US009646136B2

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

(10) **Patent No.: US 9,646,136 B2**
(45) **Date of Patent: May 9, 2017**

(54) **PHYSIOLOGICAL PARAMETER MEASURING PLATFORM DEVICE SUPPORTING MULTIPLE WORKFLOWS**

(71) Applicant: **Welch Allyn, Inc.**, Skaneateles Falls, NY (US)

(72) Inventors: **Shawn C. St. Pierre**, Syracuse, NY (US); **Esther N. Ahn**, San Francisco, CA (US); **Eric J. Bailey**, Oakland, CA (US); **Michael D. Garrant**, Marcellus, NY (US); **Roger W. Graves**, San Francisco, CA (US); **Jennifer M. Kilian**, New York, NY (US); **Thomas A. Myers**, Syracuse, NY (US)

(73) Assignee: **Welch Allyn, Inc.**, Skaneateles Falls, NY (US)

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(21) Appl. No.: **14/994,576**

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(65) **Prior Publication Data**

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(Continued)

(51) **Int. Cl.**
***G08B 1/08*** (2006.01)
***G06F 19/00*** (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ..... ***G06F 19/3406*** (2013.01); ***A61B 5/02055*** (2013.01); ***A61B 5/7445*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC combination set(s) only.
See application file for complete search history.

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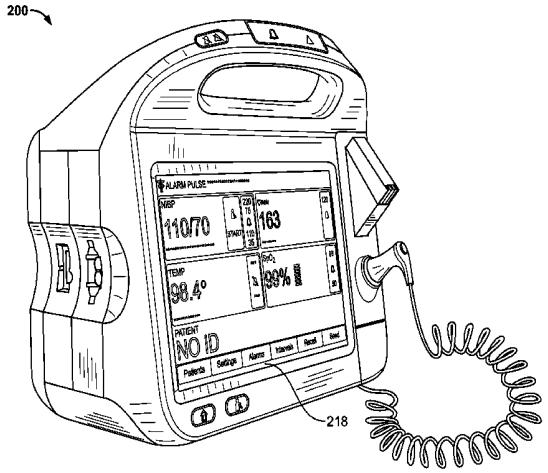
*Primary Examiner* — Travis Hunnings
(74) *Attorney, Agent, or Firm* — Merchant & Gould P.C.

(57) **ABSTRACT**

A device obtains a series of measurements of a physiological parameter of a monitored patient when the device is operating within a monitoring workflow. The device displays a monitoring workflow home screen when the device is operating within the monitoring workflow. The monitoring workflow home screen contains a representation of the physiological parameter of the monitored patient. In addition, the device obtains a measurement of the physiological parameter of each patient in a series of patients when the device is operating within a non-monitoring workflow. The device displays a non-monitoring workflow home screen when the device is operating within the non-monitoring workflow. The non-monitoring workflow home screen contains a representation of the physiological parameter of a
(Continued)



given patient in the series of patients. The monitoring workflow home screen is different than the non-monitoring workflow home screen.

**18 Claims, 27 Drawing Sheets**

**Related U.S. Application Data**

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(51) **Int. Cl.**

| | |
|---|---|
| ***A61B 5/0205*** | (2006.01) |
| ***A61B 5/00*** | (2006.01) |
| ***G06Q 10/06*** | (2012.01) |
| ***G06Q 50/22*** | (2012.01) |

(52) **U.S. Cl.**

CPC ..... ***A61B 5/7475*** (2013.01); ***G06F 19/3487*** (2013.01); ***G06Q 10/06*** (2013.01); ***G06Q 50/22*** (2013.01); *A61B 5/746* (2013.01)

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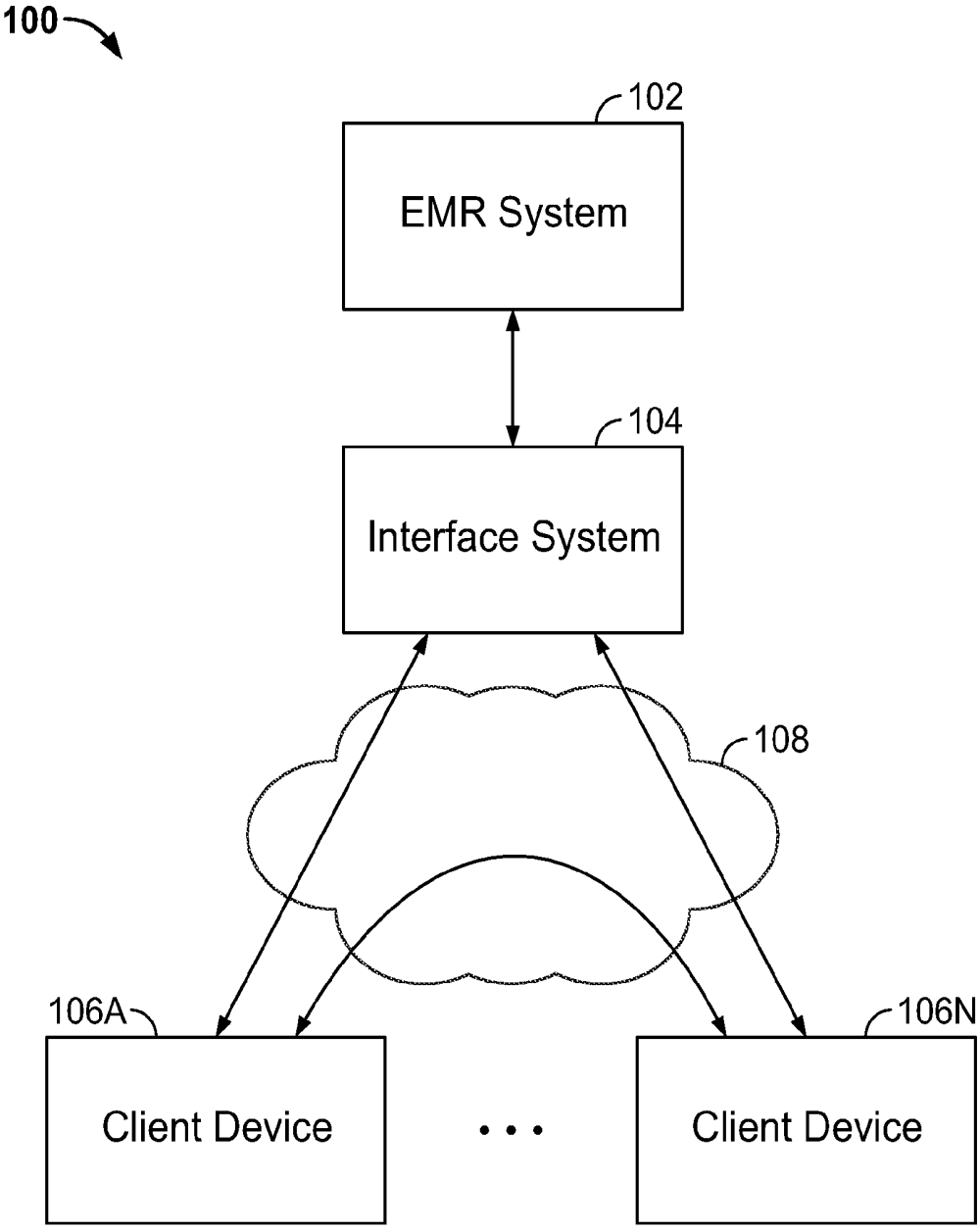

100
102
EMR System
104
Interface System
108
106A
106N
Client Device
Client Device

FIG. 1

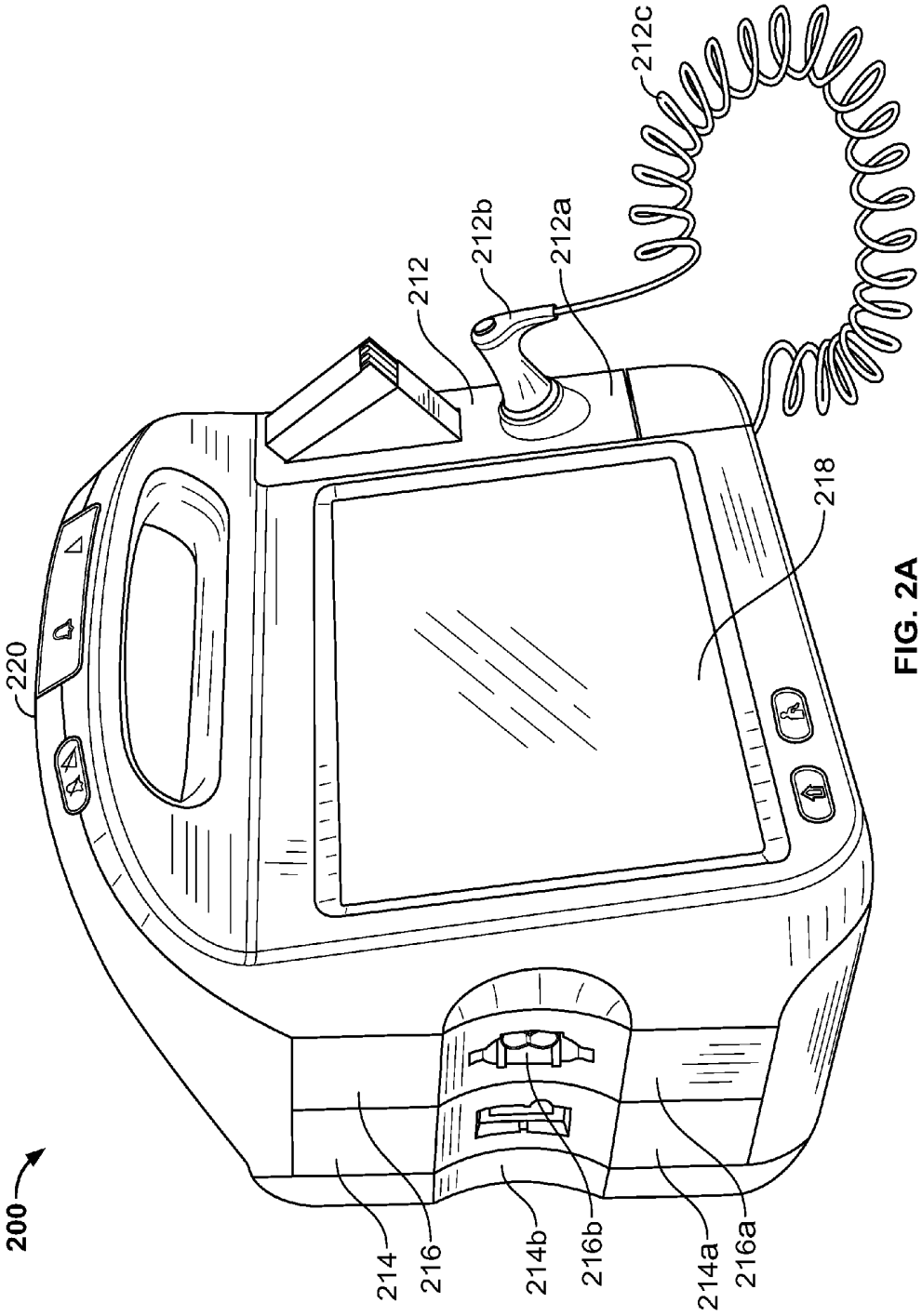



FIG. 2A

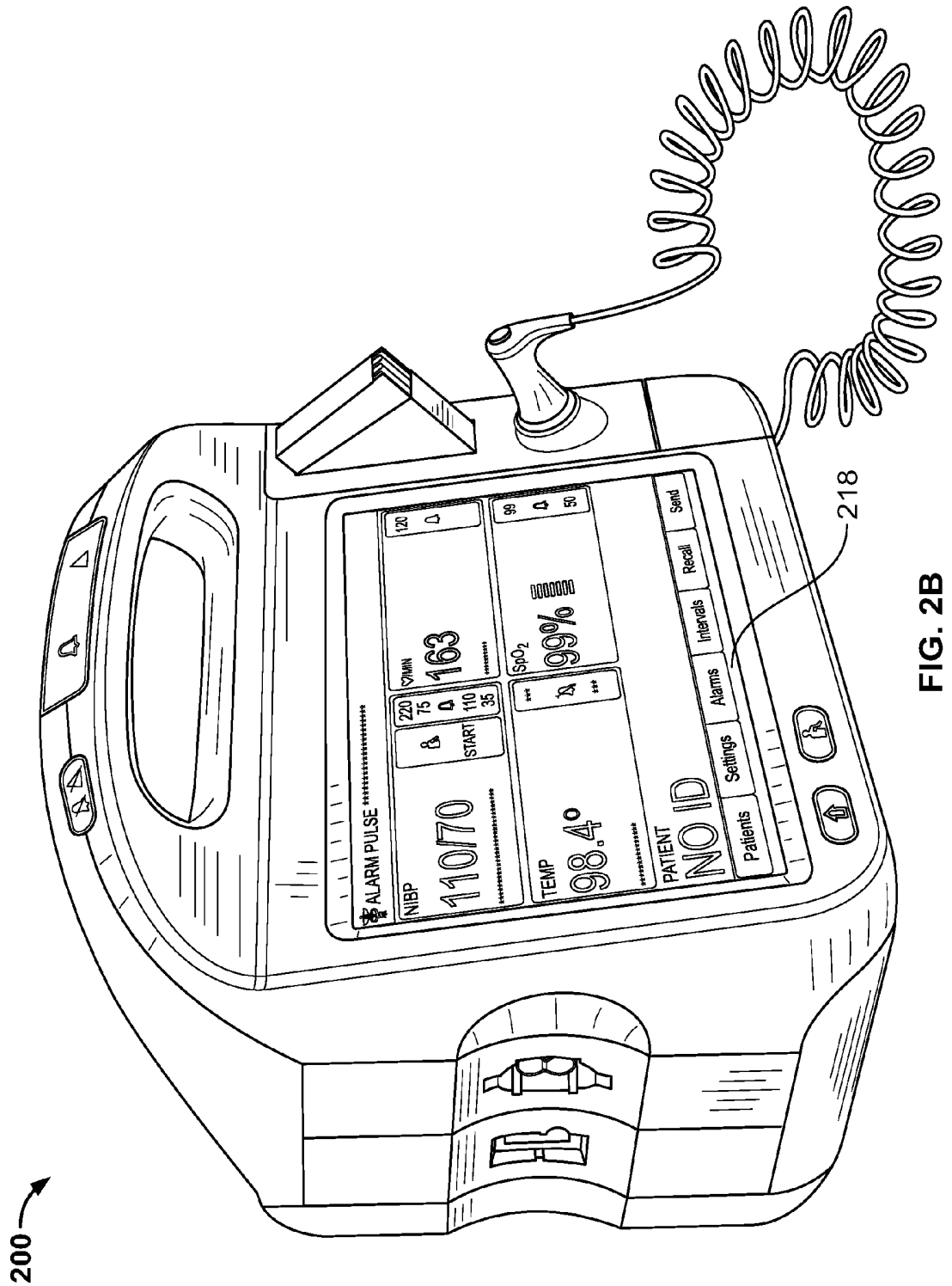
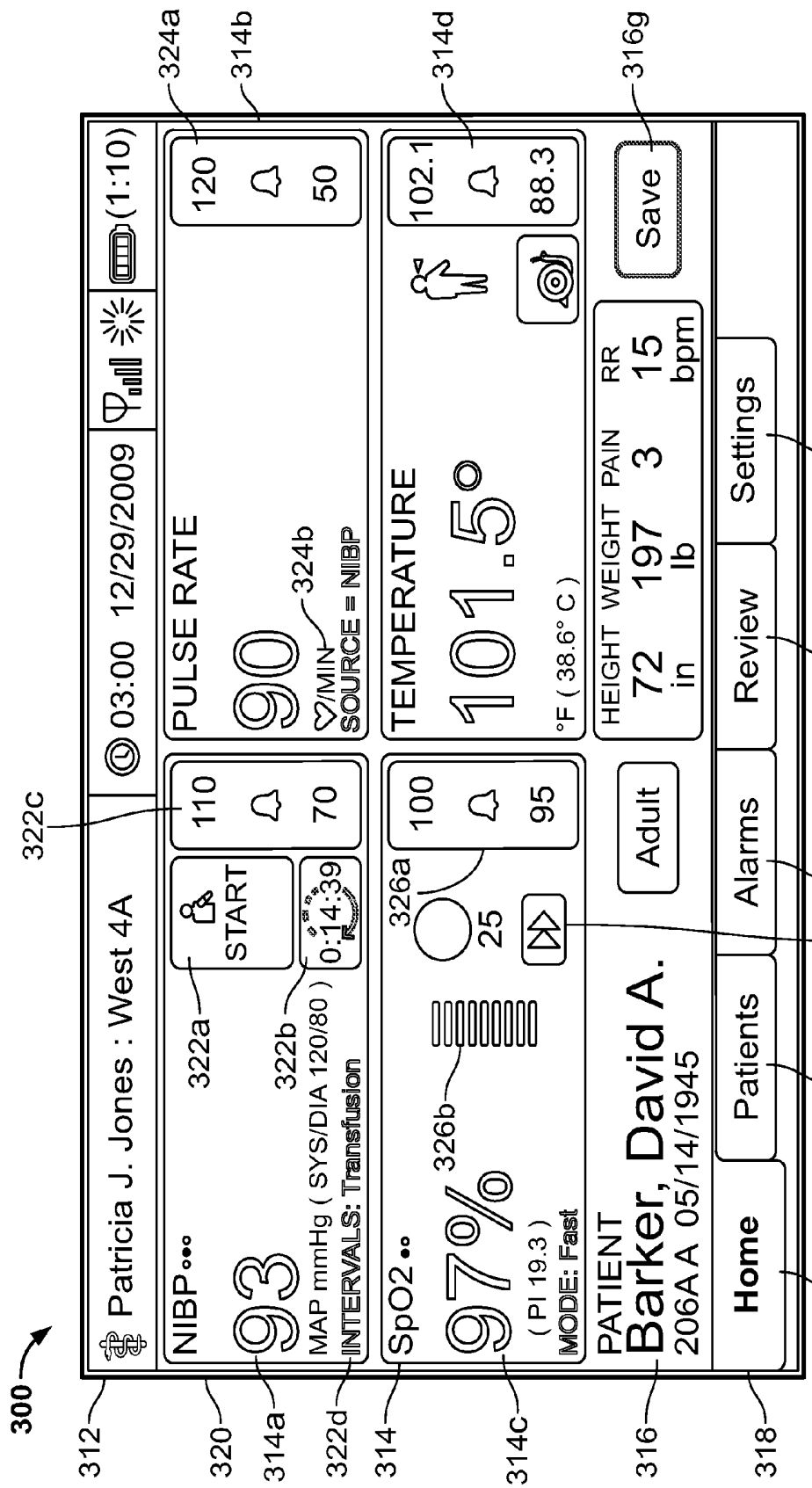

200
218
ALARM PULSE
NIBP
110/70
START
220
75
110
35
120
99
50
163
SpO2
99%
TEMP
98.4°
PATIENT
NO ID
Patients
Settings
Alarms
Intervals
Recall
Send

FIG. 2B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320
314a
322d
314
314c
316
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322c
322a
322b
324a
314b
324b
314d
316g
326a
326b
326c
318a
318b
318c
318d
318e
Patricia J. Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP
93
MAP mmHg ( SYS/DIA 120/80 )
INTERVALS: Transfusion
START
110
70
0:14:39
PULSE RATE
90
/MIN
SOURCE = NIBP
120
50
SpO2
97%
( PI 19.3 )
MODE: Fast
100
95
25
Adult
TEMPERATURE
101.5
°F ( 38.6° C )
102.1
88.3
HEIGHT WEIGHT PAIN RR
72 197 3 15
in lb bpm
Save
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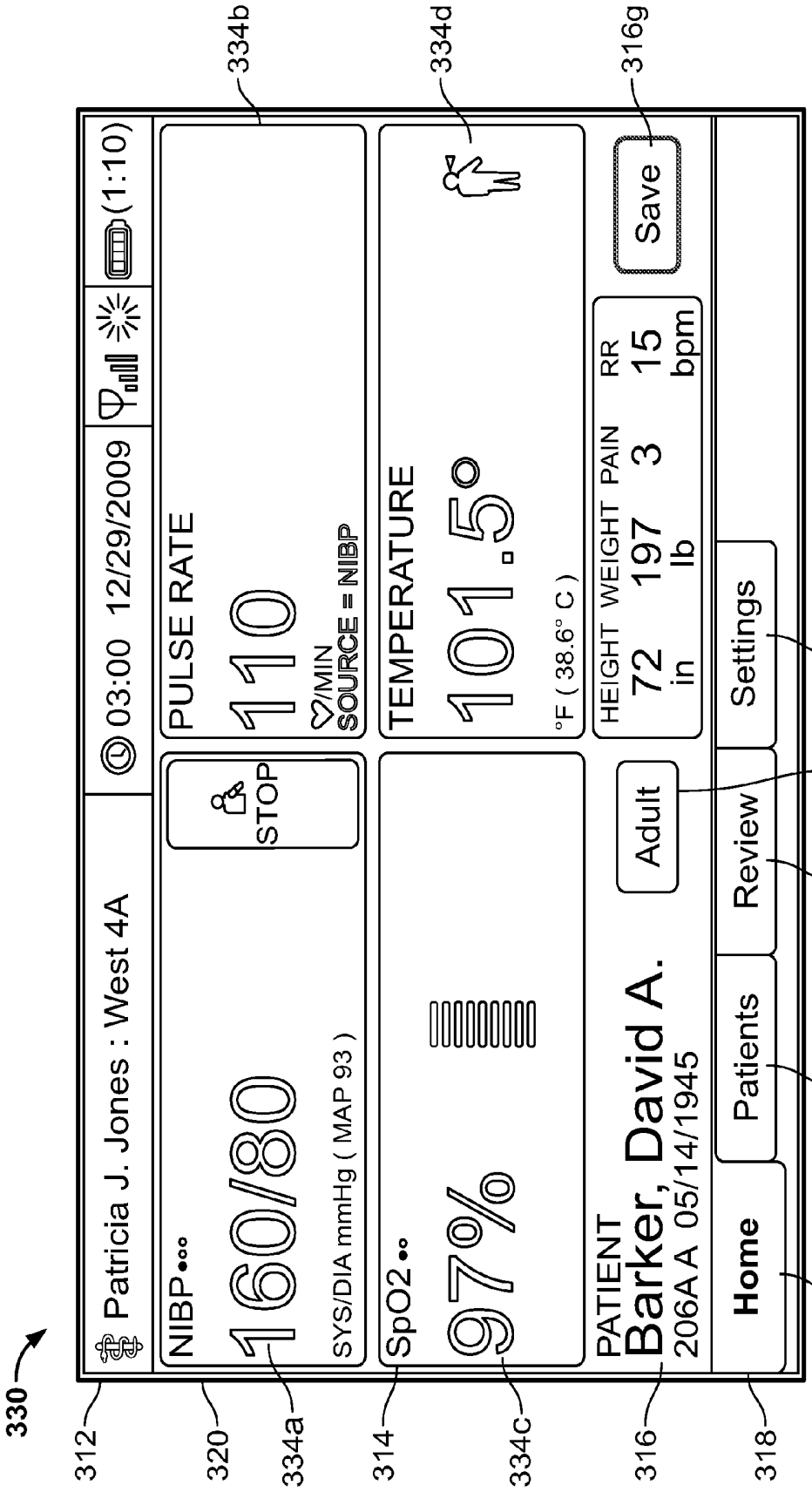
Home
Patients
Alarms
Review
Settings

FIG. 3A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Patricia J. Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP
STOP
160/80
SYS/DIA mmHg ( MAP 93 )
PULSE RATE
110
/MIN
SOURCE = NIBP
TEMPERATURE
101.5°
°F ( 38.6° C )
HEIGHT WEIGHT PAIN RR
72 197 3 15
in lb bpm
Save
SpO2
97%
PATIENT
Barker, David A.
206A A 05/14/1945
Adult
316b
Home
Patients
Review
Settings
318a
318b
318d
318e

FIG. 3B

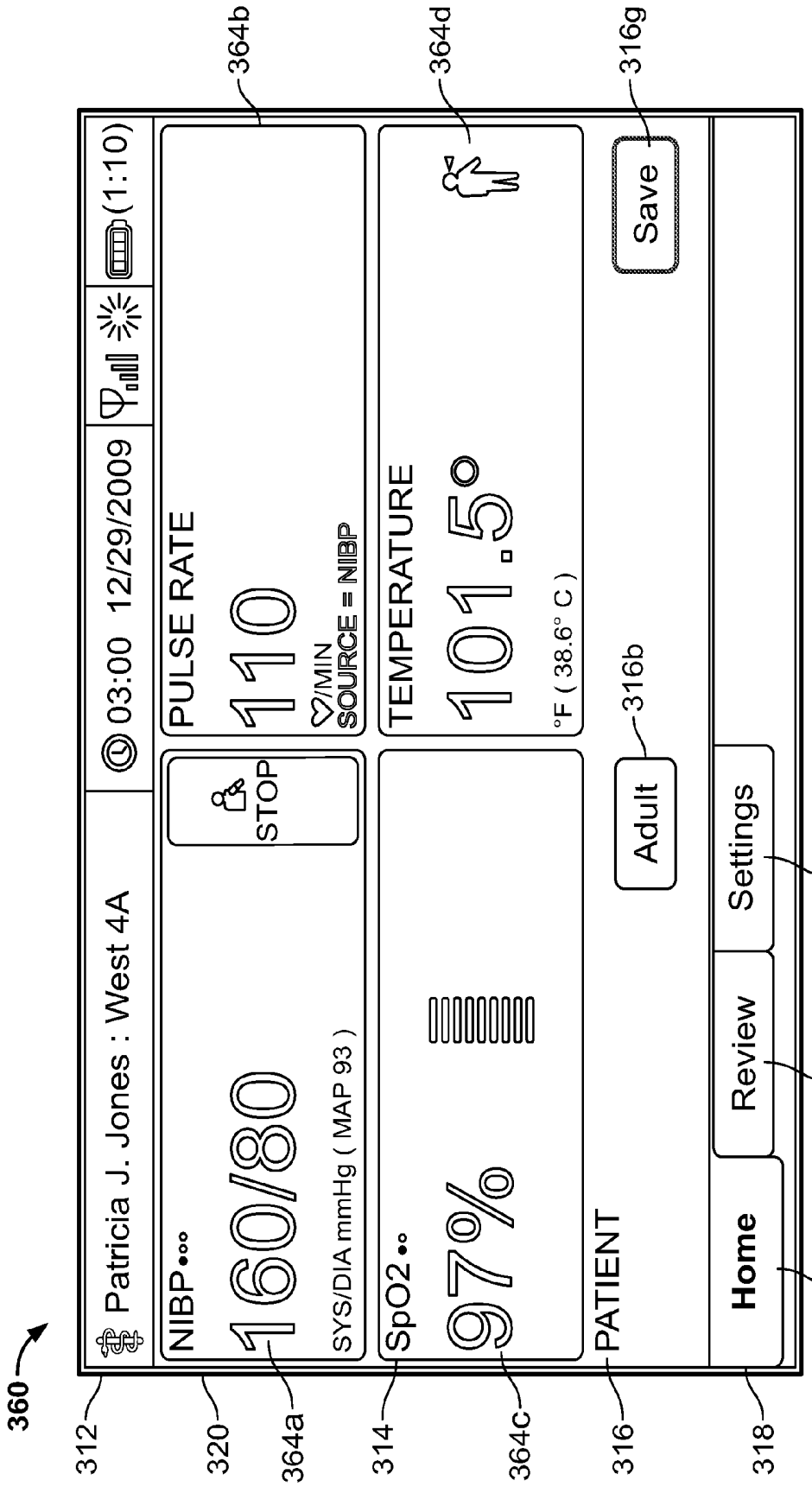
360
312
320
364a
314
364c
316
318
364b
364d
316g
316b
318a
318d
318e
Patricia J. Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP
160/80
SYS/DIA mmHg ( MAP 93 )
STOP
PULSE RATE
110
/MIN
SOURCE = NIBP
SpO2
97%
TEMPERATURE
101.5°
°F ( 38.6° C )
Save
Adult
PATIENT
Home
Review
Settings

FIG. 3C

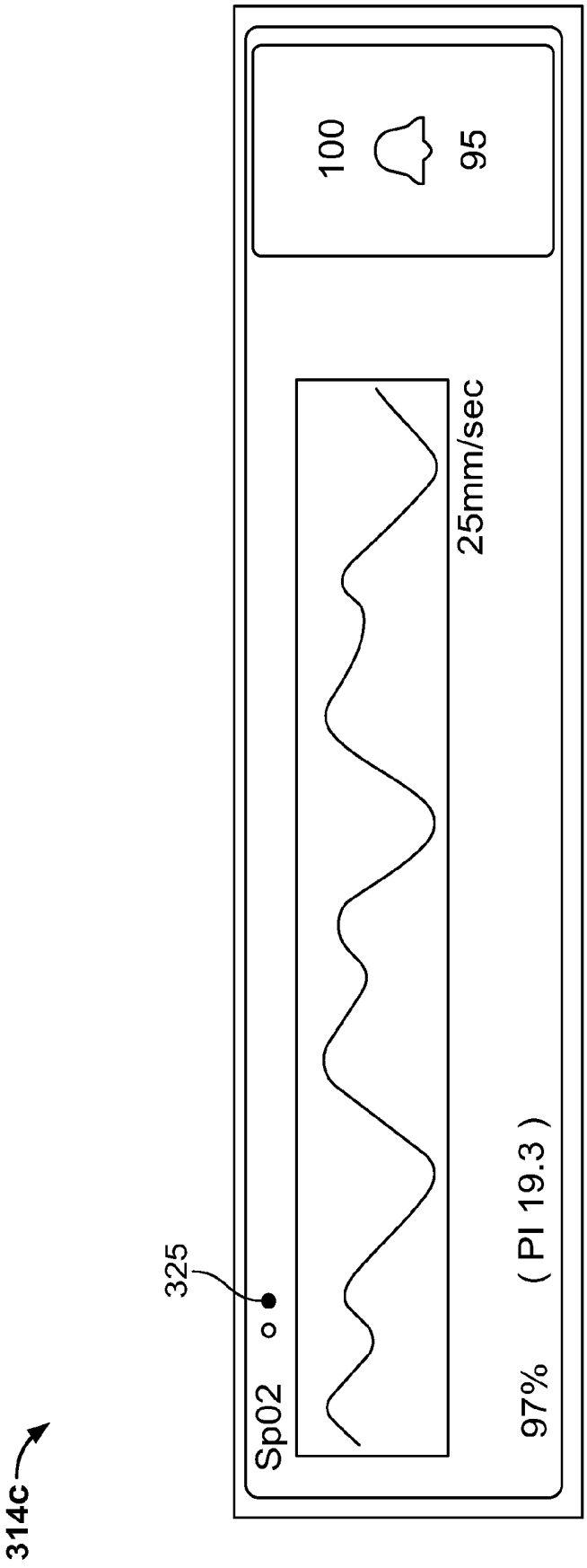


FIG. 3D

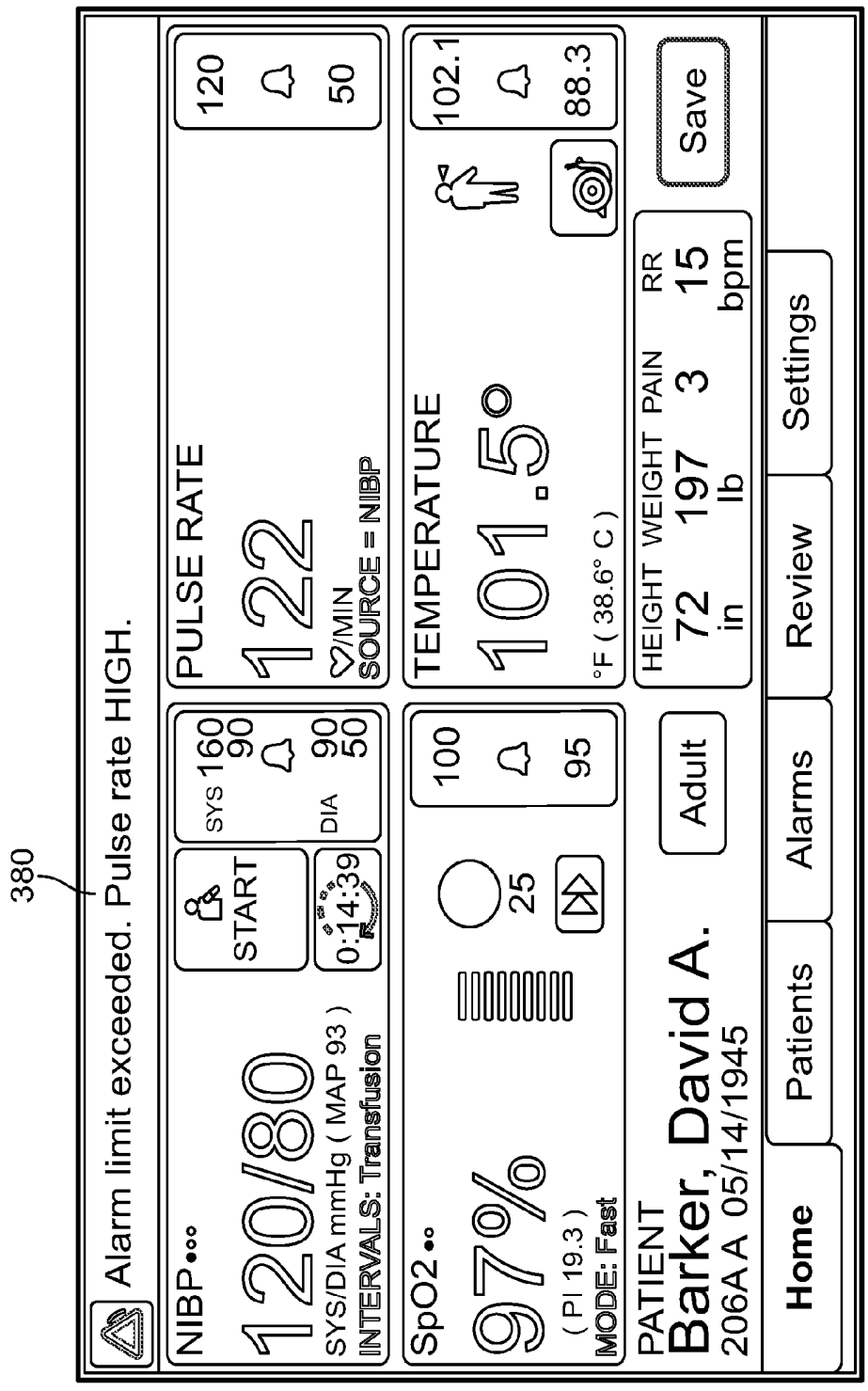
380
Alarm limit exceeded. Pulse rate HIGH.
NIBP
START
SYS 160
90
DIA 90
50
120/80
SYS/DIA mmHg ( MAP 93 )
0:14:39
INTERVALS: Transfusion
PULSE RATE
120
50
122
/MIN
SOURCE = NIBP
SpO2
100
25
95
97%
( PI 19.3 )
MODE: Fast
Adult
TEMPERATURE
102.1
88.3
101.5°
°F ( 38.6° C )
HEIGHT WEIGHT PAIN RR
72 197 3 15
in lb bpm
Save
PATIENT
Barker, David A.
206A A 05/14/1945
Home
Patients
Alarms
Review
Settings

FIG. 3E

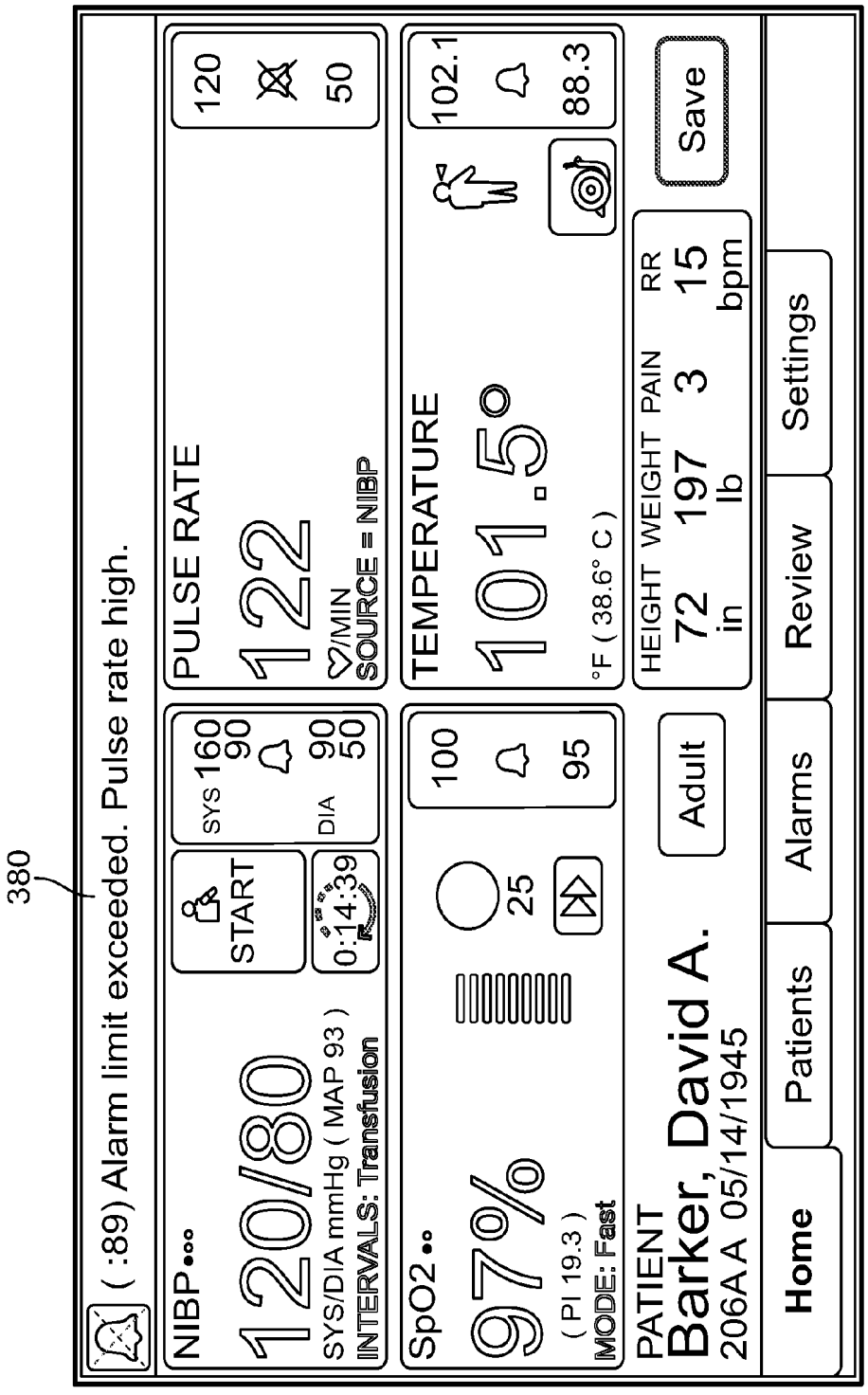
380
( :89) Alarm limit exceeded. Pulse rate high.
NIBP
START
SYS 160
90
DIA 90
50
120/80
SYS/DIA mmHg ( MAP 93 )
INTERVALS: Transfusion
0:14:39
PULSE RATE
120
50
122
♡/MIN
SOURCE = NIBP
SpO2
100
95
97%
( PI 19.3 )
MODE: Fast
25
Adult
TEMPERATURE
102.1
88.3
101.5
°F ( 38.6° C )
HEIGHT WEIGHT PAIN RR
72 197 3 15
in lb bpm
Save
PATIENT
Barker, David A.
206A A 05/14/1945
Home
Patients
Alarms
Review
Settings

FIG. 3F

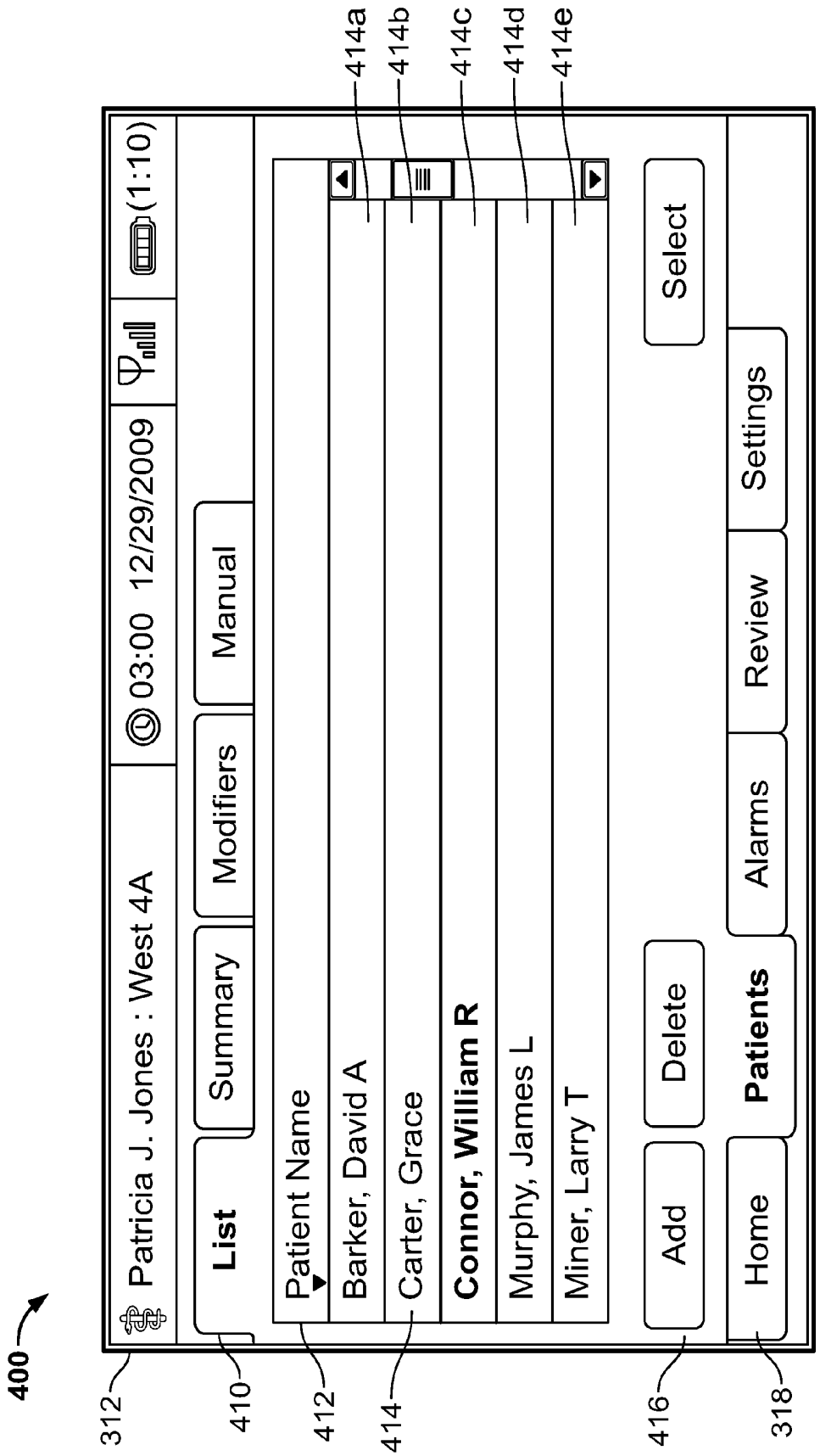
400
312
410
412
414
416
318
414a
414b
414c
414d
414e
Patricia J. Jones : West 4A
03:00 12/29/2009
(1:10)
List
Summary
Modifiers
Manual
Patient Name
Barker, David A
Carter, Grace
Connor, William R
Murphy, James L
Miner, Larry T
Select
Add
Delete
Home
Patients
Alarms
Review
Settings

FIG. 4

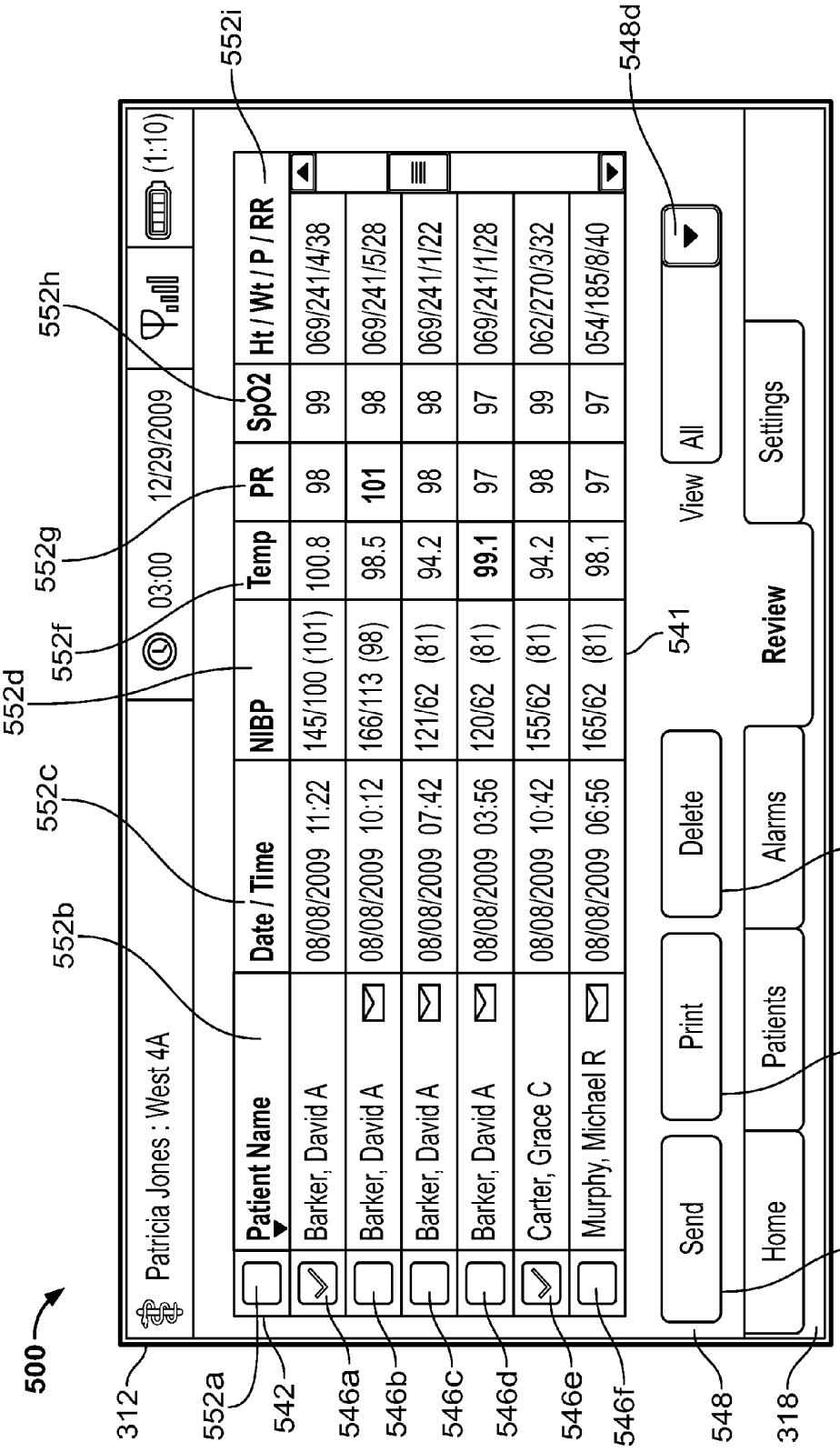
500
312
552a
542
552b
552c
552d
552f
552g
552h
552i
546a
546b
546c
546d
546e
546f
548
548a
548b
548c
548d
318
541
Patricia Jones : West 4A
03:00
12/29/2009
(1:10)
Patient Name
Date / Time
NIBP
Temp
PR
SpO2
Ht / Wt / P / RR
Barker, David A 08/08/2009 11:22 145/100 (101) 100.8 98 99 069/241/4/38
Barker, David A 08/08/2009 10:12 166/113 (98) 98.5 101 98 069/241/5/28
Barker, David A 08/08/2009 07:42 121/62 (81) 94.2 98 98 069/241/1/22
Barker, David A 08/08/2009 03:56 120/62 (81) 99.1 97 97 069/241/1/28
Carter, Grace C 08/08/2009 10:42 155/62 (81) 94.2 98 99 062/270/3/32
Murphy, Michael R 08/08/2009 06:56 165/62 (81) 98.1 97 97 054/185/8/40
View
All
Send
Print
Delete
Review
Settings
Home
Patients
Alarms

FIG. 5

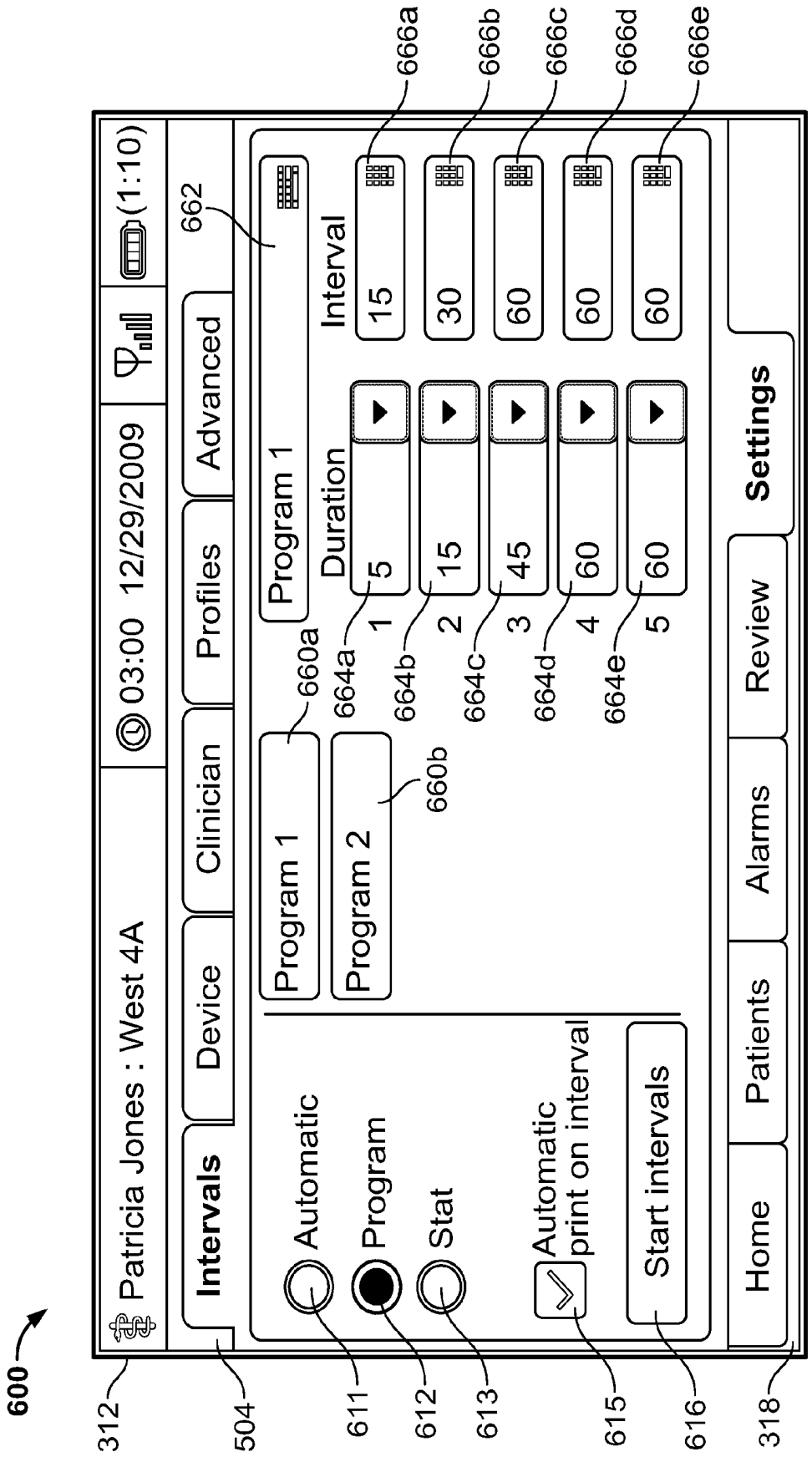
600
312
504
611
612
613
615
616
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
662
Program 1
Program 2
660a
660b
Automatic
Program
Stat
Automatic print on interval
Start intervals
Duration
Interval
664a
664b
664c
664d
664e
666a
666b
666c
666d
666e
1
2
3
4
5
5
15
45
60
60
15
30
60
60
60
Home
Patients
Alarms
Review
Settings

FIG. 6A

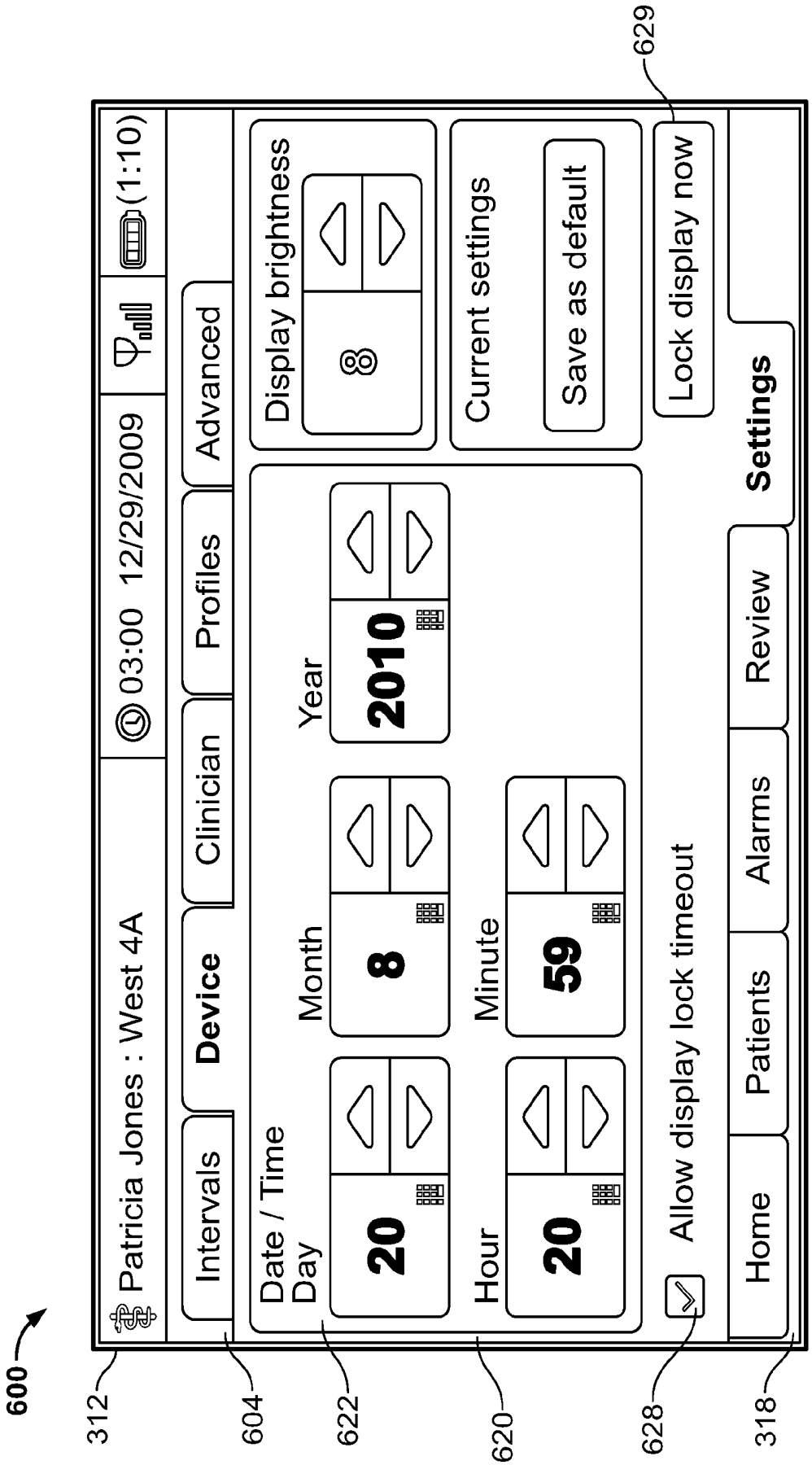
600
312
604
622
620
628
318
629
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
Date / Time
Day
20
Month
8
Year
2010
Hour
20
Minute
59
Allow display lock timeout
Display brightness
8
Current settings
Save as default
Lock display now
Home
Patients
Alarms
Review
Settings

FIG. 6B

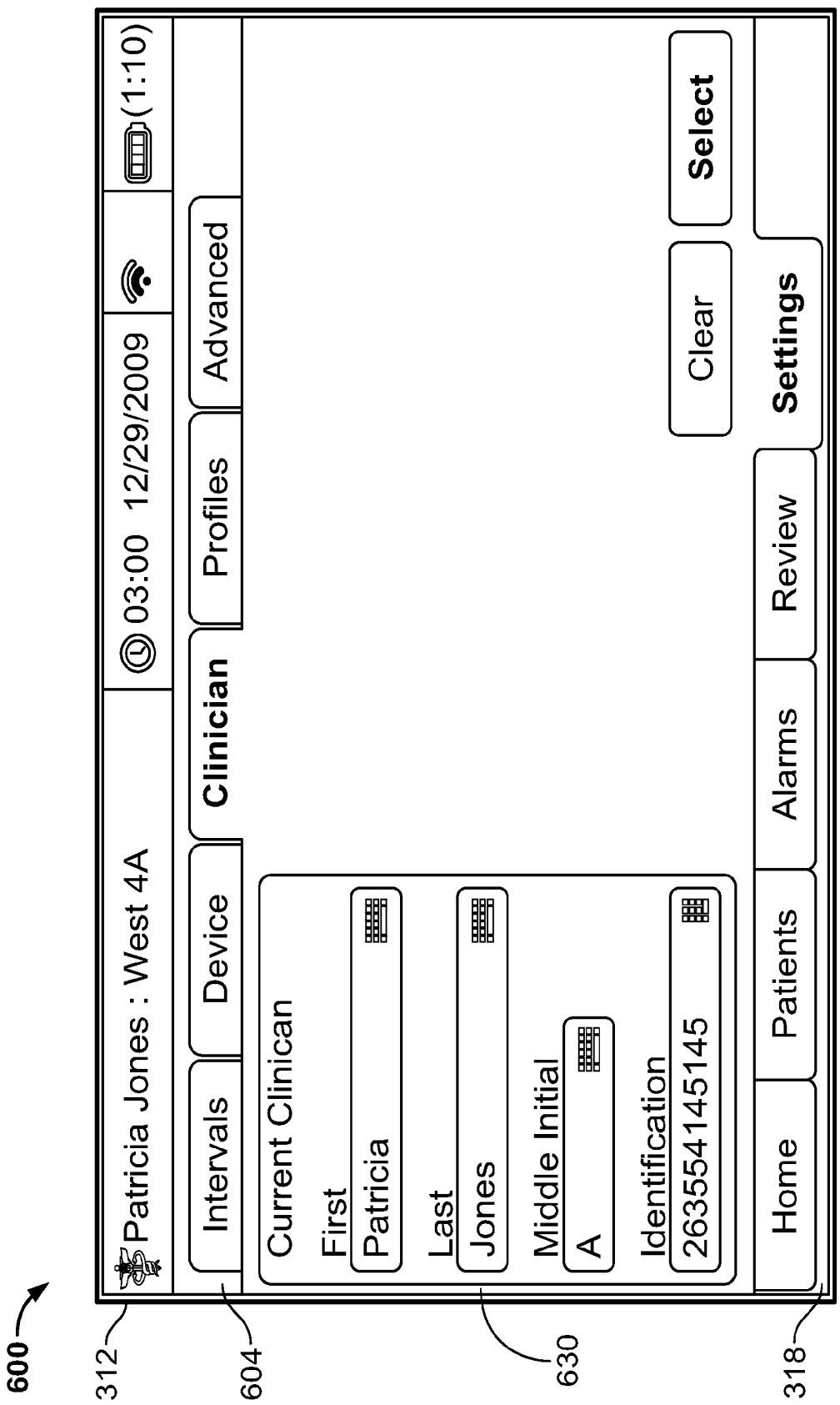
600
312
604
630
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
Current Clinican
First
Patricia
Last
Jones
Middle Initial
A
Identification
2635541451145
Clear
Select
Home
Patients
Alarms
Review
Settings

FIG. 6C

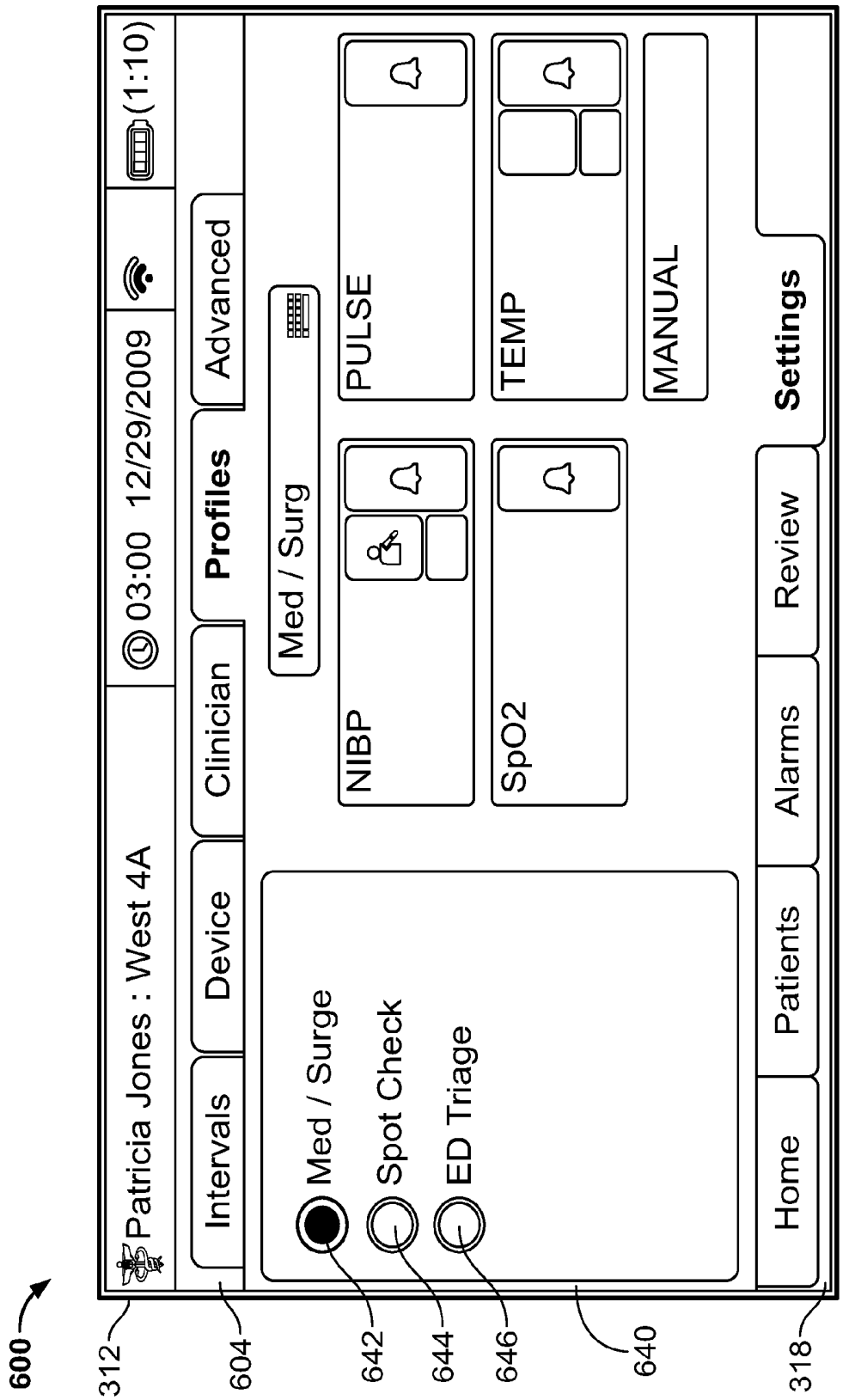
600
312
604
642
644
646
640
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
Med / Surg
Med / Surge
Spot Check
ED Triage
NIBP
SpO2
PULSE
TEMP
MANUAL
Home
Patients
Alarms
Review
Settings

FIG. 6D

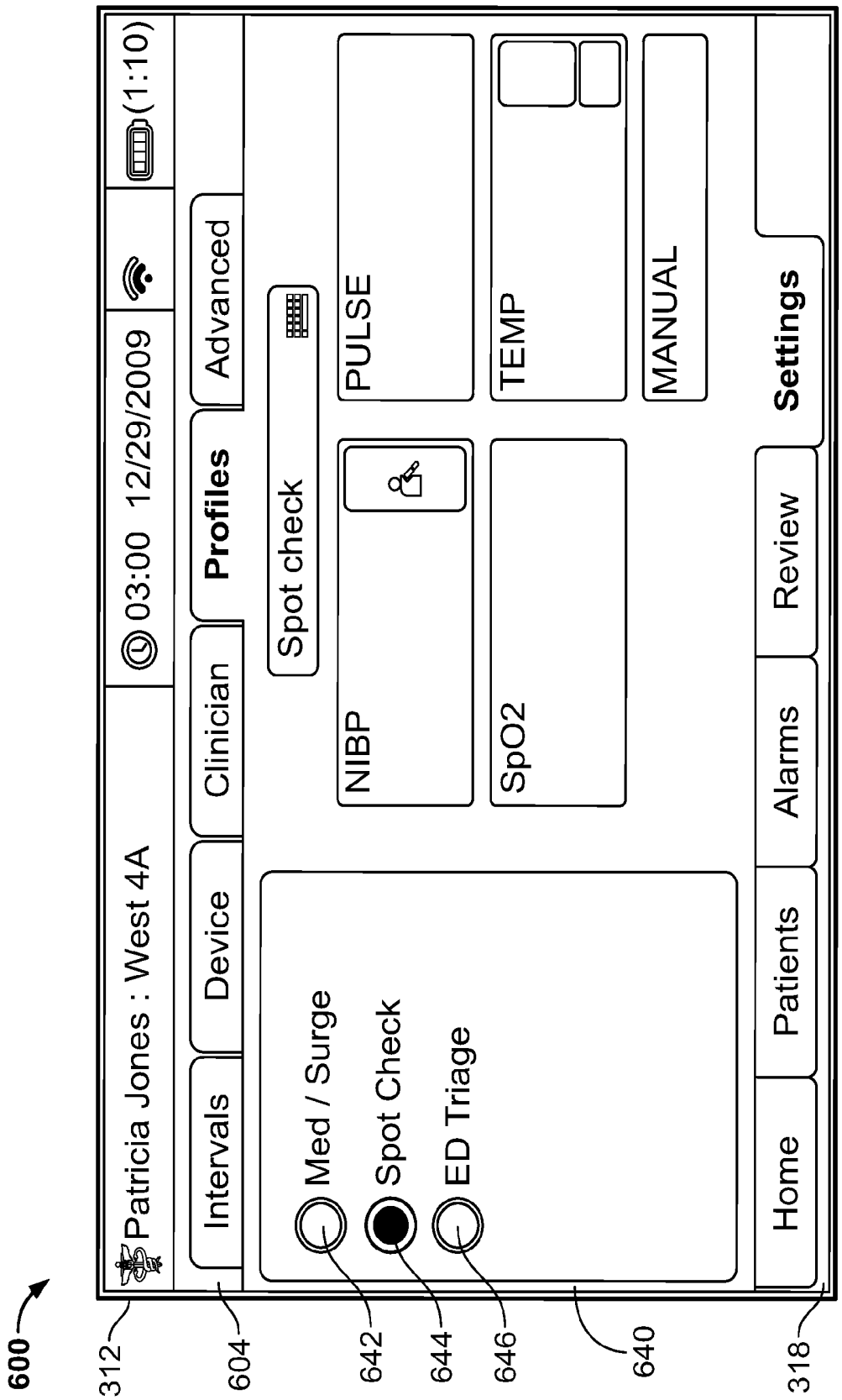
600
312
604
642
644
646
640
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
Spot check
NIBP
PULSE
TEMP
MANUAL
SpO2
Med / Surge
Spot Check
ED Triage
Home
Patients
Alarms
Review
Settings

FIG. 6E

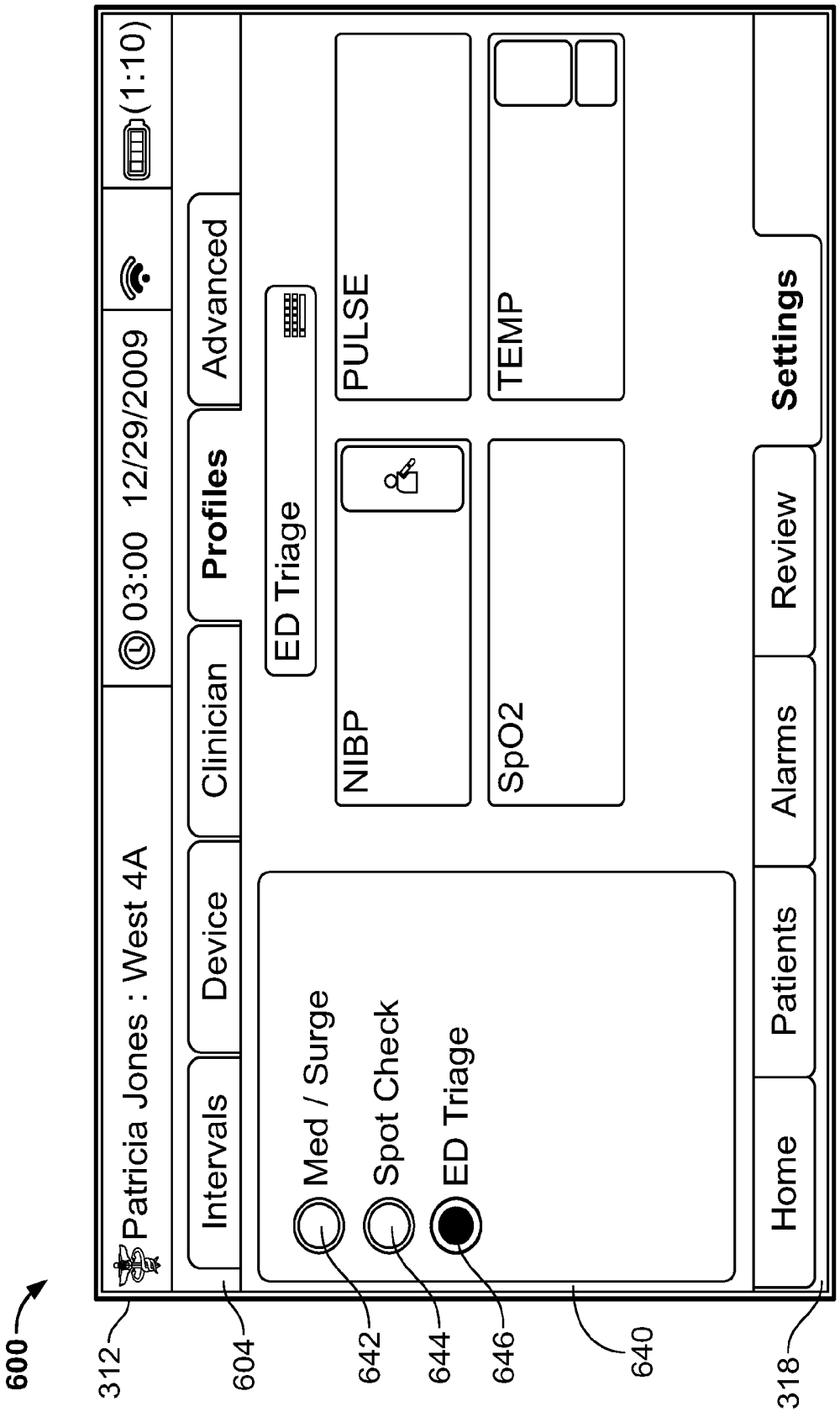
600
312
604
642
644
646
640
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
ED Triage
Med / Surge
Spot Check
ED Triage
NIBP
SpO2
PULSE
TEMP
Home
Patients
Alarms
Review
Settings

FIG. 6F

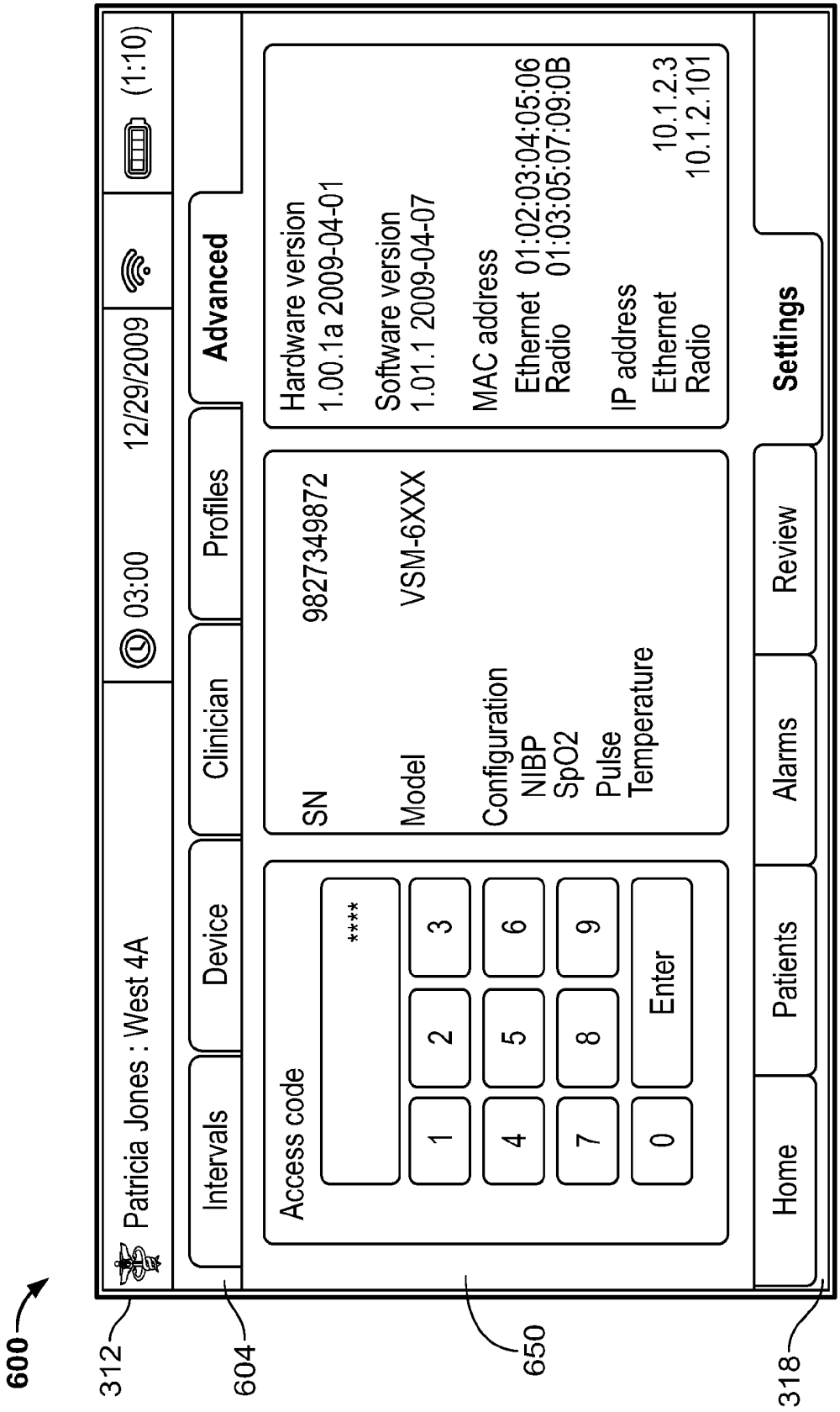
600
312
604
650
318
Patricia Jones : West 4A
03:00
12/29/2009
(1:10)
Intervals
Device
Clinician
Profiles
Advanced
Access code
****
1
2
3
4
5
6
7
8
9
0
Enter
SN
9827349872
Model
VSM-6XXX
Configuration
NIBP
SpO2
Pulse
Temperature
Hardware version
1.00.1a 2009-04-01
Software version
1.01.1 2009-04-07
MAC address
Ethernet 01:02:03:04:05:06
Radio 01:03:05:07:09:0B
IP address
Ethernet 10.1.2.3
Radio 10.1.2.101
Home
Patients
Alarms
Review
Settings

FIG. 6G

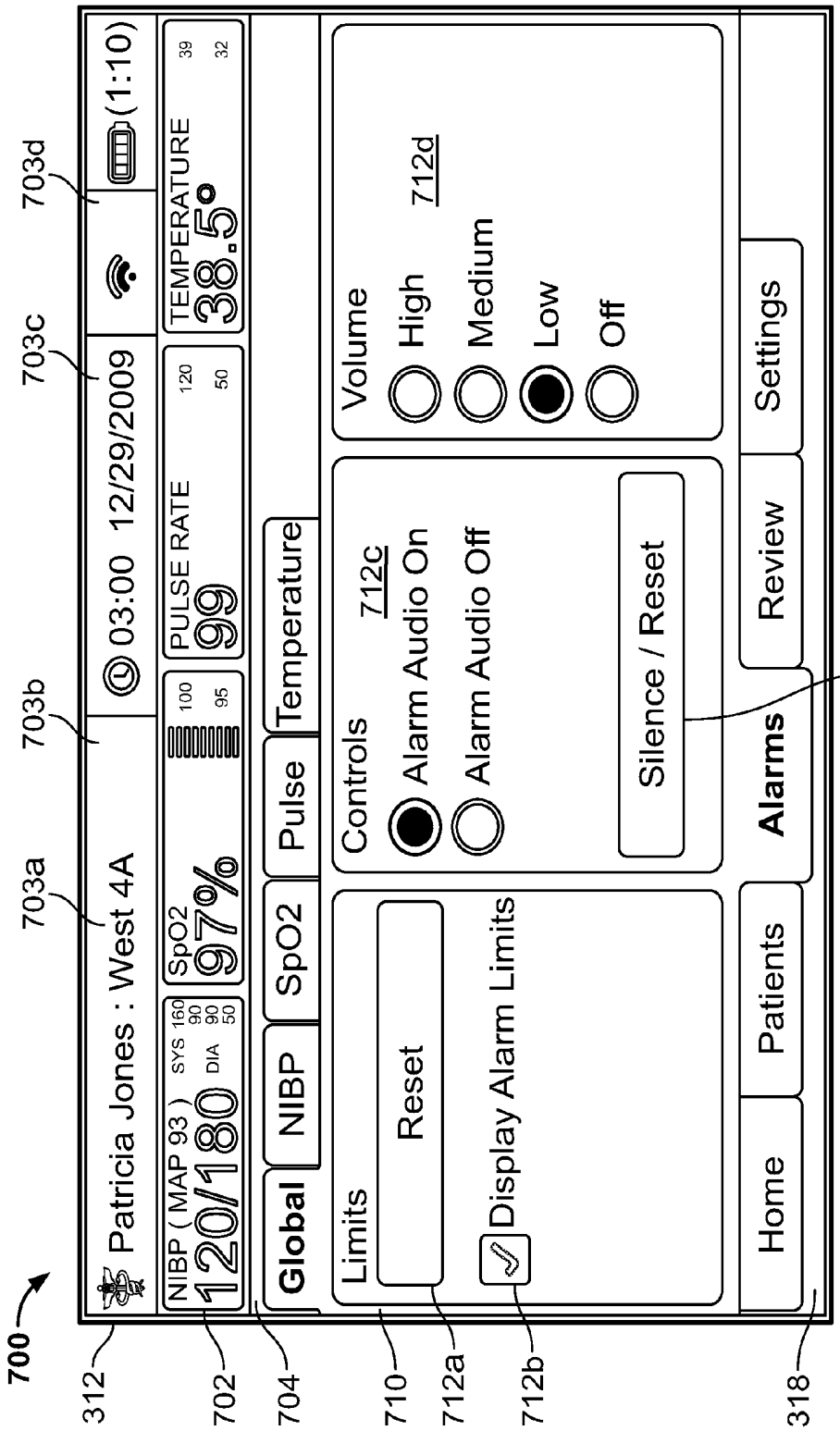
700
312
702
704
710
712a
712b
318
703a
703b
703c
703d
712e
712d
712c
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP ( MAP 93 )
SYS 160 90
DIA 90 50
120/180
SpO2
97%
100
95
PULSE RATE
99
120
50
TEMPERATURE
38.5°
39
32
Global
NIBP
SpO2
Pulse
Temperature
Limits
Reset
Display Alarm Limits
Controls
Alarm Audio On
Alarm Audio Off
Silence / Reset
Volume
High
Medium
Low
Off
Home
Patients
Alarms
Review
Settings

FIG. 7A

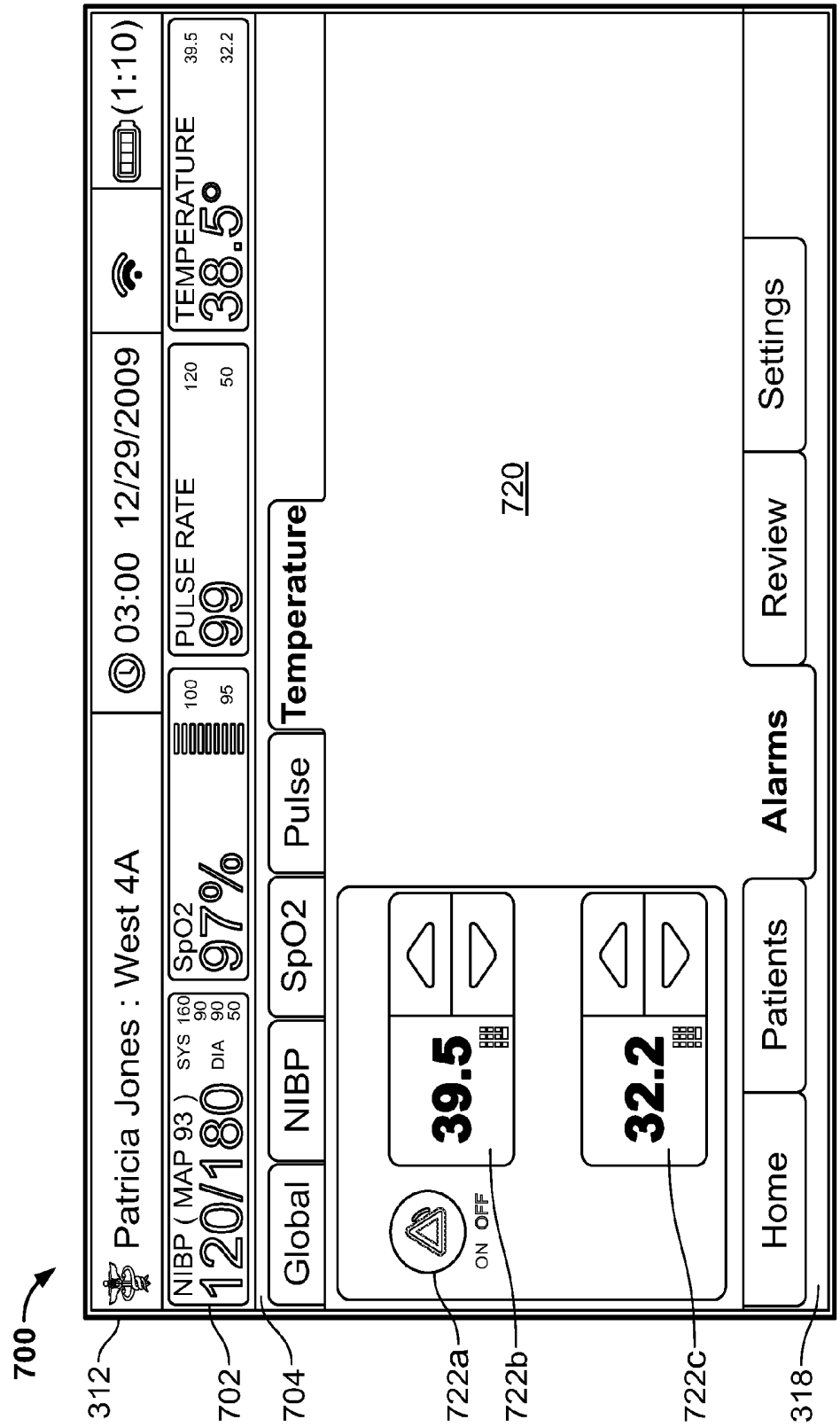
700
312
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP ( MAP 93 )
120/180
SYS 160 90
DIA 90 50
SpO2
97%
100
95
PULSE RATE
99
120
50
TEMPERATURE
38.5°
39.5
32.2
702
Global
NIBP
SpO2
Pulse
Temperature
704
720
39.5
ON OFF
32.2
722a
722b
722c
Home
Patients
Alarms
Review
Settings
318

FIG. 7B

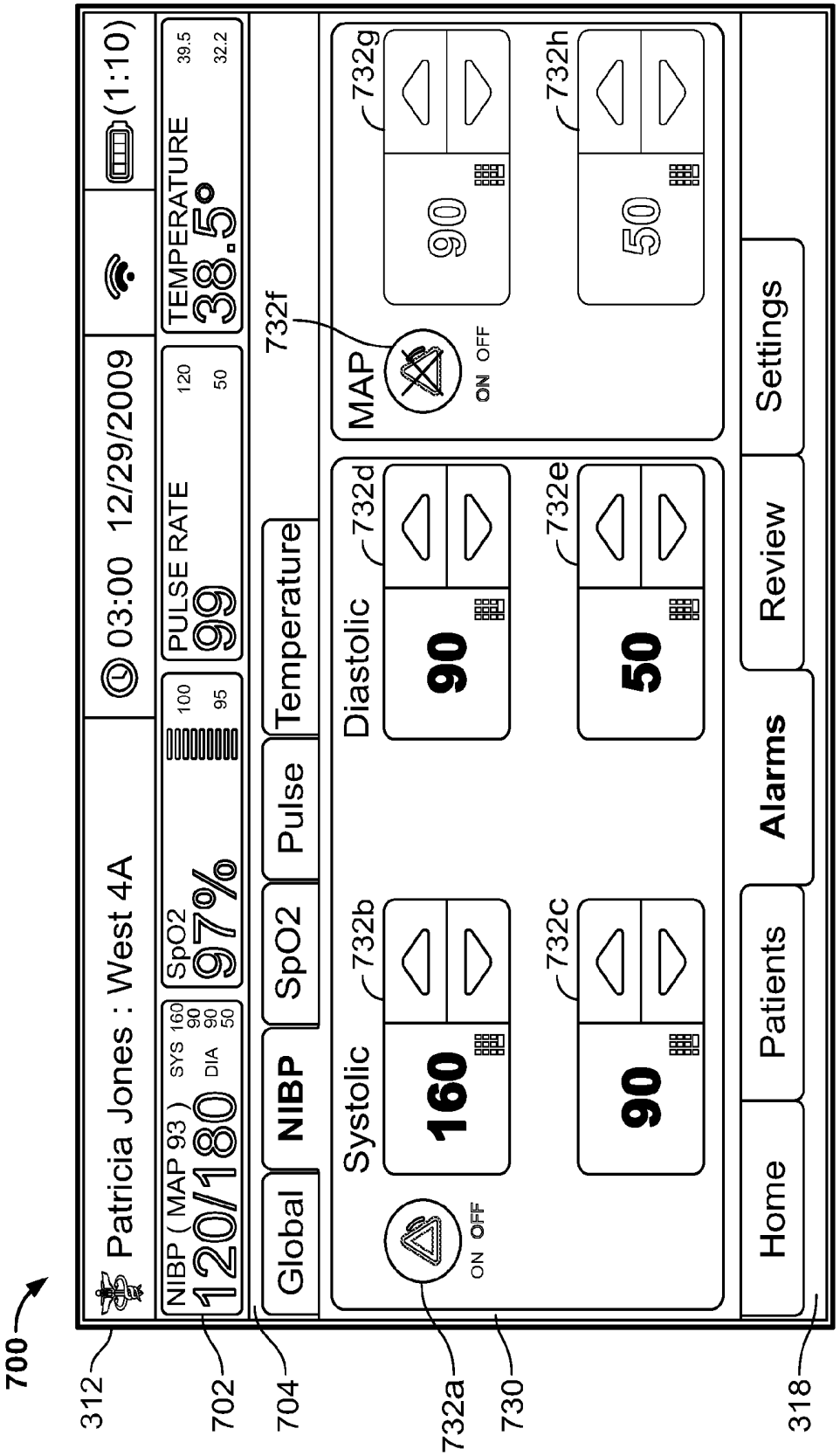
700
312
702
704
732a
730
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP ( MAP 93 )
120/180
SYS 160 90
DIA 90 50
SpO2
97%
100 95
PULSE RATE
99
120 50
TEMPERATURE
38.5°
39.5 32.2
Global
NIBP
SpO2
Pulse
Temperature
732f
Systolic
732b
160
732c
90
Diastolic
732d
90
732e
50
MAP
732g
90
ON OFF
732h
50
ON OFF
Home
Patients
Alarms
Review
Settings

FIG. 7C

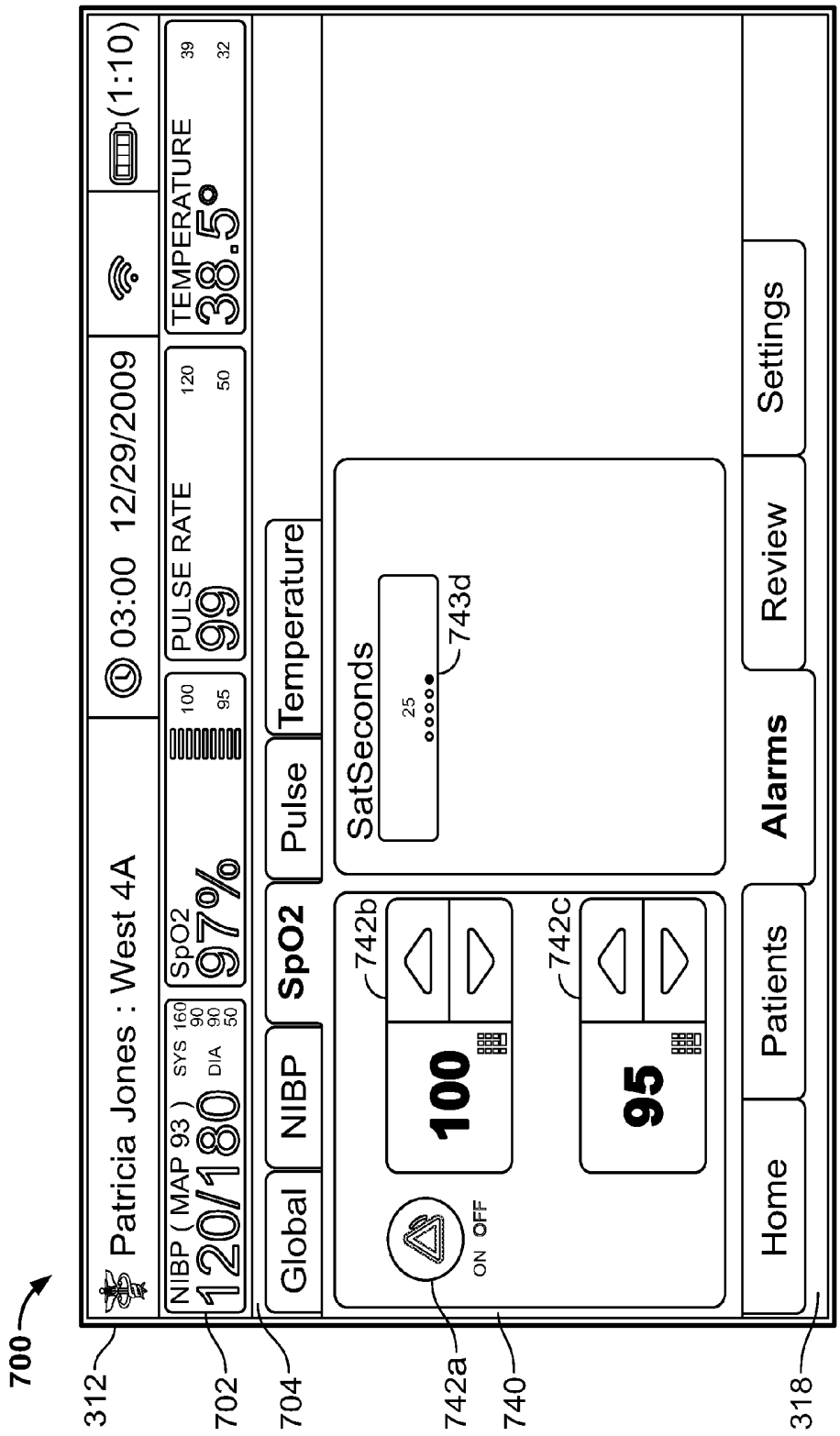
700
312
702
704
742a
740
318
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP ( MAP 93 )
120/180
SYS 160 90
DIA 90 50
SpO2
97%
100
95
PULSE RATE
99
120
50
TEMPERATURE
38.5°
39
32
Global
NIBP
SpO2
Pulse
Temperature
SatSeconds
25
743d
742b
100
742c
95
ON OFF
Home
Patients
Alarms
Review
Settings

FIG. 7D

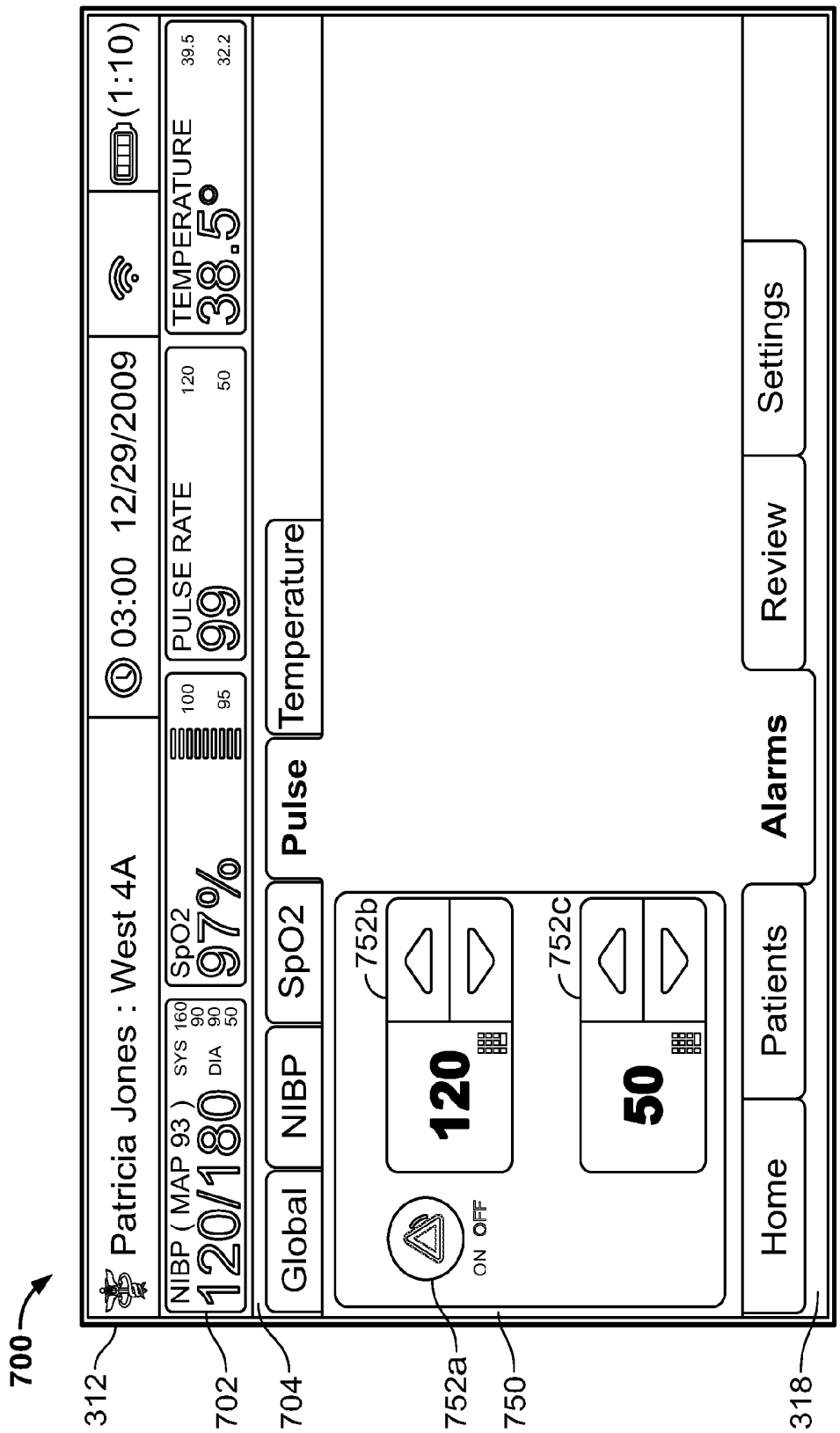
700
312
Patricia Jones : West 4A
03:00 12/29/2009
(1:10)
NIBP ( MAP 93 )
SYS 160 90
DIA 90 50
120/180
SpO2
97%
100
95
PULSE RATE
99
120
50
TEMPERATURE
38.5°
39.5
32.2
Global
NIBP
SpO2
Pulse
Temperature
752b
120
752c
50
ON OFF
Home
Patients
Alarms
Review
Settings
702
704
752a
750
318

FIG. 7E

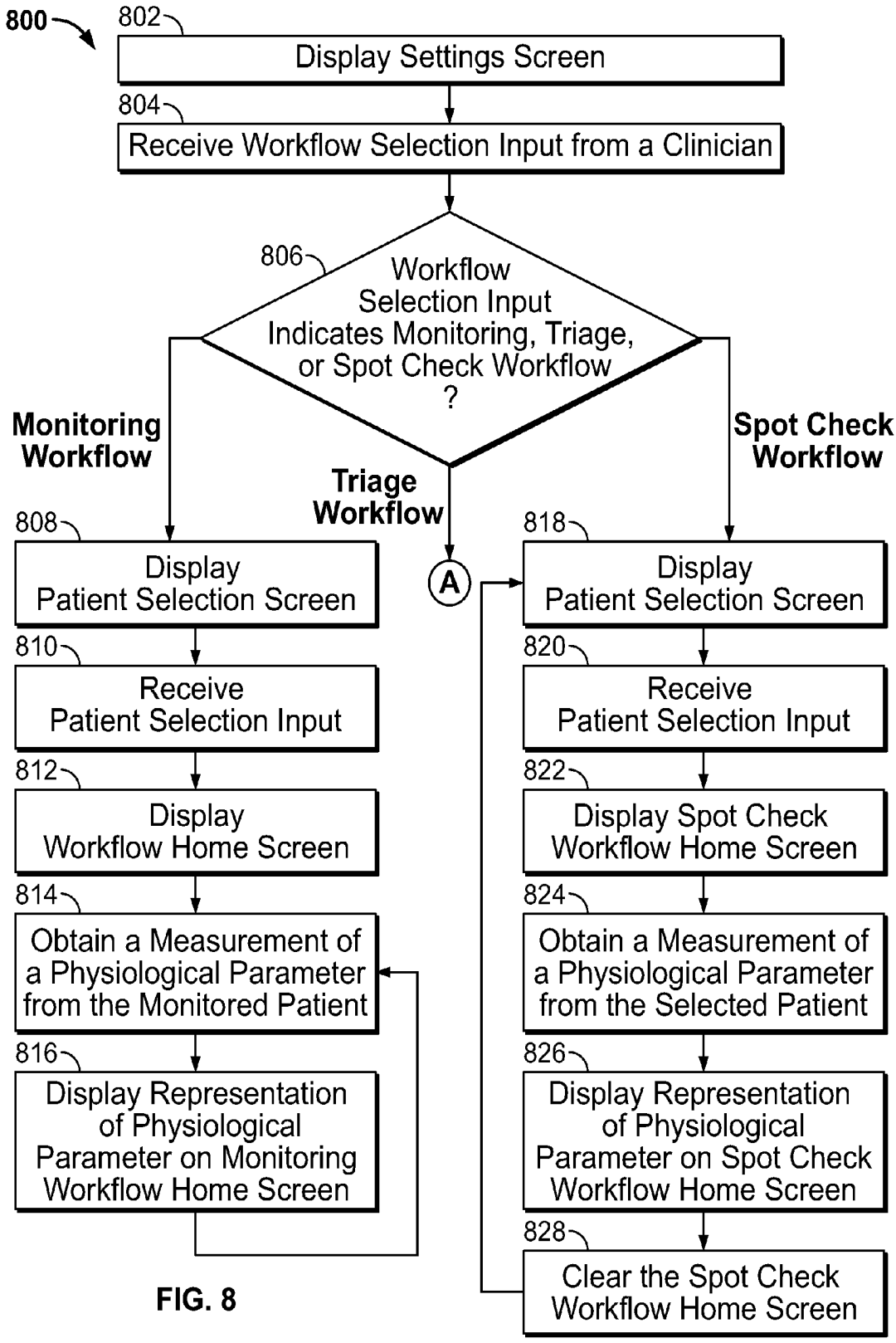
800
802
Display Settings Screen
804
Receive Workflow Selection Input from a Clinician
806
Workflow Selection Input Indicates Monitoring, Triage, or Spot Check Workflow ?
Monitoring Workflow
Triage Workflow
Spot Check Workflow
808
Display Patient Selection Screen
810
Receive Patient Selection Input
812
Display Workflow Home Screen
814
Obtain a Measurement of a Physiological Parameter from the Monitored Patient
816
Display Representation of Physiological Parameter on Monitoring Workflow Home Screen
A
818
Display Patient Selection Screen
820
Receive Patient Selection Input
822
Display Spot Check Workflow Home Screen
824
Obtain a Measurement of a Physiological Parameter from the Selected Patient
826
Display Representation of Physiological Parameter on Spot Check Workflow Home Screen
828
Clear the Spot Check Workflow Home Screen

FIG. 8

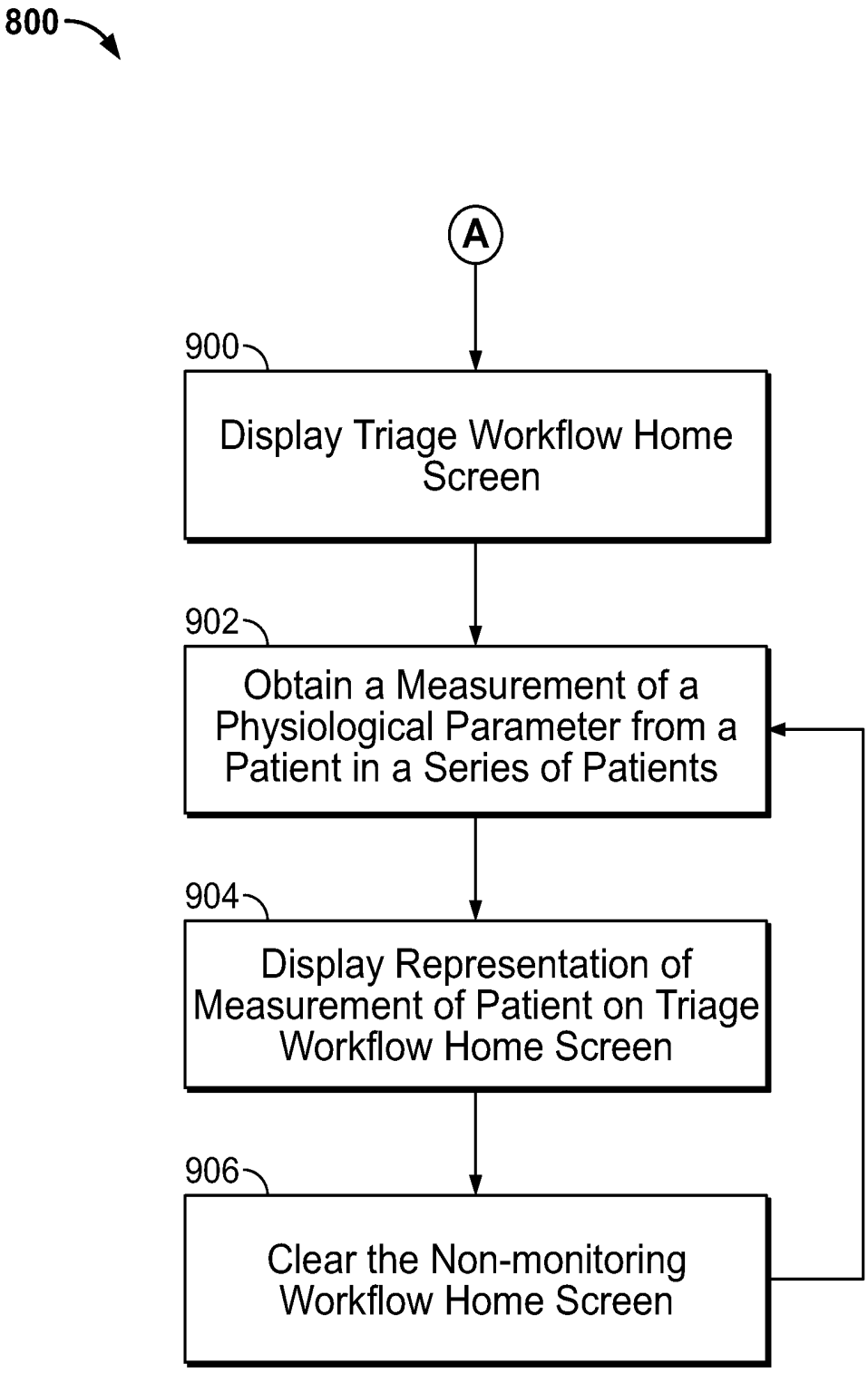
800
A
900
Display Triage Workflow Home Screen
902
Obtain a Measurement of a Physiological Parameter from a Patient in a Series of Patients
904
Display Representation of Measurement of Patient on Triage Workflow Home Screen
906
Clear the Non-monitoring Workflow Home Screen

FIG. 9

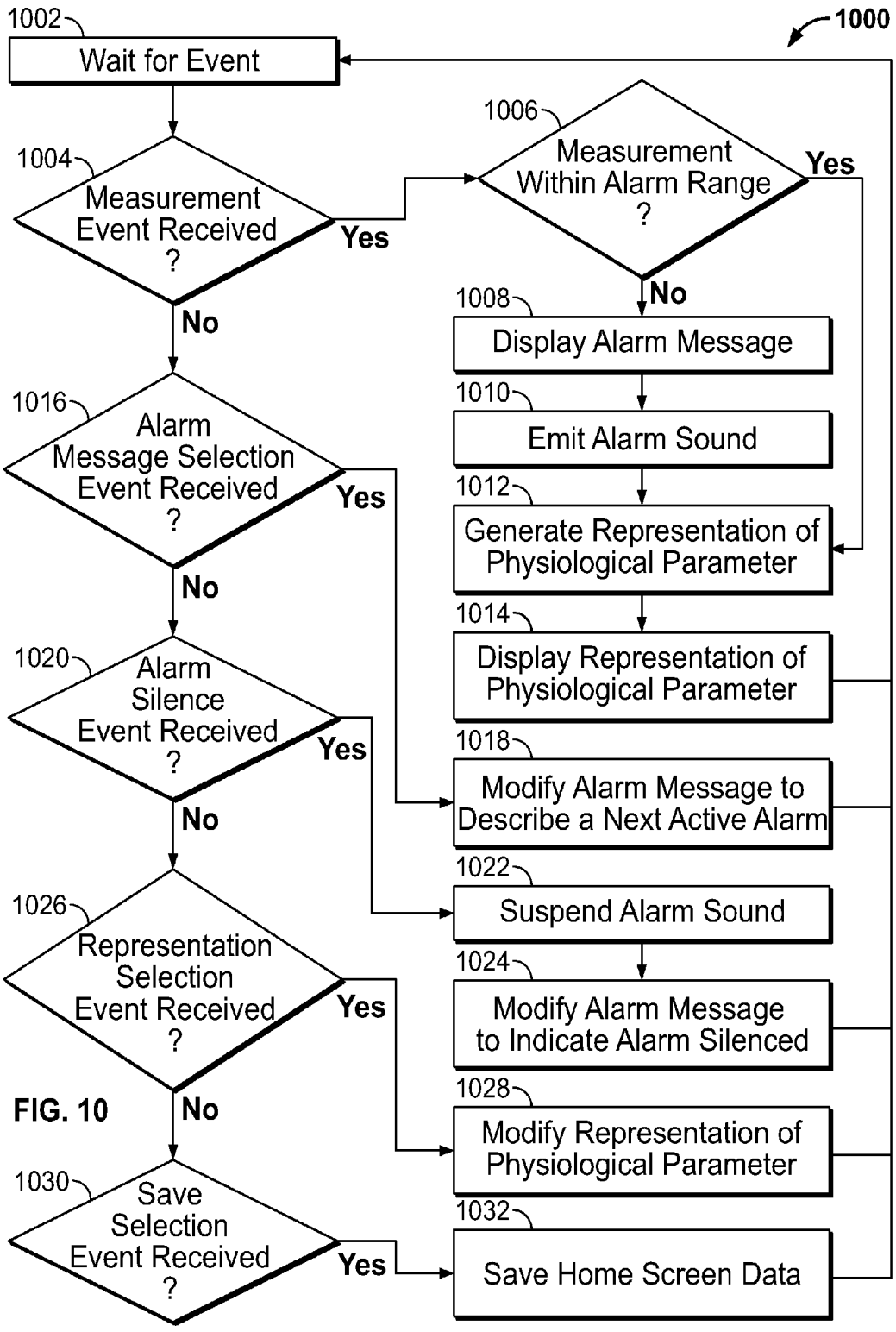
1000
1002
Wait for Event
1004
Measurement Event Received ?
Yes
No
1006
Measurement Within Alarm Range ?
Yes
No
1008
Display Alarm Message
1010
Emit Alarm Sound
1012
Generate Representation of Physiological Parameter
1014
Display Representation of Physiological Parameter
1016
Alarm Message Selection Event Received ?
Yes
No
1018
Modify Alarm Message to Describe a Next Active Alarm
1020
Alarm Silence Event Received ?
Yes
No
1022
Suspend Alarm Sound
1024
Modify Alarm Message to Indicate Alarm Silenced
1026
Representation Selection Event Received ?
Yes
No
1028
Modify Representation of Physiological Parameter
1030
Save Selection Event Received ?
Yes
1032
Save Home Screen Data

FIG. 10

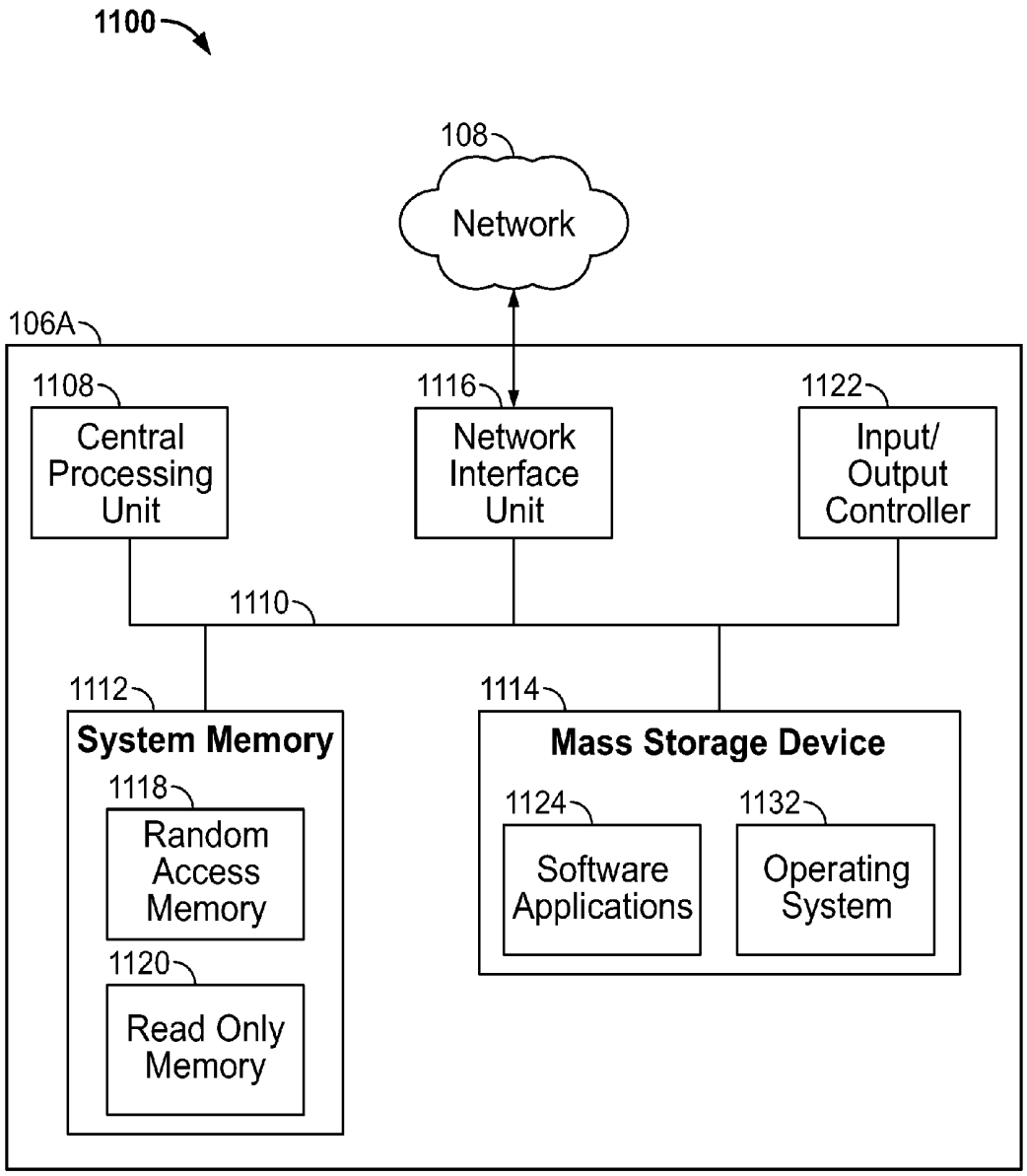
1100
108
Network
106A
1108
Central Processing Unit
1116
Network Interface Unit
1122
Input/ Output Controller
1110
1112
System Memory
1118
Random Access Memory
1120
Read Only Memory
1114
Mass Storage Device
1124
Software Applications
1132
Operating System

FIG. 11

# PHYSIOLOGICAL PARAMETER MEASURING PLATFORM DEVICE SUPPORTING MULTIPLE WORKFLOWS

## RELATED APPLICATION

The present application claims priority to U.S. Provisional Patent Application Ser. No. 61/243,872, filed Sep. 18, 2009, the entirety of which is hereby incorporated by reference.

## BACKGROUND

Health care practitioners, such as nurses and physicians, use various types of health-care equipment to assist with the task of providing health care to a patient, also referred to herein as a health-care recipient. Some health-care equipment, referred to as single function equipment, is designed to perform a particular function, such as temperature measurement. Some health-care equipment, referred to as multi-function equipment, is designed to implement the performance of more than one function, such as temperature measurement and blood pressure measurement. Such multi-function equipment may impose excess bulk and/or weight upon a user if such multi-function equipment is used for only one function or a subset of the functions implemented by the multi-function equipment.

## SUMMARY

In one aspect, a physiological measuring platform (PMP) device comprises a central processing unit (CPU) that is configured to control operation of the PMP device. The PMP device also comprises a display screen. In addition, the PMP device comprises one or more computer readable data storage media storing software instructions that, when executed by the CPU, cause the PMP device to obtain a series of measurements of a physiological parameter of a monitored patient when the PMP device is operating within a monitoring workflow. The software instructions, when execute by the CPU, further cause the PMP device to display, on the display screen, a monitoring workflow home screen when the PMP device is operating within the monitoring workflow. The monitoring workflow home screen contains a first representation of the physiological parameter of the monitored patient. The first representation is based on a measurement in the series of measurements. In addition, the software instructions, when executed by the CPU, further cause the PMP device to obtain a measurement of the physiological parameter of each patient in a series of patients when the PMP device is operating within a non-monitoring workflow. In addition, the software instructions, when executed by the CPU, further cause the PMP device to display, on the display screen, a non-monitoring workflow home screen when the PMP device is operating within the non-monitoring workflow. The non-monitoring workflow home screen contains a second representation of the physiological parameter of a given patient in the series of patients. The second representation is based on the measurement of the physiological parameter of the given patient in the series of patients. The monitoring workflow home screen is different than the non-monitoring workflow home screen.

Another aspect is a method for performing physiological parameter measurements for a plurality of patients. The method comprises, displaying, by a physiological measurement platform (PMP) device, a settings screen on a display screen, the settings screen enabling a user to select a workflow within which the PMP device is to operate. The method further comprises, when the PMP device is operating within a monitoring workflow: obtaining, by the PMP device, a series of measurements of a physiological parameter of a monitored patient; and displaying, by the PMP device, a monitoring workflow home screen on the display screen. The monitoring workflow home screen contains a first representation of the physiological parameter of the given patient, the first representation based on a measurement in the series of measurements. The method also comprises when the PMP device is operating within a non-monitoring workflow: obtaining, by the PMP device, a measurement of the physiological parameter of each patient in a series of patients; and displaying, by the PMP device, a non-monitoring workflow home screen on the display screen. The non-monitoring workflow home screen contains a second representation of the physiological parameter of a given patient in the series of patients, the second representation based on the measurement of the physiological parameter of the given patient in the series of patients.

Yet another aspect is a method comprising obtaining, by a physiological measuring platform (PMP) device, a measurement of a physiological parameter of a given patient. The method also comprises displaying an alarms screen on a display screen of the PMP device. The alarms screen enables a user of the PMP device to configure global alarm settings and parameter-specific alarm settings. The alarms screen includes a compressed parameter reporting area. The compressed parameter reporting area contains a compressed parameter frame containing a representation of the physiological parameter of the given patient.

Yet another aspect is a method comprising obtaining, by a physiological measuring platform (PMP) device, a measurement of a physiological parameter of a patient. The method also comprises displaying, on a display screen of the PMP device, a parameter reporting area containing a representation of the physiological parameter of the patient. In addition, the method comprises displaying, on the display screen of the PMP device, an alarm message describing a first alarm when the first alarm is active. The first alarm is active when the measurement of the physiological parameter is outside an alarm range for the physiological parameter. The method also comprises modifying, on the display screen, the alarm message to describe a second alarm when the second alarm is active and when a user selects the alarm message.

Yet another aspect is a method comprising displaying, on a display screen of a physiological measuring platform (PMP) device a settings screen. The settings screen containing a set of interval program selection controls. The method also comprises receiving, by the PMP device, a selection by a user of one of the interval program selection controls. Furthermore, the method comprises obtaining, by the PMP device, measurements of a physiological parameter of a patient. In addition, the method comprises recording, by the PMP device, measurements of the physiological parameter at intervals specified by an interval program for a duration specified by the interval program. The interval program corresponds to the selected one of the interval program selection controls.

Yet another aspect is a computer-readable storage medium comprising software instructions that, when executed, cause a physiological measurement platform (PMP) device to display, on a display screen, a settings screen that enables a user to select a workflow within which the PMP device is to operate. When the user selects a monitoring workflow from the settings screen, the software instructions, when executed, cause the PMP device to:

obtain a series of measurements of a physiological parameter of a monitored patient;

display a monitoring workflow home screen on the display screen, the monitoring workflow home screen containing a first representation of the physiological parameter, the first representation of the physiological parameter based on at least one measurement in the series of measurements; and

display, on the display screen, an alarms screen that enables the user to configure global alarm settings and parameter-specific alarm settings. The alarms screen includes a compressed parameter reporting area. The compressed parameter reporting area contains a compressed parameter frame containing a second representation of the physiological parameter of the monitored patient.

When the user selects a spot check workflow from the settings screen, the software instructions, when executed, cause the PMP device to:

obtain a measurement of the physiological parameter of each patient in a series of previously identified patients; and

display a spot check workflow home screen on the display screen. The spot check workflow home screen contains a third representation of the physiological parameter of a given patient in the series of previously identified patients. The third representation of the physiological parameter is based on the measurement of the physiological parameter of the given patient in the series of previously identified patients.

When the user selects a triage workflow from the settings screen, the software instructions, when executed, cause the PMP device to:

obtain a measurement of the physiological parameter of each patient in a series of unidentified patients; and

display a triage workflow home screen on the display screen. The triage workflow home screen contains a fourth representation of the physiological parameter of a given patient in the series of unidentified patients, the fourth representation of the physiological parameter based on the measurement of the given patient in the series of unidentified patients.

The monitoring workflow home screen, the spot check workflow home screen, and the triage workflow home screen are each different from one another. The software instructions, when executed, also cause the PMP device to display, on the display screen, an alarm message describing a first alarm when the first alarm is active. The first alarm is active when a given measurement of the physiological parameter is outside an alarm range for the physiological parameter. The software instructions, when executed, also cause the PMP device to modify, on the display screen, the alarm message to describe a second alarm when the second alarm is active and when the user selects the alarm message. The software instructions, when executed, also cause the PMP device to emit an alarm sound when the first alarm is active. The software instructions, when executed, also cause the PMP device to suspend emitting the alarm sound for a given time period in response to user input. The software instructions, when executed, also cause the PMP device to extend the given time period when the PMP device receives additional user input before the given time period expires. The software instructions, when executed, also cause the PMP device to resume emitting the alarm sound when the given time period expires.

## BRIEF DESCRIPTION OF THE DRAWINGS

The objects and features of the invention can be better understood with reference to the claims and drawings described below. The drawings are not necessarily to scale, and the emphasis is instead generally being placed upon illustrating the principles of the invention. Within the drawings, like reference numbers are used to indicate like parts throughout the various views. Differences between like parts may cause those like parts to be each indicated by different reference numbers. Unlike parts are indicated by different reference numbers.

FIG. **1** is a block diagram illustrating an example system for collecting measurements of physiological parameters of patients.

FIG. **2**A illustrates a view of an example physiological parameter measuring platform (PMP) device.

FIG. **2**B illustrates an example user interface displayed on a user interface display of the PMP device of FIG. **2**A.

FIG. **3**A illustrates an example monitoring workflow home screen.

FIG. **3**B illustrates an example spot check workflow home screen.

FIG. **3**C illustrates an example triage workflow home screen.

FIG. **3**D illustrates an example alternative view of a patient's SpO2 level.

FIG. **3**E illustrates the example monitoring workflow home screen when an alarm is active.

FIG. **3**F illustrates the example monitoring workflow home screen when an alarm is active and when an alarm sound for the alarm has been temporarily silenced.

FIG. **4** illustrates an example patient selection screen.

FIG. **5** illustrates an example review screen.

FIG. **6**A illustrates an example intervals pane of a settings screen.

FIG. **6**B illustrates an example device pane of the settings screen.

FIG. **6**C illustrates an example clinician pane of the settings screen.

FIGS. **6**D-**6**F illustrate example profile panes of the settings screen.

FIG. **6**G illustrates an example advanced pane of the settings screen.

FIG. **7**A illustrates an example global pane of an alarms screen.

FIG. **7**B illustrates an example temperature pane of the alarms screen.

FIG. **7**C illustrates an example NIBP pane of the alarms screen.

FIG. **7**D illustrates an example SpO2 pane of the alarms screen.

FIG. **7**E illustrates an example pulse rate pane of the alarms screen.

FIG. **8** is a flowchart illustrating an example operation performed by the PMP device.

FIG. **9** is a flowchart representing a continuation of the operation in which the workflow selection input indicates the triage workflow.

FIG. **10** is a flowchart illustrating an operation performed by the PMP device when the PMP device displays a workflow home screen.

FIG. **11** illustrates example physical components of the PMP device.

## DETAILED DESCRIPTION

Embodiments of the present invention are directed to a physiological parameter measuring platform (PMP) device having a user interface configured to operate within and transition between each of a monitoring workflow and a

non-monitoring workflow. In the following detailed description, references are made to the accompanying drawings that form a part hereof, and in which are shown by way of illustrations specific embodiments or examples. These embodiments may be combined, other embodiments may be utilized, and structural changes may be made without departing from the spirit or scope of the present invention. The following detailed description is therefore not to be taken in a limiting sense and the scope of the present invention is defined by the appended claims and their equivalents.

Referring now to the drawings, in which like numerals refer to like elements through the several figures, aspects of the present invention and an exemplary computing operating environment will be described.

FIG. **1** is a block diagram illustrating an example system **100** for collecting measurements of physiological parameters of patients. As illustrated in the example of FIG. **1**, the system **100** comprises an Electronic Medical Records (EMR) system **102**, an interface system **104**, a set of client devices **106**A-**106**N (collectively, "client devices **106**"), and a network **108**.

The network **108** is an electronic communication network that facilitates communication between the client devices **106** and the between the client devices **106** and the interface system **104**. An electronic communication network is a set of computing devices and links between the computing devices. The computing devices in the network use the links to enable communication among the computing devices in the network. The network **108** can include routers, switches, mobile access points, bridges, hubs, intrusion detection devices, storage devices, standalone server devices, blade server devices, sensors, desktop computers, firewall devices, laptop computers, handheld computers, mobile telephones, and other types of computing devices. In various embodiments, the network **108** includes various types of links. For example, the network **108** can include wired and/or wireless links. Furthermore, in various embodiments, the network **108** is implemented at various scales. For example, the network **108** can be implemented as one or more local area networks (LANs), metropolitan area networks, subnets, wide area networks (such as the Internet), or can be implemented at another scale.

The EMR system **102** is a computing system that allows storage, retrieval, and manipulation of electronic medical records. As used herein, a computing system is a system of one or more computing devices. A computing device is a physical, tangible device that processes data. Example types of computing devices include personal computers, standalone server computers, blade server computers, mainframe computers, handheld computers, smart phones, special purpose computing devices, and other types of devices that process data.

Each client device in the set of client devices **106** is a computing device. The client devices **106** can provide various types of functionality. For example, the set of client devices **106** can include one or more PMP devices (such as the PMP device **200**). In addition, the set of client devices **106** can include one or more wall-mounted devices. Such wall-mounted devices can have similar functionality to the PMP device **200** but are stationary instead of portable. In addition, the set of client devices **106** can include one or more monitor devices. Such monitor devices can display representations of physiological parameters, but do not directly obtain measurements of the physiological parameters from patients. A monitor device could, for example, be used by a clinician to monitor the physiological parameters of multiple patients at one time.

The client devices **106** can communicate with each other through the network **108**. In various embodiments, the client devices **106** can communicate various types of data with each other through the network **108**. For example, in embodiments where the set of client devices **106** includes a set of PMP devices and a monitor device, each of the PMP devices can send data representing measurements of physiological parameters of patients to the monitor device. In this way, the monitor device can display representations of physiological parameters to a clinician.

The interface system **104** is a computing system that acts as an interface between the EMR system **102** and the client devices **106**. In some embodiments, the interface system **104** is a Connex system. Different EMR systems have different software interfaces. For example, the EMR system used by two different hospitals can have two different software interfaces. The interface system **104** provides a single software interface to each of the client devices **106**. The client devices **106** send requests to software interface provided by the interface system **104**. When the interface system **104** receives a request from one of the client devices **106**, the interface system **104** translates the request into a request that works with the software interface provided by the EMR system **102**. The interface system **104** then provides the translated request to the software interface provided by the EMR system **102**. When the interface system **104** receives a response from the EMR system **102**, the interface system **104** translates the response from a format of the EMR system **102** to a system understood by the client devices **106**. The interface system **104** then forwards the translated response to an appropriate one of the client devices **106**.

The client devices **106** can send various types of data to the interface system **104** for storage in the EMR system **102** and can receive various types of data from the EMR system **102** through the interface system **104**. For example, in some embodiments, the client devices **106** can send measurements of physiological parameters to the interface system **104** for storage in the EMR system **102**. In another example, a monitor device can retrieve past measurements of physiological parameters of patients from the EMR system **102** through the interface system **104**.

FIG. **2**A illustrates a view of a PMP device **200**. The PMP device **200** is classified and referred to as a portable monitor platform device. The PMP device **200** includes multiple health care equipment (HCE) modules. Each of the HCE modules is configured to measure one or more physiological parameters of a health-care recipient, also referred to herein as a patient.

A temperature measurement module **212** is accessible from the front side of the PMP device **200**. A SpO2 module **214** and a non-invasive blood pressure (NIBP) module **216** are accessible from a left hand side of the PMP device **200**. An upper handle portion **220** enables the PMP device **200** to be carried by hand.

A front side of the PMP device **200** includes a display screen **218** and an outer surface of the temperature measurement module **212**. The temperature measurement module **212** is designed to measure the body temperature of a patient. As used in this document, a "module" is a combination of a physical module structure which typically resides within the PMP device **200** and optional peripheral components (not shown) that typically attach to and reside outside of the PMP device **200**.

The temperature measurement module **212** includes a front panel **212***a*. The front panel **212***a* has an outer surface

that is accessible from the front side of the PMP device **200**. The front panel **212***a* provides access to a wall (not shown) storing a removable probe (not shown), also referred to as a temperature probe, that is attached to a probe handle **212***b*. The probe and its attached probe handle **212***b* are tethered to the temperature measurement module **212** via an insulated conductor **212***c*. The probe is designed to make physical contact with a patient in order to sense a body temperature of the patient.

A left hand side of the PMP device **200** includes an outer surface of the SpO2 module **214** and an outer surface of the NIBP module **216**. The SpO2 module **214** is a HCE module designed to measure oxygen content within the blood of a patient. The NIBP module **216** is a HCE module designed to measure blood pressure of a patient.

As shown, the SpO2 module **214** includes a front panel **214***a*. The front panel **214***a* includes an outer surface that is accessible from the left side of the PMP device **200**. The front panel **214***a* includes a connector **214***b* that enables a connection between one or more peripheral SpO2 components (not shown) and a portion of the SpO2 module **214** residing inside the PMP device **200**. The peripheral SpO2 components reside external to the PMP device **200**. The peripheral SpO2 components are configured to interoperate with the SpO2 module **214** when connected to the SpO2 module **214** via the connector **214***b*. In some embodiments, the peripheral SpO2 components include a clip that attaches to an appendage of a patient, such as a finger. The clip is designed to detect and measure a pulse and an oxygen content of blood flowing within the patient.

As shown, the NIBP module **216** includes a front panel **216***a* having an outer surface that is accessible from the left side of the PMP device **200**. The front panel **216***a* includes a connector **216***b* that enables a connection between one or more peripheral NIBP components (not shown) and a portion of the NIBP module **216** residing inside the PMP device **200**. The peripheral NIBP components reside external to the PMP device **200**. The peripheral NIBP components are configured to interoperate with the NIBP module **216** when connected to the NIBP module **216** via the connector **216***b*. In some embodiments, the peripheral NIBP components include an inflatable cuff that attaches to an appendage of a patient, such as an upper arm of the patient. The inflatable cuff is designed to measure the systolic and diastolic blood pressure of the patient, the mean arterial pressure (MAP) of the patient, and the pulse rate of blood flowing within the patient.

The PMP device **200** is able to operate within one or more workflows. A workflow is a series of one or more tasks that a user of the PMP device **200** performs. When the PMP device **200** operates within a workflow, the PMP device **200** provides functionality suitable for assisting the user in performing the workflow. When the PMP device **200** operates within different workflows, the PMP device **200** provides different functionality.

When the PMP device **200** is manufactured, the PMP device **200** is configured to be able to operate within one or more workflows. After the PMP device **200** is manufactured, the PMP device **200** can be reconfigured to operate within one or more additional workflows. In this way, a user can adapt the PMP device **200** for use in different workflows as needed.

In various embodiments, the PMP device **200** operates within various workflows. For example, in some embodiments, the PMP device **200** can operate within a monitoring workflow or a non-monitoring workflow. Example types of non-monitoring workflows include, but are not limited to, a spot check workflow and a triage workflow.

In example embodiments, the names for the workflows can be defined by the user. For example, the user can rename a "triage workflow" as "ED 3 North" or any other nomenclature as desired to provide more context to the user.

When the PMP device **200** is operating within the monitoring workflow, the PMP device **200** obtains a series of measurements of one or more physiological parameters of a single monitored patient over a period of time. In addition, the PMP device **200** displays, on the display screen **218**, a monitoring workflow home screen. The monitoring workflow home screen contains a representation of a physiological parameter of the monitored patient. The representation is based on at least one measurement in the series of measurements. A representation of a physiological parameter is a visible image conveying information about the physiological parameter. For example, when the PMP device **200** is operating within the monitoring workflow, the PMP device **200** can obtain a temperature measurement of a single patient once every ten minutes for six hours. In this example, the PMP device **200** displays a monitoring workflow home screen that contains a representation of the patient's body temperature based on a most recent one of the temperature measurements. In this way, a user of the PMP device **200** can monitor the status of the patient.

When the PMP device **200** is operating within a non-monitoring workflow, the PMP device **200** obtains a measurement of one or more physiological parameters from each patient in a series of patients. In addition, the PMP device **200** displays a non-monitoring workflow home screen on the display screen **218**. The non-monitoring workflow home screen contains a representation of the physiological parameter of a given patient in the series of patients. The representation is based on the measurement of the physiological parameter of the given patient. In one example, when the PMP device **200** is operating within a spot check workflow, the PMP device **200** obtains blood pressure measurements from a series of previously-identified patients. In this other example, the PMP device **200** displays a spot check workflow home screen containing a blood pressure measurement of a given patient in the series of previously-identified patients. In this way, a user of the PMP device **200** can perform spot checks on the blood pressures of patients who have already been admitted to a hospital. As used in this document, a patient is a previously identified patient when the PMP device **200** stores information regarding the identity of the patient. In another example, when the PMP device **200** is operating within a triage workflow, the PMP device **200** can obtain a single blood pressure measurement from each patient in a series of unidentified patients as the patients arrive at a hospital. In this example, the PMP device **200** displays a triage workflow home screen containing a representation of the patients' blood pressure based on the single blood pressure measurements of the patients. In this way, a user of the PMP device **200** can perform triage on the series of unidentified patients as they arrive. As used in this document, a patient is an unidentified patient when the PMP device **200** does not store information regarding the identity of the patient.

The monitoring workflow home screen is different than the non-monitoring workflow home screen. In various embodiments, the monitoring workflow home screen is different than the non-monitoring workflow home screen in various ways. For example, in some embodiments, the monitoring workflow home screen includes at least one user-selectable control that is not included in the non-

monitoring workflow home screen. In other embodiments, a representation of a physiological parameter in the monitoring workflow home screen has a different size than a representation of the same physiological parameter in the non-monitoring workflow home screen.

FIG. **2**B illustrates an example user interface displayed on the display screen **218** of FIG. **2**A. The PMP device **200** outputs and displays user interfaces discussed in this document on the display screen **218**.

FIG. **3**A illustrates an example monitoring workflow home screen **300**. The PMP device **200** displays the monitoring workflow home screen **300** while the PMP device **200** is operating within a monitoring workflow. The monitoring workflow is designed for obtaining a series of physiological measurements associated with an identified patient over a period of time.

The PMP device **200** is functionally connected to one or more sensors that enable monitoring of at least one physiological parameter that is associated with a patient. Typically, each sensor is physically attached to the patient while the PMP device **200** is operating within the monitoring workflow. These sensors include a temperature probe, a SpO2 clip, and a NIBP blood pressure cuff that are each attachable to the PMP device **200** as described above.

As shown in the example of FIG. **3**A, the monitoring workflow home screen **300** includes a device status area **312**, a navigation area **318**, and a content area **320**. The content area **320** is divided into a parameter reporting area **314** and a patient attribute area **316**.

The device status area **312** contains data regarding a status of the PMP device **200**. In the example of FIG. **3**A, the device status area **312** includes text that identifies a clinician ("Patricia Jones") and a health care facility location ("West 4A"). A current time of day value ("03:00") is located towards the center of the device status area **312**. A date value ("12/29/2009") is located to the right side of the time of day value. A remaining time of a battery ("1:10") value is located at the right side of the device status area **312**.

The navigation area **318** includes a home tab **319***a*, a patients tab **319***b*, an alarms tab **319***c*, a review tab **319***d*, and a settings tab **319***e*. Collectively, the home tab **319***a*, the patients tab **319***b*, the alarms tab **319***c*, the review tab **319***d*, and the settings tab **319***e* are referred to herein collectively as the screen tabs **319**. Selection of screen tabs **319***b*-**319***e* causes substitution of the monitoring workflow home screen **300** with another screen associated with the screen tabs **319***b*-**319***e*. For example, the PMP device **200** displays a patient screen when a user selects the patients tab **319***b*. FIG. **4**A, discussed elsewhere in this document, illustrates an example patient selection screen. Furthermore, the PMP device **200** displays an alarms screen when a user selects the alarms tab **319***c*. FIGS. **7**A-**7**E, discussed elsewhere in this document, illustrate an example alarms screen. Furthermore, the PMP device **200** displays a review screen when a user selects the review tab **319***d*. FIG. **5**, discussed elsewhere in this document, illustrates an example review screen. Furthermore, the PMP device **200** displays a settings screen when a user selects the settings tab **319***e*. FIGS. **6**A-**6**G, discussed elsewhere in this document, illustrate an example settings screen. When the PMP device **200** displays a screen other than the monitoring workflow home screen **300** and a user selects the home tab **319***a*, the PMP device **200** displays the monitoring workflow home screen **300**.

The parameter reporting area **314** includes one or more parameter reporting frames. Each of the parameter reporting frames contains a representation of a different physiological parameter a patient. The representations are based on one or more measurements of the physiological parameters of a monitored patient. In addition, each of the parameter reporting frames contains an alarm reporting area. The alarm reporting areas specify upper alarm limits and lower alarm limits for the physiological parameters. The upper alarm limits and the lower alarm limits define the alarm ranges for the physiological parameters. Alarms associated with the physiological parameters are active when measurements of the physiological parameters are outside the alarm range for the physiological parameters.

In the example of FIG. **3**A, the parameter reporting area **314** contains a NIBP frame **314***a*, a pulse rate frame **314***b*, a SpO2 frame **314***c*, and a temperature frame **314***d*. The NIBP frame **314***a* is located within an upper left portion of the parameter reporting area **314**. The pulse rate frame **314***b* is located within an upper right portion of the parameter reporting area **314**. The SpO2 frame **314***c* is located within a lower left portion of the parameter reporting area **314**. The temperature frame **314***d* is located within a lower right portion of the parameter reporting area **314**.

The NIBP frame **314***a* contains a representation of the blood pressure of the patient. The representation of the blood pressure of the patient is based on one or more measurements of the blood pressure of the patient. In various embodiments, the NIBP frame **314***a* contains various representations of the blood pressure of the patient. In the example of FIG. **3**A, the NIBP frame **314***a* includes enlarged numerical text that represents a systolic blood pressure value ("120") and a diastolic blood pressure value ("80"), separated from each other via a slash '/' text character. The systolic blood pressure value is located at the left side of the NIBP frame **314***a* and the diastolic blood pressure is located to the right side of the systolic blood pressure value.

An NIBP alarm status area **322***c* is located at the right side of the NIBP frame **314***a*. The NIBP alarm status area **322***c* specifies an upper alarm limit and a lower alarm limit for the patient's systolic blood pressure and an upper alarm limit and a lower alarm limit for the patient's diastolic blood pressure. The upper alarm limit and the lower alarm limit for the patient's systolic blood pressure define a systolic blood pressure alarm range. The upper alarm limit and the lower alarm limit for the patient's diastolic blood pressure define a diastolic blood pressure alarm range. An alarm associated with the patient's blood pressure is active when the patient's systolic blood pressure is outside the systolic blood pressure alarm range or when the patient's diastolic blood pressure is outside the diastolic blood pressure alarm range

The NIBP frame **314***a* also contains a NIBP cuff inflation stop button **322***a*. The NIBP cuff inflation stop button **322***a* is labeled with the text "Stop." The NIBP frame **314***a* also contains a NIBP automatic interval timer **322***b*. The NIBP automatic interval timer **322***b* is located between the diastolic blood pressure value and the NIBP alarm status area **322***c*. Selection of the NIBP cuff inflation stop button **322***a* ceases inflation of the NIBP cuff and toggles the label of the NIBP cuff inflation stop button **322***a* to display the ("Start") text. As used herein, a user selects a button or control when the user provides input to the PMP device **200** that specifies the control. For example, a user can select a control by pressing the control, by pressing another button while the control is highlighted, or by another means. Selection of the NIBP cuff inflation stop button **322***a* (now labeled the "Start" button) restarts inflation of the NIBP cuff and toggles the label of the NIBP cuff inflation stop button **322***a* to display the ("Stop") text. The NIBP automatic interval timer **322***b* indicates an amount of time remaining before the next scheduled inflation of the NIBP cuff. Additionally, a user can

determine the age of the current NIBP reading on the NIBP frame **314***a* by subtracting the remaining time on the NIBP automatic interval timer **322***b* from the original interval duration. In the example of FIG. **3**A, the NIBP frame **314***a* also displays a MAP value in an extended label field **322***d*.

The pulse rate frame **314***b* contains a representation of the patient's pulse rate. The representation of the patient's pulse rate is based on one or more measurements of the patient's pulse rate. In different embodiments, the pulse rate frame **314***b* contains different representations of the patient's pulse rate. In the example of FIG. **3**A, the pulse rate frame **314***b* includes enlarged numerical text that represents a pulse rate value ("122"). The pulse rate value ("122") is located at the left side of the pulse rate frame **314***b*. A pulse rate alarm status area **324***a* is located at the right side of the pulse rate frame **314***b*. The pulse rate frame **314***b* also indicates a source of the pulse rate in an extended label field **324***b*.

The pulse rate alarm status area **324***a* specifies an upper alarm limit and a lower alarm limit. The upper alarm limit and the lower alarm limit define a pulse rate alarm range. An alarm associated with the patient's pulse rate is active when the patient's pulse rate is outside the pulse rate alarm range.

The SpO2 frame **314***c* contains a representation of the patient's SpO2 level. The representation of the patient's SpO2 level is based on one or more measurements of the patient's SpO2 level. In different embodiments, the SpO2 frame **314***c* contains different representations of the patient's SpO2 level. In the example of FIG. **3**A, the SpO2 frame **314***c* includes enlarged numerical text that represents an SpO2 value ("97%"). The SpO2 value ("97%") is located at the left side of the SpO2 frame **314***c* and is accompanied by a '%' text character on the right side of the SpO2 value. A SpO2 alarm status area **326***a* is located at the right side of the SpO2 frame **314***c*. An SpO2 alarm parameter **326***d*, appearing as a circle adjacent to the text ("25"), indicates a duration of time. The SpO2 alarm status area **326***a* specifies an upper alarm limit and a lower alarm limit. The upper alarm limit and the lower alarm limit define a SpO2 alarm range. An alarm associated with the patient's SpO2 level is active when the patient's SpO2 level is outside the SpO2 alarm range for the duration of time indicated by the SpO2 alarm parameter **326***d*. The SpO2 frame **314***c* also includes a pulse amplitude blip bar **326***b* which indicates pulse beat and shows the relative pulse amplitude. As the detected pulse becomes stronger, more bars in the pulse amplitude blip bar **326***b* light up with each pulse. The SpO2 frame **314***c* also includes an SpO2 response time control button **326***c* that is configured for a user to control the SpO2 alarm parameter **326***d*.

The temperature frame **314***d* contains a representation of the patient's body temperature. The representation of the patient's body temperature is based on one or more measurements of the patient's body temperature. In different embodiments, the temperature frame **314***d* contains different representations of the patient's body temperature. In the example of FIG. **3**A, the temperature frame **314***d* includes enlarged numerical text that represents a temperature value ("101.5"). The temperature value ("101.5") is located at the left side of the temperature frame **314***d* and is accompanied by a Fahrenheit degree indicating symbol on the right side of the temperature value. A temperature alarm status area **328***a* is located at the right side of the temperature frame **314***d*. The temperature alarm status area **328***a* specifies an upper alarm limit and a lower alarm limit. The upper alarm limit and the lower alarm limit define a temperature alarm range. An alarm associated with the patient's temperature is active when the patient's temperature level is outside the temperature alarm range.

In some embodiments, the PMP device **200** can measure the patient's temperature in either a predictive mode or in a direct mode. When the PMP device **200** measures the patient's temperature in the predictive mode, the PMP device **200** predicts the patient's current temperature based on periodic readings of the patient's temperature. When the PMP device **200** measures the patient's temperature in the direct mode, the PMP device **200** continually measures the patient's temperature.

The temperature value in the temperature frame **314***d* is based on measurements received from a thermometer attached to a patient. When the PMP device **200** measures the patient's temperature in the predictive mode, the thermometer can be located at various places on the patient's body. Example locations on the patient's body where the thermometer can be located include in the patient's mouth, on the patient's thigh, in the patient's armpit, in the patient's rectum, and other locations. The temperature frame **314***d* includes a thermometry location control **328***b*. The thermometry location control **328***b* indicates a location on the patient's body where the thermometer is located. In the example of FIG. **3**A, the thermometry location control **328***b* indicates that the thermometer is located in the patient's mouth.

When a user selects the thermometry location control **328***b*, the PMP device **200** updates the thermometry location control **328***b* such that the thermometry location control **328***b* indicates a different location on the patient's body or whether the PMP device **200** is to obtain measurements of the patient's temperature in direct mode. The user can continue selecting the thermometry location control **328***b* until the thermometry location control **328***b* indicates a location where the thermometer is located on the patient's body or until the thermometry location control **328***b* indicates that measurements are to be obtained in direct mode. For example, in some embodiments, the PMP device **200** accepts readings from a thermometer when the thermometer is located in the patient's mouth, in an adult patient's armpit, or in a pediatric patient's armpit. In this example, the thermometry location control **328***b* initially indicates that the thermometer is in a patient's mouth. When the user selects the thermometry location control **328***b* one time, the thermometry location control **328***b* indicates that the thermometer is located in an adult patient's armpit. When the user selects the thermometry location control **328***b* again, the thermometry location control **328***b* indicates that the thermometer is located in a pediatric patient's armpit. When the user selects the thermometry location control **328***b* yet again, the thermometry location control **328***b* indicates that the measurements of the patient's temperature are to be obtained in direct mode. When the user selects the thermometry location control **328***b* yet again, the thermometry location control **328***b* again indicates that the thermometer is located in a patient's mouth.

The display screen **218** enables a user to select the parameter reporting frames **314***a*-**314***d* in order to change how the physiological parameters are represented in the parameter reporting frames **314***a*-**314***d*. In other words, each of the parameter reporting frames **314***a*-**314***d* contains an initial representation of a physiological parameter. The parameter reporting frame displays an alternate representation of the physiological parameter instead of the initial representation of the physiological parameter when a user selects the parameter reporting frame. For example, select-

ing the temperature frame **314***d* toggles the temperature value between being expressed in Fahrenheit or Centigrade. This feature is referred to as "tap to toggle." In another example, when a user selects the pulse rate frame **314***b*, the PMP device **200** displays a waveform in the pulse rate frame **314***b* instead of a number representing the patient's current pulse rate. The waveform represents a patient's pulse over time. In this example, when the user selects the pulse rate frame **314***b* again, the PMP device **200** displays a number in the pulse rate frame **314***b* representing the patient's current pulse rate. In yet another example, when the user selects the SpO2 frame **314***c*, the PMP device **200** displays a plethysmograhic waveform view in the SpO2 frame **314***c*. FIG. **3**D illustrates an example alternate representation of a patient's SpO2 level. In the example of FIG. **3**D, the SpO2 frame **314***c* contains a plethysmographic waveform view **325**.

The patient attribute area **316** contains data that specify attributes of a patient. In various embodiments, the patient attribute area **316** contains data that specify various attributes of a patient. For example, in some embodiments, text that identifies a patient is located at the left side of the patient attribute area **316**. In the example of FIG. **3**A, the patient attribute area **316** contains the value "83645211" to identify the patient.

Furthermore, in the example of FIG. **3**A, the patient attribute area **316** contains a patient type button **316***b* that is labeled with the text "Adult." The patient type button **316***b* is located towards the center of the patient attribute area **316**. Patient-related attribute values that are labeled with the text ("HEIGHT"), ("WEIGHT"), ("PAIN") and ("RR") are located to the right side of the patient type button **316***b*. A save button **316***g* that is labeled with the text ("Save") is located at the right side of the patient attribute area **316**.

The patient type button **316***b* indicates a value of a patient type parameter associated with the current patient. The patient type parameter can store a value of "Adult", "Pediatric", or "Neonatal" patient type. The patient type parameter controls the amount of air pressure applied to the NIBP cuff. Furthermore, in some embodiments, the patient type parameter controls the default alarm limits for the patient's physiological parameters. Thus, by using the patient type button **316***b* to change the patient type parameter, the user can automatically change the alarm limits for the patient's physiological parameters. As described elsewhere in this document, the user can also manually set the alarm limits for physiological parameters. When a user selects the patient type button **316***b*, the monitoring workflow home screen **300** is replaced by the patient selection screen as if the patients tab **319***b* was selected.

When the save button **316***g* is selected while the PMP device is operating in the monitoring workflow, the PMP device **200** saves a patient reading to local non-volatile storage within the PMP device **200**. The patient reading is a set of data that includes measurements of the physiological parameters of the patient. If applicable, the patient reading can also include data indicating attributes of the patient. A user can use the review screen to review saved patient reading. Furthermore, in some embodiments, the PMP device **200** automatically attempts to transmit the patient reading to another computing node. A user can use the settings screen to specify the other computing node. In some embodiments, the other computing node is an electronic medical records system. Optionally, the other computing node is the interface system **104**. The PMP device **200** does not clear the monitoring workflow home screen **300** when the save button **316***g* is selected.

The monitoring workflow is designed for obtaining a series of measurements of one or more physiological parameters of an identified patient over a period of time. A user uses the patient selection screen to select the identified patient. The PMP device **200** is programmable via an intervals pane of the settings screen to periodically record measurements of one or more physiological parameters over time from the identified patient.

A user may select the save button **316***g* one or more times. Each time the user selects the save button **316***g*, the PMP device **200** locally saves the patient reading and attempts to send the patient reading to another computing node. The sending is dependent on the workflow in which the PMP device **200** is operating. In the spot check workflow (see FIG. **3**B), the PMP device **200** automatically sends the patient reading because a clinician is present when the measurements are obtained. When the PMP device **200** is operating in the monitoring workflow, a clinician may not be always present. Thus, the patient reading is not sent automatically. Instead, a clinician navigates to the review screen (See FIG. **5**) and manually selects the patient reading that the user wants to send.

When the PMP device **200** is operating in the monitoring workflow, the representations of the physiological parameters and patient attributes remain displayed on the monitoring workflow home screen **300**, regardless of whether or not the patient reading is saved locally and/or transmitted to another computing node in response to a selection of the save button **316***g*. Unlike the spot check and triage workflows, the PMP device **200** does not clear the monitoring workflow home screen **300** when a user selects the save button **316***g*.

In some embodiments, the home screens for each workflow supported by the PMP device **200** contain at least one common user interface element. The common user interface element has the same appearance in each of the home screens, but does not necessarily perform the same function in the home screens of the different workflows. In the example of FIG. **3**A, the patient type button **316***b* and the save button **316***g* are user interface elements that are included within and common to the monitoring workflow home screen **300** and to home screens for the spot check workflow (FIG. **3**B) and the triage workflow (FIG. **3**C). Further, the patient type button **316***b* and the save button **316***g* have a same appearance but also have different functions depending upon which workflow the PMP device **200** is operating within.

When the PMP device **200** is operating in the monitoring workflow, the PMP device **200** clears the monitoring workflow home screen **300** upon discharge of the current (first) identified patient for which physiological parameters are being obtained. When the PMP device **200** clears the monitoring workflow home screen **300**, the PMP device **200** modifies the monitoring workflow home screen **300** such that the monitoring workflow home screen **300** no longer contains data representing physiological parameters of a patient and attributes of the patient. The monitored patient is discharged by the selection of another (second) identified patient for which to obtain physiological data, via the patient selection screen **400** or by power-cycling the PMP device **200**. Upon selection of the second patient, the PMP device **200** locally stores the patient reading for the first patient and transmits the patient reading for the first patient to another computing node when a user selects a send patient reading control **448***a* on the review screen (see FIG. **5**). Upon attaching the sensors to the second identified patient, the PMP device **200** obtain measurements of a set of one or

more physiological parameter from the second identified patient, periodically over time.

Unlike the home screens for non-monitoring workflows (e.g., the spot check workflow and the triage workflow), the monitoring workflow home screen **300** provides direct access to the alarm screen via the alarm status areas **322***c*, **324***a*, **326***a*, **328***a* located within the parameter reporting frames **314***a*-**314***d*. Each alarm status area **322***c*, **324***a*, **326***a*, **328***a* (including the bell-shaped symbols) indicates high and low alarm limits and provides a visual indication of when an alarm is active.

FIG. **3**E illustrates the monitoring workflow home screen **300** when an alarm is active. When an alarm is active with respect to a particular physiological parameter, a perimeter around the parameter reporting frame for the particular physiological parameter transitions from a gray color to a red color. Changing the color of the perimeter provides a visual indication that the alarm is active. In some embodiments, the perimeter around the parameter reporting frame also flashes, thereby providing another visual indication that the alarm is active. Furthermore, the bell-shaped symbol within the alarm status area transitions from a white color to a red or yellow color, depending on a priority of the alarm. This provides another visual indication that the alarm is active. When the alarm is resolved, the bell-shaped symbol within the alarm status area transitions from the red or yellow color to the white color. In the example of FIG. **3**E, an alarm associated with the patient's pulse rate is active. Accordingly, the perimeter around the pulse rate frame **314***b* is red instead of gray.

Furthermore, as illustrated in the example of FIG. **3**E, when an alarm associated with a particular physiological parameter is active, the PMP device **200** causes the device status area **312** to display an alarm message **380**. The alarm message **380** visually indicates that an alarm is active and indicates a brief description of the alert. In the example FIG. **3**E, the alarm message **380** indicates that the reason for the alert is that the patient's heart rate is too high.

Furthermore, when an alarm associated with a particular physiological parameter is active, the PMP device **200** emits an alarm sound. The PMP device **200** continues to emit the alarm sound until the alarm is deactivated or until a user temporarily silences the alarm sound. When the user temporarily silences the alarm sound, the PMP device **200** suspends emitting the alarm sound for a given time period. In various embodiments, the user is able to temporarily silence the alarm sound in various ways. For example, in some embodiments, the user temporarily silences the alarm sound by touching the parameter reporting frame corresponding to the alarm. In other embodiments, the user temporarily silences the alarm sound by touching the alarm message **380**. In yet other embodiments, the user temporarily silences the alarm sound by selecting a physical button on the PMP device **200**.

When the user temporarily silences the alarm sound, the PMP device **200** resumes emitting the alarm sound after a given time period expires. For example, in some embodiments, the PMP device **200** resumes emitting the alarm sound after 30 seconds. When the user temporarily silences the alarm sound, the alarm message **380** indicates a time remaining before the PMP device **200** resumes emitting the alarm sound.

FIG. **3**F illustrates the monitoring workflow home screen **300** when an alarm is active and when the alarm sound for the alarm has been temporarily silenced. In the example of FIG. **3**F, the alarm message **380** indicates that eighty-nine seconds remain before the PMP device **200** resumes emitting the alarm sound.

In some embodiments, the user is able to temporarily silence the alarm sound for various lengths of time by selecting a button on the PMP device **200** or a control displayed by the PMP device **200** multiple times. For example, when the user selects the alarm message **380** one time, the PMP device **200** resumes emitting the alarm sound after sixty seconds. In this example, each time the user selects the alarm message **380**, the PMP device **200** adds thirty seconds to the length of time before the PMP device **200** resumes emitting the alarm sound. In some embodiments, the PMP device **200** prevents the user from temporarily silencing the alarm sound for more than a given amount of time. For example, in some embodiments, the PMP device **200** prevents the user from temporarily silencing the alarm sound for more than five minutes.

When the user temporarily silences an alarm sound for an alarm, the monitoring workflow home screen **300** visually indicates that the alarm sound has been temporarily silenced. In various embodiments, the monitoring workflow home screen **300** visually indicates that the alarm sound has been temporarily silenced in various ways. For example, in some embodiments, the alarm message **380** contains a bell-shaped icon when the alarm sound has been temporarily silenced. In this example, the bell-shaped icon has an X-shaped mark over a bell. The lines of the X-shaped mark are dashed. In other example embodiments, the alarm message **380** or other parts of the monitoring workflow home screen **300** contain differently shaped icons or visual indicators.

The alarm status areas **322***c*, **324***a*, **326***a*, **328***a* act as navigational short cuts to appropriate panes within the alarms screen for each respective physiological parameter (See FIG. **7**A). In this way, selecting an alarm status area while no alarm is active results in the PMP device **200** displaying the same user interface as if a user selects the alarms tab **319***c* and then selects an appropriate pane of the alarms screen. Navigation to the appropriate pane of the alarms screen happens only when the PMP device **200** is not emitting an alarm sound. In other words, the first selection of this area (or anywhere in the parameter reporting frame) would cause the alarm to silence the audio. A subsequent selection of the alarm status area performs the navigation.

Various alarms have various priority levels. For example, an alarm associated with a patient's pulse rate has a high priority level and an alarm associated with detachment of a SpO2 clip has a medium priority level. The PMP device **200** visually and/or sonically indicates alarms having different priority levels in different ways. For example, in some embodiments, when an alarm having a high priority level is active, the PMP device **200** displays visual indications of the alarm in a given color, such as red. When an alarm having a medium or low priority level is active, the PMP device **200** displays visual indications of the alarm in another color, such as yellow. Furthermore, in some embodiments, when an alarm having a high priority level is active, the PMP device **200** emits a given alarm sound, such as a continuous tone. When an alarm having a medium or low priority level is active, the PMP device **200** emits another alarm sound, such as a periodic beep.

When the PMP device **200** is operating in different workflows, the PMP device **200** can activate different alarms and/or emit different alarm sounds. For example, the PMP device **200** activates an alarm when a SpO2 clip detachment event occurs while the PMP device **200** operating within the monitoring workflow, but does not activate the alarm while

in a non-operating in the monitoring workflow. This feature can be convenient considering that the PMP device **200** and the patient are more likely to be unattended by a user of the PMP device **200** for periods of time when the PMP device **200** is operating in the monitoring workflow, but less likely when the PMP device **200** is operating in the spot check or the triage workflows. In one embodiment, monitoring of SpO2 may be prevented by the PMP device **200** beyond ten minutes if the PMP device **200** is operating in the spot check or the triage workflows.

Under certain circumstances, multiple alarms can be active concurrently. For example, one alarm can be active because a patient's pulse rate is too high and another alarm can be active because a SpO2 clip has been detached from the patient. When multiple alarms are active concurrently, the PMP device **200** indicates that multiple alarms are active. In various embodiments, the PMP device **200** indicates that multiple alarms are active in various ways. For example, in some embodiments, the alarm message **380** includes an icon that indicates a number of alarms that are currently active. In this example, icon can be a triangle containing the number of alarms that are currently active.

In some embodiments, the PMP device **200** displays different visual indicators depending on the priority levels of concurrently active alarms. For example, when two or more high level alarms are active concurrently, the PMP device **200** displays visual indications for each of the high level alarms. In another example, when an alarm having a medium priority level ("the medium level alarm") and an alarm having a high priority level ("the high level alarm") are active concurrently, the PMP device **200** displays visual indications for the high level alarm and does not display visual indications for the medium level alarm. If the user of the PMP device **200** temporarily silences the alarm sound for the high level alarm, the PMP device **200** does not emit the alarm sound for the high level alarm or the alarm sound for the medium level alarm. When the high level alarm is resolved before the medium level alarm is resolved, the PMP device **200** displays visual indications for the medium level alarm and the PMP device **200** resumes emitting the alarm sound for the medium level alarm.

In some embodiments, the user of the PMP device **200** is able to toggle between multiple concurrently active alarms by selecting one or more controls in the user interface of the PMP device **200** or by selecting one or more buttons on the PMP device **200**. In this way, the user causes the PMP device **200** to display the visual indications for each of the multiple concurrently active alarms. For example, a first alarm and a second alarm can be concurrently active. In this example, the PMP device **200** displays an alarm message describing a first alarm. In this example, the PMP device **200** modifies the alarm message to describe a second alarm when a user selects the alarm message.

In some embodiments, the PMP device **200** enables a user to customize the content within the monitoring workflow home screen **300**. For example, the PMP device **200** enables a user to adjust the relative sizes of the parameter reporting frames **314***a*-**314***d* within the monitoring workflow home screen **300**. In another example, the PMP device **200** enables the user to add or remove parameter reporting frames from the monitoring workflow home screen **300**. Furthermore, in some such embodiments, the PMP device **200** includes one or more predefined templates for the monitoring workflow home screen **300**. Each of the predefined templates specifies a predefined set of content within the monitoring workflow home screen **300**. For example, one predefined template specifies that the monitoring workflow home screen **300** includes a large parameter reporting frame for the patient's blood pressure and three smaller parameter reporting frames for the patient's pulse rate, SpO2 level, and body temperature. In this example, another predefined template specifies that the monitoring workflow home screen **300** includes only a frame for the patient's SpO2 level and the patient's blood pressure. The user can customize the content within the monitoring workflow home screen **300** by selecting one of these predefined templates or by modifying one of these predefined templates.

FIG. **3**B illustrates an example spot check workflow home screen **330**. The PMP device **200** displays the spot check workflow home screen **330** when the PMP device **200** is operating in a spot check workflow. The spot check workflow home screen **330** is referred to as the "Home" screen for the spot check workflow. Like when the PMP device **200** is operating in the monitoring workflow, each sensor is physically attached to an identified patient when the PMP device **200** is operating in the spot check workflow. These sensors include a temperature probe, a SpO2 clip, and a NIBP blood pressure cuff. As described elsewhere in this document, the temperature probe, the SpO2 clip and the NIBP blood pressure cuff are peripheral to the PMP device **200**.

Also, like the monitoring workflow home screen **300** illustrated in the example of FIG. **3**A, the spot check workflow home screen **330** includes a device status area **312**, a content area **320**, and a navigation area **318**. The content area **320** includes a parameter reporting area **314** and a patient attribute area **316**. The parameter reporting area **314** of the spot check workflow home screen **330** includes an NIBP frame **334***a*, a pulse rate frame **314***b*, a SpO2 frame **334***c* and a temperature frame **334***d*.

The NIBP frame **334***a* contains a representation of a patient's blood pressure. The representation is based on one or more measurements of the blood pressure of a previously identified patient. In the example of FIG. **3**B, the NIBP frame **334***a* includes text representing the patient's systolic and diastolic blood pressure. In the spot check workflow home screen **330**, the text representing the patient's systolic and diastolic blood pressure is larger than the text in the monitoring workflow home screen **300** representing the patient's systolic and diastolic blood pressure. The NIBP frame **334***a* of the spot check workflow home screen **330** does not include the NIBP alarm status area **322***c* and does not include the NIBP automatic interval timer **322***b* of the monitoring workflow home screen **300**.

The pulse rate frame **334***b* contains a representation of the patient's pulse rate. The representation is based on one or more measurements of the pulse rate of the patient. In the example of FIG. **3**B, the pulse rate frame **334***b* includes text representing the patient's pulse rate. In the spot check workflow home screen **330**, the text representing the patient's pulse rate is larger than the text in the monitoring workflow home screen **300** representing the patient's pulse rate. The pulse rate frame **334***b* of the spot check workflow home screen **330** does not include the pulse rate alarm status area **324***a* included within the pulse rate frame **314***b* of the monitoring workflow home screen **300**.

The SpO2 frame **334***c* contains a representation of the patient's SpO2 level. The representation is based on one or more measurements of the SpO2 level of the patient. In the example of FIG. **3**B, the SpO2 frame **334***c* includes text representing the SpO2 value. In the spot check workflow home screen **330**, the text representing the patient's SpO2 level is larger than the text in the monitoring workflow home screen **300** representing the patient's SpO2 level. The SpO2 frame **334***c* does not include the alarm status area **326***a*, the

SpO2 response time control button **326***c*, or the SpO2 alarm parameter **326***d* of the SpO2 frame **314***c* of the monitoring workflow home screen **300**.

The temperature frame **334***d* contains a representation of the patient's body temperature. The representation is based on one or more measurements of the body temperature of the patient. In the example of FIG. **3**B, the temperature frame **334***d* includes text representing the patient's body temperature. In the spot check workflow home screen **330**, the text representing the patient's body temperature is larger than the text in the monitoring workflow home screen **300** representing the patient's body temperature. The temperature frame **334***d* of the spot check workflow home screen **330** does not include the temperature alarm status area **328***a* included within the temperature frame **314***d* of the monitoring workflow home screen **300**.

The patient attribute area **316** of the spot check workflow home screen **330** includes text that identifies the patient by name, initials, numerical identifier, or location. In the example of FIG. **3**B, the patient attribute area **316** includes text that identifies the patient as "Bar, D." A user is able use the settings screen to configure the PMP device **200** to identify the patient by name or by number. The user is also able to use the settings screen to configure the PMP device **200** not to save or send patient readings when the PMP device **200** does not store information regarding the identity of the patient.

The navigation area **318** of the spot check workflow home screen **330** includes the home tab **319***a*, the patients tab **319***b*, the review tab **319***d*, and the settings tab **319***e*. The navigation area **318** excludes the alarms tab **319***c* included in the navigation area **318** of the monitoring workflow home screen **300**. As a result, the spot check workflow home screen **330** does not provide direct navigation to the alarms screen as provided by the monitoring workflow home screen **300**.

When the PMP device **200** is operating in the spot check workflow, the PMP device **200** locally saves a patient reading and attempts to send the patient reading to another computing node when a user selects the save button **316***g*. The patient reading includes measurements of the physiological parameters of the patient and data identifying the patient. Unlike when the PMP device **200** is operating in the monitoring workflow, the PMP device **200** clears the spot check workflow home screen **330** when the user selects the save button **316***g*. When the PMP device **200** clears the spot check workflow home screen **330**, the PMP device **200** modifies the spot check workflow home screen **330** such that the spot check workflow home screen **330** no longer contains representations of the physiological parameters of the patient and attributes of the patient.

Because the PMP device **200** clears the spot check workflow home screen **330** when a user selects the save button **316***g* of the spot check workflow home screen **330**, a first identified patient is essentially discharged when the user selects the save button **316***g*. After selecting the save button **316***g*, the user selects a second identified patient via the patient selection screen. Upon attaching the sensors to the second identified patient, the PMP device **200** obtains a set of one or more physiological parameter values from the second identified patient.

The spot check workflow is designed for obtaining measurements of physiological parameters from each patient in a series of identified patients. A user selects each patient in the series of identified patients from the patient selection screen. Alternatively, a user can select each patient in the series of identified patient by scanning barcodes of the patients, thereby bypassing the patient selection screen. Further, a user can identify a patient at any step in the workflow prior to saving the patient reading of the spot check workflow home screen **330**. Upon attaching the sensors a patient in the series of identified patients, a user uses the PMP device **200** to obtain measurements of one or more physiological parameters of that patient. Typically, the PMP device **200** is attached to a first patient for no more time than is required to obtain one measurement for each of the NIBP, the pulse rate, the SpO2, and the body temperature of the first patient. The user then detaches the sensors from the first patient and attaches the sensors to a second patient that is next in the series of patients.

In one use scenario, a user can use the spot check workflow "making rounds" within a health care facility. For example, a clinician can use the PMP device **200** to obtain one set of measurements of physiological parameters for each patient in a group of twelve patients within a health care facility. Optionally, the clinician can transport the PMP device **200** sequentially to each patient in the group of patients within one "round" of obtaining measurements of physiological parameters. Each "round" of obtaining measurements of physiological parameters can be obtained for each patient in the patients of the group every hour during a working shift.

In some embodiments, the PMP device **200** enables a user to customize the content within the spot check workflow home screen **330**. For example, the PMP device **200** enables a user to adjust the relative sizes of the parameter reporting frames **334***a*-**334***d* within the spot check workflow home screen **330**. In another example, the PMP device **200** enables the user to add or remove parameter reporting frames from the spot check workflow home screen **330**. Furthermore, in some such embodiments, the PMP device **200** includes one or more predefined templates for the spot check workflow home screen **330**. Each of the predefined templates specifies a predefined set of content within the spot check workflow home screen **330**. The user can customize the content within the spot check workflow home screen **330** by selecting one of these predefined templates or by modifying one of these predefined templates.

FIG. **3**C illustrates an example triage workflow home screen **360**. The PMP device **200** displays the triage workflow home screen **360** when the PMP device **200** is in a triage workflow.

Like when the PMP device **200** is operating in the monitoring workflow or the spot check workflow, a user physically attaches each sensor to an unidentified patient when the PMP device **200** is operating in the triage workflow. These sensors include the temperature probe, the SpO2 clip, and the blood pressure cuff that are each attachable to the PMP device **200** as described elsewhere in this document.

The triage workflow home screen **360** includes a device status area **312**, a content area **320**, and a navigation area **318**. The content area **320** of the triage workflow home screen **360** includes a parameter reporting area **314** and a patient attribute area **316**. The parameter reporting area **314** of the triage workflow home screen **360** includes an NIBP frame **364***a*, a pulse rate frame **364***b*, a SpO2 frame **364***c* and a temperature frame **364***d*.

The NIBP frame **364***a* contains a representation of the systolic and diastolic blood pressure of the patient. The representation is based on one or more measurements of the blood pressure of the patient. In the example of FIG. **3**C, the NIBP frame **364***a* includes text representing the systolic and diastolic blood pressure of the patient. The size of the text in

the NIBP frame **364***a* is similar to the size of the text in the NIBP frame **334***a* of the spot check workflow home screen **330** and larger than the size of the text in the NIBP frame **314***a* of the monitoring workflow home screen **300**. The NIBP frame **364***a* does not include the NIBP alarm status area **322***c* and does not include the NIBP automatic interval timer **322***b* included in the NIBP frame **314***a* of the monitoring workflow home screen **300**.

The pulse rate frame **364***b* contains a representation of the pulse rate of the patient. The representation is based on one or more measurements of the pulse rate of the patient. In the example of FIG. **3**C, the pulse rate frame **364***b* contains text representing the pulse rate value of the patient. The size of the text in the pulse rate frame **364***b* is similar to the size of the text in the pulse rate frame **334***b* of the spot check workflow home screen **330** and larger than the size of the text in the pulse rate frame **314***b* of the monitoring workflow home screen **300**. The pulse rate frame **364***b* does not include the pulse rate alarm status area **324***a* that is included within the pulse rate frame **314***b* of the monitoring workflow home screen **300**.

The SpO2 frame **364***c* contains a representation of the SpO2 level of the patient. The representation is based on one or more measurements of the SpO2 level of the patient. In the example of FIG. **3**C, the SpO2 frame **364***c* includes text representing the SpO2 value of the patient. The size of the text in the SpO2 frame **364***c* is similar to the size of the text in the SpO2 frame **334***c* of the spot check workflow home screen **330** and larger than the size of the text in the SpO2 frame **314***c* of the monitoring workflow home screen **300**. The SpO2 frame **334***c* does not include the alarm status area **326***a*, the SpO2 response time control button **326***b*, or the SpO2 alarm parameter **326***b* of the SpO2 frame **314***c* of the monitoring workflow home screen **300**.

The temperature frame **364***d* contains a representation of the body temperature of the patient. The representation is based on one or more measurements of the body temperature of the patient. In the example of FIG. **3**C, the temperature frame **364***d* includes text representing the body temperature of the patient. The size of the text in the temperature frame **364***d* is similar to the size of the text in the temperature frame **334***d* of the spot check workflow home screen **330** and larger than the size of the text in the temperature frame **314***d* of the temperature frame **314***d* of the monitoring workflow home screen **300**. The temperature frame **364***d* does not include the temperature alarm status area **328***a* that is included within the temperature frame **314***d* of the monitoring workflow home screen **300**.

The navigation area **318** of the triage workflow home screen **360** includes the home tab **319***a*, the review tab **319***d*, and the settings tab **319***e*. The navigation area **318** of the triage workflow home screen **360** excludes the alarms tab **319***c* of the monitoring workflow home screen **300**. As a result, the triage workflow home screen **360** does not provide direct navigation to the alarms screen as provided by the monitoring workflow home screen **300**. Furthermore, the navigation area **318** of the triage workflow home screen **360** excludes the patients tab **319***b* of the monitoring workflow home screen **300** and the spot check workflow home screen **330**. As a result, the triage workflow home screen **360** does not provide direct navigation to the patient selection screen as provided by the monitoring workflow home screen **300** and the spot check workflow home screen **330**.

The patient attribute area **316** of the triage workflow home screen **360** includes a patient type button **316***b* and a save button **316***g*. The patient attribute area **316** does not include text that identifies the patient.

When the PMP device **200** is operating within the triage workflow, the PMP device **200** locally saves a patient reading of the triage workflow home screen **360**. The home screen data of the triage workflow home screen **360** includes measurements of the physiological parameters of the unidentified patient. Furthermore, a user can configure the PMP device **200** to transmit the patient reading of the triage workflow home screen **360** to another computing node in response to a selection of the save button **316***g*. Unlike the monitoring workflow home screen **300** and like the spot check workflow home screen **330**, the PMP device **200** clears the triage workflow home screen **360** when a user selects the save button **316***g*. When the PMP device **200** clears the triage workflow home screen **360**, the PMP device **200** modifies the triage workflow home screen **360** such that the triage workflow home screen **360** no longer contains representations of the physiological parameters of the patient.

When the PMP device **200** is operating in the triage workflow, selection of the patient type button **316***b* toggles the text label of the patient type button **316***b* and toggles a value of a patient type parameter within the triage workflow home screen **360**. The text label and data value associated with the patient type button **316***b*, toggles between the label/values of ("Adult"), ("Pediatric") and ("Neonatal").

When the user selects the save button **316***g*, the patient reading transmitted to another computing node includes a patient type parameter value equal to ("Adult"), ("Pediatric") and ("Neonatal"). The patient type data substitutes for patient identification data that is absent from the patient reading while operating within the triage workflow.

As a result, when the PMP device **200** is operating in the triage workflow, a first unidentified patient is essentially discharged when a user selects the save button **316***g*. Upon attaching the sensors to a second unidentified patient, the user uses the PMP device **200** to obtain a set of one or more measurements of physiological parameter from the second unidentified patient.

The triage workflow is designed for obtaining measurements of physiological parameters from each of a series of unidentified patients. A user does not select each patient in the series of unidentified patients from the patient selection screen. Instead, the user attaches the sensors to each unidentified patient in sequence. Upon attaching the sensors to a patient in the series of the unidentified patients, the user uses the PMP device **200** to obtain measurements of one or more physiological parameters of that patient at that time. Typically, the user attaches the sensors to the patient for no more time that is required to obtain one measurement for each of the NIBP, the pulse rate, the SpO2 level, and the body temperature of the patient. The user then detaches the sensors are from the patient and attaches the sensors to another patient that is next in the series of patients.

In one use scenario, the triage workflow can be used for obtaining measurements of physiological parameters from unidentified health care recipients. The recipients may or may not be patients of a health care facility. The other computing node is a personal computer which receives the patient reading from the PMP device **200** with no patient names attached.

In some embodiments, the PMP device **200** enables a user to customize the content within the triage workflow home screen **360**. For example, the PMP device **200** enables a user to adjust the relative sizes of the parameter reporting frames **364** within the triage workflow home screen **360**. In another example, the PMP device **200** enables the user to add or remove parameter reporting frames from the triage work-

flow home screen **360**. Furthermore, in some such embodiments, the PMP device **200** includes one or more predefined templates for the triage workflow home screen **360**. Each of the predefined templates specifies a predefined set of content within the triage workflow home screen **360**. The user can customize the content within the triage workflow home screen **360** by selecting one of these predefined templates or by modifying one of these predefined templates.

FIG. **4** illustrates an example patient selection screen **400**. A user can navigate to the patient selection screen **400** by selecting the patients tab **319***b*. The patient selection screen **400** includes a device status area **312**, a pane selection tab area **310** and a navigation area **318**. The pane selection tab area **310** includes four pane selection tabs that are labeled "List", "Summary", "Modifiers" and "Manual." The list pane **418** includes a column label area **412**, a patient listing area **414**, and a screen control area **416**. The device status area **312** appears like the device status area **312** of the monitoring workflow home screen **300**, the device status area **312** of the spot check workflow home screen **330**, and the device status area **312** of the triage workflow home screen **360**. The navigation area **318** appears like the navigation area **318** of the monitoring workflow home screen **300**.

The patient listing area **414** includes lines **415***a*-**415***e* (collectively, "lines **415**"). Each of the lines **415** is associated with a different patient. For example, a patient having a name "Barker, D." is listed on the line **415***a*, a patient having a name "Connor, W." is listed on the line **415***c*, and a patient having a name "Davison, A" is listed on the line **415***e*.

The screen control area **416** includes three buttons. A first (left) button that is labeled "Add" is utilized to add a patient to the patient listing area **414**. A second (middle) button that is labeled "Delete" is utilized to delete a patient from the patient listing area **414**. A third (right) button that is labeled "Select" is utilized to highlight a patient that listed within the patient listing area **414**.

FIG. **5** illustrates an example review screen **500**. A user can navigate to the review screen **500** using the review tab **319***d*. The review screen **500** includes a device status area **312**, a review table **541**, a screen control area **548**, and a navigation area **318**. The device status area **312** appears like the device status area **312** of the monitoring workflow home screen **300**, the device status area **312** of the spot check workflow home screen **330**, and the device status area **312** of the triage workflow home screen **360**. The navigation area **318** of the review screen **500** appears like the navigation area **318** of the monitoring workflow home screen **300**.

The review table **541** includes a column label line **542**. In addition, the review table **541** includes patient readings **546***a*-**546***f* and columns **552***a*-**552***i*. Each of the patient readings **546***a*-**546***f* comprises a different set of measurements of physiological parameters of a patient. Each of the columns **552***b*-**552***h* is associated with a different physiological parameter. Check marks in the column **552***a* indicate whether particular ones of the patient readings **546***a*-**546***f* are selected. In the example of FIG. **5**, the patient readings **546**A and **546***e* are selected.

For example, the patient reading **546***a* includes a patient name ("Barker, D.") in the column **552***b*, a date and time value in the column **552***c*, a systolic and diastolic measurement value in the column **552***d*, a mean arterial pressure (MAP) measurement value (not shown), a temperature measurement value in the column **552***f*, a pulse measurement value in the column **552***g*, an SpO2 measurement value in the column **552***h*, and a patient attributes set of values in the column **552***i*.

The screen control area **548** includes a send patient reading button **548***a*, a print patient reading button **548***b*, a delete patient reading button **548***c* and a view list box **548***d*. The print patient reading button **548***b* is utilized to send a selected patient reading. The print patient reading button **548***b* is utilized to print selected patient readings. The delete patient reading button **548***c* is utilized to delete selected patient readings. The view list box **548***d* enables filtering of the review table **541**. A user can use the view list box **548***d* to select to view all available patient readings or only particular patient readings based on sent, unsent or alarm status.

FIG. **6**A illustrates an example intervals pane **610** of a settings screen **600**. Direct navigation to the settings screen **600** is provided from the monitoring workflow home screen **300**, from the spot check workflow home screen **330**, and from the triage workflow home screen **360**. For example, in some embodiments, a user of the PMP device **200** navigates to the settings screen **600** by selecting the settings tab **319***e*. As illustrated in the example of FIG. **6**A, the settings screen **600** includes a device status area **312**, a pane selection tab area **604**, the intervals pane **610** and a navigation area **318**.

The device status area **312** of the settings screen **600** appears like the device status area **312** of the monitoring workflow home screen **300**, the device status area **312** of the spot check workflow home screen **330**, and the device status area **312** of the triage workflow home screen **360**. The pane selection tab area **604** includes five pane selection tabs that are labeled "Intervals," "Device," "Clinician," "Profiles," and "Advanced." The navigation area **318** of the settings screen **600** appears like the navigation area **318** of the monitoring workflow home screen **300**.

A user can use the intervals pane **610** to program the PMP device **200** to save NIBP measurements, pulse rate measurements, SpO2 measurements, and temperature measurements for a patient at given intervals over an given time period. Other combinations of physiological parameters can be obtained at other fixed or non-fixed intervals.

The intervals pane **610** includes an automatic control **611**, a program control **612**, a stat control **613**, an off control (not shown), a print control **615**, and a start control **616**. When the automatic control **611** is selected, the settings screen **600** contains one or more controls for entering a fixed time period to right of control. When the program control **612** is selected, the settings screen **600** contains controls for defining and selecting interval programs. When the stat control **613** is selected, the settings screen **600** contains one or more controls for capturing and saving as many measurements of physiological parameters as possible within a time period, for example a five minute period. When the off control is selected, intervals are turned off. When the print control **615** is selected, a captured measurement at each interval may be printed. The start control **616** is a command button to start the selected interval workflow: Automatic, Program, or Stat. The PMP device **200** automatically initiates an NIBP reading and initiates the interval program once the start control **616** is selected.

In the example of FIG. **6**A, the program control **612** is selected. Consequently, the intervals pane **610** includes controls for defining and selecting interval programs. An interval program is a set of parameters that governs the intervals at which the PMP device **200** records measurements of one or more physiological parameters of a patient

and for lengths of time for which the PMP device **200** records the measurements of the one or more physiological parameters of the patient.

In the example of FIG. **6**A, the intervals pane **610** contains interval program selection controls **660***a*, **660***b* (collectively, interval program selection controls **660**). More or fewer controls **660** can be provided. The interval program selection controls **660** specify the names of interval programs. In some examples, the interval program selection controls **660** specify names associated with the controls, such as "Transplant," "Transfusion," "Cardiac," which represent names of interval programs.

A user selects an interval program by selecting one of the interval program selection controls **660** that corresponds to the interval program. After selecting the interval program, the user starts the interval program by selecting the start control **616**. When the user starts the interval program, the PMP device **200** records measurements of physiological parameters of a patient at the intervals specified by the interval program for the duration specified by the interval program.

In some embodiments, the monitoring workflow home screen **300** contains remaining time controls. The remaining time controls indicate amounts of time remaining before the PMP device **200** records measurements of the physiological parameters. For example, the pulse rate frame **314***b* of the monitoring workflow home screen **300** can include a remaining time control that indicates that twenty seconds remain before the PMP device **200** records a measurement of the patient's pulse rate. Furthermore, in some embodiments, the PMP device **200** displays the intervals pane **610** when the user selects the remaining time controls. In this way, the user of the PMP device **200** can easily access the intervals pane **610**.

Furthermore, in the example of FIG. **6**A, the intervals pane **610** contains a program name control **662**, duration controls **664***a*-**664***e* (collectively, "duration controls **664**"), and interval controls **666***a*-**666***e* (collectively, "interval controls **666**"). The duration controls **664** and the interval controls **666** are organized into rows. Each row corresponds to a different physiological parameter of the patient. For example, a first row corresponds to the patient's blood pressure, a second row corresponds to the patient's pulse rate, and so on.

When the user selects an interval program using one of the interval program selection controls **660**, the program name control **662** contains the name of the interval program. In the example of FIG. **6**A, the program name control **662** indicates that the name of the interval program is "Transfusion." The duration controls **664** specify lengths of time during which the PMP device **200** is to record measurements of the physiological parameters. The interval controls **666** specify lengths of time that the PMP device **200** waits between recording measurements of the physiological parameters. In the example of FIG. **6**A, the duration control **664***a* indicates 1 hour and the interval control **666***a* indicates 15 minutes. Consequently, the PMP device **200** records measurements of a physiological parameter at 15 minute intervals for one hour after the "Transfusion" interval program starts.

When the user selects an interval program using one of the interval program selection controls **660**, the user is able to change the values in the program name control **662**, the duration controls **664**, and the interval controls **666**. For example, the user can change the value of the duration control **664***b* from one hour to two hours.

FIG. **6**B illustrates an example device pane **620** of the settings screen **600**. The settings screen **600** includes a device status area **312**, a pane selection tab area **604**, a device pane **520** and a navigation area **318**. The device status area **312**, the pane selection tab area **604**, and the navigation area **318** appear like that of FIG. **6**A.

The device pane **620** provides controls and information for a user to select or view device characteristics. The device pane **620** includes a set date and time control **622**, a touch-screen lock-out control **628**, and a command button **629**. The set date and time control **622** is configured to set up a date and time for the PMP device **200**. A user may select a date display format through the date format selection (not shown), such as MM/DD/YYYY. A user may also select a time zone offset from UTC based on where the PMP device **200** is located. The touch-screen lock-out control **628** is configured to allow a user to lock out the touch screen. When the command button **629** is selected, the touch screen is locked out immediately.

FIG. **6**C illustrates an example clinician pane of the settings screen **600**. The settings screen **600** includes a device status area **312**, a pane selection tab area **604**, a clinician pane **630** and a navigation area **318**. The device status area **312**, the pane selection tab area **604** and the navigation area **318** appear like that of FIG. **6**A. The clinician pane **630** provides for entry of clinician identification. The clinician identified can include a first name, a last name, a middle initial, and an identification number.

FIGS. **6**D-**6**F illustrate an example profiles pane **640** of the settings screen **600**. The settings screen **600** includes the device status area **312**, a pane selection tab area **604**, the profiles pane **640** and a navigation area **318**. The device status area **312**, the pane selection tab area **604** and the navigation area **318** appear like that of FIG. **6**A. The profiles pane **640** allows a user to select a desired workflow within which the PMP device **200** is to operate. In the examples of FIG. **6**D-**6**F, the profiles pane **640** includes a "Med/Surge" control **642**, a "Spot Check" control **644**, and an "ED Triage" control **646**. A user selects the "Med/Surge" control **642** to select a "Med/Surge" workflow as the workflow in which the PMP device **200** is to operate. The user selects the "Spot Check" control **644** to select the spot check workflow as the workflow in which the PMP device **200** is to operate. The user selects the "ED triage" control **646** to select the triage workflow as the workflow in which the PMP device **200** is to operate. As shown in the examples of FIGS. **6**D-**6**F, the profiles pane **640** shows a preview of the home screen of the selected workflow.

FIG. **6**G illustrates an example advanced pane **650** of the settings screen **600**. The settings screen **600** includes a device status area **312**, a pane selection tab area **604**, the advanced pane **650** and a navigation area **318**. The device status area **312**, the pane selection tab area **504** and the navigation area **318** appear like that of FIG. **6**A. The advanced pane **650** enables an administrator to access configuration settings that are likely to be set once or less frequently than those required for a normal use. When a proper access code is entered, the PMP device **200** switches to an administration workflow and the navigation tabs switch to advanced settings tabs. The advanced pane **650** also provides read-only information about the PMP device **200**.

FIG. **7**A illustrates an example global pane **710** of an alarms screen **700**. A user of the PMP device **200** navigates to the alarms screen **700** by selecting the alarms tab **319***c*. The alarms screen **700** includes controls that enable a user to configure global alarm settings and parameter-specific alarm settings.

As illustrated in the example of FIG. **7**A, the alarms screen **700** includes the device status area **312**, a compressed parameter reporting area **702**, a pane selection tab area **704**, the global pane **710**, and the navigation area **318**. The device status area **312** appears like the device status areas of the monitoring workflow home screen **300**, the spot check workflow home screen **330** and the triage workflow home screen **360**. The navigation area **318** of the alarms screen **700** appears like the navigation area **318** of the monitoring workflow home screen **300**.

The compressed parameter reporting area **702** contains one or more compressed parameter frames containing data representing live physiological parameters of a patient. In the example of FIG. **7**A, the compressed parameter reporting area **702** contains a compressed NIBP frame **703***a*, a compressed SpO2 frame **703***b*, a compressed pulse rate frame **703***c*, and a compressed temperature frame **703***d*. The compressed NIBP frame **703***a*, the compressed SpO2 frame **703***b*, the compressed pulse rate frame **703***c*, and the compressed temperature frame **703***d* are referred to herein collectively as the compressed frames **703**. The compressed parameter reporting area **702** has frame dimensions that are smaller than the frame dimensions of the parameter reporting area **314** of the monitoring workflow home screen **300**. Because the compressed parameter reporting area **702** is smaller than the parameter reporting area **314**, the compressed parameter reporting area **702** appears "squished" relative to the parameter reporting area **314**.

The compressed NIBP frame **703***a* contains a representation of the systolic and the diastolic blood pressure of the patient. The compressed SpO2 frame **703***b* contains a representation of a SpO2 percentage of the patient, a pulse amplitude blip bar, and alarm limits for the SpO2 parameter. The compressed pulse rate frame **703***c* contains a representation of a pulse rate of the patient. The compressed temperature frame **703***d* contains a representation of the body temperature of the patient. In the example of FIG. **7**A, the compressed frames **703** do not contain user-selectable controls. Consequently, the user is unable to toggle views of the physiological parameters from the compressed frames **703**.

When an alarm associated with one of the physiological parameters is active, the corresponding one of the compressed frames **703** provides a visual indication of the alarm. For example, when the patient's blood pressure is too high, a perimeter of the compressed NIBP frame **703***a* changes from one color (e.g., gray) to a different color (e.g., red). Furthermore, when an alarm is active, the device status area **312** of the alarms screen **700** is replaced by an alarm message describing the alarm. In some embodiments, selecting the alarm message causes the PMP device **200** to temporarily stop emitting an alarm sound associated with the alarm.

The pane selection tab area **704** includes five pane selection tabs that are labeled "Global", "NIBP", "SpO2", "Pulse" and "Temperature." When the user selects one of the pane selection tabs in the pane selection tab area **704**, the PMP device **200** updates the alarms screen **700** to contain a pane associated with the selected pane selection tab.

The global pane **710** is located below the compressed parameter reporting area **702**. The global pane **710** provides controls for configuring global alarm settings for the PMP device **200**. The global alarm settings are settings that apply to all alarms provided by the PMP device **200**. In the example of FIG. **7**A, the global pane **710** includes a reset button **712***a*, a display alarm limit parameter button **712***b*, a set of alarm audio buttons **712***c*, a set of volume buttons **712***d*, and a silence/reset button **712***e*. A user can use the reset button **712***a* to reset alarm limits. The user can use the display alarm limit parameter button **712***b* to configure the PMP device **200** to display or not to display alarm limits. The user can use the set of alarm audio buttons **712***c* to configure the PMP device **200** to emit alarm sounds. The user can use the set of volume buttons **712***d* to set a volume of the alarm sounds to high, medium or low. Also, the user can use the silence/reset button **712***e* to silence or reset alarms.

FIG. **7**B illustrates an example temperature pane **720** of the alarms screen **700**. The alarms screen **700** includes the device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704**, the temperature pane **720**, and a navigation area **318**. The device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704** and the navigation area **318** appear like that of FIG. **7**A.

The temperature pane **720** is located below the compressed parameter reporting area **702**. The temperature pane **720** enables a user of the PMP device **200** to configure parameter-specific alarm settings for the temperature alarm. In the example of FIG. **7**B, the temperature pane **720** provides controls **722***a*, **722***b* and **722***c*. The control **722***a* sets the temperature alarm to ON or OFF. The control **722***b* sets an upper temperature limit for the temperature alarm. The control **722***c* sets a lower temperature limit for the temperature alarm.

FIG. **7**C illustrates an example NIBP pane **730** of the alarms screen **700**. The alarms screen **700** includes a device status area **312**, a compressed parameter reporting area **702**, a pane selection tab area **704**, the NIBP pane **730**, and a navigation area **318**. The device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704** and the navigation area **318** appear like that of FIG. **7**A.

The NIBP pane **730** enables a user of the PMP device **200** to configure parameter-specific alarm settings for the NIBP alarm. In the example of FIG. **7**C, the NIBP pane **730** contains a control **732***a* to set the systolic and diastolic alarm ON or OFF. The NIBP pane **730** also contains controls **732***b*-**732***e* to set the systolic and diastolic upper and lower alarm limits for the systolic and diastolic alarm. Further, the NIBP pane **730** provides controls **732***f*, **732***g* and **732***h*. The control **732***f* sets a MAP alarm to ON or OFF. The control **732***g* sets set an upper MAP limit for the MAP alarm. The control **732***h* sets a lower MAP limit for the MAP alarm.

FIG. **7**D illustrates an example SpO2 pane **740** of the alarms screen **700**. The alarms screen **700** includes the device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704**, the SpO2 pane **740**, and the navigation area **318**. The device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704**, and the navigation area **318** appear like that of FIG. **7**A.

The SpO2 pane **740** enables a user of the PMP device **200** to configure parameter-specific alarm settings for the SpO2 alarm. In the example of FIG. **7**D, the SpO2 pane **740** provides controls **742***a*, **742***b* and **742***c*. The control **742***a* sets the SpO2 alarm to ON or OFF. The controls **742***b* and **742***c* set an upper SpO2 limit and a lower SpO2 limit for the SpO2 alarm. The SpO2 pane **740** also includes a SatSeconds™ control **743***d*. When a numeric value is selected, an SpO2 alarm is not activated until a length of time specified by the SatSeconds control **743***d* has expired. The length of time specified by the SatSeconds control **743***d* is based on a duration of a low SpO2 event multiplied by a number of percentage points that the patient's SpO2 falls outside the

lower SpO2 alarm threshold. Also, the SatSeconds control **743***d* appears next to the controls **742***b* and **742***c* when the control **742***a* is set to ON. However, when the control **742***a* is set to OFF, the SatSeconds control **743***d* is not displayed and the alarm condition is not delayed per a SatSeconds algorithm.

FIG. **7**E illustrates an example pulse rate pane **750** of the alarms screen **700**. The alarms screen **700** includes the device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704**, the pulse rate pane **750** and the navigation area **318**. The device status area **312**, the compressed parameter reporting area **702**, the pane selection tab area **704** and the navigation area **318** appear like that of FIG. **7**A.

The pulse rate pane **750** enables a user of the PMP device **200** to configure parameter-specific alarm settings for the pulse rate alarm. In the example of FIG. **7**E, the pulse rate pane **750** provides an on/off control **752***a*, an upper limit control **752***b* and a lower limit control **752***c*. The on/off control **752***a* allows a user to turn the pulse rate alarm on or off. The upper limit control **752***b* allows a user to set an upper pulse rate limit for the pulse rate alarm. The lower limit control **752***c* allows a user to set a lower pulse rate limit for the pulse rate alarm.

The upper limit control **752***b* includes a numerical portion, an up button and a down button. The numerical portion of the upper limit control **752***b* specifies an upper pulse rate limit for the pulse rate alarm. Selecting the up button of the upper limit control **752***b* incrementally increases the upper pulse rate limit. Selecting the down button of the upper limit control **752***b* incrementally decreases the upper pulse rate limit. Selecting the numerical portion of the upper limit control **752***b* causes the PMP device **200** to display a numerical keypad. The user is able to use the numerical keypad to manually enter a value for the upper pulse rate limit.

The lower limit control **752***c* includes a numerical portion, an up button, and a down button. The numerical portion of the lower limit control **752***c* specifies the lower pulse rate limit. Selecting the up button of the lower limit control **752***c* incrementally increases the lower pulse rate limit. Selecting the down button of the lower limit control **752***c* incrementally decreases the lower pulse rate limit. Selecting the numerical portion of the lower limit control **752***c* causes the PMP device **200** to display a numerical keypad. The user is able to use the numerical keypad to manually enter a value for the lower pulse rate limit.

In the examples shown, the values that are entered by the user are validated for accuracy. For example, upper and lower thresholds for each parameter can be set. If the user selects a value outside of the upper and lower thresholds, the system can prevent such a selection and/or alert the user. For example, if the user types in 300 minutes on the keypad for a parameter, and the upper threshold set for that parameter is 240 minutes, the system will not allow the user to increase the parameter to 300 minutes.

In some embodiments, various panes of the alarms screen **700** can include other upper limit controls and other lower limit controls like the upper limit control **752***b* and the lower limit control **752***c*. The other upper limit controls and the other lower limit controls allow a user to set upper limits and lower limits for alarms for various physiological parameters of patients.

FIG. **8** is a flowchart illustrating an example operation **800** performed by the PMP device **200**. As illustrated in the example of FIG. **8**, the operation **800** begins when the PMP device **200** displays the settings screen **600** (**802**). The PMP device **200** then receives workflow selection input from a clinician via the settings screen **600** (**804**). In response to receiving the workflow selection input, the PMP device **200** determines whether the workflow selection input indicates the monitoring workflow, the triage workflow, or the spot check workflow (**806**). If the PMP device **200** determines that the workflow selection input indicates the triage workflow, the PMP device **200** performs the steps illustrated in FIG. **9**.

If the PMP device **200** determines that the workflow selection input indicates the monitoring workflow, the PMP device **200** displays the patient selection screen **400** (**808**). The PMP device **200** then receives patient selection input from the clinician via the patient selection screen **400** (**810**). The patient selection input indicates a patient that the clinician intends to monitor.

Next, the PMP device **200** displays the monitoring workflow home screen **300** (**812**). In some embodiments, the PMP device **200** displays the monitoring workflow home screen **300** automatically after the clinician selects the monitored patient via the patient selection screen **400**. In other embodiments, the PMP device **200** displays the monitoring workflow home screen **300** in response to the clinician selecting the home tab **319***a*.

Subsequently, the PMP device **200** obtains a measurement of a physiological parameter of the monitored patient (**814**). The PMP device **200** then displays a representation of the physiological parameter on the monitoring workflow home screen **300** (**816**). The representation of the physiological parameter is based, at least in part, on the measurement of the physiological parameter. The PMP device **200** then obtains another measurement of the physiological parameter from the same monitored patient (**814**). In this way, the PMP device **200** enables the clinician to monitor the physiological parameters of the same monitored patient over a period of time.

If, however, the PMP device **200** determines that the workflow selection input indicates the spot check workflow, the PMP device **200** displays the patient selection screen **400** (**818**). In various embodiments, the PMP device **200** displays the patient selection screen **400** in response to various events. For example, in some embodiments, the PMP device **200** automatically displays the patient selection screen **400** when the PMP device **200** determines that the workflow selection input indicates the spot check workflow. In another example, the PMP device **200** displays the patient selection screen **400** in response to receiving a selection of the patients tab **319***b*.

The PMP device **200** then receives patient selection input from the clinician via the patient selection screen **400** (**820**). The patient selection input indicates a selected patient. The selected patient is a patient on whom the clinician intends to perform a spot check.

Next, the PMP device **200** displays the spot check workflow home screen **330** (**822**). In various embodiments, the PMP device **200** displays the spot check workflow home screen **330** in response to various events. For example, in some embodiments, the PMP device **200** automatically displays the spot check workflow home screen **330** when the PMP device **200** receives the patient selection input from the clinician. In other embodiments, the PMP device **200** displays the spot check workflow home screen **330** in response to receiving a selection of the home tab **319***a*.

The PMP device **200** then obtains a measurement of a physiological parameter of the selected patient (**824**). In response to obtaining the measurement of the physiological parameter of the selected patient, the PMP device **200**

displays a representation of the physiological parameter of the selected patent (**826**). The representation of the physiological parameter is based, at least in part, on the measurement of the physiological parameter.

Subsequently, the PMP device **200** clears the home screen data from the spot check workflow home screen **330** (**828**). The PMP device **200** then displays the patient selection screen **400** again (**818**) and receives patient selection input indicating another patient (**818**), and so on. In this way, the PMP device **200** displays representations of physiological parameters of each patient in a series of patients.

FIG. **9** is a flowchart representing a continuation of the operation **800** in which the workflow selection input indicates the triage workflow. As illustrated in the example of FIG. **9**, if the PMP device **200** determines that the workflow selection input indicates the triage workflow, the PMP device **200** displays the triage workflow home screen **360** (**900**). In various embodiments, the PMP device **200** displays the triage workflow home screen **360** in response to various events. For example, in some embodiments, the PMP device **200** automatically displays the triage workflow home screen **360** when the PMP device **200** determines that the workflow selection input indicates the triage workflow. In another example, the PMP device **200** displays the triage workflow home screen **360** when the PMP device **200** receives a selection of the home tab **319***a*.

Next, the PMP device **200** obtains a measurement of a physiological parameter of an unidentified patient in a series of patients (**902**). After obtaining the measurement, the PMP device **200** displays a representation of the physiological parameter on the triage workflow home screen **360** (**904**). The representation of the physiological parameter is based at least in part on the measurement of the physiological parameter.

Subsequently, the PMP device **200** clears the home screen data from the triage workflow home screen **360** (**906**). The PMP device **200** then obtains a measurement of the physiological parameter of a different patient in the series of unidentified patients (**902**), displays a representation of the physiological parameter (**904**), and so on. In this way, the PMP device **200** displays representations of physiological parameters of each patient in the series of unidentified patients.

FIG. **10** is a flowchart illustrating an operation **1000** performed by the PMP device **200** when the PMP device **200** displays a workflow home screen. In some embodiments, the PMP device **200** can perform the operation **1000** when the PMP device **200** displays either the monitoring workflow home screen **300**, the spot check workflow home screen **330**, or the triage workflow home screen **360**.

As illustrated in the example of FIG. **10**, the PMP device **200** initially waits to receive an event (**1002**). An event is an occurrence or happening of significance to a task or program.

The PMP device **200** receives a measurement event when the PMP device **200** receives a measurement of a physiological parameter of a patient. If the PMP device **200** receives a measurement event ("YES" of **1004**), the PMP device **200** determines whether the measurement of the physiological parameter is within an alarm range for the physiological parameter (**1006**). If the measurement of the physiological parameter is not within (i.e., is outside) the alarm range for the physiological parameter ("NO" of **1006**), the PMP device **200** displays an alarm message on the workflow home screen (**1008**). In addition, the PMP device **200** emits an alarm sound (**1010**).

The PMP device **200** also generates a representation of the physiological parameter based on the measurement of the physiological parameter (**1012**). The PMP device **200** generates the representation of the physiological parameter regardless of whether the measurement is within the alarm range of the physiological parameter. The PMP device **200** then displays the representation of the physiological parameter on the workflow home screen (**1014**). The PMP device **200** then waits for another event (**1002**).

The PMP device **200** can receive an alarm message selection event when the PMP device **200** displays an alarm message, there are two or more active alarms, and a clinician selects the alarm message. If the PMP device **200** receives an alarm message selection event ("YES" of **1016**), the PMP device **200** modifies the alarm message such that the alarm message describes a next one of the active alarms (**1018**). The PMP device **200** then waits for another event (**1002**).

The PMP device **200** can receive an alarm silence event when an alarm is currently active, the PMP device **200** is emitting an alarm sound, and a clinician selects a control to suspend the alarm sound. If the PMP device **200** receives an alarm silence event ("YES" of **1020**), the PMP device **200** suspends the alarm sound (**1022**). In addition, the PMP device **200** modifies the alarm message to indicate that the alarm has been silenced (**1024**). The PMP device **200** then waits for another event (**1002**).

The PMP device **200** can receive a representation selection event when a clinician selects a representation of a physiological parameter. If the PMP device **200** receives a representation selection event ("YES" of **1026**), the PMP device **200** modifies a parameter reporting area associated with the physiological parameter such that the parameter reporting area contains a different representation of the physiological parameter (**1028**). The PMP device **200** then waits for another event (**1002**).

The PMP device **200** can receive a save selection event when a clinician selects a save button (e.g., save button **316***g*) on the workflow home screen. If the PMP device **200** receives a save selection event ("YES" of **1030**), the PMP device **200** saves the home screen data (**1032**). The PMP device **200** then waits for another event (**1002**).

FIG. **11** illustrates example physical components of the PMP device **200**. As illustrated in the example of FIG. **11**, the PMP device **200** include at least one central processing unit ("CPU") **1108**, a system memory **1112**, and a system bus **1110** that couples the system memory **1112** to the CPU **1108**. The system memory **1112** includes a random access memory ("RAM") **1118** and a read-only memory ("ROM") **1120**. A basic input/output system containing the basic routines that help to transfer information between elements within the PMP device **200**, such as during startup, is stored in the ROM **1120**. The PMP device **200** further includes a mass storage device **1114**. The mass storage device **1114** is able to store software instructions and data.

The mass storage device **1114** is connected to the CPU **1108** through a mass storage controller (not shown) connected to the bus **1110**. The mass storage device **1114** and its associated computer-readable data storage media provide non-volatile, non-transitory storage for the PMP device **200**. Although the description of computer-readable data storage media contained herein refers to a mass storage device, such as a hard disk or CD-ROM drive, it should be appreciated by those skilled in the art that computer-readable data storage media can be any available non-transitory, physical device or article of manufacture from which the PMP device **200** can read data and/or instructions.

Computer-readable data storage media include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable software instructions, data structures, program modules or other data. Example types of computer-readable data storage media include, but are not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROMs, digital versatile discs ("DVDs"), other optical storage media, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by the PMP device **200**.

According to various embodiments of the invention, the PMP device **200** may operate in a networked environment using logical connections to remote network devices through the network **108**, such as a local network, the Internet, or another type of network. The PMP device **200** connects to the network **108** through a network interface unit **1116** connected to the bus **1110**. It should be appreciated that the network interface unit **1116** may also be utilized to connect to other types of networks and remote computing systems. The PMP device **200** also includes an input/output controller **1122** for receiving and processing input from a number of other devices, including a keyboard, a mouse, a touch user interface display screen, or another type of input device. Similarly, the input/output controller **1122** may provide output to a touch user interface display screen, a printer, or other type of output device.

As mentioned briefly above, the mass storage device **1114** and the RAM **1118** of the PMP device **200** can store software instructions and data. The software instructions include an operating system **1132** suitable for controlling the operation of the PMP device **200**. The mass storage device **1114** and/or the RAM **1118** also store software instructions, that when executed by the CPU **1108**, cause the PMP device **200** to provide the functionality of the PMP device **200** discussed in this document. For example, the mass storage device **1114** and/or the RAM **1118** can store software instructions that, when executed by the CPU **1108**, cause the PMP device to display the monitoring workflow home screen **300** and other screens.

It should be appreciated that various embodiments can be implemented (1) as a sequence of computer implemented acts or program modules running on a computing system and/or (2) as interconnected machine logic circuits or circuit modules within the computing system. The implementation is a matter of choice dependent on the performance requirements of the computing system implementing the invention. Accordingly, logical operations including related algorithms can be referred to variously as operations, structural devices, acts or modules. It will be recognized by one skilled in the art that these operations, structural devices, acts and modules may be implemented in software, firmware, special purpose digital logic, and any combination thereof without deviating from the spirit and scope of the present invention as recited within the claims set forth herein.

Although the invention has been described in connection with various embodiments, those of ordinary skill in the art will understand that many modifications may be made thereto within the scope of the claims that follow. For example, it should be appreciated that the screens illustrated in this document are merely examples and that in other embodiments equivalent screens can have different contents and appearances. Accordingly, it is not intended that the scope of the invention in any way be limited by the above description, but instead be determined entirely by reference to the claims that follow.

What is claimed is:

**1**. A physiological measuring platform (PMP) device comprising:

a central processing unit (CPU) that is configured to control operation of the PMP device;

a display screen; and

a set of one or more computer-readable data storage media storing software instructions that, when executed by the CPU, cause the PMP device to:

display, on the display screen, a monitoring workflow home screen when the PMP device is operating within a monitoring workflow, wherein the monitoring workflow home screen includes a first blood pressure measurement display of a first size;

obtain a series of measurements of a physiological parameter of a monitored patient when the PMP device is operating within the monitoring workflow;

display, on the display screen, a non-monitoring workflow home screen when the PMP device is operating within a non-monitoring workflow, wherein the non-monitoring workflow home screen includes a second blood pressure measurement display of a second size, the second size being larger than the first size;

obtain a measurement of the physiological parameter of each patient in a series of patients when the PMP device is operating within the non-monitoring workflow;

display, on the display screen, a patient selection screen including a patient listing area, the patient listing area displaying a plurality of patient names

display an intervals screen, the intervals screen being navigable from the monitoring workflow home screen, wherein the intervals screen includes a user-selectable duration control and a user-selectable interval control,

wherein the user-selectable duration control sets a first length of time during which the PMP device records measurements for a given physiological Parameter; and

wherein the user-selectable interval control sets a second length of time between measurements recorded by the PMP device.

**2**. The PMP device of claim **1**, further comprising software instructions that, when executed by the CPU, cause the PMP device to:

display, on the display screen, a review screen including patient data,

wherein the patient selection screen includes user-selectable controls to add, delete, and select one of the plurality of patient names.

**3**. The PMP device of claim **2**, wherein the patient data in the review screen includes: patient name, date and time, and the physiological parameter.

**4**. The PMP device of claim **3**, wherein the review screen further includes user-selectable controls to send, print, and delete one or more entries.

**5**. The PMP device of claim **4**, wherein the patient data displayed on the review screen includes physiological data for a plurality of patients; and

wherein the physiological data includes at least one of: blood pressure, temperature, respiration rate, SpO2, height, and weight.

6. The PMP device of claim 5, wherein the review screen further includes a user-selectable control to view patient data by at least one of: sent data, unsent data, and alarm data.

7. The PMP device of claim 1, wherein the monitoring workflow home screen includes a user-selectable save control, the user-selectable save control configured to save a patient reading, the patient reading including measurements of the physiological parameter of the patient.

8. The PMP device of claim 1, wherein, when an alarm is active for a particular physiological parameter, a parameter reporting frame for the particular physiological parameter displayed on the monitoring workflow home screen transitions from a gray color to a red color.

9. The PMP device of claim 8, wherein the parameter reporting frame further includes a bell symbol, the bell symbol transitioning from a white color to a yellow color or a red color based on a priority of the alarm.

10. A method for obtaining a physiological parameter associated with a patient, comprising:

obtaining, by a physiological measuring platform (PMP) device, a measurement of the physiological parameter of the patient;

displaying, on a display screen, a monitoring workflow home screen when the PMP device is operating within a monitoring workflow, the monitoring workflow home screen containing at least one first parameter reporting area containing a representation of the physiological parameter of the patient;

displaying on the display screen, a non-monitoring workflow home screen when the PMP device is operating within a non-monitoring workflow, the non-monitoring workflow home screen containing at least one second parameter reporting area containing a representation of the physiological parameter of the patient;

displaying, on the display screen, a patient selection screen including a patient listing area, the patient listing area displaying a plurality of patient names, wherein the patient selection screen includes user-selectable controls to add, delete, and select one of the plurality of patient names;

displaying, on the display screen, a review screen including patient data including patient name, date and time, and the physiological parameter; and

displaying, on the display screen, an intervals screen, the intervals screen being navigable from the monitoring workflow home screen, wherein the intervals screen includes a user-selectable duration control and a user-selectable interval control,

wherein the user-selectable duration control sets a first length of time during which the PMP device records measurements for a given physiological parameter; and

wherein the user-selectable interval control sets a second length of time between measurements recorded by the PMP device.

11. The method of claim 10, wherein the review screen further includes user-selectable controls to send, print, and delete one or more entries;

wherein the patient data displayed on the review screen includes physiological data for a plurality of patients; and

wherein the physiological data includes at least one of: blood pressure, temperature, respiration rate, SpO2, height, and weight.

12. The method of claim 11, wherein the review screen further includes a user-selectable control to view patient data by at least one of: sent data, unsent data, and alarm data;

wherein the monitoring workflow home screen includes a first blood pressure measurement display of a first size; and

wherein the non-monitoring workflow home screen includes a second blood pressure measurement display of a second size, the second size being larger than the first size.

13. The method of claim 12, wherein the monitoring workflow home screen includes a user-selectable save control, the user-selectable save control configured to save a patient reading, the patient reading including measurements of the physiological parameter of the patient.

14. The method of claim 13, wherein when an alarm is active for a particular physiological parameter, a parameter reporting frame for the particular physiological parameter displayed on the monitoring workflow home screen transitions from a gray color to a red color; and

wherein the parameter reporting frame further includes a bell symbol, the bell symbol transitioning from a white color to a yellow color or a red color based on a priority of the alarm.

15. A physiological measuring platform (PMP) device comprising:

a central processing unit (CPU) that is configured to control operation of the PMP device;

a display screen; and

a set of one or more computer-readable data storage media storing software instructions that, when executed by the CPU, cause the PMP device to:

display, on the display screen, a monitoring workflow home screen when the PMP device is operating within a monitoring workflow;

obtain a series of measurements of a physiological parameter of a monitored patient when the PMP device is operating within the monitoring workflow;

display, on the display screen, a non-monitoring workflow home screen when the PMP device is operating within a non-monitoring workflow;

obtain a measurement of the physiological parameter of each patient in a series of patients when the PMP device is operating within the non-monitoring workflow;

display, on the display screen, a patient selection screen including a patient listing area, the patient listing area displaying a plurality of patient names, wherein the patient selection screen additionally includes user-selectable controls to add, delete, and select one of the plurality of patient names;

display, on the display screen, a review screen including patient data including patient name, date and time, and the physiological parameter, the review screen additionally including user-selectable controls to send, print, and delete one or more entries; and

display, on the display screen, an intervals screen, the intervals screen being navigable from the monitoring workflow home screen, wherein the intervals screen includes a user-selectable duration control and a user-selectable interval control,

wherein the user-selectable duration control sets a first length of time during which the PMP device records measurements for a given physiological parameter; and

wherein the user-selectable interval control sets a second length of time between measurements recorded by the PMP device.

16. The PMP device of claim 15, wherein the patient data displayed on the review screen includes physiological data for a plurality of patients;

wherein the physiological data includes at least one of: blood pressure, temperature, respiration rate, SpO2, height, and weight; and

wherein the review screen further includes a user-selectable control to view patient data by at least one of: sent data, unsent data, and alarm data.

17. The PMP device of claim 16, wherein the monitoring workflow home screen includes a first blood pressure measurement display of a first size;

wherein the non-monitoring workflow home screen includes a second blood pressure measurement display of a second size, the second size being larger than the first size; and

wherein the monitoring workflow home screen includes a user-selectable save control, the user-selectable save control configured to save a patient reading, the patient reading including measurements of the physiological parameter of the patient.

18. The PMP device of claim 17, wherein when an alarm is active for a particular physiological parameter, a parameter reporting frame for the particular physiological parameter displayed on the monitoring workflow home screen transitions from a gray color to a red color; and

wherein the parameter reporting frame further includes a bell symbol, the bell symbol transitioning from a white color to a yellow color or a red color based on a priority of the alarm.

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摘要(译)

当设备在监测工作流程内操作时，设备获得被监测患者的生理参数的一系列测量。当设备在监控工作流程内运行时，设备会显示监控工作流程主屏幕。监视工作流程主屏幕包含被监视患者的生理参数的表示。此外，当设备在非监测工作流程内操作时，该设备获得一系列患者中每个患者的生理参数的测量值。当设备在非监控工作流程内运行时，设备会显示非监控工作流程主屏幕。非监测工作流程主屏幕包含一系列患者中给定患者的生理参数的表示。监视工作流程主屏幕与非监视工作流程主屏幕不同。