US010098553B2

(12) **United States Patent**
St. Pierre et al.

(10) **Patent No.: US 10,098,553 B2**
(45) **Date of Patent: Oct. 16, 2018**

(54) **BLOOD PRESSURE MONITORING SYSTEM AND METHOD**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 865 days.

(21) Appl. No.: **13/606,967**

(22) Filed: **Sep. 7, 2012**

(65) **Prior Publication Data**

US 2013/0245467 A1 Sep. 19, 2013

Related U.S. Application Data

(60) Provisional application No. 61/532,719, filed on Sep. 9, 2011.

(51) **Int. Cl.**
A61B 5/022 (2006.01)
A61B 5/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A61B 5/02225*** (2013.01); ***A61B 5/7246*** (2013.01); *A61B 5/0002* (2013.01); *A61B 2560/0223* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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Assistant Examiner — Jairo Portillo
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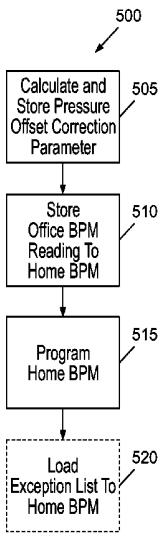
(57) **ABSTRACT**

Systems and methods for correlating diagnostic readings obtained by at least two medical devices can include a pressure offset correction parameter that is calculated for the purpose of correlating oscillometric blood pressure readings between a "home" blood pressure monitor and an "office" blood pressure monitor. The offset correction parameter is used to adjust blood pressure readings of the "home" or "office" blood pressure monitor such that these readings can be validly compared with blood pressure readings obtained using the other blood pressure monitor. In this manner, a more complete and reliable blood pressure trend may be developed and used for managing blood pressure related medical conditions.

10 Claims, 8 Drawing Sheets



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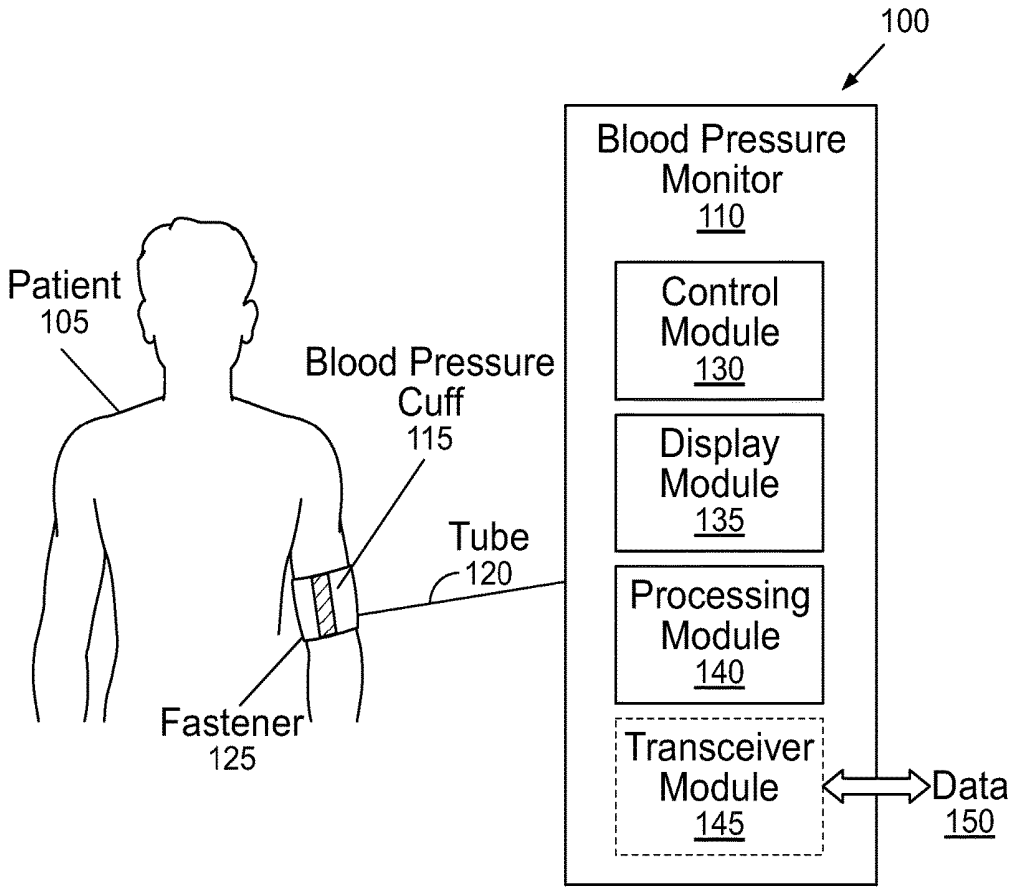
100
Blood Pressure Monitor
110
Control Module
130
Display Module
135
Processing Module
140
Transceiver Module
145
Data
150
Patient
105
Blood Pressure Cuff
115
Tube
120
Fastener
125

FIG. 1

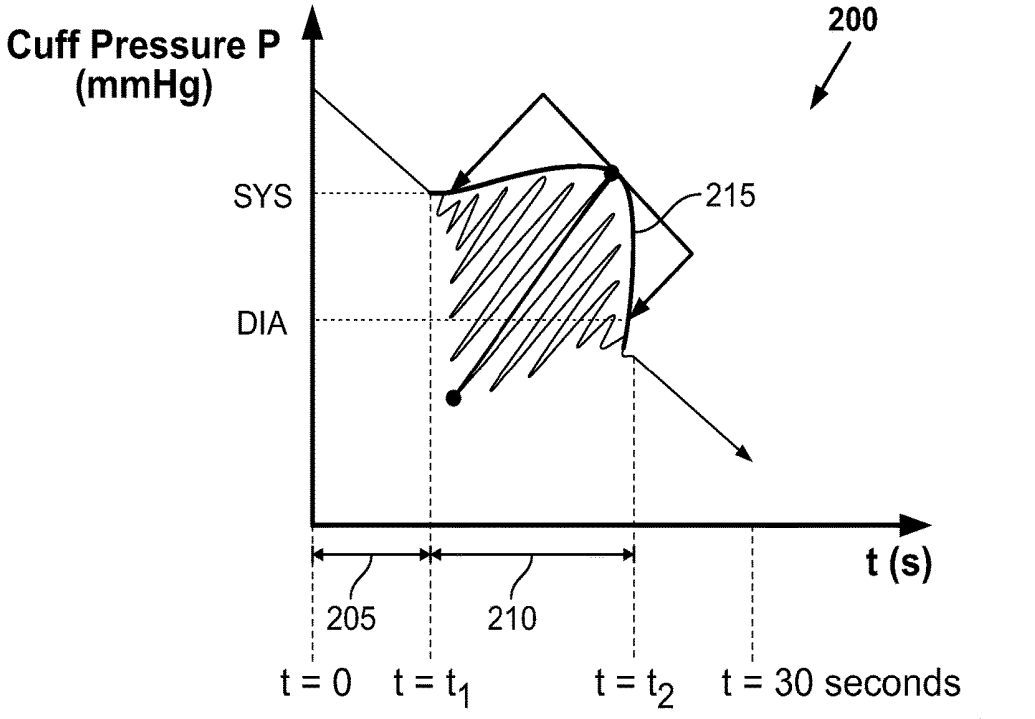
200
Cuff Pressure P (mmHg)
SYS
DIA
215
t (s)
205
210
t = 0
t = t1
t = t2
t = 30 seconds

FIG. 2

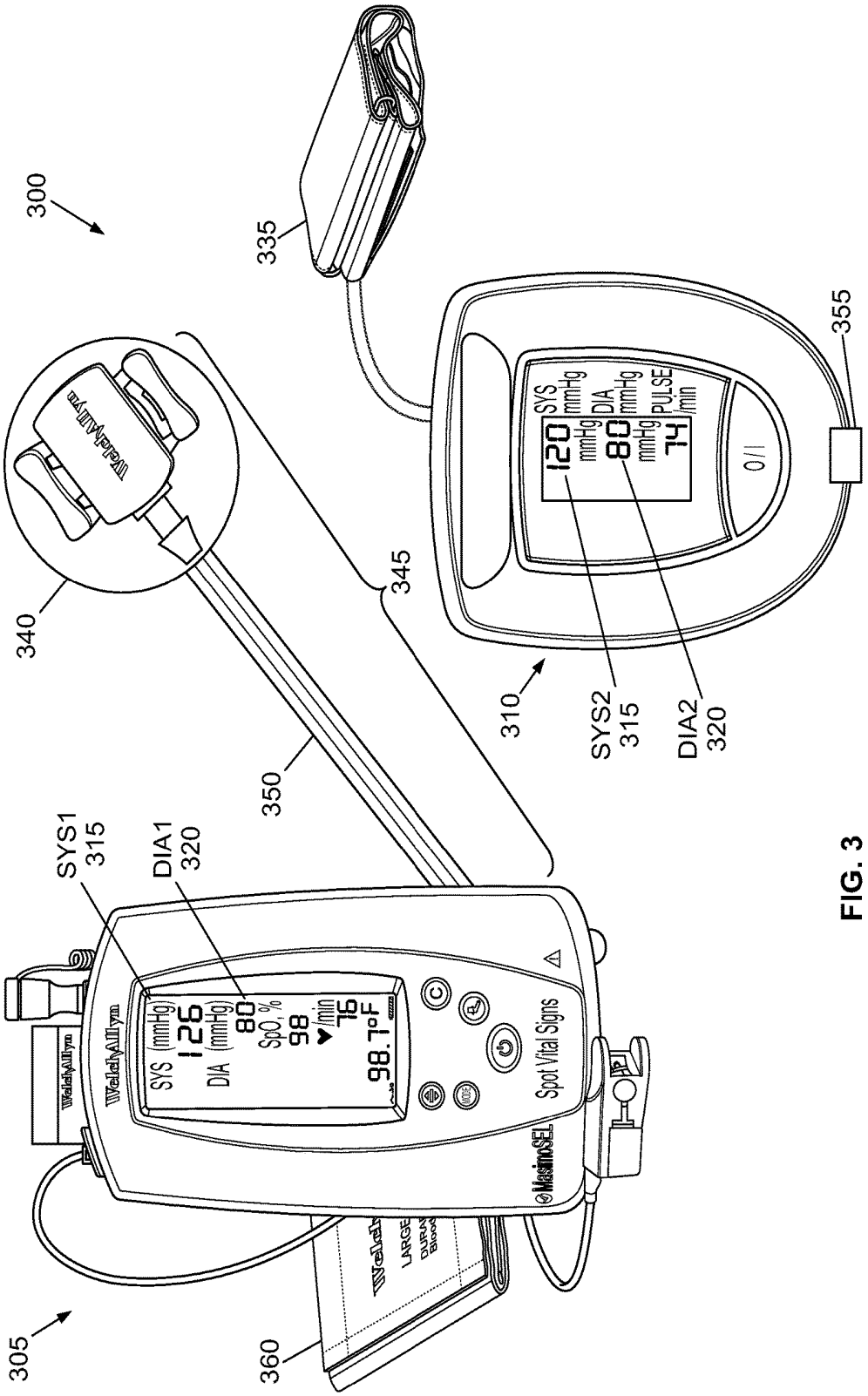
300
335
340
345
355
310
SYS2
315
DIA2
320
350
SYS1
315
DIA1
320
305
360
SYS
mmHg
DIA
mmHg
PULSE
/min
120
80
74
SYS (mmHg)
126
DIA (mmHg)
80
SpO2 %
98
/min
76
98.7°F
Spot Vital Signs

FIG. 3

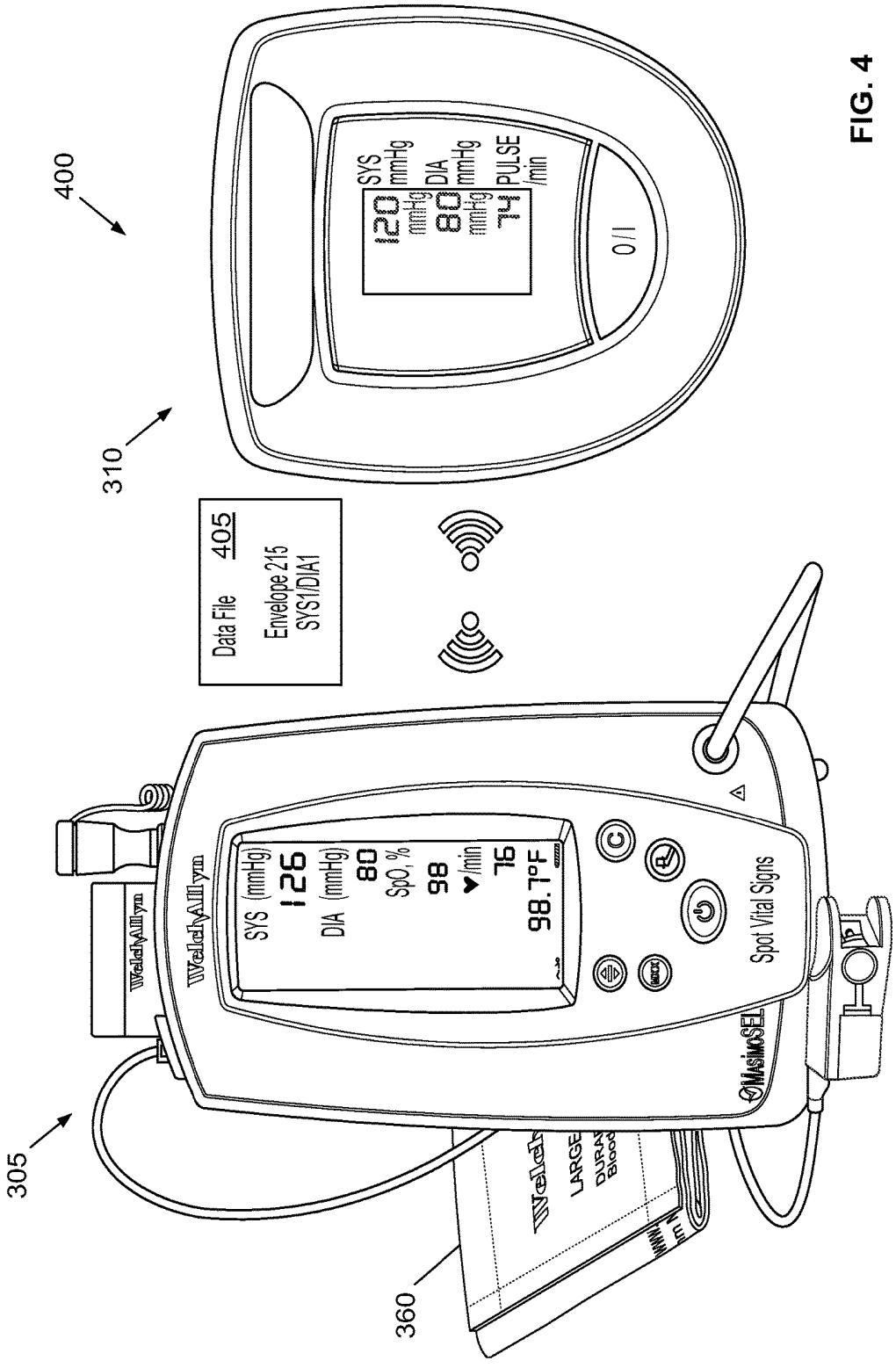
400
310
305
360
Data File 405
Envelope 215
SYS1/DIA1
SYS mmHg
120
DIA mmHg
80
PULSE /min
74
0/1
SYS (mmHg)
126
DIA (mmHg)
80
SpO, %
98
/min
76
98.1°F
Spot Vital Signs
LARGE

FIG. 4

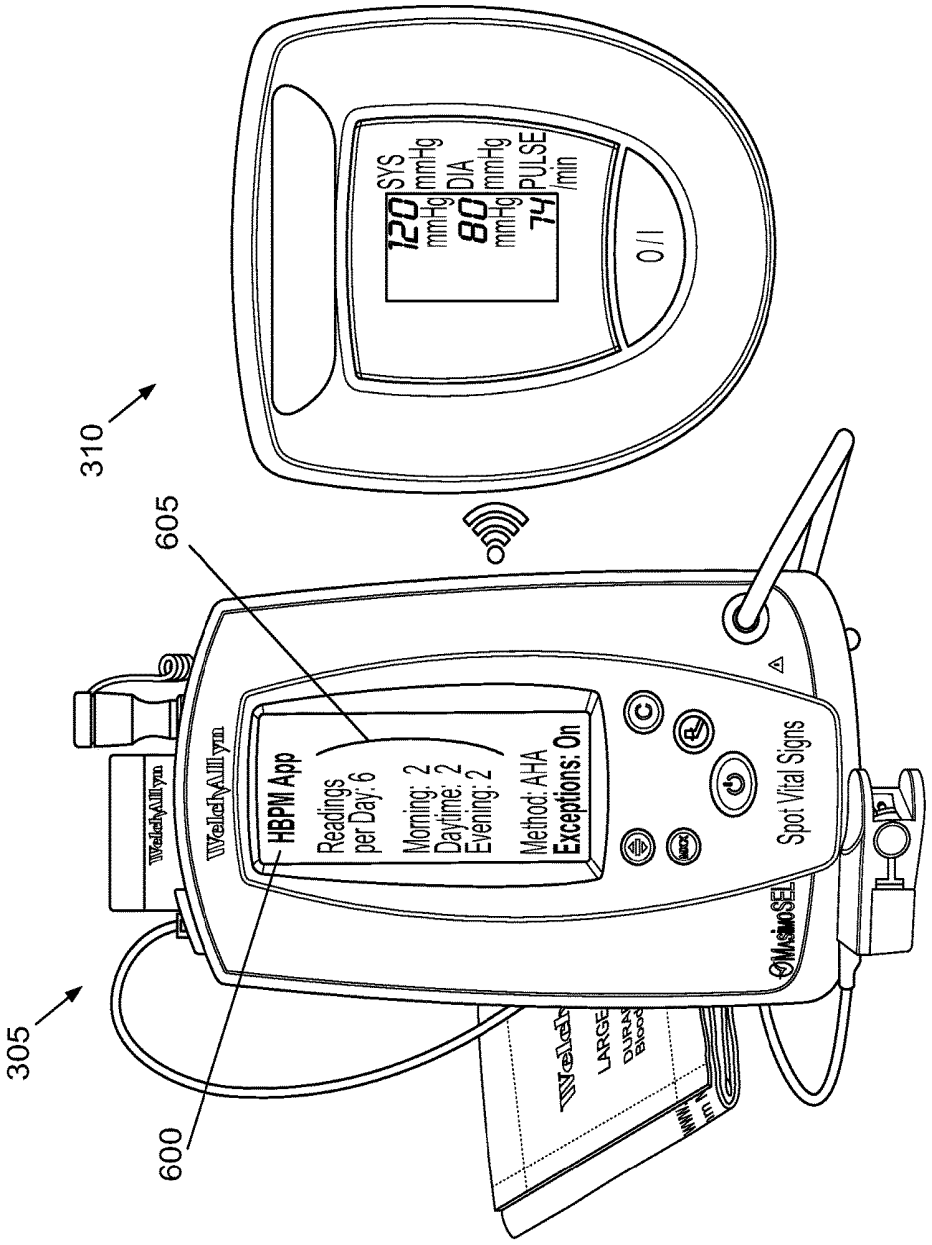
310
605
600
305
SYS
120
mmHg
DIA
80
mmHg
PULSE
74
/min
HBPM App
Readings per Day: 6
Morning: 2
Daytime: 2
Evening: 2
Method: AHA
Exceptions: On
Spot Vital Signs

FIG. 6

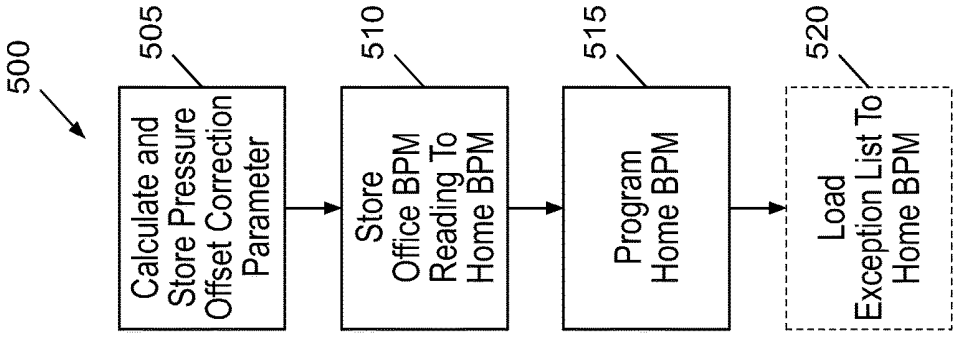
500
505
Calculate and Store Pressure Offset Correction Parameter
510
Store Office BPM Reading To Home BPM
515
Program Home BPM
520
Load Exception List To Home BPM

FIG. 5

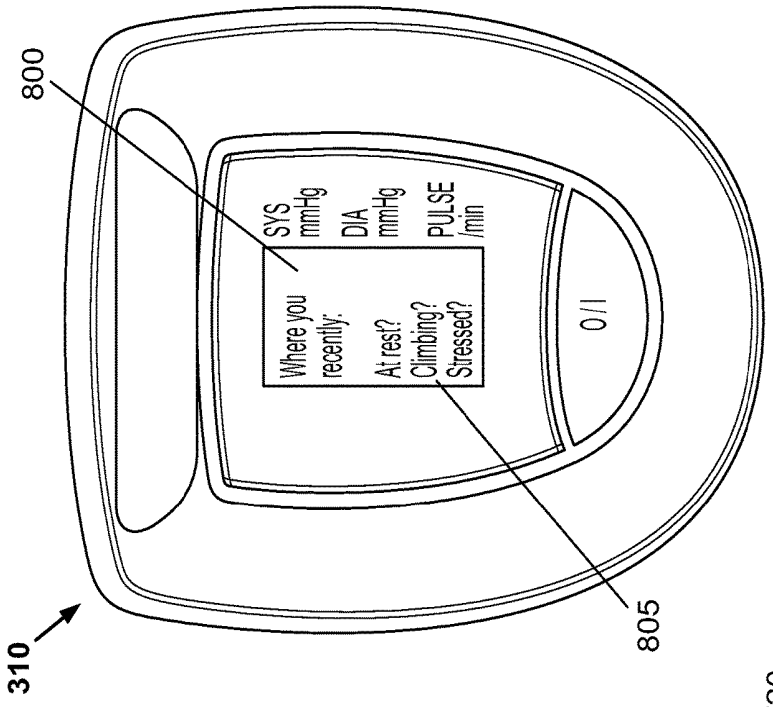
800
SYS mmHg
DIA mmHg
PULSE /min
Where you recently:
At rest?
Climbing?
Stressed?
0 / 1
805
310

FIG. 8

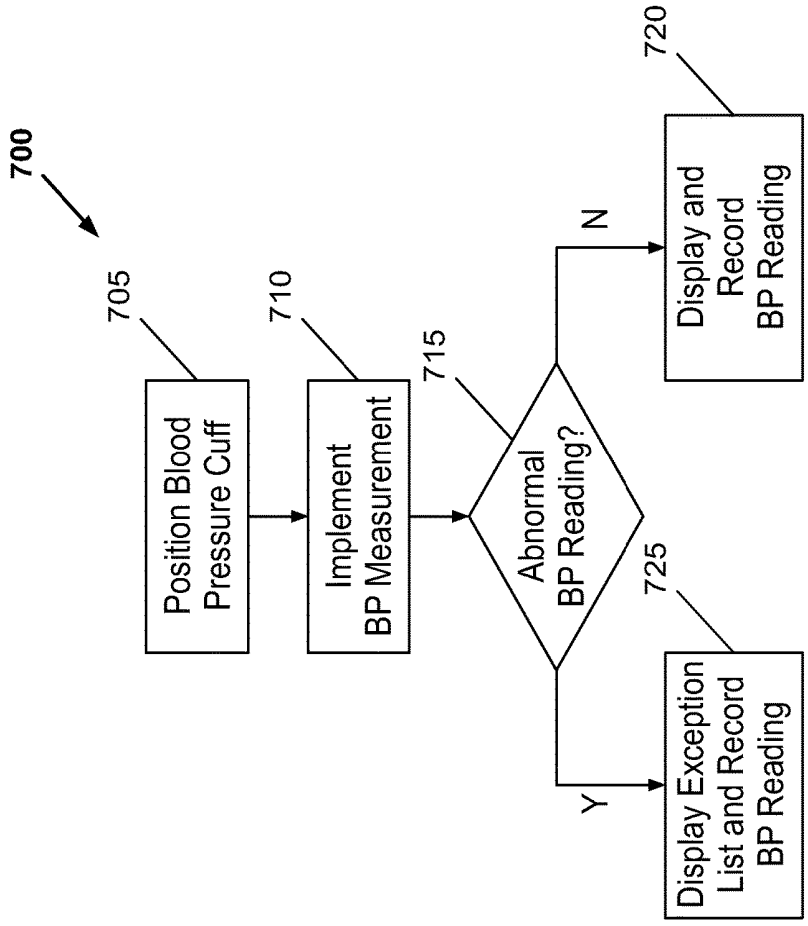
700
705
Position Blood Pressure Cuff
710
Implement BP Measurement
715
Abnormal BP Reading?
N
720
Display and Record BP Reading
Y
725
Display Exception List and Record BP Reading

FIG. 7

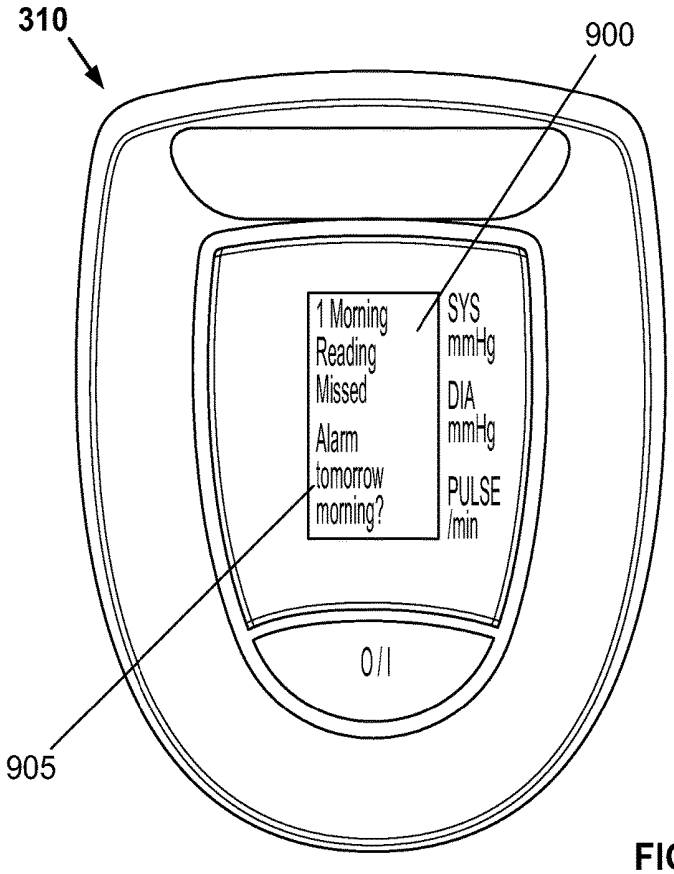
310
900
1 Morning
Reading
Missed
Alarm
tomorrow
morning?
SYS
mmHg
DIA
mmHg
PULSE
/min
0/I
905

FIG. 9

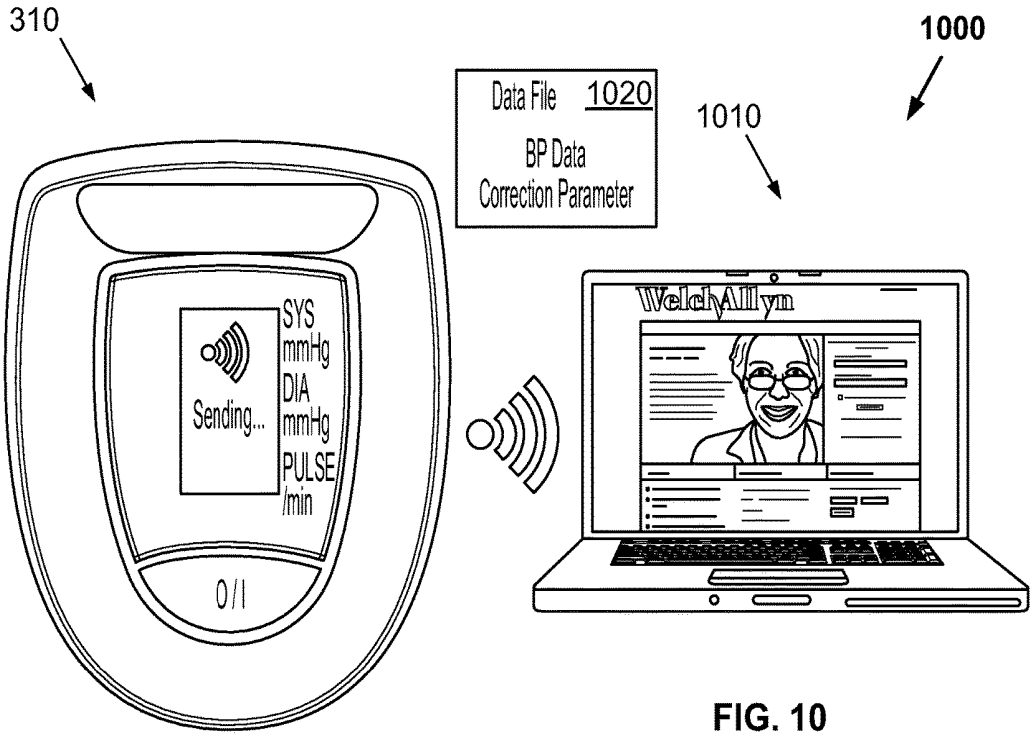
310
1000
Data File 1020
BP Data
Correction Parameter
1010
Sending...
SYS
mmHg
DIA
mmHg
PULSE
/min
0/I
WelchAllyn

FIG. 10

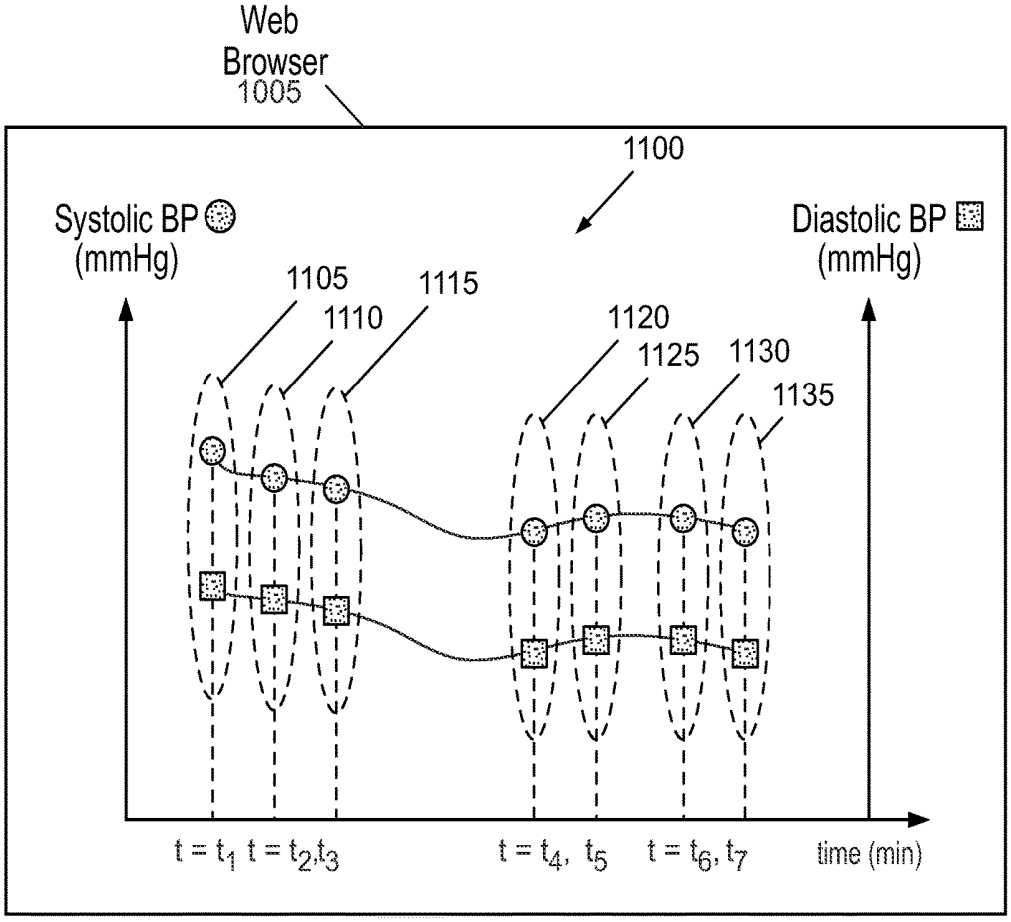
Web
Browser
1005
1100
Systolic BP
(mmHg)
Diastolic BP
(mmHg)
1105
1110
1115
1120
1125
1130
1135
t = t1
t = t2,t3
t = t4, t5
t = t6, t7
time (min)

FIG. 11

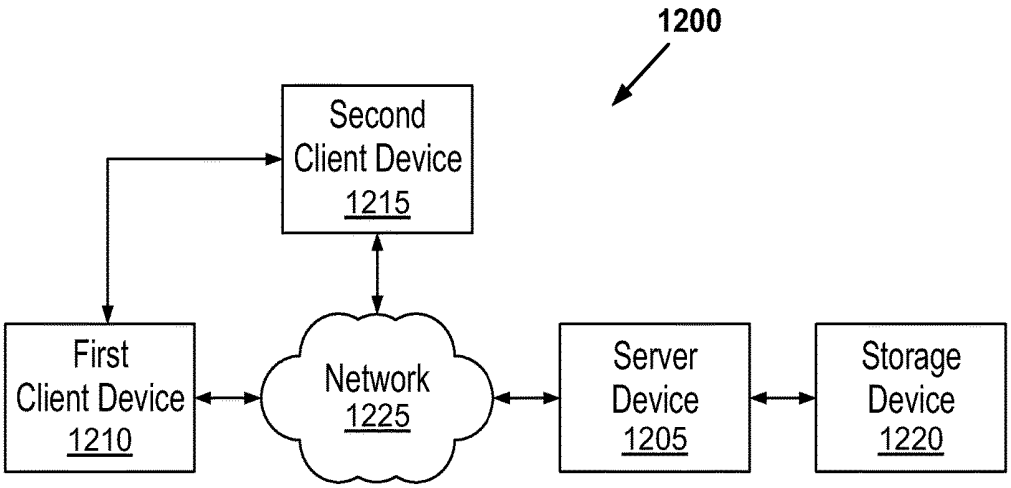
1200
Second
Client Device
1215
First
Client Device
1210
Network
1225
Server
Device
1205
Storage
Device
1220

FIG. 12

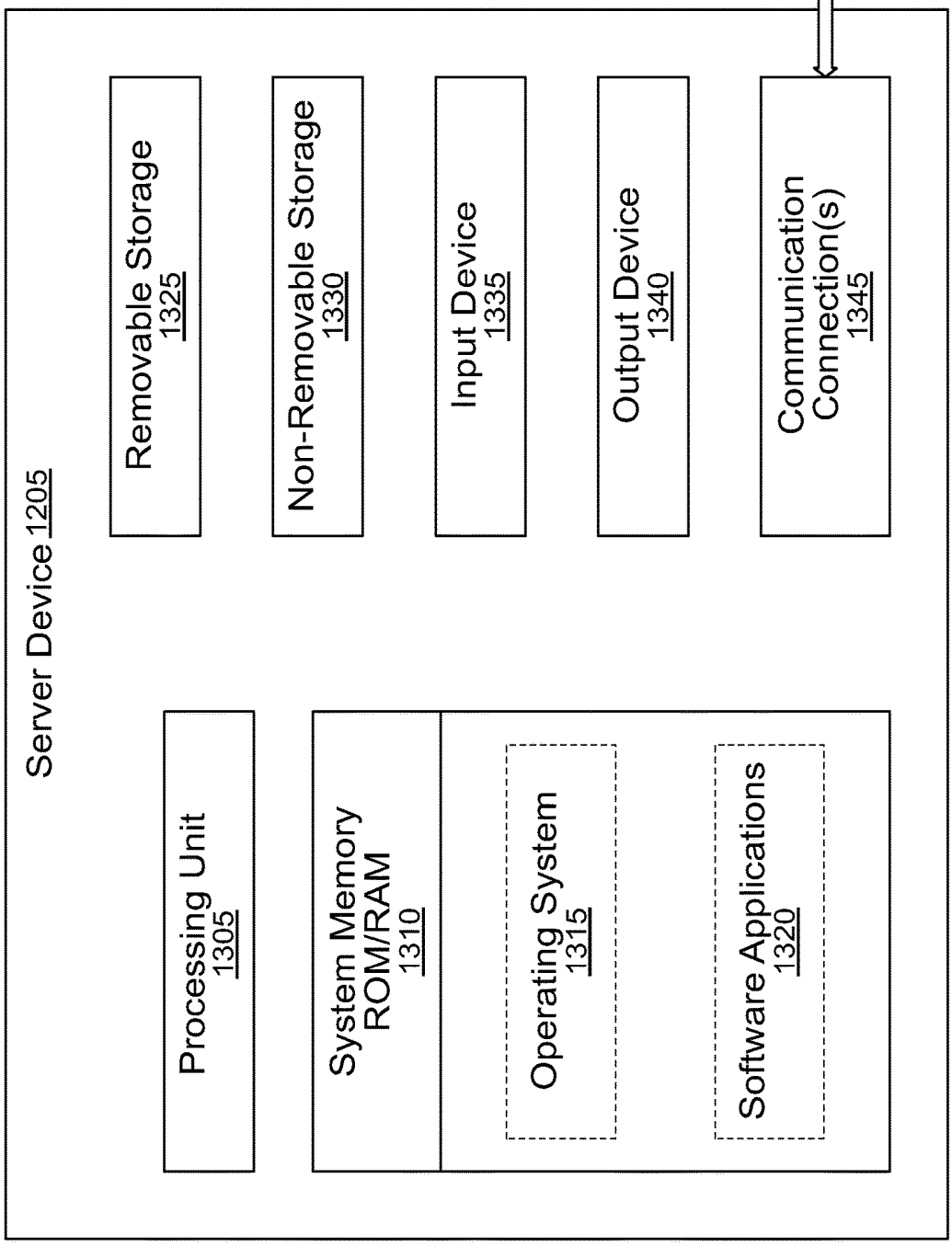
Server Device 1205
Processing Unit 1305
System Memory ROM/RAM 1310
Operating System 1315
Software Applications 1320
Removable Storage 1325
Non-Removable Storage 1330
Input Device 1335
Output Device 1340
Communication Connection(s) 1345
Data

FIG. 13

BLOOD PRESSURE MONITORING SYSTEM AND METHOD

RELATED APPLICATION

This application claims the benefit of U.S. Patent Application Ser. No. 61/532,719 filed on Sep. 9, 2011, the entirety of which is hereby incorporated by reference.

BACKGROUND

Automated blood pressure machines provide an easy and convenient way for healthcare professionals to obtain an in-office patient blood pressure reading. The ease of use of these machines also makes them ideal for use in a home, where patients can monitor their own blood pressure free of the stress of a medical setting.

SUMMARY

In one aspect, a method for correlating diagnostic measurements obtained by at least two different medical devices is disclosed. The method includes: obtaining a first diagnostic measurement by a first medical device; obtaining a second diagnostic measurement by a second medical device; generating a correction parameter by comparing the first and second diagnostic measurements; and adjusting one of the first diagnostic measurement and the second diagnostic measurement using the correction parameter to correlate the second diagnostic measurement to the first diagnostic measurement.

In another aspect, a method for correlating blood pressure values obtained by a first blood pressure device and a second blood pressure device is disclosed. The method includes: calculating a first blood pressure value with the first blood pressure device; calculating a second blood pressure value with the second blood pressure device; comparing the first and second blood pressure values and generating a correction value representing a difference between the first and second blood values; and modifying the second blood pressure value using the correction value to correlate the first and second blood pressure values.

In yet another aspect, a computer-implemented method for correlating blood pressure values obtained by two blood pressure devices is disclosed. The method includes: calculating a first blood pressure value from a set of oscillometric blood pressure data obtained by an office blood pressure device, the office blood pressure device being configured for use in a doctor's office; calculating a second blood pressure value with a home blood pressure device from the set of oscillometric blood pressure data obtained by the office blood pressure device, the home blood pressure device being configured for use in a patient's personal home; comparing the first and second blood pressure values; generating a correction value representing a difference between the first and second blood values; modifying the second blood pressure value using the correction value to correlate the first and second blood pressure values; transferring at least the first blood pressure value and the modified second blood pressure value to a web portal from the home blood pressure device; and generating a blood pressure trend plot including at least the first blood pressure value the modified second blood pressure value.

This Summary is provided to introduce a selection of concepts, in a simplified form, that are further described below in the Detailed Description. This Summary is not intended to be used in any way to limit the scope of the claimed subject matter. Rather, the claimed subject matter is defined by the language set forth in the Claims of the present disclosure.

DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an example environment for obtaining a blood pressure measurement.

FIG. **2** shows an example pressure curve illustrating pressure recorded within a blood pressure cuff during a blood pressure measurement.

FIG. **3** shows a first example system for correlating blood pressure readings between first and second blood pressure monitors.

FIG. **4** shows a second example system for correlating blood pressure readings between first and second blood pressure monitors.

FIG. **5** shows an example method for configuring a home blood pressure monitor for initial use by a patient.

FIG. **6** shows a software application of an office blood pressure monitor used to define a blood pressure reading schedule.

FIG. **7** shows an example method for using a home blood pressure monitor.

FIG. **8** shows an example exception list that is displayed by a home blood pressure monitor.

FIG. **9** shows an example notification indicating one or more missed blood pressure readings.

FIG. **10** shows an example environment for uploading and viewing blood pressure data obtained by a home blood pressure monitor to a web portal.

FIG. **11** shows an example pressure curve illustrating blood pressure trend data of a patient.

FIG. **12** shows an example networked computing environment.

FIG. **13** shows a server computing device of the networked computing environment of FIG. **12**.

DETAILED DESCRIPTION

The present disclosure is directed to systems and methods for correlating diagnostic readings between at least two medical devices. In general, differences between the two medical devices may lead to differences between measurements reported by each respective medical device.

In one example embodiment, each medical device is used to measure blood pressure. A pressure offset correction parameter is calculated for the purpose of correlating oscillometric blood pressure readings between a "home" blood pressure monitor and an "office" blood pressure monitor. The offset correction parameter is used to adjust blood pressure readings of the "home" or "office" blood pressure monitor such that these readings can be easily compared with blood pressure readings obtained by the other blood pressure monitor. In this manner, a more complete and reliable blood pressure trend may be developed and used for managing blood pressure-related medical conditions.

Although not so limited, an appreciation of the various aspects of the present disclosure will be gained through a discussion of the examples provided below.

FIG. **1** shows an example environment **100** in which an oscillometric blood pressure measurement is performed and/or obtained. The environment **100** includes a patient **105**, a monitor **110**, and a cuff **115**. The environment **100** also includes a tube **120** that couples the cuff **115** to the monitor **110**. In the example shown, the cuff **115** is positioned to the

upper left arm of the patient **105**, secured in place by a fastener **125** (e.g., Velcro). Other embodiments are possible.

The example monitor **110** includes a control module **130**, a display module **135**, and a processing module **140**, each generally configured to facilitate and/or implement the blood pressure measurement. For example, the control module **130** is generally configured to perform the measurement upon user selection of a corresponding control mechanism (e.g., start selection, stop selection, etc.), while the display module **135** is configured to render a blood pressure reading (e.g., systolic/diastolic) upon completion of the measurement.

The processing module **140** is configured to control, monitor, and record pressure within the cuff **115** during the blood pressure measurement. Referring now to FIG. **2**, an example pressure curve **200** is shown illustrating a pressure P recorded within the cuff **115** over an example measurement time period t=30 seconds.

In operation, the processing module **140** initially inflates the cuff **115** via the tube **120** such that at least the brachial artery within the upper left arm of the patient **105** is fully occluded. The processing module **140** then gradually reduces the pressure P within the cuff **115** during a first phase **205**, defined between t=0 and $t=t_1$.

Once blood flow is present within the brachial artery, but restricted (i.e., beginning at $t=t_1$), the pressure P within the cuff **115** varies in synchrony with expansion and contraction of the brachial artery during a second phase **210**, defined between $t=t_1$ and $t=t_2$. The processing module **140** continues to reduce the pressure P within the cuff **115** during the second phase **210** through the end of the measurement at t=30 seconds. The processing module **140** subsequently calculates values for the systolic pressure "SYS" and the diastolic pressure "DIA" from recorded oscillometric raw data, typically represented by an envelope **215**, using a pre-defined statistical algorithm.

Other embodiments of the monitor **110** are possible. For example, in some embodiments the monitor **110** includes a transceiver module **145** (see FIG. **1**) generally configured to transmit (e.g., via wireless and/or hardwire connection) information or data **150** between the monitor **110** and one or more other compatibly configured devices (e.g., other blood pressure monitors, personal computer, etc). Examples of data **150** include blood pressure reading(s), calibration parameter(s), instructions and/or comments for rendering by the display module **135**, and other information, such as described in further detail below in connection with FIGS. **3-13**.

Referring now to FIG. **3**, a first example system **300** for correlating blood pressure readings between a first example blood pressure monitor (BPM) **305** and a second example BPM **310** is shown. In general, the first BPM **305** and the second BPM **310** are each configured similar to the monitor **110** described above in connection with FIGS. **1-2**.

However, in example embodiments, the first BPM **305** is an "office" device used by a healthcare professional (e.g., physician, medical assistant, etc.) to obtain "in-office" patient blood pressure readings, and optionally other vital information (e.g., temperature, pulse oximetry, etc.). In typical scenarios, the "office" device is a more robust device having more advanced functionality. With the advanced functionality, the "office" device is typically more expensive than other devices.

In contrast, the second BPM **310** is a "home" device used by a patient to obtain "at-home" blood pressure readings away from the office of the healthcare professional. Home monitoring is beneficial in many aspects. For example, home monitoring supplements blood pressure data obtained by the first BPM **305** to provide a healthcare professional with more information to better understand and manage patient blood pressure. Additionally, home monitoring enables identification of other blood pressure-related phenomena or comorbid conditions (e.g., white-coat hypertension, masked hypertension, etc.). In typical scenarios, the "home" device includes limited functionality in comparison to an "office device" and is generally designed to be easily used by the patient.

In some embodiments, the second BPM **310** is configured to obtain other patient vital information in addition to blood pressure readings, similar to the first BPM **305**. However, despite similarities with respect to the type of diagnostic measurement capabilities of the first BPM **305** and the second BPM **310**, these devices generally include different hardware components (e.g., different transducers, different signal conversion electronics, etc). Hardware differences between the first BPM **305** and second BPM **310** may lead to disparity between blood pressure readings obtained by each respective device over a similar time period.

For example, the first BPM **305** may calculate a systolic pressure "SYS**1**" **315** (see FIG. **3**) of 126 mmHg and a diastolic pressure "DIA**1**" **320** of 80 mmHg from the raw oscillometric data of FIG. **2**. In comparison, the second BPM **310** may calculate a systolic pressure "SYS**2**" **315** of 120 mmHg and a diastolic pressure "DIA**2**" **320** of 80 mmHg upon analysis of the same raw oscillometric data of FIG. **2**. In this example, a difference of 6 mmHg is present between the two systolic pressure readings.

To address this issue, the first BPM **305** and the second BPM **310** are compatibly configured to enable correlation between obtained blood pressure readings. For example, in one embodiment, a blood pressure cuff **335** of the second BPM **310** is secured to the patient **105**, and a connector **340** of a tubing assembly **345** of the first BPM **305**, comprising the connector **340** and a tube **350**, is coupled to a pneumatic pass-through port **355** of the second BPM **310**. The pneumatic pass-through port **355** is an external connector that is in fluid connection with internal components (e.g., pressure transducer) and the blood pressure cuff **335** of the second BPM **310**. In this manner, the first BPM **305** and the second BPM **310** are mechanically connected in series to form a continuous, sealed fluid connection between the first BPM **305** and the blood pressure cuff **335**.

Following mechanical connection of the first BPM **305** to the second BPM **310**, the first BPM **305** is used to drive the blood pressure cuff **335** as part of an oscillometric blood pressure measurement for the purpose of deriving and/or calculating a pressure offset correction parameter. More specifically, the first BPM **305** and the second BPM **310** are approximately simultaneously exposed to the same oscillometric data (e.g., envelope **215**) during the measurement, by virtue of being connected in series. Any difference between the final blood pressure readings calculated by the first BPM **305** and the second BPM **310** (e.g., 6 mmHg) is recorded as the correction parameter. The correction parameter is then used to adjust future blood pressure readings of the second BPM **310** such that these readings can be validly compared (i.e., "apples-to-apples") with those calculated by the first BPM **305**.

In general, the pressure offset as quantified by the correction parameter is attributed at least partially to differences in hardware between the first BPM **305** and the second BPM **310**, as the statistical algorithm used to calculate blood pressure is common to these two devices. Additionally, the correction parameter may be stored within either one or both of the first BPM **305** and the second BPM **310** and/or in

another pre-defined location (e.g., HIPAA compliant medical record, database, etc.) for future use in presenting blood pressure trend data.

Referring now to FIG. **4**, a second example system **400** for correlating blood pressure readings between the first BPM **305** and the second BPM **310** of FIG. **3** is shown. In this example, a blood pressure cuff **360** of the first BPM **305** is secured to the patient **105**, and then the first BPM **305** is used to perform an oscillometric blood pressure measurement to calculate patient systolic and diastolic pressure values (e.g., SYS**1**/DIA**1**=126/80). The raw oscillometric data (e.g., envelope **215**) used by the first BPM **305** to calculate these pressure values is saved within a data file **405** by the first BPM **305**, along with the systolic and diastolic pressure values calculated by the first BPM **305**.

In addition to the pressure values, in some embodiments the data file **405** can include configuration data. For example, the data file **405** can include configuration data relating to how the first BPM **305** is configured, such as the settings used to obtain the pressure values. Examples of such configuration data include set-up and pneumatic information, such as pressure presets, etc. In this example, the configuration data that is sent by the first BPM **305** can be used to configure the second BPM **310**.

Following population of the data file **405** by the first BPM **305**, the data file **405** is subsequently transmitted to the second BPM **310** via wireless communication (e.g., Bluetooth, ZigBee, etc.). The second BPM **310** is configured to receive and process the data file **405** to calculate values of the systolic and diastolic pressures (e.g., SYS**2**/DIA**2**=120/80) from the same raw oscillometric data used by the first BPM **305**.

Any difference between the final blood pressure readings calculated by the first BPM **305** and the second BPM **310** (e.g., (SYS**1**−SYS**2**)=6 mmHg) is recorded as the pressure offset correction parameter. Similar to the workflow described above on connection with FIG. **3**, the correction parameter may then be stored within either one or both of the first BPM **305** and the second BPM **310** and/or in another pre-defined location for future use in presenting blood pressure trend data.

The example workflows described above in connection with FIGS. **3** and **4** for correlating blood pressure readings between an office BPM and a home BPM are beneficial in many respects. For example, in many instances a healthcare professional may express a general distrust of blood pressure readings generated by a home BPM, as these readings typically do not correlate well or directly with blood pressure readings generated by an office BPM. However, when the blood pressure readings of the first BPM **305** and the second BPM **310** are shown to correlate, a more complete and reliable blood pressure trend may be developed and used for managing one or more patient medical conditions.

Referring now to FIG. **5**, an example method **500** for configuring the second BPM **310** of FIG. **3** for use by the patient **105** of FIG. **1** is shown. In general, the second BPM **310** is configured by a healthcare professional using the first BPM **305** while the patient is "in-office." Other embodiments are possible as well.

The method **500** begins at an operation **505**. At operation **505**, a pressure offset correction parameter is calculated and stored for the purpose of correlating blood pressure readings between the first BPM **305** and the second BPM **310**. In one embodiment, the correction parameter is calculated and stored in accordance with the workflow described above in connection with FIG. **3**. In another embodiment, the correction parameter is calculated and stored in accordance with the workflow described above in connection with FIG. **4**. Still other embodiments are possible.

Next, at an operation **510**, an "in-office" blood pressure reading calculated by the first BPM **305** (e.g., SYS**1**/DIA**1**=126/80) as part of an oscillometric blood pressure measurement is stored within the second BPM **310**. The "in-office" blood pressure reading may generally be wirelessly transferred to the second BPM **310** for storage or optionally extracted from the data file **405** by the second BPM **310** for storage, based on the method and/or workflow used to calculate the correction parameter at operation **505**. As described in detail below in connection with FIGS. **7-9**, the "in-office" blood pressure reading is used to "trigger" exceptions and/or "flag" future blood pressure readings obtained by the second BPM **310**.

Next, at an operation **515**, a software application executing on the first BPM **305** is used to program the second BPM **310** for use by the patient **105**. For example, referring now additionally to FIG. **6**, an application **600** of the first BPM **305** is used to confirm and/or adjust a configurable and patient-specific blood pressure reading schedule **605**. In the example shown, the schedule **605** corresponds to the American Heart Association preferred blood pressure reading schedule of six (6) "Readings per Day" in which two (2) respective readings are scheduled to be performed each during "Morning" and "Daytime" and "Evening." Other embodiments are possible.

The schedule **605** is then transmitted (e.g., via wireless and/or hardwire connection) to the second BPM **310**, which is configured to receive and process the schedule **605**. In some embodiments, date/time settings of the second BPM **310** are additionally synchronized to the date/time settings of the first BPM **305** during or following transfer of the schedule **605** between the two devices.

Referring again to FIG. **5**, an exception list is optionally transmitted to the second BPM **310** at an operation **520**. An example exception list is described below in connection with FIGS. **7-9**. The second BPM **310** is configured to receive and internally process the exception list, which is in turn displayed by the second BPM **310** when a blood pressure reading obtained by the second BPM **310** differs "significantly" in magnitude from the "in-office" reading stored within the second BPM **310** at operation **510**, also described further below.

Referring now to FIG. **7**, an example method **700** for using the second BPM **310** is shown in accordance with the present disclosure. In the example embodiment, the second BPM **310** is used by the patient **105** to supplement "in-office" blood pressure data obtained by the first BPM **305** to provide a healthcare professional with more information to understand and manage patient blood pressure. Additionally, use of the second BPM **310** to obtain "at-home" blood pressure readings enables identification of other blood pressure-related phenomena or comorbid conditions.

The method **700** begins at an operation **705**. At operation **705**, the blood pressure cuff **335** of the second BPM **310** is positioned to the patient **105** for the purpose of obtaining an oscillometric blood pressure measurement.

Next, at an operation **710**, the patient **105** initiates the measurement upon selection of a corresponding control mechanism (e.g., start button) of the second BPM **310**. In the example embodiment, the second BPM **310** calculates values of the systolic and diastolic pressures (e.g., SYS**2**/DIA**2**=120/80) upon analysis of raw oscillometric data (e.g., envelope **215**) that is obtained in a manner similar to that described above in connection with FIGS. **1-6**.

Next, at operation **715**, the second BPM **310** compares the "at-home" blood pressure reading calculated at operation **710** to a stored "in-office" blood pressure reading to determine whether the "at-home" reading is potentially "abnormal." For example, referring now additionally to FIG. **8**, an exception list **800** is displayed by the second BPM **310** when the blood pressure reading calculated at operation **710** sufficiently differs in magnitude from the stored "in-office" reading based on a pre-defined rule (e.g., |SYS**1**−SYS**2**|>5 mmHg; |SYS**1**−SYS**2**|>3 mmHg AND |DIA**1**−DIA**2**|>4 mmHg, |SYS**1**−SYS**2**|>4 mmHg OR |DIA**1**−DIA**2**|>2 mmHg etc.). When the condition(s) of the pre-defined rule is satisfied, one or more items **805** are displayed (e.g., "Stressed?") for optional selection by the patient **105** for the purpose of providing context to the "abnormal" blood pressure reading. Other embodiments are possible.

For example, in some embodiments, the "at-home" blood pressure reading is further compared to the "in-office" blood pressure reading stored within the second BPM **310** for the purpose of identifying white-coat hypertension, a phenomenon in which patients exhibit elevated blood pressure in a clinical setting but not in other settings. For example, when the "at-home" blood pressure reading is "significantly" less than the "in-office" blood pressure reading (e.g., (SYS**1**−SYS**2**)≥5 mmHg), the second BPM **310** flags or documents the "at home" blood pressure reading. Such an arrangement beneficially enables a physician to obtain a more accurate picture of patient blood pressure readings and/or trends. Other embodiments are possible.

When the "at-home" blood pressure reading calculated at operation **710** is evaluated as "normal" at operation **715**, process flow proceeds to an operation **720** in which the blood pressure reading is both displayed (e.g., SYS**2**/DIA**2**=120/80) and stored to the second BPM **310** for future use, as described in further detail below in connection with FIGS. **10-11**. When the "at-home" blood pressure reading is evaluated as "abnormal" at operation **715**, process flow proceeds to an operation **725** in which both the exception list **800** of FIG. **8** is displayed and the blood pressure reading is stored to the second BPM **310** for future use.

In general, the second BPM **310** is configured to help the patient properly use the second BPM **310**. In some embodiments, a notification is shown on a display of the second BPM **310** indicating one or more "missed" blood pressure readings. For example, FIG. **9** shows an example notification **900** indicating "1 Morning Reading Missed" and also shows a text **905** "Alarm tomorrow morning?" that is optionally selectable by the patient **105** to program the second BPM **310** to alert the patient **105** such that another "morning" blood pressure reading is not missed. In this manner, the example notification **900** increases patient compliance.

Referring now to FIG. **10**, an example computing environment **1000** configured for uploading and viewing blood pressure data obtained by the second BPM **310** is shown. In this example, either the patient **105** or a healthcare professional initially accesses a web portal via a web browser **1005** executing on a computing device **1010**. A communication link is then automatically or manually established to communicatively connect the second BPM **310** to the computing device **1010**. Following establishment of the communication link, a data file **1020** including all time-stamped blood pressure data obtained by the second BPM **310** and a pressure offset correction parameter is transferred to the computing device **1010**. The correction parameter being previously calculated and stored within the second BPM **310** in a manner similar to that described above in connection with FIGS. **1-9**.

The example computing device **1010** is configured to receive and transfer all information within the data file **1020** to the web portal via a network connection (not shown). Subsequently, the patient **105** or a healthcare professional can access the web portal via the web browser **1005** to view blood pressure trend data over a configurable time period. For example, referring now to additionally to FIG. **11**, an example pressure curve **1100** is shown illustrating blood pressure trend data of the patient **105** over an example time period t=24 hours.

In the example shown, a first data point **1105** taken at time $t=t_1$ in late afternoon corresponds to an initial "in-office" blood pressure reading obtained by the first BPM **305**. In contrast, a second data point **1110** taken at time $t=t_2$ and a third data point **1115** taken at time $t=t_3$ each correspond to an "at-home" blood pressure reading obtained by the second BPM **310** in accordance with a predefined schedule (e.g., schedule **605**). The second data point **1110** and third data point **1115** being both taken by the patient **105** in the evening of the same day that the first data point **1105** was taken.

Similarly, a fourth data point **1120** taken at time $t=t_4$ and a fifth data point **1125** taken at time $t=t_5$ corresponds to "at-home" blood pressure readings obtained by the second BPM **310**, both taken in the morning following the day that the first data point **1105** was taken. Lastly, a sixth data point **1130** taken at time $t=t_6$ and a seventh data point **1135** taken at time $t=t_7$ corresponds to "at-home" blood pressure readings obtained by the second BPM **310**, both taken in the afternoon following the day that the first data point **1105** was taken.

In example embodiments, the data points **1110-1135** as obtained by the second BPM **310** are plotted on the pressure curve **1100** taking into account the pressure offset correction parameter as defined within the data file **1020**. In this manner, the blood pressure readings associated with these data points are correlated and consistent with the blood pressure reading of the first data point **1105** calculated by the first BPM **305**. Other embodiments are possible.

Referring now to FIG. **12**, an example networked environment **1200** is shown in accordance with the present disclosure. The networked environment **1200** includes a server device **1205**, a first client device **1210**, a second client device **1215**, a storage device **1220**, and a network **1225**. Other embodiments are possible. For example, the networked environment **1200** may generally include more or fewer devices, networks, and other components as desired.

The server device **1205**, first client device **1210**, and second client device **1215** are computing devices, described in further detail below in connection with FIG. **13**.

The storage device **1220** is an electronic data storage device, such as a relational database or any other type of persistent data storage device. The storage device **1220** stores data in a predefined format such that the server device **1205** can query, modify, and/or manage electronic data stored thereon. Example electronic data includes information related to HIPAA protected patient-specific medical information (e.g., blood pressure data, medical history, etc.). Other embodiments of the storage device **1220** are possible.

The network **1225** is a bi-directional data communication path for data transfer between one or more devices. In the example shown, the network **1225** establishes a communication path for data transfer between the server device **1205**, first client device **1210**, and the second client device **1215**. However, in the example shown, the first client device **1210**

and the second client device **1215** are additionally configured to communication directly (e.g., via wireless and/or hardwire connection).

In general, the network **1225** can be of any of a number of wireless or hardwired WAN, LAN, Internet, or other packet-based communication networks such that data can be transferred among the respective elements of the networked environment **1200**. Other embodiments of the network **1225** are possible.

Referring now to FIG. **13**, the server device **1205** of FIG. **12** is shown in further detail. As mentioned above, the server device **1205** is a computing device. An example computing device includes a desktop computer, laptop computer, server computer, personal data assistant, smartphone, netbook, notebook, and many others.

The server device **1205** includes a processing unit **1305** and a system memory **1310**. The system memory **1310** stores an operating system **1315** for controlling the operation of the server device **1205** and/or another computing device(s). The system memory **1310** further includes one or more software applications **1320**. Software applications **1320** include many different types of single and multiple-functionality programs, such as a server program, a web browser program, an electronic mail program, and many others. An example server program is portal server that hosts and/or provides access to functionality associated with a web portal. Other embodiments are possible.

The system memory **1310** is computer-readable media. Examples of computer-readable media include computer storage media and communication media. Computer storage media is physical and/or tangible media that is distinguished from communication media.

Computer storage media includes physical volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules, or other data. Computer storage media also includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, DVD or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other physical medium which can be used to store the desired information and which can be accessed by the server device **1205**. Any such computer storage media may be part of or external to the server device **1205**. Such storage is illustrated in FIG. **13** by removable storage **1325** and non-removable storage **1330**.

Communication media is typically embodied by computer-readable instructions, data structures, program modules, or other data, in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. The term "modulated data signal" describes a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared and other wireless media.

The server device **1205** also includes any number and type of an input device **1335** and output device **1340**. An example input device **1335** includes a keyboard, mouse, pen, voice input device, touch input device, and others. An example output device **1340** includes a display, speakers, printer, and others. The server device **1205** also includes a communication connection **1345** configured to enable communications with other computing devices directly and/or over a network (e.g., network **1225**) in a distributed computing system environment.

The first client device **1210** and the second client device **1215** are generally configured similar to the server device **1205** as described in connection with FIG. **12**. In example embodiments, the first client device **1210** is additionally configured as a programmable automated blood pressure machine (e.g., monitor **110**, first BPM **305**, second BPM **310**, etc.) to perform an oscillometric blood pressure measurement. The second client device **1215** is a special purpose computing device (e.g., computing device **1010**) configured to enable a user to access and/or implement functionality of the server device **1205** and the first client device **1210**. Other embodiments are possible.

The example embodiments described herein can be implemented as logical operations in a computing device in a networked computing system environment. The logical operations can be implemented as: (i) a sequence of computer implemented instructions, steps, or program modules running on a computing device; and (ii) interconnected logic or hardware modules running within a computing device.

For example, the logical operations can be implemented as algorithms in software, firmware, analog/digital circuitry, and/or any combination thereof, without deviating from the scope of the present disclosure. The software, firmware, or similar sequence of computer instructions can be encoded and stored upon a computer readable storage medium and can also be encoded within a carrier-wave signal for transmission between computing devices.

Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

What is claimed is:

1. A method for correlating diagnostic measurements obtained by at least two different medical devices, the method comprising:

obtaining a first diagnostic measurement at a location on a patient by initiating a first oscillometric blood pressure measurement reading with a first medical device using a first inflatable cuff inflated to a pressure exceeding a systolic arterial pressure;

obtaining configuration data of the first medical device, the configuration data including set-up information and pneumatic information;

configuring a second medical device based on the configuration data of the first medical device;

obtaining a second diagnostic measurement at the same location on the patient by initiating a second oscillometric blood pressure measurement reading with the second medical device using the first inflatable cuff or a second inflatable cuff inflated to the pressure exceeding the systolic arterial pressure;

generating, by a processing unit, a correction parameter by comparing the first and second diagnostic measurements, wherein the correction parameter includes a pressure offset correction parameter that quantifies a difference in oscillometric blood pressure measured by the first medical device and the second medical device;

storing the correction parameter in the second medical device;

obtaining, by the second medical device, a blood pressure measurement; and

adjusting the blood pressure measurement using the correction parameter by offsetting the blood pressure measurement by the pressure offset correction parameter.

2. The method of claim **1**, wherein the first diagnostic measurement is a first blood pressure value and the second diagnostic measurement is a second blood pressure value.

3. The method of claim **2**, further comprising mechanically coupling the first medical device and the second medical device.

4. The method of claim **3**, further comprising approximately simultaneously calculating, by the processing unit, the first and second blood pressure values.

5. The method of claim **4**, further comprising calculating, by the processing unit, the first and second blood pressure values from the first and second oscillometric blood pressure measurement readings.

6. The method of claim **2**, further comprising calculating, by the processing unit, the first blood pressure value from the first oscillometric blood pressure measurement reading.

7. The method of claim **6**, further comprising wirelessly transmitting the first blood pressure value and the first oscillometric blood pressure measurement reading to the second medical device.

8. The method of claim **7**, further comprising calculating, by the processing unit, the second blood pressure value from the second oscillometric blood pressure measurement reading.

9. The method of claim **2**, further comprising transferring, by the processing unit, at least the first blood pressure value and the second blood pressure value to a web portal from the second medical device.

10. The method of claim **9**, further comprising generating, by the processing unit, a blood pressure trend plot including at least the first blood pressure value and the second blood pressure value.

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专利名称(译)	血压监测系统和方法		
公开(公告)号	US10098553	公开(公告)日	2018-10-16
申请号	US13/606967	申请日	2012-09-07
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IPC分类号	A61B5/022 A61B5/00		
CPC分类号	A61B5/02225 A61B5/7246 A61B2560/0223 A61B5/0002		
代理机构(译)	商户德律P.C.		
优先权	61/532719 2011-09-09 US		
其他公开文献	US20130245467A1		
外部链接	Espacenet		

摘要(译)

用于关联由至少两个医疗设备获得的诊断读数的系统和方法可以包括压力偏移校正参数，其被计算用于关联“家庭”血压监测器和“办公室”血压监测器之间的示波血压读数。偏移校正参数用于调整“家庭”或“办公室”血压监测器的血压读数，使得这些读数可以有效地与使用另一个血压监测器获得的血压读数进行比较。以这种方式，可以开发更完整和可靠的血压趋势并用于管理与血压相关的医疗状况。