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(54) **PHYSIOLOGICAL STATUS MONITOR**

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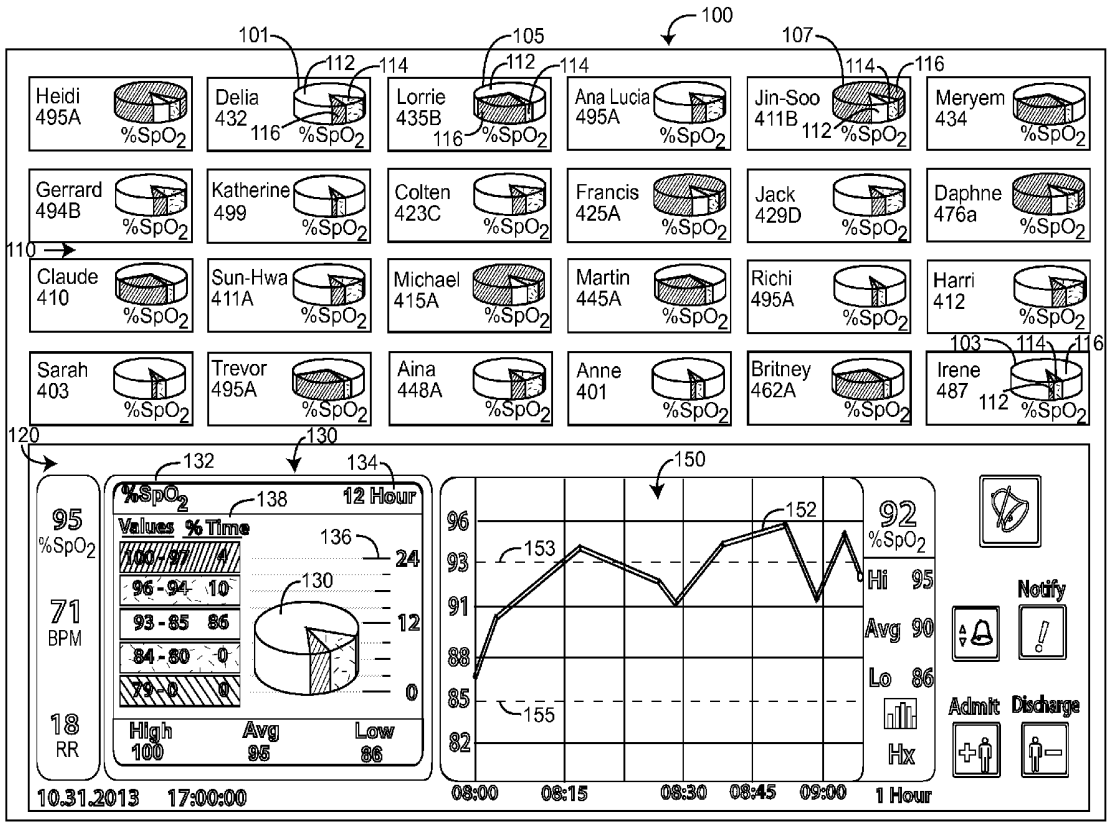
(57) **ABSTRACT**

A physiological status monitor has a monitor and an interconnected sensor that generates a sensor signal. The monitor computes physiological parameters responsive to the sensor signal and displays physiological parameters accordingly. In an embodiment, the monitor displays physiological parameter information across multiple patients in a cumulative pie chart format so that a caregiver can quickly discern and readily identify patients in need of immediate medical attention.



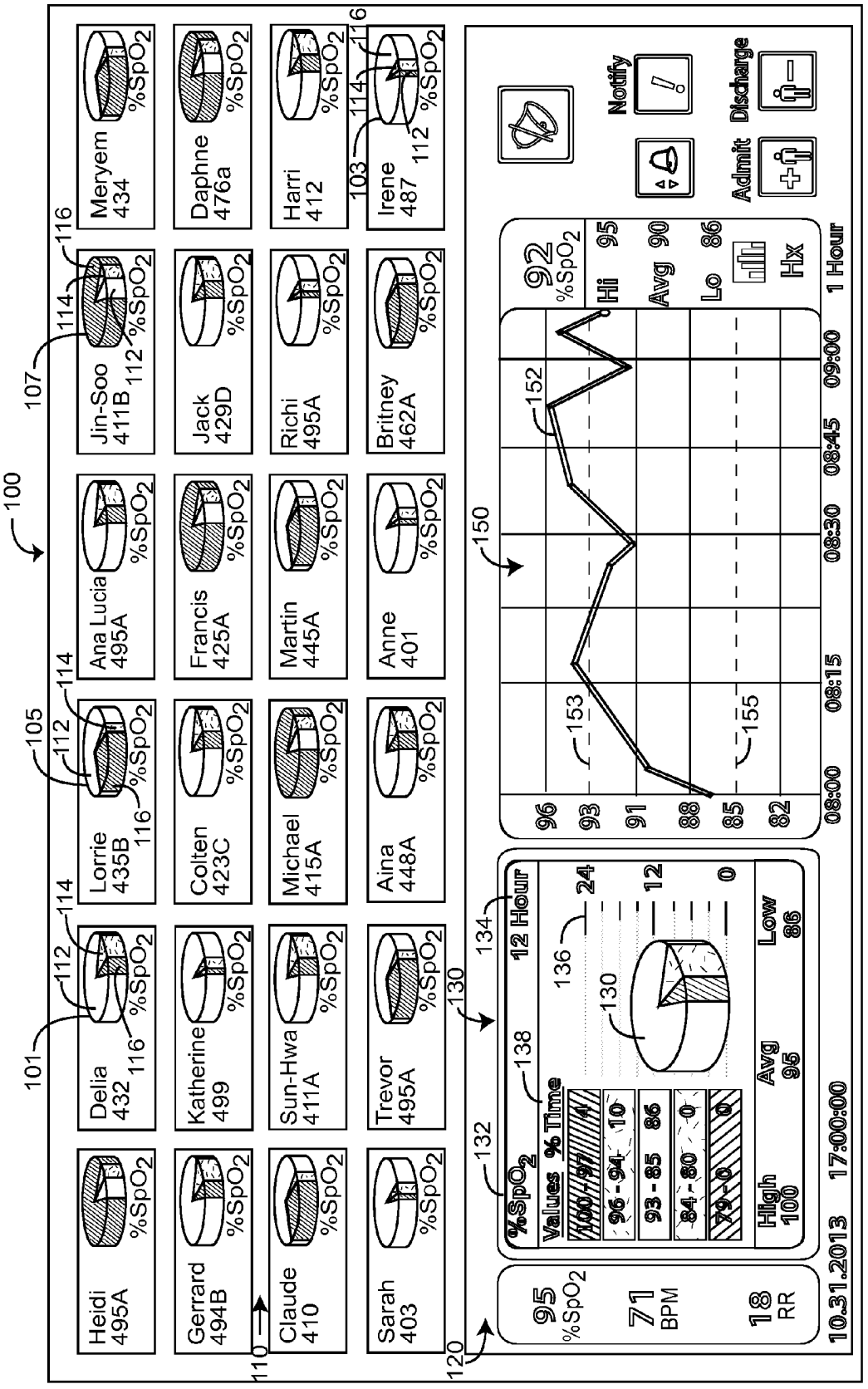

100
101
105
107
110
120
130
132
134
136
138
150
152
153
155
Heidi 495A
Gerrard 494B
Claude 410
Sarah 403
Delia 432
Katherine 499
Sun-Hwa 411A
Trevor 495A
Lorrie 435B
Colten 423C
Michael 415A
Aina 448A
Ana Lucia 495A
Francis 425A
Martin 445A
Anne 401
Jin-Soo 411B
Jack 429D
Richi 495A
Britney 462A
Meryem 434
Daphne 476a
Harri 412
Irene 487
%SpO2
112
114
116
103
95 %SpO2
71 BPM
18 RR
10.31.2013 17:00:00
12 Hour
Values % Time
100 - 97 4
96 - 94 10
93 - 85 86
84 - 80 0
79 - 0 0
High 100
Avg 95
Low 86
24
12
0
92 %SpO2
Hi 95
Avg 90
Lo 86
Hx
Notify
Admit
Discharge
96
93
91
88
85
82
08:00
08:15
08:30
08:45
09:00
1 Hour

FIG. 1

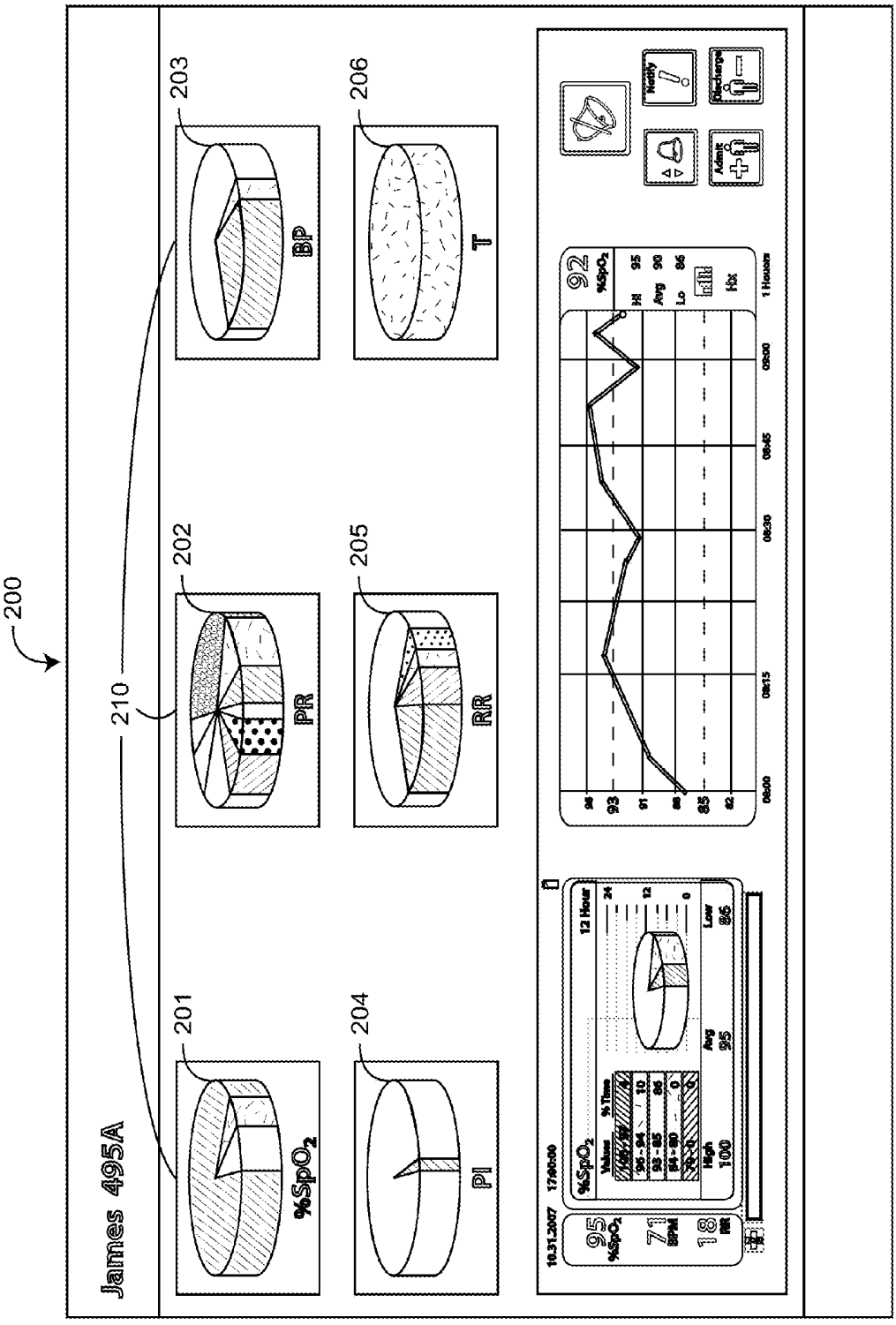


FIG. 2

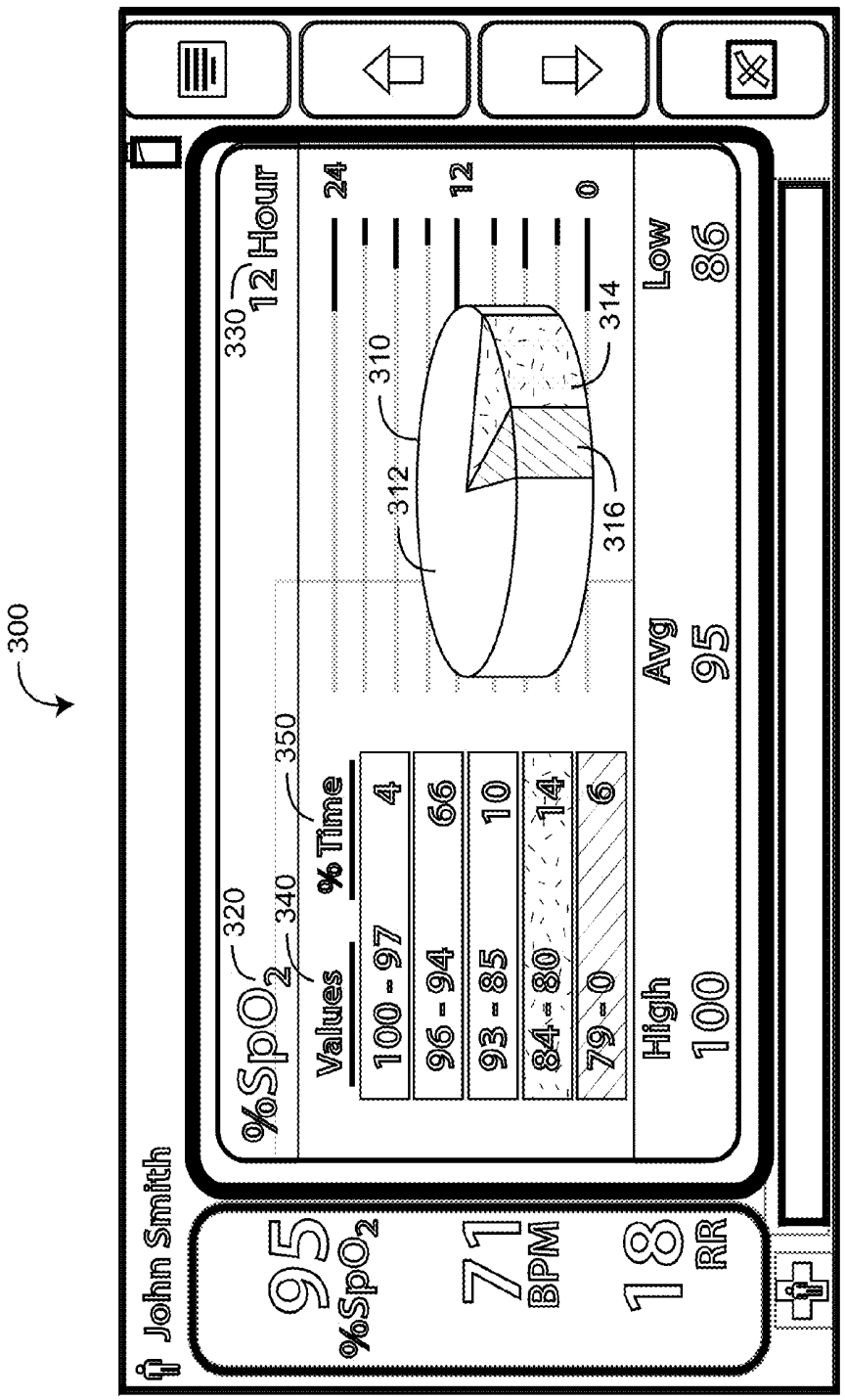

300
John Smith
95
%SpO2
71
BPM
18
RR
%SpO2
320
340
Values
% Time
350
100 - 97
4
96 - 94
66
93 - 85
10
84 - 80
14
79 - 0
6
12 Hour
330
24
12
0
310
312
314
316
High
100
Avg
95
Low
86

FIG. 3

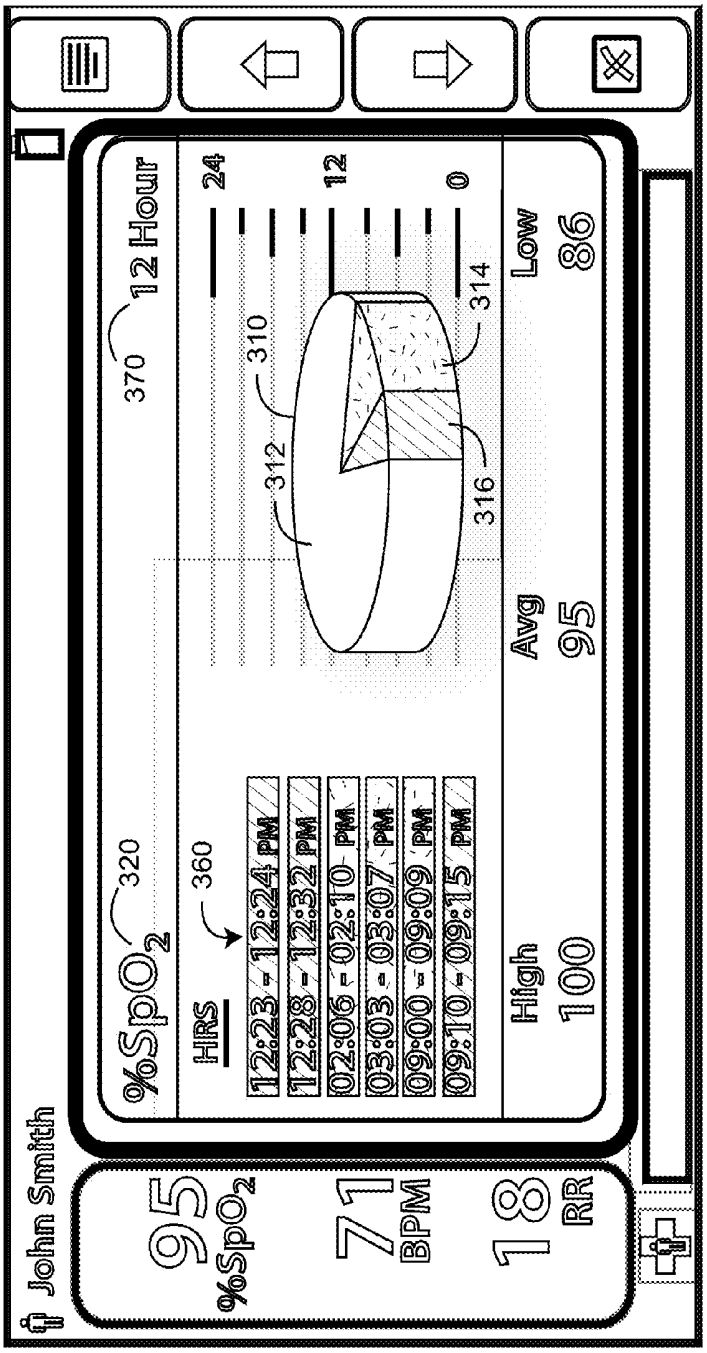

301
John Smith
95
%SpO2
71
BPM
18
RR
%SpO2
320
360
HRS
12:23 - 12:24 PM
12:28 - 12:32 PM
02:06 - 02:10 PM
03:03 - 03:07 PM
09:00 - 09:09 PM
09:10 - 09:15 PM
370
12 Hour
24
12
0
310
312
314
316
High
100
Avg
95
Low
86

FIG. 4

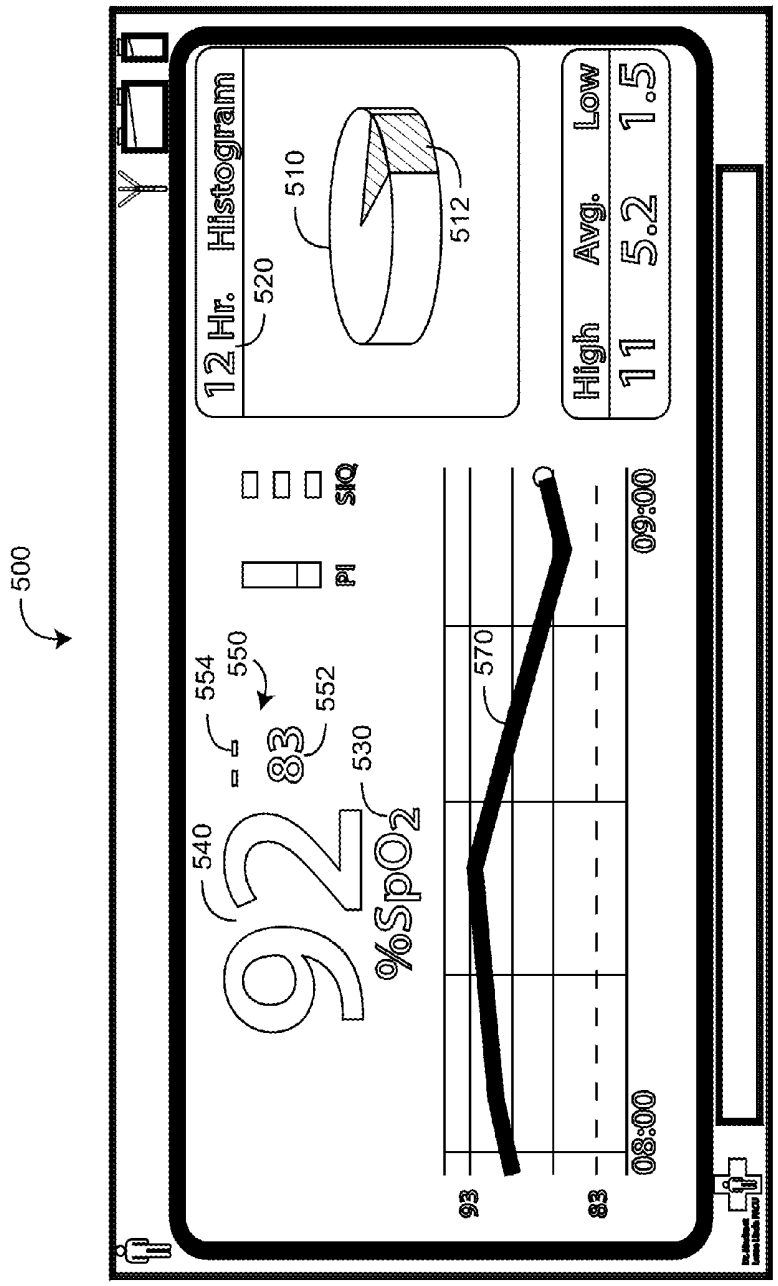

500
12 Hr. Histogram
520
510
512
High Avg. Low
11 5.2 1.5
554
550
552
530
540
92
%SpO2
83
SIQ
PI
570
93
83
08:00
09:00

FIG. 5

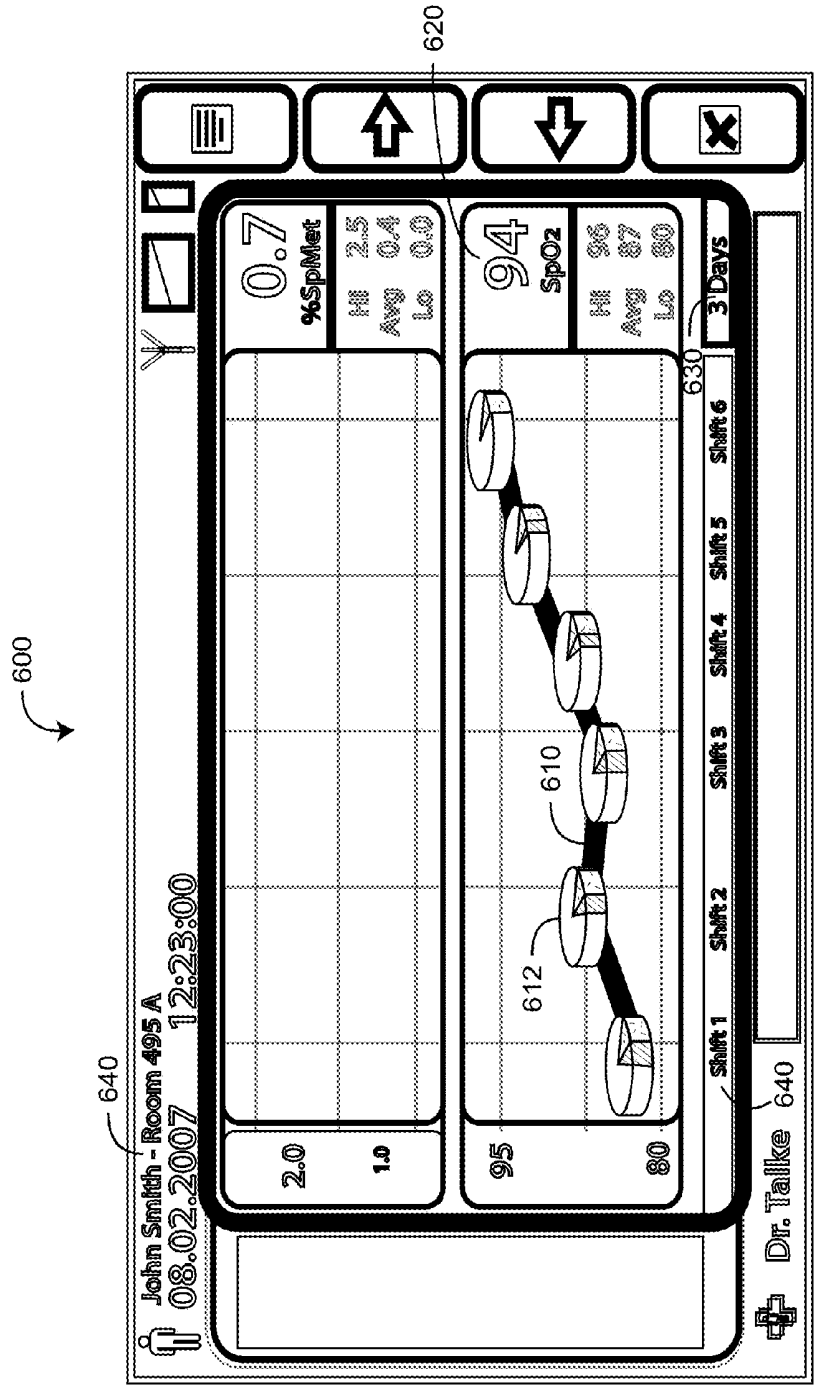

600
620
640
John Smith - Room 495 A
08.02.2007 12:23:00
0.7
%SpMet
Hi 2.5
Avg 0.4
Lo 0.0
94
SpO2
Hi 96
Avg 87
Lo 80
3 Days
630
610
612
2.0
1.0
95
80
Shift 1
Shift 2
Shift 3
Shift 4
Shift 5
Shift 6
Dr. Talke
640

FIG. 6

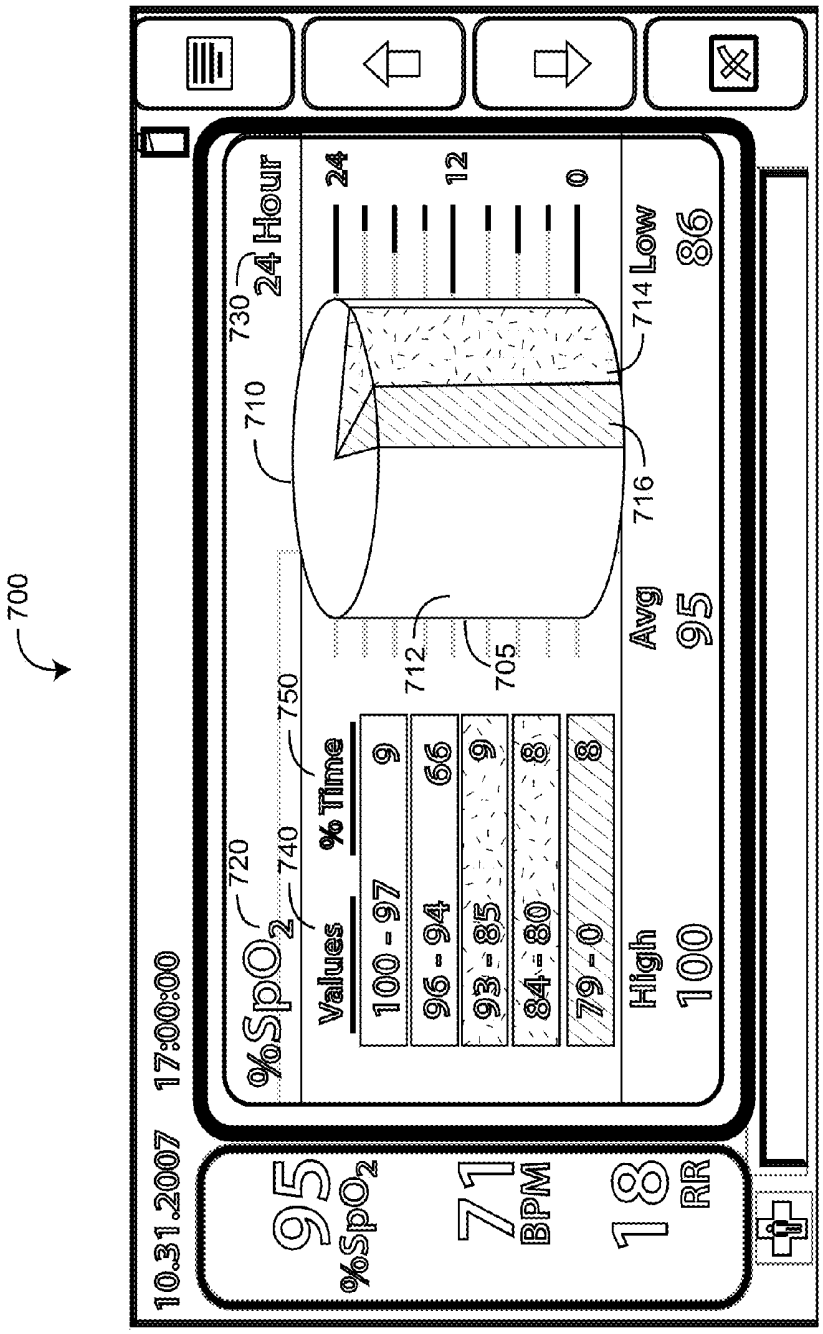

700
10.31.2007 17:00:00
95 %SpO2
71 BPM
18 RR
%SpO2 720
24 Hour 730
710
714 Low 86
716
Avg 95
High 100
712
705
750
740
% Time
Values
100 - 97 9
96 - 94 66
93 - 85 9
84 - 80 8
79 - 0 8
24
12
0

FIG. 7

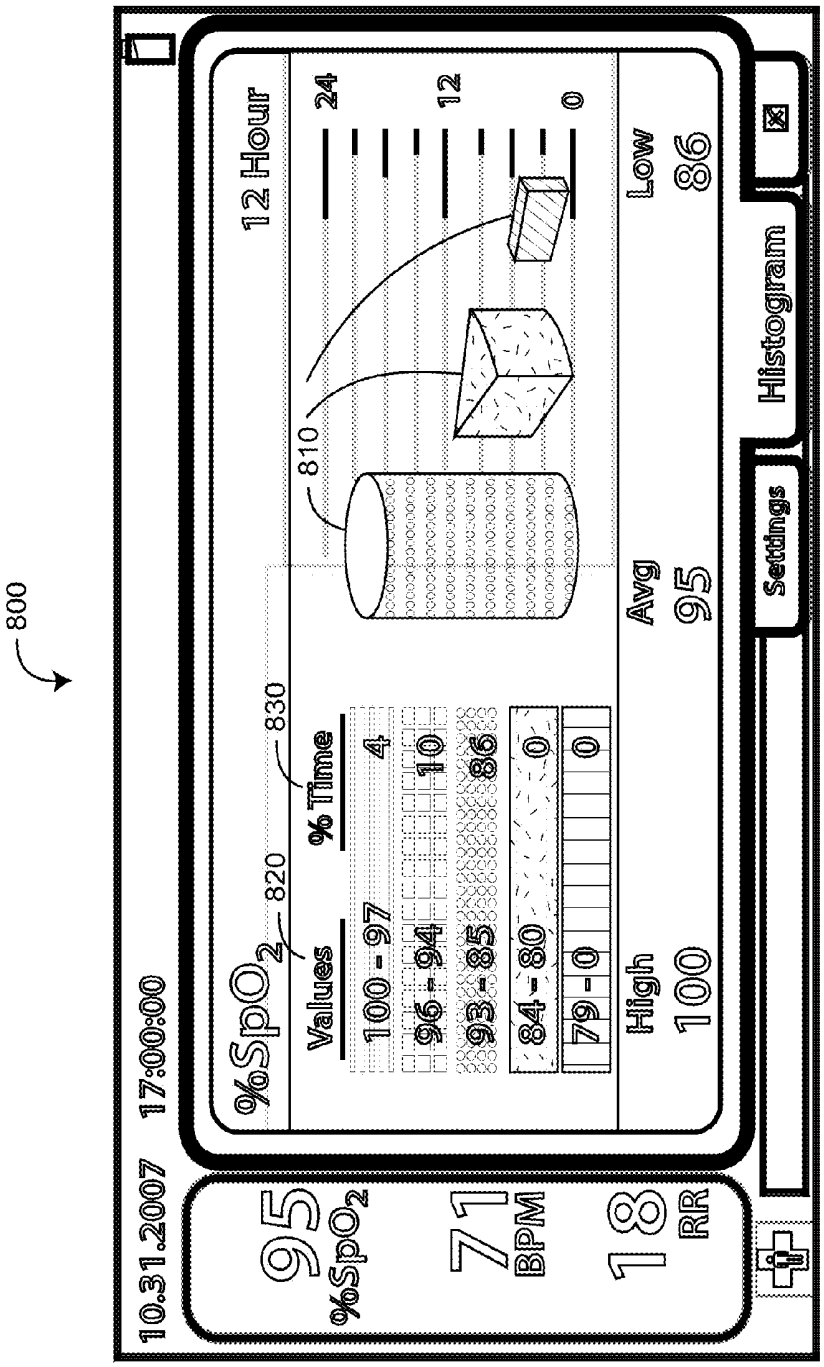

800
10.31.2007 17:00:00
95
%SpO2
71
BPM
18
RR
%SpO2
820
830
Values
% Time
100 - 97
4
96 - 94
10
93 - 85
86
84 - 80
0
79 - 0
0
12 Hour
24
12
0
810
High
100
Avg
95
Low
86
Settings
Histogram

FIG. 8

PHYSIOLOGICAL STATUS MONITOR

PRIORITY CLAIM TO RELATED PROVISIONAL APPLICATION

[0001] The present application claims priority benefit under 35 U.S.C. §119(e) to U.S. Provisional Patent Application Ser. No. 61/775,568 filed Mar. 9, 2013, titled Physiological Status Monitor. The above-cited provisional patent application is hereby incorporated in its entirety by reference herein.

BACKGROUND OF THE INVENTION

[0002] Pulse oximetry is a widely accepted noninvasive procedure for measuring the oxygen saturation level of arterial blood, an indicator of a person's oxygen supply. A typical pulse oximetry system utilizes an optical sensor attached to a fingertip to measure the relative volume of oxygenated hemoglobin in pulsatile arterial blood flowing within the fingertip. Oxygen saturation (SpO_2), pulse rate and a plethysmograph waveform, which is a visualization of pulsatile blood flow over time, are displayed on a monitor accordingly.

[0003] Conventional pulse oximetry assumes that arterial blood is the only pulsatile blood flow in the measurement site. During patient motion, venous blood also moves, which causes errors in conventional pulse oximetry. Advanced pulse oximetry processes the venous blood signal so as to report true arterial oxygen saturation and pulse rate under conditions of patient movement. Advanced pulse oximetry also functions under conditions of low perfusion (small signal amplitude), intense ambient light (artificial or sunlight) and electrosurgical instrument interference, which are scenarios where conventional pulse oximetry tends to fail.

[0004] Advanced pulse oximetry is described in at least U.S. Pat. Nos. 6,770,028; 6,658,276; 6,157,850; 6,002,952; 5,769,785 and 5,758,644, which are assigned to Masimo Corporation ("Masimo") of Irvine, California and are incorporated in their entirety by reference herein. Corresponding low noise optical sensors are disclosed in at least U.S. Pat. Nos. 6,985,764; 6,813,511; 6,792,300; 6,256,523; 6,088,607; 5,782,757 and 5,638,818, which are also assigned to Masimo and are also incorporated in their entirety by reference herein. Advanced pulse oximetry systems including Masimo SET® low noise optical sensors and read through motion pulse oximetry monitors for measuring SpO_2, pulse rate (PR) and perfusion index (PI) are available from Masimo. Optical sensors include any of Masimo LNOP®, LNCS®, SofTouch™ and Blue™ adhesive or reusable sensors. Pulse oximetry monitors include any of Masimo Rad-8®, Rad-5®, Rad®-5v or SatShare® monitors.

[0005] Advanced blood parameter measurement systems are described in at least U.S. Pat. 7,647,083, filed Mar. 1, 2006, titled Multiple Wavelength Sensor Equalization; U.S. Pat. No. 7,729,733, filed Mar. 1, 2006, titled Configurable Physiological Measurement System; U.S. Pat. Pub. No. 2006/0211925, filed Mar. 1, 2006, titled Physiological Parameter Confidence Measure and U.S. Pat. Pub. No. 2006/0238358, filed Mar. 1, 2006, titled Noninvasive Multi-Parameter Patient Monitor, all assigned to Cercacor Laboratories, Inc., Irvine, Calif. (Cercacor) and all incorporated in their entirety by reference herein. Advanced blood parameter measurement systems include Masimo Rainbow® SET, which provides measurements in addition to SpO_2, such as total hemoglobin (SpHb™), oxygen content (SpOC™), methemoglobin (SpMet®), carboxyhemoglobin (SpCO®) and PVI®. Advanced blood parameter sensors include Masimo Rainbow® adhesive, ReSposable™ and reusable sensors. Advanced blood parameter monitors include Masimo Radical-7™, Rad-87™ and Rad-57™, Pronto-7® and Pronto® monitors, all available from Masimo. Such advanced pulse oximeters, low noise sensors and advanced blood parameter systems have gained rapid acceptance in a wide variety of medical applications, including surgical wards, intensive care and neonatal units, general wards, home care, physical training, and virtually all types of monitoring scenarios.

SUMMARY OF THE INVENTION

[0006] Advantageously, a physiological status monitor provides information that allows a medical practitioner to visually discern patient condition at a glance. In an embodiment, a colored historical pie chart for a critical parameter, such as oxygen saturation, can be displayed for multiple patients. In another embodiment, multiple historical pie charts are displayed, depicting various parameters for a single patient so as to allow assessment of real time data and duration of time spent in various ranges. In particular, colored historical pie charts reflect visual representations of parameter histograms. Furthermore, colored pie charts may also represent alarm histories or medical personnel shifts.

[0007] One aspect of a physiological status monitor displays historical physical information of patients side by side, visually compares the information and identifies patients in need of immediate medical attention. In various embodiments, the display divides the information into medical conditions including a normal condition and a serious condition and distinguishes the conditions with indicators. Comparing may comprise viewing the indicators and discerning a serious condition with an indicator representing a particular serious condition. Identifying may comprise determining a patient having a high percentage of a serious condition indicator as the one in need of immediate medical attention. A particular condition may be oxygen saturation status. Distinguishing may comprise assigning colors to the conditions or assigning objects to the conditions.

[0008] Another aspect of a physiological status monitor is a monitor having an interconnected sensor. The sensor transmits optical radiation into a tissue site and generates a sensor signal responsive to the optical radiation after attenuation by pulsatile blood flow within the tissue site. The monitor computes a physiological parameter responsive to the sensor signal and utilizes a display to show the physiological parameter on screen. In an embodiment, the physiological status monitor comprises a monitor that determines a physiological parameter in response to an optical sensor signal derived from patients, a display incorporated with the monitor so as to present the physiological parameter, objects representing historical information regarding the physiological parameter over patients and a preferred screen presenting the objects side by side on the display for viewing by a caregiver so that the caregiver can visually discern and readily identify patients in need of immediate medical attention.

[0009] In various embodiments, the objects are colored pie charts. Each of the pie charts have zones representing different medical conditions, wherein the zones are assigned colors to make a visual distinction. The physiological parameter is oxygen saturation. The colors comprise a green color indicating a normal condition, an orange color indicating an abnormal condition and a red color indicating a serious condition,

wherein a patient corresponding to one of the pie charts having the most percentage of the red color is in need of a immediate medical attention. The objects are different shapes, wherein the shapes are filled in lines, dots, circle and square patterns to make a distinction for a color blind user.

[0010] As used herein the term "display" is used to denote how a monitor screen appears on a physical monitor device. The term "monitor" is used as shorthand for a monitor screen and its associated appearance to someone viewing a physical monitor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is an illustration of a multiple-patient and a selected-patient physiological status monitor displaying a critical parameter, such as oxygen saturation, over time;

[0012] FIG. **2** is an illustration of a single-patient physiological status monitor displaying multiple parameters, such as oxygen saturation, pulse rate, blood pressure, perfusion index, respiration rate and temperature over time;

[0013] FIG. **3** is an illustration of a single-patient, single-parameter physiological status monitor displaying a parameter over time, where the pie chart colors correspond to assigned ranges for the parameter;

[0014] FIG. **4** is an illustration of a single-patient, single-parameter physiological status monitor displaying time intervals that correspond to pie chart segments;

[0015] FIG. **5** is an illustration of a single-patient, multiple-parameter physiological monitor displaying parameter alarm limits;

[0016] FIG. **6** is an illustration of a single-patient, single-parameter physiological status monitor displaying parameter trends having integrated pie-chart summaries at specific time intervals;

[0017] FIG. **7** is an illustration of a single-patient, single-parameter physiological status monitor displaying a pie-chart having a height that represents the total monitored time interval and pie slices that each represent the percentage of time a parameter is within the specified value range; and

[0018] FIG. **8** is an illustration of single-patient, single-parameter physiological status monitor displaying iconic patterns utilized in lieu of colors, such as for a color blind user, a monochromatic display or high contrast display applications.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] FIG. **1** illustrates a physiological status monitor **100** having a multiple-patient display **110** and a selected-patient display **120** of a critical parameter, such as oxygen saturation, over time. Historical information of a critical parameter over a duration of time is advantageously displayed for multiple patients simultaneously so as to allow a caregiver to visually discern and readily identify one or more patients in need of immediate medical attention. Advantageously, multiple colored historical pie charts **110** are advantageously utilized to represent the historical information. In an embodiment, each pie chart **110** has zones **112**, **114**, **116** representing the percentage of time a parameter has been measured in a particular range of values. Each zone **112**, **114**, **116** is assigned a different color indicating a different medical condition so that a relative comparison is made by simply viewing the size of a particular slice. For example, a pie chart **110** having a large red slice may indicate the corresponding patient has been experiencing difficulties and is in need of immediate medical attention.

[0020] As shown in FIG. **1**, the exemplar parameter depicted in the pie charts **110** is oxygen saturation (SpO_2). In other embodiments, the display **100** may depict any of various alternative parameters, such as those described above and with respect to FIG. **2**, below. In an embodiment, each pie chart **110** has a first zone **112** assigned to a safe green color indicating a normal oxygen saturation condition, a second zone **114** assigned to an orange color indicating an abnormal oxygen saturation condition and a third zone **116** assigned to a warning red color indicating a serious oxygen saturation condition. A normal patient condition is advantageously identified when the first zone **112** (green) is the largest slice of a pie chart, with the second zone **114** (orange) and the third zone **116** (red) being significantly smaller slices, such as shown with respect to pie charts **101** and **103**. That is, patients represented by the pie charts **101**, **103** are in a normal condition over most of a specified time period, such as 12 hours.

[0021] Also shown in FIG. **1**, an abnormal, but not serious, patient condition is advantageously identified when the third zone **116** (red) occupies a significant portion, but less than half, of a pie chart and the other zones **112**, **114** combined occupy more than half of the pie chart. An example is pie chart **105**, which a caregiver can readily identify at a glance as a patient needing an immediate medical assessment and further care.

[0022] Further shown in FIG. **1**, a serious patient condition is advantageously identified when the third zone **116** (red) occupies most of the pie chart, and the other two zones **112**, **114** combined occupy less of the pie chart than the third zone **116**. As example is pie chart **107**, which a caregiver can readily identify at a glance as a patient in distress and in need of emergency medical attention.

[0023] Additionally shown in FIG. **1**, a selected-patient display **120** has a pie chart **130** mini screen and a graph **150** mini screen that provide more details regarding a selected patient than are available from the multiple patient display **110**. In particular, the pie chart **130** mini screen shows details of a particular pie chart **131** including the critical parameter **132**, a duration of time **134**, a histogram **136** and range categories **138**. The range categories **138** have predetermined value ranges and corresponding percentages of time that the selected parameter **132** spent in each range. Each range **138** is assigned to a color corresponding to that in the pie chart **130**. The percentages of time spent in each range **138** over the specified time duration **134** is automatically tracked and displayed. In this manner, the details of one pie chart **131** can be viewed with respect to parameter ranges **138** that each color represents. For example, a green color in the pie chart **131** represents an SpO_2 range of 93-85, and the patient spent 86% of time spent in this range. An orange color represents an SpO_2 range of 96-94 and 84-80 and the patient spent 10% and 0% of the time in those ranges, respectively. A red color represents an SpO_2 range of 100-97 and 79-0 and the patient spent 4% and 0% of the time in those ranges, respectively.

[0024] Also shown in FIG. **1**, the selected-patient display **120** has a graph mini-screen **150** showing further details of the pie chart **131**. The graph mini-screen **150** has a graph **152** showing parameter values versus time over a period, an upper alarm limit **153** and a lower alarm limit **155**. Thus, the specific times in an alarm state are illustrated.

[0025] FIG. **2** illustrates a single-patient physiological status monitor **200** displaying multiple parameters, such as oxygen saturation, pulse rate, blood pressure, perfusion index, respiration rate and temperature over time. Advantageously, the display **200** allows a caregiver to view multiple parameter histories side-by side in a visually-rich format. In this manner, a caregiver can readily identify a patient having a serious medical condition or one incapable of adapting to a constantly changing medical environment. In particular, multiple-colored historical pie charts **210** are advantageously utilized to represent multiple parameters over time. Each colored pie chart **210** corresponds to a parameter and is a visual representation of the percentage of time spent in predetermined parameter ranges. Each range is assigned to a different color so that a serious medical condition can be rapidly discerned by simply comparing the multiplicity of the colors across the pie charts **210**. Specifically, pie charts **210** that have a rainbow of colors indicate physiological variability, which is a normal condition depending on the parameter. Pie charts **210** having only a single color, or just a few colors, indicate a patient that may not be adapting to their environment, which may indicate an abnormal condition depending on the parameter.

[0026] As shown in FIG. **2**, the display **200** has multiple-colored pie charts **210** representing parameters over time. In this embodiment, a SpO_2 pie chart **201**, a pulse rate (PR) pie chart **202**, a blood pressure (BP) pie chart **203**, a perfusion index (PI) pie chart **204**, a respiration rate (RR) pie chart **205** and a temperature (T) pie chart **206** are shown. The PR pie chart **202** has a rainbow of colors showing that the patient's pulse rate is constantly varying over time and indicating the patient is adapting to a varying environment in this respect. The T pie chart **206** has only a single color showing the patient's temperature is constant. The pie charts SpO_2 **201**, BP **203**, PI **204** and RR **205** each has moderate color changes in between a rainbow style and a single color showing the measured parameters SpO_2, BP, PI and RR are varying somewhat, but are not constantly varying over the monitored time duration. By viewing the color variety in pie charts **201-206**, the patient's condition may be determined as moderately good. Advantageously, the display of multiple parameters over time as colored pie charts may allow a ready determination of a patient's condition based upon color variability. If all or most of the pie charts **210** have a single color, the patient may have a serious condition in need of immediate medical attention.

[0027] FIGS. **3-4** illustrate a single-patient, single-parameter physiological status monitor **300**, **301** displaying a parameter over time, where the pie chart colors correspond to assigned ranges for the parameter. The displays **300**, **301** track a single parameter **320** for a single patient over a period of time and includes a pie chart **310**, a parameter indicator **320** and time duration **330**. The pie chart **310** has different zones **312**, **314**, **316** representing ranges of parameter values **340**. Each zone **312**, **314**, **316** is assigned a different color so as to be easily viewed by a user. The parameter indicator **320** indicates the particular parameter depicted in the charts, such as SpO_2, HbCO, HbMet, Hbt, Hct, PI or PVI, to name a few.

[0028] As shown in FIG. **3**, the single-patient, single parameter monitor **300**, **301** has parameter value ranges **340** (FIG. **3**) and the associated percentage of time **350** (FIG. **3**) the parameter **320** spends in each range **340**. Each of the ranges **340** is assigned a corresponding color in the pie chart **310**. In this manner, the details of each zone (color) can be viewed. For example, a green zone **312** indicates a normal condition, i.e. SpO_2 in the range of 85-100%, an orange zone **314** indicates an abnormal condition, i.e. SpO_2 in the range of 84-80%, and a red zone **316** indicates a serious condition, i.e. SpO_2 below 79%.

[0029] As shown in FIG. **4**, an alternative display **301** shows sequential time intervals **360** in the two unsafe zones **314**, **316** of the pie chart **310**. These unsafe intervals **360** are shown sequentially. When scrolled down, the display **360** shows all of the intervals in the two unsafe zones **314**, **316** until reaching the total duration of time. The intervals **360** have colors corresponding to the colors in the two unsafe zones **314**, **316** so as to provide the details of specific times spent in the unsafe zones. In another embodiment, the display **301** shows the longest intervals in the dangerous zone **316** of the pie chart **310**. By repeatedly clicking on the intervals, smaller intervals in the dangerous zone **316** are shown. In yet another embodiment, the display **301** shows intervals sequentially in all zones **312**, **314**, **316** of the pie chart **301**. The totality of intervals are shown by scrolling down the display **360** until the time duration **370** is displayed.

[0030] FIG. **5** illustrates a single-patient, multiple-parameter physiological monitor **500** displaying parameter alarm limits. The display **500** has a pie chart **510**, an indicator of duration of time **520**, a parameter value **540** and alarm limits **550**. The pie chart **510** has a zone **512** assigned in a distinct color, red, for example, representing a percentage of time in alarm during the duration of time. The alarm limits **550** are displayed next to the actual parameter value **540** having a lower limit **552** and an upper limit **554**. An alarm is activated when the limits **552**, **554** are exceeded.

[0031] Also shown in FIG. **5**, the display **500** has a graph **570** showing the parameter values versus time during the duration of time and thus the specific times in alarm are shown. By repeatedly clicking the graph **570**, the rest of the times can be shown until the end of the recorded time duration is reached. For example, FIG. **5** shows the lower limit **552** is **83** and no upper limit **554**. Because the graph **570** does not exceed the lower limit **83** between 8:00 to 9:00, no alarm is activated during this period of time. By clicking the graph **570**, other values and times in alarm will be shown until reaching the duration of 12 hours.

[0032] FIG. **6** illustrates a single-patient, single-parameter physiological status monitor **600** displaying parameter trends having integrated pie-chart summaries at specific time intervals. The display **600** has a trend line **610** with integrated pie-chart summaries **612** at specific time intervals. The display **600** also has a parameter indicator **620**, a duration of time **630** and a shift timeline **640**. The parameter indicator **620** corresponds to the trend line **610** and pie chart summaries **612**. The duration of time **630** is the duration of the trend line **610**. The trend line **610** has a plurality of pie charts **612** indicating a patient's parameter levels for each of the shifts over the shift duration. This trend line **610** advantageously provides an overview of each staff shift with respect to difficulty or success in patient management. In particular, the trend line **610** indicates acceptable levels of patient condition during each staff shift. This provides hospital or a medical institution feedback of medical care efficacy. For example, the monitor **600** advantageously provides information regarding which shift is maintaining the better patient management and which staff members are maintaining better patient management.

[0033] As shown in FIG. **6** as an example, six shifts and associated pie charts are displayed **600**. Shift 3 had difficulty with this patient. However, the patient improved over his three day stay across the different shifts.

[0034] FIG. **7** illustrates a single-patient, single-parameter physiological status monitor **700** has a pie chart **710**, a parameter indicator **720** and a duration of time indicator **730**. The pie-chart **710** has a height **705** that represents the total monitored time interval and pie slices **712**, **714**, **716** that each represent the percentage of time **750** a parameter is within the specified value range **740**. The pie chart **710** is a histogram over a duration of time **730**, such as 24 hours. The pie chart **710** has different zones **712**, **714**, **716** indicating percentage of time **750** spent in each of the different value ranges **740**. Each zone **712**, **714**, **716** is assigned to a different color so as to be easily viewed by a user to determine, at a glance, an overview of a patient's condition over a time interval.

[0035] For example, in the pie chart **710**, a safe green color **712** indicates a normal condition occurring 75% of the time. An orange color **714** indicates an abnormal condition occurring 17% of the time. A red color **716** indicates a dangerous condition occurring 8% of the time. Accordingly, the details of the pie chart **710** are viewed in the range chart **740**, **750** showing 9% of time spent in a SpO_2 range of 100-97, 66% of time spent in a range of 96-94, 9% in a range of 93-95, 8% in a range 84-80 and 8% in a range of 79-0.

[0036] FIG. **8** illustrates a single-patient, single-parameter physiological status monitor **800** displaying iconic patterns utilized in lieu of colors, such as for a color blind user, a monochromatic display or a high contrast display. The display **800** has different shapes **810** representing percentages of time in each condition instead of a pie chart. Further, each shape **810** has lines, dots, circle patterns to distinguish each other rather than different colors assigned in a pie chart. Accordingly, value ranges **820** and percentages of time **830** have corresponding lines, dots, circle and square patterns, instead of different colors, assigned to each range.

[0037] A physiological status monitor has been disclosed in detail in connection with various embodiments. These embodiments are disclosed by way of examples only and are not to limit the scope of the claims that follow. One of ordinary skill in art will appreciate many variations and modifications.

What is claimed is:

1. A patient monitoring method comprising:
- displaying historical physical information on a plurality of patients side by side;
- visually comparing the information; and
- identifying patients in need of immediate medical attention.

2. The patient monitoring method according to claim **1** wherein the displaying comprises:
- dividing the information into a plurality of medical conditions including a normal condition and a serious condition; and
- distinguishing the conditions with a plurality of indicators.

3. The patient monitoring method according to claim **2** wherein the comparing comprising:
- viewing the indicators; and
- discerning a serious condition according to an indicator representing a particular serious condition.

4. The patient monitoring method according to claim **3** wherein the identifying comprising determining a patient having the most percentage of the serious condition indicator as the one in need of immediate medical attention.

5. The patient monitoring method according to claim **4** wherein the physical information is oxygen saturation status.

6. The patient monitoring method according to claim **5** wherein the distinguishing comprises assigning colors to the conditions.

7. The patient monitoring method according to claim **5** wherein the distinguishing comprises assigning objects to the conditions.

8. A physiological status monitor responsive to an interconnected sensor, the sensor generates a sensor signal responsive to a physiological phenomenon and a display presents a measured physiological parameter responsive to the phenomenon, the physiological status monitor comprising:
- a monitor that determines a physiological parameter in response to a sensor signal derived from a patient;
- a display incorporated with the monitor so as to present the physiological parameter;
- a plurality of objects representing historical information regarding the physiological parameter over a plurality of patients; and
- a preferred screen presenting the objects side by side on the display for viewing by a caregiver so that the caregiver can visually discern and readily identify patients in need of immediate medical attention.

9. The physiological status monitor according to claim **8** wherein the objects are a plurality of colored pie charts.

10. The physiological status monitor according to claim **9** wherein each of the pie chart comprising:
- a plurality of zones representing different medical conditions,
- wherein the zones are assigned colors to make a visual distinction.

11. The physiological status monitor according to claim **10** wherein the physiological parameter is oxygen saturation.

12. The physiological status monitor according to claim **11** wherein the colors comprise:
- a green color indicating a normal condition;
- an orange color indicating an abnormal condition; and
- a red color indicating a serious condition,
- wherein a patient corresponding to one of the pie charts having the most percentage of the red color is in need of a immediate medical attention.

13. The physiological status monitor according to claim **8**:
- wherein the objects are a plurality of different shapes,
- wherein the shapes are filled in lines, dots, circle and square patterns to make a distinction for a color blind user.

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摘要(译)

生理状态监视器具有监视器和互连传感器，其产生传感器信号。监视器响应于传感器信号计算生理参数并相应地显示生理参数。在一个实施例中，监视器以累积饼图格式显示多个患者的生理参数信息，使得护理人员可以快速辨别并容易地识别需要立即就医的患者。