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(54) PAIN ASSESSMENT USER INTERFACE

(76) Inventors: **Michael D. McMahon**, Lake Forest Park, WA (US); **Christopher Pearce**, Monroe, WA (US); **John C. Daynes**, Redmond, WA (US)

Correspondence Address:
SHUMAKER & SIEFFERT, P. A.
8425 SEASONS PARKWAY
SUITE 105
ST. PAUL, MN 55125 (US)

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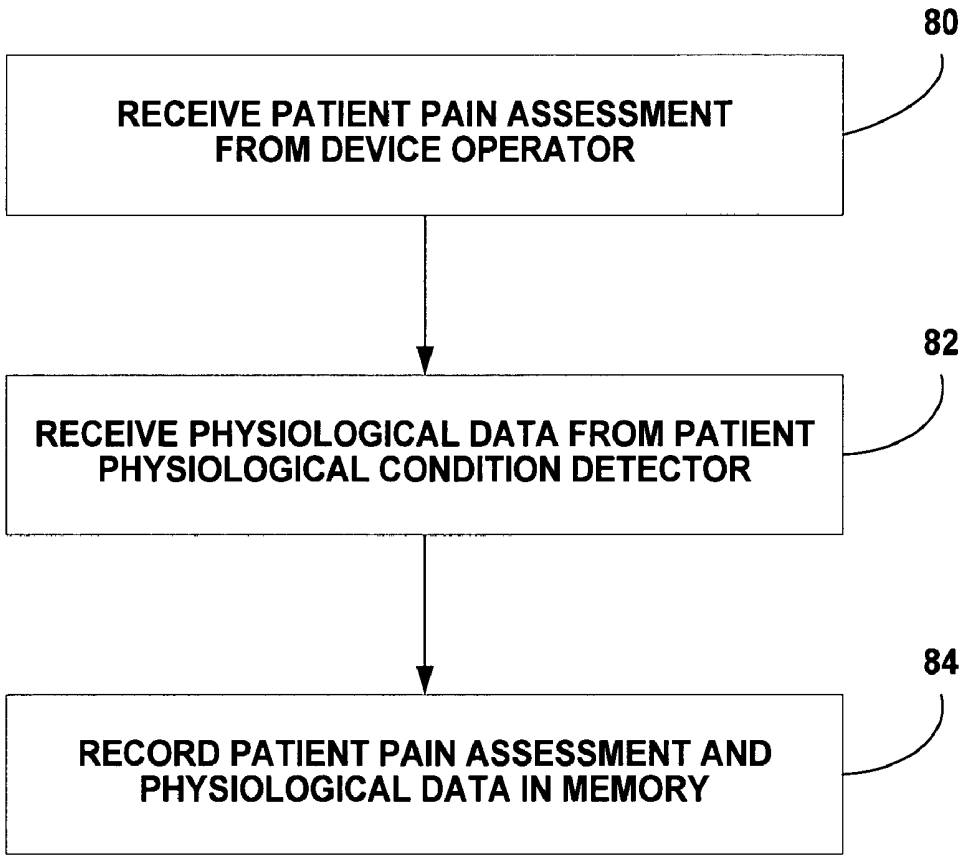
(57) ABSTRACT

In general, the invention is directed to a user interface for patient pain assessment. The user interface allows an operator to input and store a patient's pain assessment based on a given pain assessment scale. The invention may tranmit the pain assessment data along with patient physiological condition data to a remotely located hospital database. As part of the patient's medical record, pain assessment measurements can provide trending information similar to most physiological condition data, which may be useful for future treatment. The invention may prompt the operator with suggestions for treatment based on the pain assessment and physiological data collected. In some embodiments, the user interface may be applied to a defibrillator or a patient monitor.



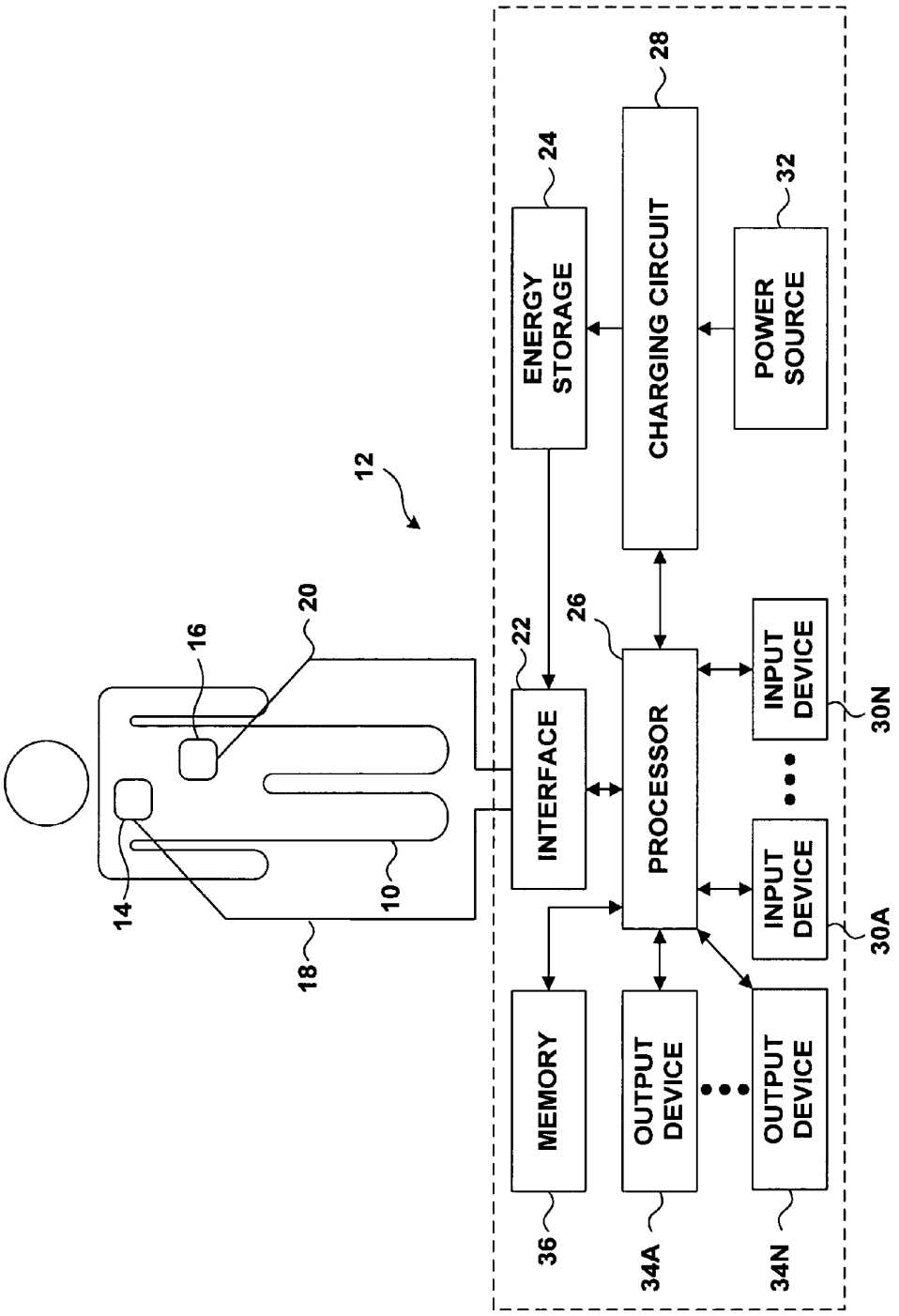

12
20
16
14
10
18
22
26
28
24
32
INTERFACE
PROCESSOR
CHARGING CIRCUIT
ENERGY STORAGE
POWER SOURCE
INPUT DEVICE
30N
INPUT DEVICE
30A
MEMORY
36
OUTPUT DEVICE
34A
OUTPUT DEVICE
34N

FIG. 1

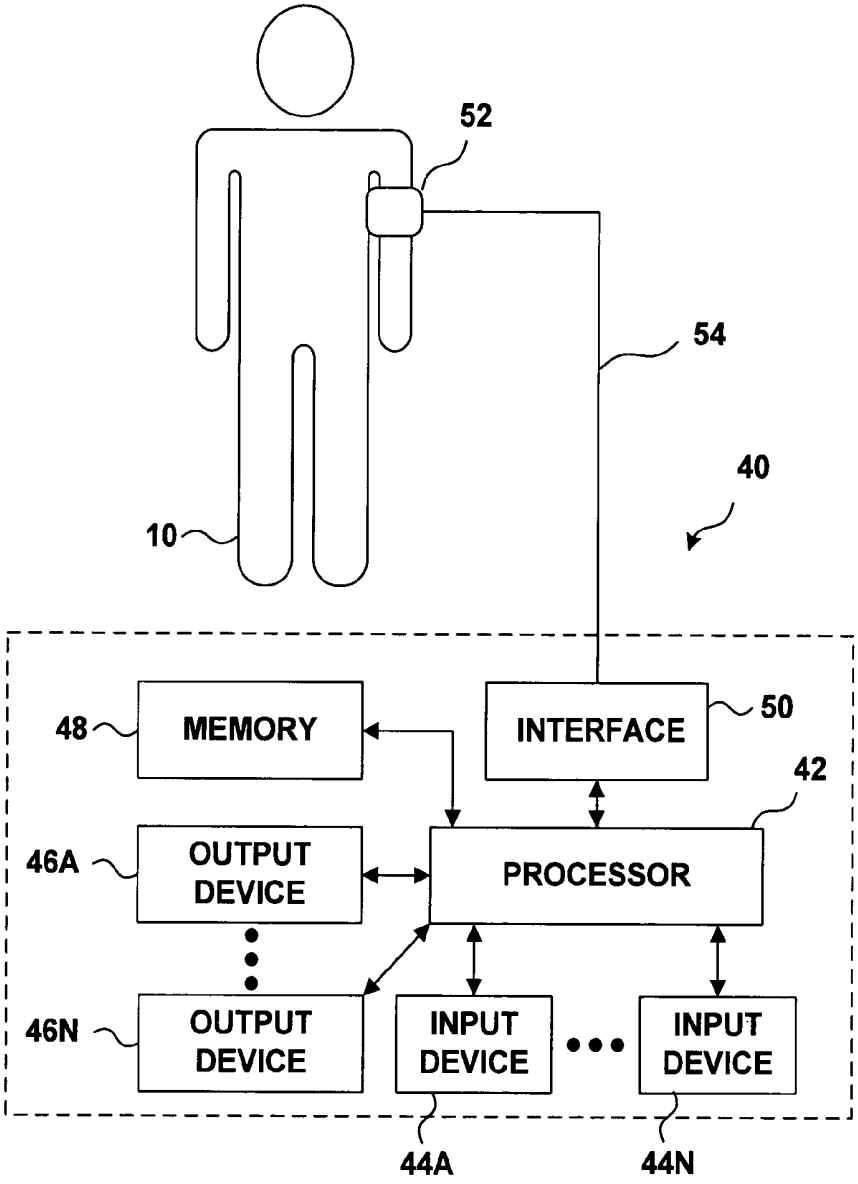

52
54
40
10
48
MEMORY
INTERFACE
50
42
46A
OUTPUT DEVICE
PROCESSOR
46N
OUTPUT DEVICE
INPUT DEVICE
INPUT DEVICE
44A
44N

FIG. 2

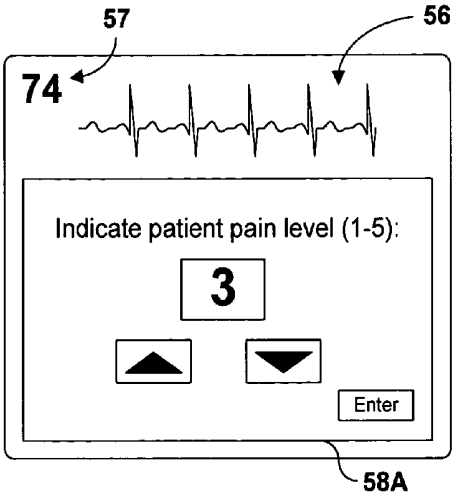


FIG. 3

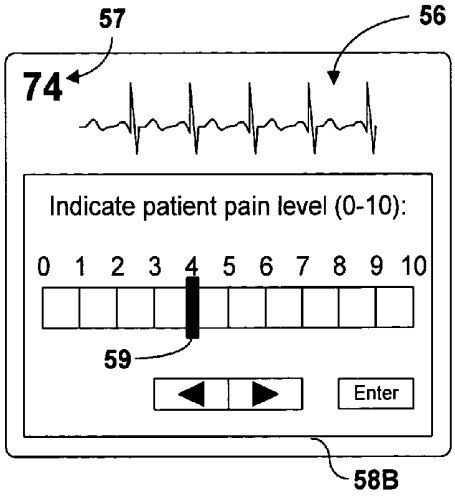


FIG. 4

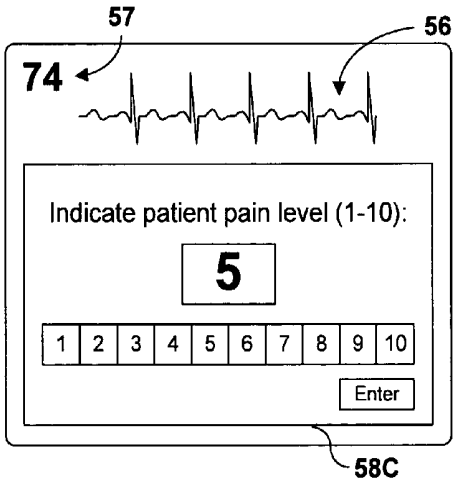


FIG. 5

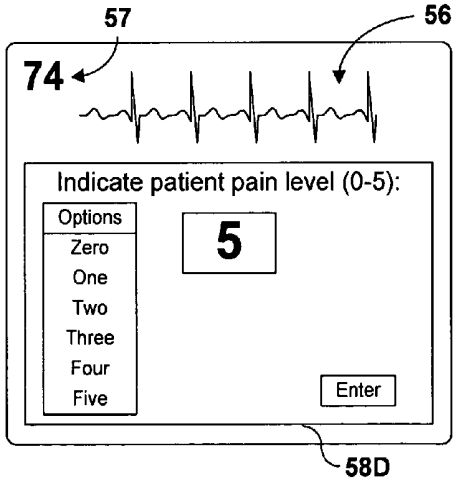


FIG. 6

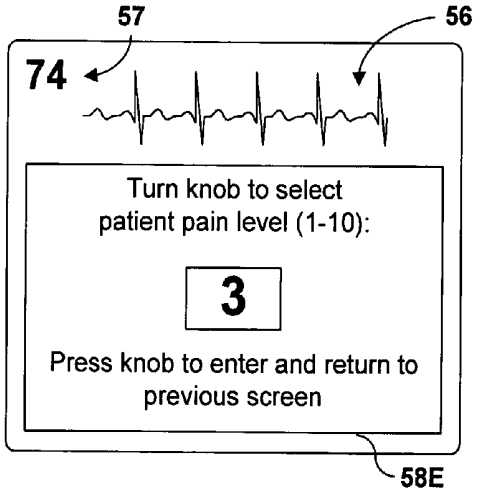


FIG. 7

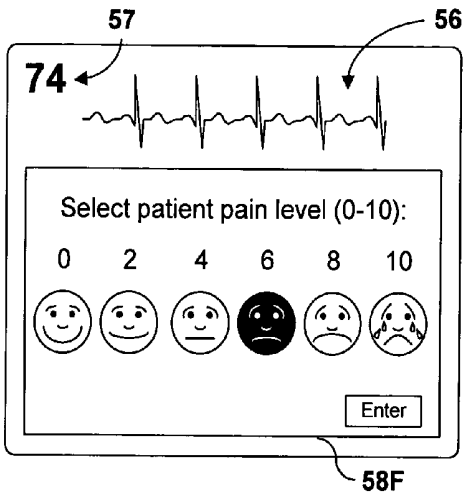


FIG. 8

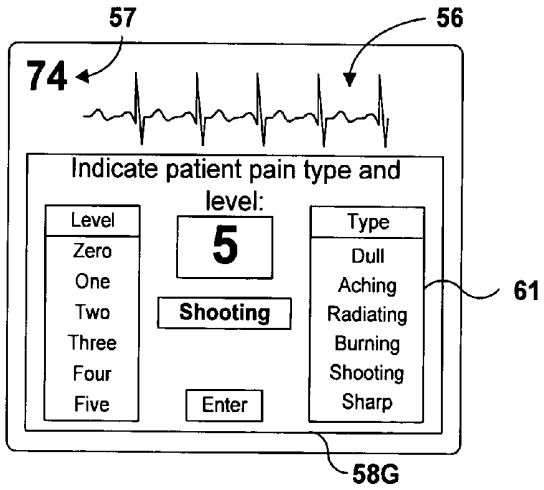


FIG. 9

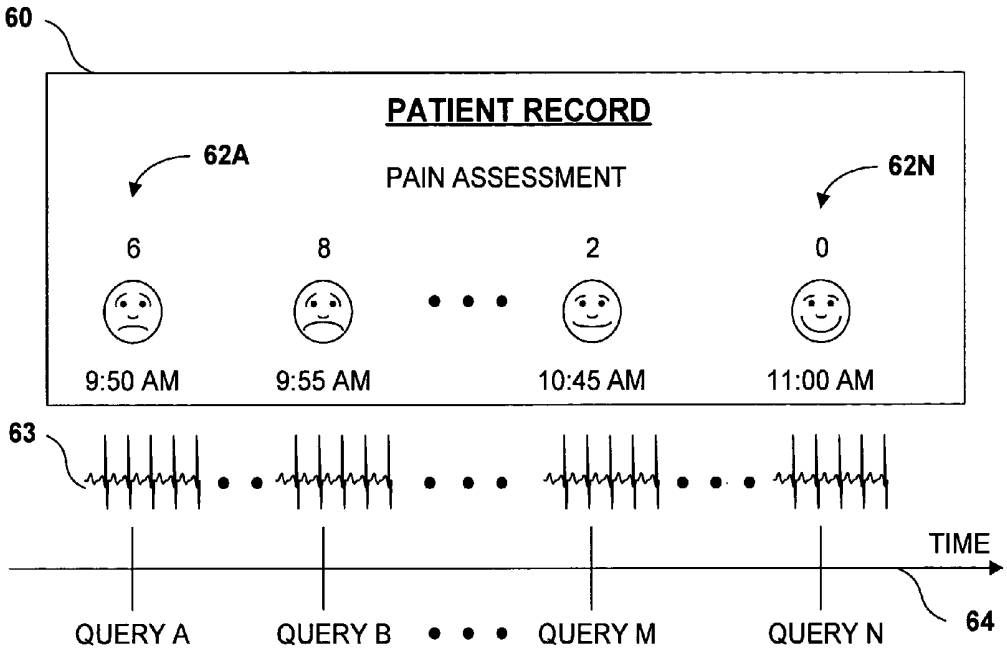


FIG. 10A

65

PATIENT RECORD

EVENT LOG

QUERY	TIME	HR (BPM)	PAIN LEVEL	PAIN TYPE	NOTES
A	9:50 AM	76	6	Sharp	--
B	9:55 AM	80	8	Sharp	--
•	•				
•	•				
•	•				
M	10:45 AM	74	2	Dull	--
N	11:00 AM	74	0	--	--

66A

66N

FIG. 10B

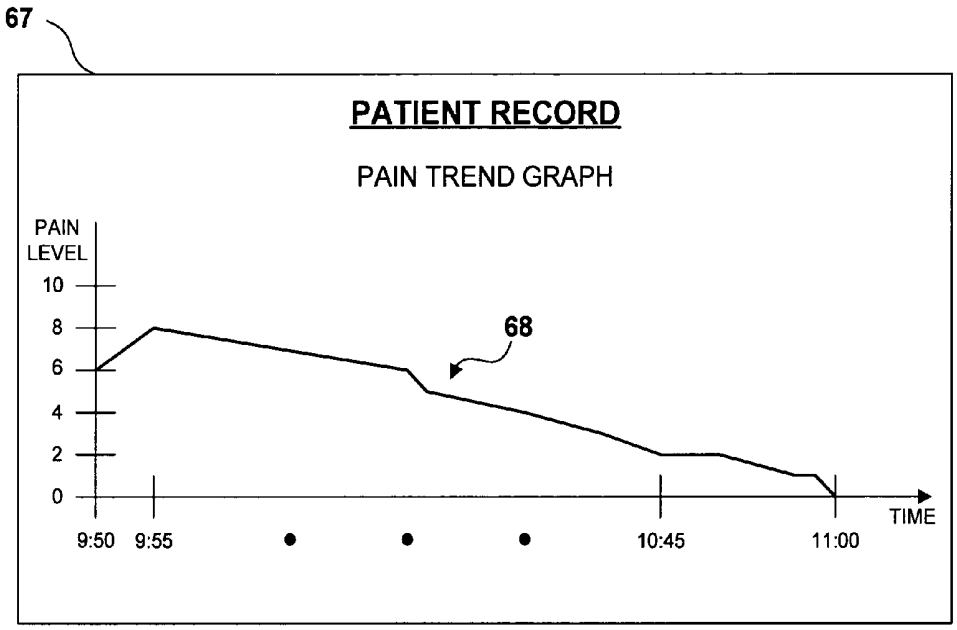

67
PATIENT RECORD
PAIN TREND GRAPH
PAIN LEVEL
10
8
6
4
2
0
68
TIME
9:50
9:55
10:45
11:00

FIG. 10C

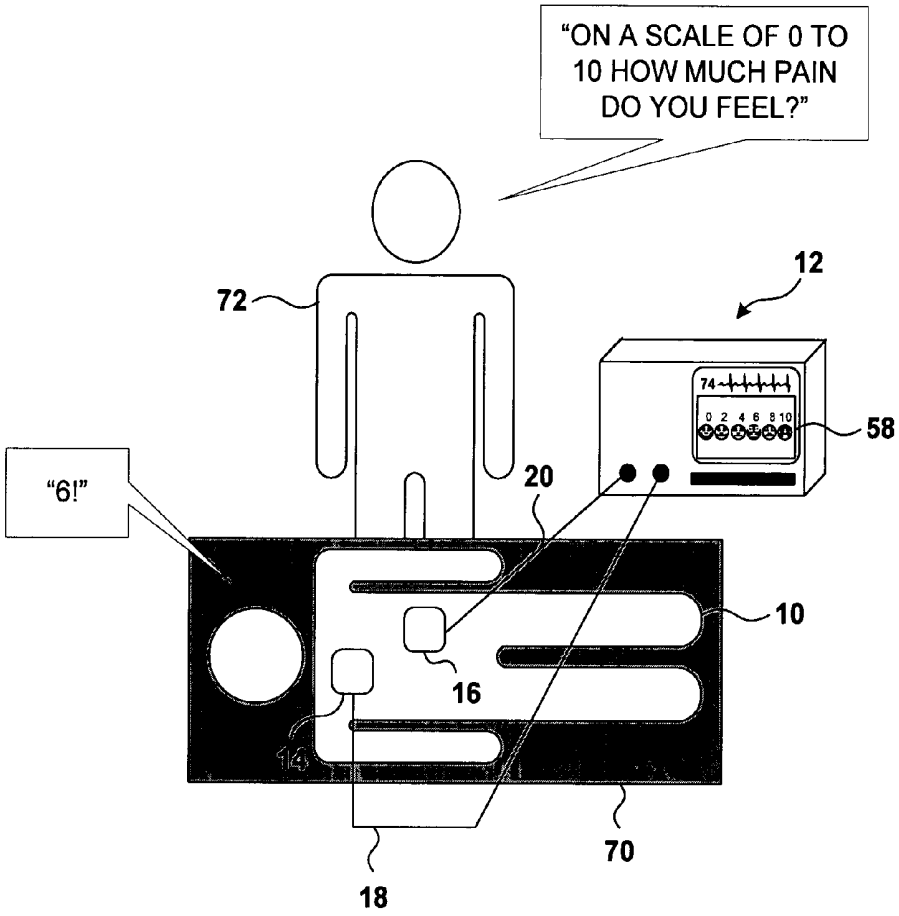

"ON A SCALE OF 0 TO 10 HOW MUCH PAIN DO YOU FEEL?"
72
12
74
0 2 4 6 8 10
58
"6!"
20
10
16
14
70
18

FIG. 11

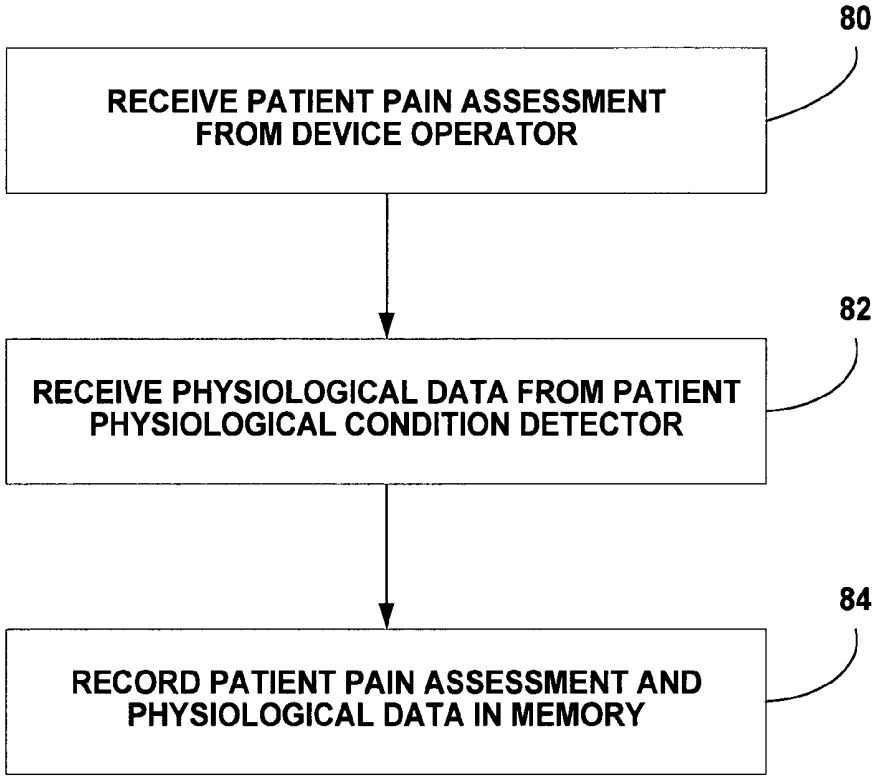

80
RECEIVE PATIENT PAIN ASSESSMENT FROM DEVICE OPERATOR
82
RECEIVE PHYSIOLOGICAL DATA FROM PATIENT PHYSIOLOGICAL CONDITION DETECTOR
84
RECORD PATIENT PAIN ASSESSMENT AND PHYSIOLOGICAL DATA IN MEMORY

FIG. 12

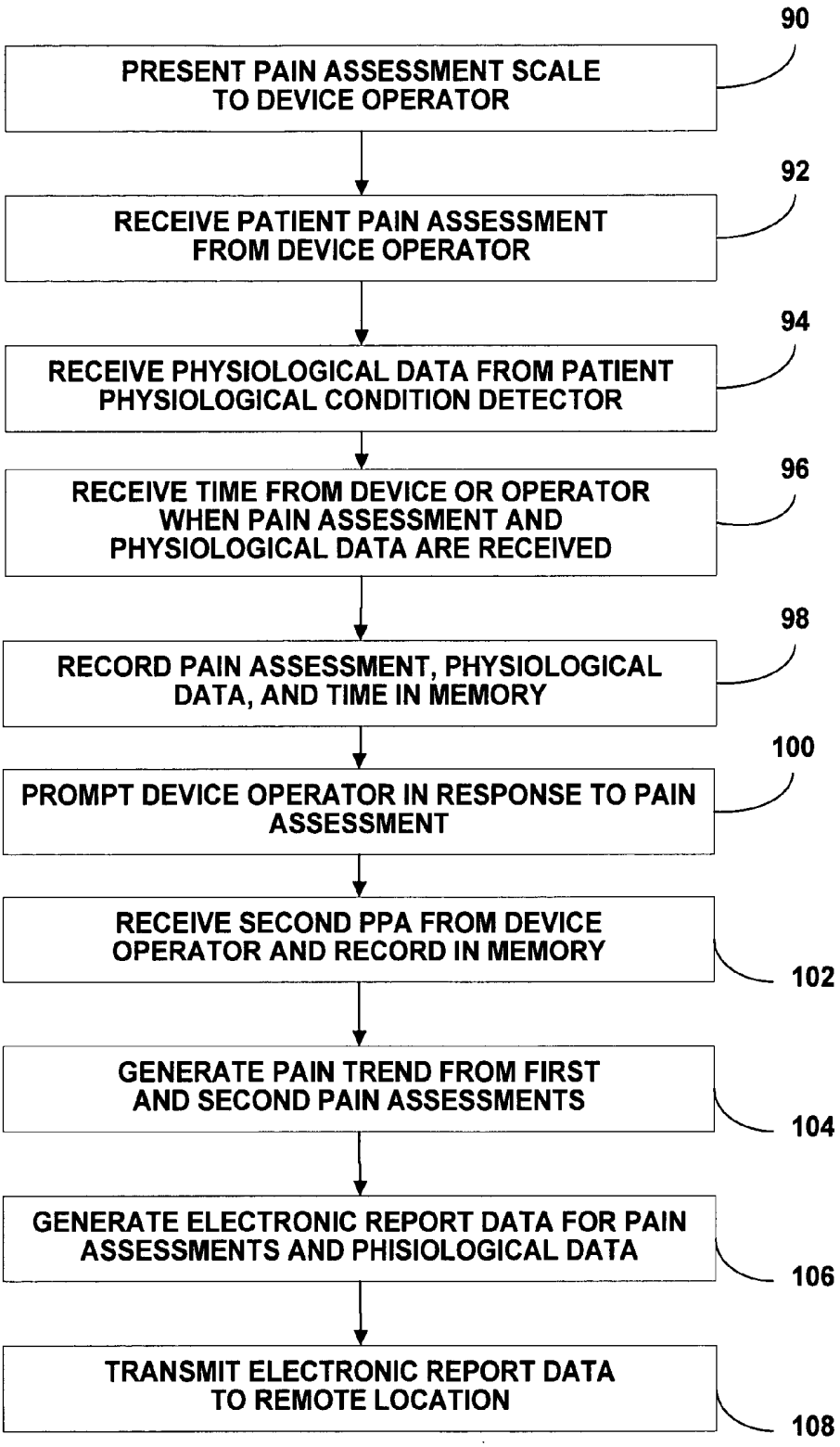

90
PRESENT PAIN ASSESSMENT SCALE TO DEVICE OPERATOR
92
RECEIVE PATIENT PAIN ASSESSMENT FROM DEVICE OPERATOR
94
RECEIVE PHYSIOLOGICAL DATA FROM PATIENT PHYSIOLOGICAL CONDITION DETECTOR
96
RECEIVE TIME FROM DEVICE OR OPERATOR WHEN PAIN ASSESSMENT AND PHYSIOLOGICAL DATA ARE RECEIVED
98
RECORD PAIN ASSESSMENT, PHYSIOLOGICAL DATA, AND TIME IN MEMORY
100
PROMPT DEVICE OPERATOR IN RESPONSE TO PAIN ASSESSMENT
RECEIVE SECOND PPA FROM DEVICE OPERATOR AND RECORD IN MEMORY
102
GENERATE PAIN TREND FROM FIRST AND SECOND PAIN ASSESSMENTS
104
GENERATE ELECTRONIC REPORT DATA FOR PAIN ASSESSMENTS AND PHISIOLOGICAL DATA
106
TRANSMIT ELECTRONIC REPORT DATA TO REMOTE LOCATION
108

FIG. 13

PAIN ASSESSMENT USER INTERFACE

TECHNICAL FIELD

[0001] The invention relates to medical devices and, more particularly, to emergency medical devices including event recording capabilities.

BACKGROUND

[0002] Tracking physiological conditions, including heart rate, blood pressure, temperature, and the like, provides data that is important in diagnosing and treating a patient. The amount of pain that the patient is experiencing is also an important value when determining the best course of action to treat the injury or disease. For example, one method of treatment may be selected over another method if it is believed that the patient could handle an increase level of pain based on an initial pain assessment. An incorrect diagnosis may be avoided if the reported level of pain does not fit the usual symptoms. In particular, the pain assessment may cause a medical technician to reevaluate an initial assumption. Patients tend to have different tolerances to injuries and medication that only they can determine. Consequently, asking a patient to specify a level of pain may ensure that the patient is kept as comfortable as possible without being overmedicated. Pain assessment is also used to determine if a drug treatment, such as morphine or nitroglycerin, is an effective therapy by comparing the patient's pain levels over a period of time.

[0003] Patient pain assessment is very subjective and difficult to quantify, because it relies on the patient's judgment. This makes it difficult to compare pain levels between patients with similar diagnoses. In order to create a more definitive pain measurement technique, some devices generate a stimulus that the patient can compare to a perceived level of pain. For Example, a small voltage may be applied to the patient's skin. The patient is instructed to signal when the pain from the stimulus is equivalent to the pain due to the aliment or injury. This technique can determine a pain baseline for each patient and allow a more mathematical approach to the pain measurement process.

[0004] In general, existing pain assessment techniques comprise a simple numerical scale starting with zero or one being representative of no or little pain and ending with five or ten being representative of most pain possible. The numerical scale may be accompanied by pictorial representations of the pain levels, such as facial expressions. The facial expression scale uses simple line drawings to indicate the increasing distress and discomfort associated with an increase in pain. The patient is presented with the scale either verbally or physically. The patient responds by speaking the number or pointing to the facial expression that best describes the level of pain. This simple technique may not be very useful when comparing pain levels between patients. On a case by case basis, however, this technique can give the medical staff an idea of what the patient is experiencing.

SUMMARY

[0005] In general, the invention is directed to a user interface for patient pain assessment. The user interface may be integrated with a medical therapy or diagnosis device, and allows an operator to input and store a patient's pain assessment based on a given pain assessment scale. As part of the patient's medical record, pain assessment measurements can provide trending information similar to other physiological condition data, which may be useful for future treatment. In addition, the pain assessment measurements can form a valuable part of an information record, such as run report, that documents various information during the course of a medical treatment or monitoring episode. In some embodiments, the user interface may be incorporated within a defibrillator or a patient monitor.

[0006] In one embodiment, the invention is directed to a method in which a patient pain assessment is received from an operator and patient physiological condition data is received from a physiological condition detector. This information is then stored in a memory. The pain assessment data may be transmitted along with patient physiological condition data to a remotely located hospital database to include in the patient's medical record. The patient pain assessment is based on a pain assessment scale that may be presented to the operator. The patient physiological condition may include blood pressure, blood oxygen saturation, body temperature, cardiac rhythm, respiration rate, and the like.

[0007] In another embodiment, the invention is directed to a device that includes a first input device and a second input device. The first input device is used by an operator to enter a patient pain assessment that is based on a pain assessment scale. The second input device includes a physiological condition detector used to gather patient physiological condition data that may include blood pressure, blood oxygen saturation, body temperature, respiration rate, and the like. The device also includes a memory to store the information collected by the first and second input devices. The invention may also include an output to enable operator prompts to suggest treatments based on the pain assessment and physiological data input.

[0008] In another embodiment, the invention is directed to a computer-readable medium containing instructions executable by a processor. The instructions cause a processor to receive a patient pain assessment from an operator interface, receive patient physiological condition data from a physiological condition detector, and record the patient pain assessment and the physiological data within a memory. The instructions may also cause a processor to create a report of the information stored in the memory. In some embodiments, the instructions may cause a processor to react to patient pain assessment input with output prompts providing further information to the operator.

[0009] The invention may provide one or more advantages. For example, unlike conventional pain assessment techniques, the pain assessment user interface creates an electronic record of the entered pain level and may be combined with other physiological data. The data gathered may be transmitted to a remotely located hospital database to become part of the patient's medical record, so the pain assessments may be used to determine a best course of action for the patient in the future. Also, the invention may prompt the operator with suggestions for treatment based on the pain assessment and physiological data collected.

[0010] The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF DRAWINGS

[0011] **FIG. 1** is a block diagram illustrating an external defibrillator suitable for use with a pain assessment user interface in accordance with one embodiment of the invention.

[0012] **FIG. 2** is a block diagram illustrating an example patient monitor suitable for use with a pain assessment user interface in accordance with another embodiment of the invention.

[0013] **FIG. 3** is a block diagram illustrating an example of a defibrillator or patient monitor display presenting a patient pain assessment user interface.

[0014] **FIG. 4** is a block diagram illustrating an example of a defibrillator or patient monitor display presenting a patient pain assessment user interface.

[0015] **FIG. 5** is a block diagram illustrating an example of a defibrillator or patient monitor display using another patient pain assessment user interface.

[0016] **FIG. 6** is a block diagram illustrating an example of a defibrillator or patient monitor display using another patient pain assessment user interface.

[0017] **FIG. 7** is a block diagram illustrating an example of a defibrillator or patient monitor display using another patient pain assessment user interface.

[0018] **FIG. 8** is a block diagram illustrating an example of a defibrillator or patient monitor display using another patient pain assessment user interface.

[0019] **FIG. 9** is a block diagram illustrating an example of a defibrillator or patient monitor display using another patient pain assessment user interface.

[0020] **FIG. 10A** is a block diagram conceptually illustrating a report from an example patient record.

[0021] **FIG. 10B** is a block diagram conceptually illustrating another report from an example patient record.

[0022] **FIG. 10C** is a block diagram conceptually illustrating another report from an example patient record.

[0023] **FIG. 11** is a block diagram illustrating an interaction between a patient and a defibrillator operator using a pain assessment user interface.

[0024] **FIG. 12** is a flow chart illustrating a method for using a patient pain assessment user interface.

[0025] **FIG. 13** is a flow chart illustrating a method for using a patient pain assessment user interface in greater detail.

DETAILED DESCRIPTION

[0026] **FIG. 1** is a block diagram illustrating an external defibrillator **12** suitable for use with a pain assessment user interface in accordance with one embodiment of the invention. As shown in **FIG. 1**, defibrillator **12** is coupled to a patient **10** by an electrode **14** and an electrode **16**, which may be hand-held electrodes paddles or adhesive electrodes pads placed on the skin of patient **10**. Electrodes **14** and **16** are coupled to defibrillator **12** by a conductor **18** and a conductor **20**, respectively. Defibrillator **12** also includes a stimulation interface **22**, an energy storage circuit **24**, a processor **26**, a charging circuit **28**, one or more input devices **30**A-**30**N (hereinafter **30**), a power source **32**, one or more output devices **34**A-**34**N (hereinafter **34**), and a memory **36**.

[0027] Conductors **18** and **20** are coupled to interface **22**. In a typical application, interface **22** includes a receptacle (not shown), and conductors **18** and **20** plug into the receptacle. Interface **22** may also include a switch that, when activated, couples energy storage circuit **24** to electrodes **14** and **16** to deliver stimulation energy in the form of a defibrillation shock.

[0028] Energy storage circuit **24** includes components, such as one or more capacitors, which store the energy to be delivered to patient **10** via electrodes **14** and **16** as a defibrillation shock. Before a defibrillation shock may be delivered to patient **10**, energy storage circuit **24** must be charged. Processor **26** directs charging circuit **28** to charge energy storage circuit **24** to a voltage level determined by processor **26**. Processor **26** may determine the voltage level based on a defibrillation shock energy level that may be, for example, input by an operator via input device **30**, or selected by processor **26** from a preprogrammed progression of defibrillation shock energy levels stored in memory **36**.

[0029] Processor **26** may activate the switch within interface **22** to cause delivery of the energy stored in energy storage circuit **24** across electrodes **14** and **16**. Processor **26** may modulate the defibrillation shock delivered to patient **10**. Processor **26** may, for example, control the switch to regulate the shape of the waveform of the shock and the width of the shock. Processor **26** may control the switch to modulate the shock to, for example, provide a multiphasic pulse, such as a biphasic truncated exponential pulse, as is known in the art. Processor **26** may take the form of a microprocessor, digital signal processor (DSP), application specific integrated circuit (ASIC), field-programmable gate array (FPGA), or other logic circuitry programmed or otherwise configured to operate as described herein.

[0030] Output devices **34** may include a display screen, a touch screen, an indicator light, a speaker, or the like. Processor **26** may display instructions to the operator via the display screen or the touch screen, and an electrocardiogram (ECG) and heart rate of patient **10** monitored by electrodes **14** and **16** may also be displayed via the screens. Defibrillator **12** may further include circuits (not shown) known in the art for monitoring a variety of physiological parameters of patient **10** such as blood pressure, blood oxygen saturation, body temperature, respiration rate, and the like.

[0031] Accordingly, output devices **34** may be used to display or otherwise present the values for these parameters measured by the circuits. The display screen or touch screen may also be used to present a pain assessment scale to the operator, in accordance with an embodiment of the invention. The pain assessment scale may be numerical or pictorial and may include an operator prompt and instructions regarding a preferred input method. The scale may also include a list of words relating to pain types and a prompt for an operator to input the selected word. Output device **34** may again prompt the operator to suggest possible courses of action, additional pain assessments, or provide further instructions based on the pain assessment entered via input device **30**.

[0032] Input device **30** may include a keyboard, a touch screen, a button, a pointing device, a push knob, a soft-key,

a switch, a voice recognition device, or the like. Input device **30** may be used to control the operation of defibrillator **12** and enter background information and pain assessment data for a patient. The pain assessment data, background information, and physiological data, along with any other electronic data gathered by defibrillator **12** or entered by the operator through input **30**, may be compiled into an electronic report by processor **26**, or by an external processing unit that obtains the data from defibrillator **12**. The external processing unit may be a computer, e.g., at a hospital or clinic, to which data from defibrillator **12** is uploaded. Processor **26** or an external processing unit may generate trending information, to include in the report, based on the previously listed measurements taken over time.

[**0033**] In some embodiments, the report may take the form of an electronic run report that documents events during an emergency medical treatment or monitoring episode. The report incorporates pain assessment data received by input from a user of defibrillator **12**, and physiological data representative of one or more physiological conditions of the patient. The pain assessment data may be input by the operator based on a pain assessment scale. The pain assessment data and the physiological data are stored in a memory, such as memory **36**. The stored data, or a report prepared based on the data, may be transmitted into a hospital information system to become part of the patient's medical record.

[**0034**] Power source **32** generates energy to power processor **26** and, for those components that require power, input devices **30**, output devices **34**, and memory **36**. Under the control of processor **26**, charging circuit **28** transfers energy provided by power source **32** to energy storage circuit **24** for delivery as a defibrillation shock to patient **10**. Charging circuit **28** comprises, for example, a flyback charger.

[**0035**] In addition to providing power for defibrillation shocks, and for processor **26**, input device **30**, output device **34**, and memory **36**, power source **32** may provide power for other components of defibrillator **12** not illustrated in **FIG. 1**, such as the physiological monitoring circuits that may be incorporated in the defibrillator as described above. It is understood that the voltage provided by power source **32** may be regulated as necessary for use by the components of defibrillator **12**.

[**0036**] **FIG. 2** is a block diagram illustrating an example patient monitor **40** as another embodiment of the invention. Patient monitor **40** is coupled to a patient **10** by a physiological condition detector, which may measure blood pressure, body temperature, cardiac rhythm, respiration rate, blood oxygen saturation, or the like. In **FIG. 2**, for the purposes of illustration, a physiological sensor **52** in the form of a blood pressure cuff **52** is placed around the arm of patient **10** to obtain a measurement of blood pressure. Conductor **54** couples blood pressure cuff **52** to patient monitor **40**. Patient monitor **40** also includes a processor **42**, one or more input devices **44**A-**44**N (hereinafter **44**), one or more output devices **46**A-**46**N (hereinafter **46**), a memory **48**, and a physiological signal processing interface **50**.

[**0037**] Conductor **54** is coupled to interface **50**, and may include both a signal path and ground return. In a typical application, interface **50** includes a receptacle, and conductor **54** plugs into the receptacle. The physiological data received by interface **50** from a physiological sensor **52** in the form of a blood pressure cuff is sent to processor **42**. Processor **42** may then generate an appropriate response to the received signal. In particular, processor **42** may store a digital representation of the signal in memory **48**, convert the signal to a digital value, transmit an operator prompt to output **46**, drive output device **46** to present a representation or indication of the signal, or the like.

[**0038**] Output device **46** may include a display screen, a touch screen, an indicator light, a speaker, or the like. Processor **42** may display instructions to an operator via the display screen or the touch screen, and the physiological condition of patient **10** monitored by blood pressure cuff **52** may also be displayed via the screens. As in the embodiment of defibrillator **12** described with reference to **FIG. 1**, the display screen or touch screen in patient monitor **40** may also be used to present a pain assessment scale to the operator. The pain assessment scale may be numerical or pictorial and may include an operator prompt and instructions regarding a preferred input method. The scale may also include a list of words relating to pain types and a prompt for an operator to input the selected word. Output device **46** may then prompt the operator, suggesting possible courses of action or additional pain assessments, or presenting further instructions based on the pain assessment entered via input **44** and/or the physiological data obtained via sensor **52**.

[**0039**] Input **44** may include a keyboard, a touch screen, a button, a pointing device, a push knob, a soft-key, a switch, a voice recognition device, or the like. Input **44** may be used to control the operation of patient monitor **40** and enter a patient's background information and pain assessment data. The patient's pain assessment data and background information, along with the physiological data gathered by patient monitor **40** and any other electronic data entered by the operator through input **44**, may be compiled into a report by processor **42** or an external processing unit. Again, as in the embodiment of **FIG. 1**, processor **42** of **FIG. 2** or an external processing unit may generate trending information to include in the report, based on the previously listed measurements taken over time. The report may later be transmitted into a hospital information system to become part of the patient's medical record.

[**0040**] **FIG. 3** through **FIG. 9** are block diagrams illustrating various examples of defibrillator or patient monitor displays using a patient pain assessment user interface **58**A-**58**G in accordance with the invention. **FIG. 3** depicts an example of physiological data in the form of ECG data **56** and a numerical heart rate measurement **57** along with a pain assessment user interface **58**A. Other physiological data may be presented, e.g., as an alternative to or in combination with ECG data **56**. User interface **58**A may present an operator with a pain assessment scale, a prompt asking for input, and input instructions if needed.

[**0041**] The patient pain assessment user interface **58**A illustrated in **FIG. 3** uses a numerical scale from 1 to 5 that can be entered by up and down arrow keys as displayed. In the example of **FIG. 3**, the "enter" key is pressed once the chosen pain assessment value is displayed on the screen. The input device may be arrow keys on a keyboard, soft-keys on a display, buttons, or the displayed arrows on a touch screen. The enter operation may be performed by any of the input options previously listed.

[0042] **FIG. 4** illustrates a patient pain assessment user interface **58**B that uses a numerical scale from 0 to 10 on a horizontal axis. The pain value is entered by right and left arrow keys, as shown in **FIG. 4**. In particular, the arrow keys serve to cause a sliding indicator **59** to change its position along the horizontal axis. Once indicator **59** is moved to the location of the chosen value, the enter key is pressed. Again, the input device may be arrow keys on a keyboard, soft-keys, buttons, or the displayed arrows on a touch screen.

[0043] **FIG. 5** illustrates a patient pain assessment user interface **58**C that uses a numerical scale from 1 to 10. This example also uses a horizontal axis similar to that shown in **FIG. 4**; however, buttons, not arrow keys, are used to enter the value in this case. In particular, the ten possible values are displayed on the screen along with the chosen value and a prompt to press the enter key once the choice has been made, as shown in **FIG. 5**. The input device may be number keys on a keyboard, soft-keys, buttons, or the displayed numbers on a touch screen.

[0044] **FIG. 6** illustrates a patient pain assessment user interface **58**D that uses a numerical scale from 0 to 5. The value options are presented in text form along a vertical axis on the screen and the selected value is displayed in numerical form, as shown in **FIG. 6**. The values may be selected with a pointing device or touch screen input. When the correct value is displayed, the enter key is pressed to input the information. As an alternative, the input device may be a voice recognition device. The enter operation may also be performed by any of the input options previously listed.

[0045] **FIG. 7** illustrates a patient pain assessment user interface **58**E that uses a numerical scale from 1 to 10. Instructions regarding the use of a knob to enter the pain assessment value are displayed on the screen along with the chosen value, as shown in **FIG. 7**. The input device in this example is a knob, mounted on the defibrillator or patient monitoring device, that may be turned until the value given by the patient appears on the display. In some embodiments, the knob is pushed inward to enter the displayed number.

[0046] **FIG. 8** illustrates a patient pain assessment user interface **58**F that uses a numerical scale from 0 to 10, in increments of two, along with pictorial representations for each value. The pictorial pain representations may be line drawings of facial expressions that correspond to the amount of pain associated with each number. The chosen facial expression is highlighted when indicated, as shown in **FIG. 8**. The input device may be number keys on a keyboard, arrow keys on a keyboard, soft-keys, buttons, a pointing device for a touch screen, or the facial expression pictures on a touch screen. Once the value is chosen and the facial expression is highlighted, the enter key may be pressed by any of the input devices listed.

[0047] **FIG. 9** illustrates a patient pain assessment user interface **58**G that uses a numerical scale from 0 to 5 along with a pain type scale **61**. The pain value scale in **FIG. 9** is similar to the scale shown in **FIG. 6**. The pain value options are presented in text form along a vertical axis on the screen and the pain type options are presented as descriptive words also along a vertical axis **61** on the screen. The addition of the pain type scale may further specify the pain a patient is feeling by using descriptive words including shooting, sharp, burning, radiating, aching, dull, and the like. The selected pain value is displayed in numerical form and the selected pain type is displayed in text form, as shown in **FIG. 9**. The options may be selected with a pointing device or touch screen input. When the correct pain value and type are displayed, the enter key is pressed to input the information. As an alternative, the input device may be a voice recognition device. The enter operation may also be performed by any of the input options previously listed.

[0048] In the various embodiments illustrated in **FIGS. 3-9**, input media such as buttons, keys, soft keys, touch screen keys, knobs and the like may be incorporated in the defibrillator or patient monitoring device. As an alternative, however, such input media may be incorporated in a remote control device, such as a handheld communication device carried by a medical technician or other device operator. In this case, the remote control device may include a wired or wireless transmitter and the defibrillator or patient monitoring device may include a wired or wireless receiver to receive pain assessment input or other instructions from the operator. The remote control device and defibrillator or monitoring device may communication in a variety of ways, e.g., radio frequency communication, infrared communication, and the like.

[0049] **FIG. 10A** is a block diagram conceptually illustrating a report **60** from an example patient record. The patient record shows a pain assessment report **60** that may be generated by data obtained via a patient pain assessment user interface in accordance with the invention. Pain assessment report **60** includes one or more entries **62**A-**62**N (hereinafter **62**) corresponding to one or more queries displayed over a horizontal time axis **64**. When an operator takes a pain assessment from a patient, the input value is transmitted to a processor and then stored in a memory, as described in **FIG. 1** and **FIG. 2**. When the pain assessment data is stored, the time is also recorded from an internal device, an external device, or operator entry. Each entry **62** includes the pain assessment value or a picture as shown in **FIG. 10A** to indicate the pain assessment, and the time at which the assessment was recorded.

[0050] Also recorded with entry **62** may be additional information from the operator such as notes about the condition of the patient and treatment being administered. In addition, report **60** may include physiological data obtained during the course of a treatment or monitoring episode. The physiological data and the pain assessment data may be synchronized to a common time line to enable temporal correlation of the pain assessments with particular physiological data such as blood pressure, blood oxygen saturation, body temperature, cardiac rhythm, respiration rate, and the like. In the example of **FIG. 10A**, an ECG **63** is shown in conjunction with pain assessment entries **62**. Hence, the pain assessment data and physiological data may be used to later analyze a treatment or monitoring episode, e.g., for trending and diagnostic purposes, or simply for recordkeeping.

[0051] Pain assessment report **60** illustrates one example of trending information that may be generated by repeated pain assessments recorded over time. For example, report **60** enables an observer to readily ascertain whether the patient's pain is increasing or decreasing during the course of treatment or monitoring. Records of this type may help medical personnel decide what type of treatment is best for each patient. In some cases, the pain assessment trend informa-

tion may permit development of historical data over several episodes of treatment or monitoring. The patient record may have additional pages for the patient's background information, test results, treatment decisions, physiological data, further trending information, and the like.

[0052] **FIG. 10B** is a block diagram conceptually illustrating another report from an example patient record. The patient record shows an event log **65** that may be generated by data obtained from a patient during the course of a treatment or monitoring episode. Event log **65** includes information similar to pain assessment report **60** shown in **FIG. 10A**, but in a different format and with additional information. Event log **65** includes one or more entries **66**A-**66**N (hereinafter **66**) corresponding to one or more queries displayed along a vertical axis. Each entry **66** includes the time at which the data was recorded, a heart rate value or other physiological data value, a patient pain level value, a patient pain type value, and any relevant notes input by an operator.

[0053] Event log **65** may record all actions performed by the operator relating to the patient pain assessment user interface and the defibrillator or patient monitor it may be incorporated in. Records of this type may help medical personnel follow the exact steps taken to treat a patient and may allow an easier transition between emergency staff members and subsequent care givers.

[0054] **FIG. 10C** is a block diagram conceptually illustrating another report from an example patient record. The patient record shows a pain trend graph **67** that may be generated by data obtained via a patient pain assessment user interface in accordance with the invention. Pain trend graph **67** plots the numerical pain levels recorded in pain assessment report **60**, shown in **FIG. 10A**, dependent upon the time at which the data was recorded.

[0055] Pain trend graph **67** illustrates another example of trending information that may be generated by repeated pain assessments recorded over time. For example, graph **67** enables an observer to view a pain trend line **68** of the entire course of treatment or monitoring episode, and not just discrete pain values as in pain assessment report **60** shown in **FIG. 10A**. Using pain trend line **68**, hospital personnel may easily determine how quickly a treatment relieved the patient's pain and at what time the most significant drops in pain level occurred.

[0056] **FIG. 11** is a block diagram illustrating an example interaction between a patient **10** and a defibrillator operator **72**. In the example of **FIG. 11**, patient **10** is lying on a gurney **70**, and is attached to a defibrillator **12** via an electrode **14** and an electrode **16**. Electrodes **14** and **16** are coupled to defibrillator **12** by a conductor **18** and a conductor **20** respectively, as shown in **FIG. 1** and **FIG. 10**. Defibrillator **12** includes an example of a patient pain assessment user interface **58** similar to the one shown in **FIG. 8**. Defibrillator operator **72** asks patient **10**, "On a scale of 0 to 10 how much pain do you feel?" Patient **10** responds by saying, "**6**!" Defibrillator operator **72** may read the pain assessment scale aloud to patient **10** because patient **10** may be unable to view the pain assessment scale. Patient **10** may also read the pain assessment scale directly from pain assessment user interface **58** or, in this case, determine the pain value by examining the pictorial representations.

[0057] Defibrillator operator **72** may then enter the pain assessment value given by patient **10** into defibrillator **12** by an input device as described in **FIG. 8**. The original pain assessment may be completed at any time, as long as the patient is capable of answering. This may delay the initial pain assessment until after defibrillation, if needed. Defibrillator **12** may then issue a prompt to the operator based on the pain assessment value entered. This prompt may suggest future treatment or ask for another pain assessment.

[0058] **FIG. 12** is a flow chart illustrating a method for using a pain assessment user interface **58**. A defibrillator processor **26** or a patient monitor processor **42** (hereinafter the processor) first receives a patient pain assessment from the operator (**80**). The processor also receives physiological data from a patient physiological condition through a defibrillator **12** or a patient monitor **40** (hereinafter the device) (**82**). The patient pain assessment and physiological data received are both recorded in a defibrillator memory **36** or a patient monitor memory **48** (hereinafter the memory) by the processor (**84**). The steps listed in **FIG. 12** outline the core functions the processor performs to operate the pain assessment user interface **58**.

[0059] **FIG. 13** is a flow chart illustrating a method for using a patient pain assessment user interface **58** in greater detail. The processor first presents a pain assessment scale to an operator (**90**). The presentation may include a prompt for the operator to enter a pain assessment value. The prompt may include instructions for a preferred input process of the pain assessment. The patient pain assessment value is then received from an input device used by the operator (**92**). Physiological data is also received from one or more patient physiological condition detectors included in the device (**94**). When the patient pain assessment and the physiological data are received by the processor, the time is also received (**96**). The time may be determined by an internal device, an external device, or operator input. The processor then records the patient pain assessment, physiological data, and time into the memory of the device (**98**).

[0060] The processor may generate another operator prompt in response to the patient pain assessment (**100**). This prompt may simply acknowledge receiving the pain assessment or may give a suggestion for further treatment or further pain assessments. Treatment suggestion prompts may depend on how much pain the patient reports to be experiencing and the physiological data received. A prompt for additional pain assessments may be given after a set period of time, when physiological data reaches a specified level, when medication levels reach a predetermined point, if the operator notes a procedure on the device, if the device receives a positive indication, if an error occurs in transmitting the original assessment, or the like. The operator may note the use of such drugs as nitroglycerin or morphine as a patient therapy on the pain assessment user interface **58**. The patient pain assessment user interface **58** may then default to prompting for a pain assessment every 5 minutes. The device may also receive a physiological condition signal, such as positive changes in a diagnostic ECG (12-lead) indicating an acute myocardial infarction, that may require an additional pain assessment.

[0061] The patient pain assessment user interface **58** may prompt the device operator for a second patient pain assessment due to an elapsed amount of time or an event triggered by the device or the operator, as discussed above. The operator queries patient **10** again and enters the reported

pain level. This patient pain assessment is recorded in the memory again along with the time at which the measurement was received (**102**). Physiological data generally constitutes a continuous measurement, but if data only needs to be measured periodically, it may be collected at the same time as the second patient pain assessment.

[**0062**] The processor or an external processing unit may then generate trending information for the pain assessment values gathered over time (**104**), as is typically done for physiological data. A report may be generated by the processor or the external processing unit. The report generally includes all the patient pain assessment values and physiological data and the times at which they were recorded (**106**). The report may also include any trending information generated and the patient's background information such as name, age, sex, and the like. The report may then be transmitted to a remote location (**108**), most likely a hospital patient database.

[**0063**] The transmission may be done via a wired or wireless connection, depending on the device and its preferred function. In some cases, the entire report may be generated by a processor within the defibrillator or monitoring device. In other instances, the defibrillator or monitoring device may store pain assessment and physiological data for upload to an external processing unit, such as a computer, for generation of the report. Thus, a report generation computer may operate as an intermediary between the defibrillator or monitoring device and a hospital medical information database. The report may become part of the patient's medical record with the pain assessment values included electronically along with the physiological data trends.

[**0064**] Including pain assessment values and trends in an electronic medical record may increase the use of pain assessment in diagnosis and treatment of patients. The invention may also help medical staff members understand the amount of pain a patient is experiencing to ensure the patient is comfortable.

[**0065**] Various embodiments of the invention have been described in the above figures.

[**0066**] These and other embodiments are within the scope of the following claims.

1. A method comprising:

receiving a patient pain assessment from an operator, wherein the patient pain assessment is based on a pain assessment scale;

receiving physiological data representative of a patient physiological condition; and

recording the patient pain assessment and the physiological data in a memory.

2. The method of claim 1, further comprising generating electronic report data incorporating both the patient pain assessment and the physiological data.

3. The method of claim 2, further comprising transmitting the electronic report data to a remote location.

4. The method of claim 1, further comprising recording a time when the patient pain assessment and the physiological data are received.

5. The method of claim 4, further comprising receiving the time from one of an internal device, an external device, and an operator interface.

6. The method of claim 1, wherein the patient pain assessment is a first patient pain assessment; the method further comprising:

receiving a second patient pain assessment from the operator; and

recording the second patient pain assessment in memory.

7. The method of claim 6, wherein the second patient pain assessment is received subsequent to the first patient pain assessment.

8. The method of claim 6, further comprising generating a pain trend as a function of the first and second patient pain assessments.

9. The method of claim 1, further comprising prompting the operator in response to the patient pain assessment.

10. The method of claim 1, further comprising presenting the pain assessment scale to the operator.

11. The method of claim 10, wherein presenting the pain assessment scale comprises at least one of presenting a numerical pain assessment scale and presenting a pictorial pain assessment scale.

12. The method of claim 10, wherein presenting the pain assessment scale comprises presenting a pain type scale.

13. The method of claim 12, wherein the pain type scale comprises words descriptive of a type of pain sensation; the words further comprising shooting, sharp, burning, radiating, aching, and dull.

14. The method of claim 1, wherein the patient physiological condition includes one of blood pressure, blood oxygen saturation, body temperature, cardiac rhythm, and respiration rate.

15. A device comprising:

a first input device to receive a patient pain assessment from an operator, wherein the patient pain assessment is based on a pain assessment scale;

a second input device to receive physiological data representative of a patient physiological condition; and

a memory to record the patient pain assessment and the physiological data.

16. The device of claim 15, wherein the device comprises an external defibrillator.

17. The device of claim 15, wherein the device comprises an external patient monitor.

18. The device of claim 15, wherein the first input device comprises at least one of a keyboard, a soft-key, a button, a touch screen, a pointing device, a push knob, and a voice recognition device.

19. The device of claim 15, wherein the second input device comprises at least one of a keyboard, a voice recognition device, a touch screen, a pointing device, and a patient physiological condition detector.

20. The device of claim 15, wherein the first input device and the second input device are the same device.

21. The device of claim 15, further comprising an output device to present to the operator at least one of a pain assessment scale and a prompt in response to a patient pain assessment.

22. The device of claim 21, wherein the output device comprises at least one of a display screen, a touch screen, an indicator light, and a speaker.

23. A computer-readable medium comprising instructions to cause a processor to:

receive a patient pain assessment from a user interface, wherein the patient pain assessment is based on a pain assessment scale;

receive physiological data representative of a patient physiological condition; and

record the patient pain assessment and the physiological data within a memory.

24. The computer-readable medium of claim 23, further comprising instructions that cause the processor to generate electronic report data incorporating both the patient pain assessment and the physiological data.

25. The computer-readable medium of claim 24, further comprising instructions that cause the processor to transmit the electronic report data to a remote location.

26. The computer-readable medium of claim 23, further comprising instructions that cause the processor to record a time when the patient pain assessment and the physiological data are recorded.

27. The computer-readable medium of claim 26, further comprising instructions that cause the processor to receive the time from one of an internal device, an external device, and an operator interface.

28. The computer-readable medium of claim 23, wherein the patient pain assessment is a first patient pain assessment, the computer readable medium further comprising instructions that cause the processor to:

receive a second patient pain assessment from the operator; and

record the second patient pain assessment in memory.

29. The computer-readable medium of claim 23, further comprising instructions that cause the processor to transmit a signal to an output device to prompt the operator in response to the patient pain assessment.

30. The computer-readable medium of claim 23, further comprising instructions that cause the processor to transmit the pain assessment scale to an output device to present the pain assessment scale to the operator.

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专利名称(译)	疼痛评估用户界面		
公开(公告)号	US20040267099A1	公开(公告)日	2004-12-30
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[标]申请(专利权)人(译)	MCMAHON MICHAELÐ PEARCE CHRISTOPHER DAYNES约翰·C·		
申请(专利权)人(译)	MCMAHON MICHAEL D. PEARCE CHRISTOPHER DAYNES JOHN C.		
当前申请(专利权)人(译)	美敦力公司PHYSIO-CONTROL CORP.		
[标]发明人	MCMAHON MICHAEL D PEARCE CHRISTOPHER DAYNES JOHN C		
发明人	MCMAHON, MICHAEL D. PEARCE, CHRISTOPHER DAYNES, JOHN C.		
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摘要(译)

通常，本发明涉及用于患者疼痛评估的用户界面。用户界面允许操作者基于给定的疼痛评估量表输入和存储患者的疼痛评估。本发明可以将疼痛评估数据与患者生理状况数据一起传送到位于远程的医院数据库。作为患者病历的一部分，疼痛评估测量可以提供类似于大多数生理状况数据的趋势信息，这可能对将来的治疗有用。本发明可以基于疼痛评估和收集的生理数据向操作者提示治疗建议。在一些实施例中，用户界面可以应用于除颤器或患者监视器。