step of:
 - automatically loading interface instructions upon startup of the processor; the interface instructions, when interpreted by the processor cause the processor to perform the steps of:
 - automatically wirelessly downloading medical information from a medical data device; and
 - storing the medical information in a database.
11. The computer readable medium of claim 10, wherein the interface instructions further cause the emitting of a beacon from a medical device interface.
12. The computer readable medium of claim 11, wherein the medical device interface includes a dongle.
13. The computer readable medium of claim 10, wherein the operating instructions further cause the processor to perform the step of:
 - wirelessly detecting the presence of a medical device capable of wireless communication.
14. The computer readable medium of claim 13, wherein the operating instructions further cause the processor to perform the step of:
 - providing an indication of signal strength of a signal received from a detected medical device.

15. The computer readable medium of claim **10**, wherein the operating instructions further cause the processor to perform the step of:

providing an indication of data transfer to a user.

16. A medical data transmission system including:

a transceiver configured to wirelessly receive medical data from a medical device via a data signal; the transceiver emitting a beacon signal detectable by the medical device.

17. The system of claim **16**, wherein the signal, when received by the medical device causes the medical device to enter an active state.

18. The system of claim **16**, wherein the signal is an IR signal.

19. A medical data transmission system including:

a medical data device configured to wirelessly communicate medical data to a receiver via a data signal in an

active state; the medical device having a listening mode in which the device monitors for a beacon signal emitted by the receiver.

20. The system of claim **19**, wherein the listening mode is a mode of decreased power consumption relative to the active state.

21. The system of claim **19**, wherein the device switches out of the listening mode within five seconds of detecting the beacon signal.

22. The system of claim **19**, wherein the medical device includes an indicator that indicates when the beacon signal is detected.

23. The system of claim **19**, wherein the medical device includes an indicator that indicates when the device is communicating with the receiver.

* * * * *