US 20100010319A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0010319 A1**

(43) **Pub. Date: Jan. 14, 2010**

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(54) **CLINICIAN DECISION SUPPORT SYSTEM**

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(21) Appl. No.: **12/445,366**

(22) PCT Filed: **Oct. 8, 2007**

(86) PCT No.: **PCT/IB2007/054082**

§ 371 (c)(1),
(2), (4) Date: **Apr. 13, 2009**

(30) **Foreign Application Priority Data**

Oct. 12, 2006 (EP) 06122149.5

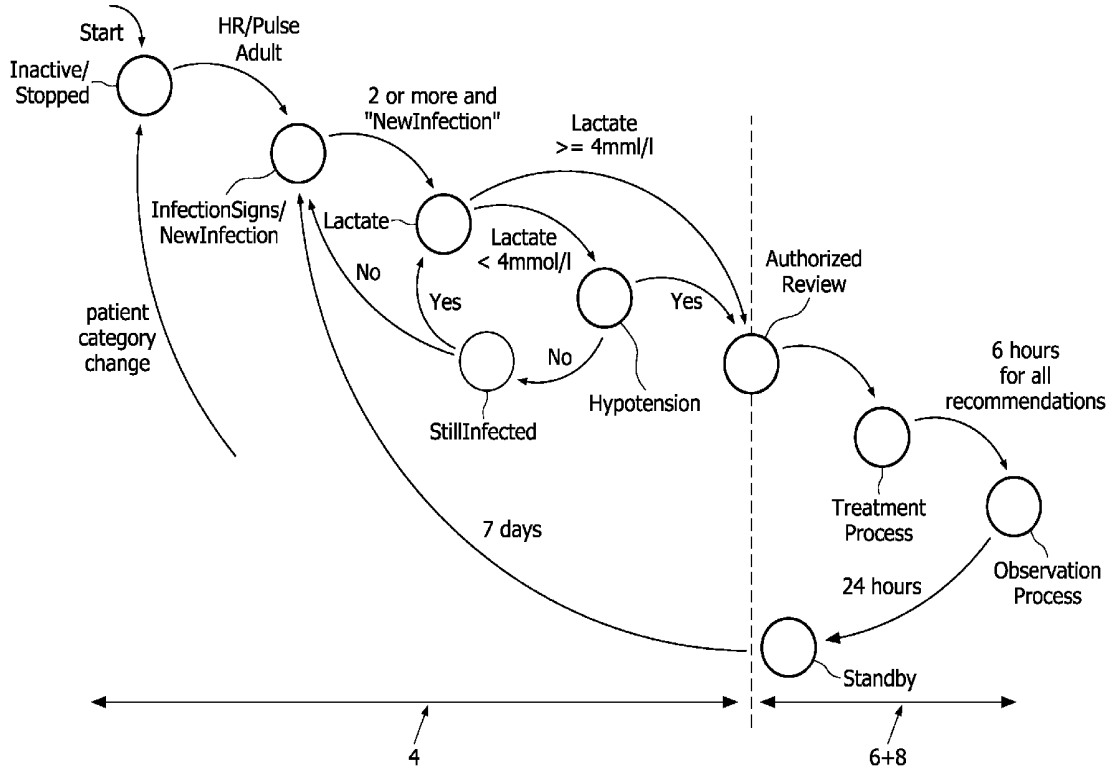
Publication Classification

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

(52) **U.S. Cl.** **600/300**

(57) **ABSTRACT**

A bedside patient monitor comprises a clinician support system. The clinician support system comprises at least one of the following modules of: a disease-specified decision module (**11**), disease-specified treatment module (**13**) or disease-specified observation module (**15**). The bedside monitor comprises a first interface (**105**) for manual patient-related input and a second interface (**107**) for continuous input of a sensor signal. The clinician is supported to deliver requested information and execute the treatment in a predetermined way supported by the clinician support system.



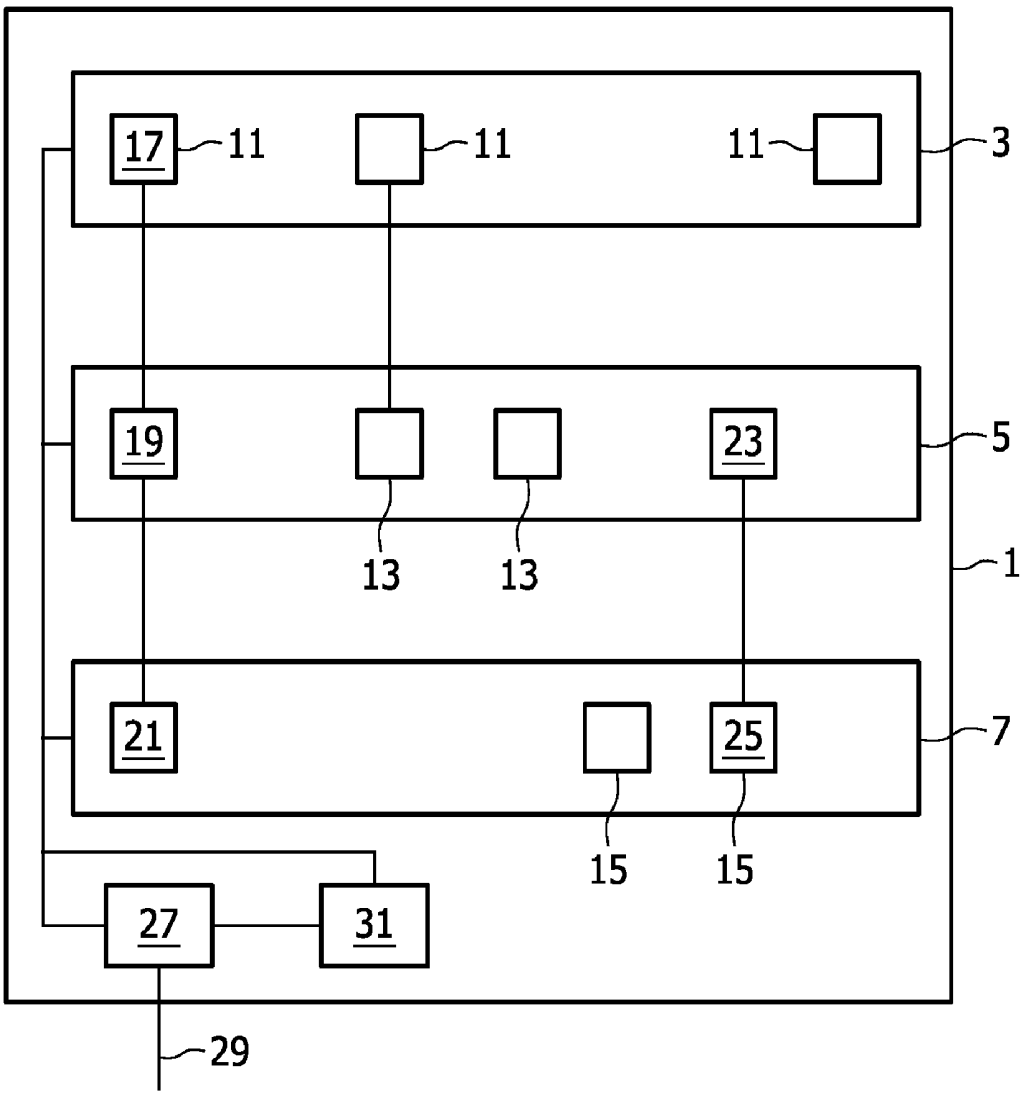


FIG. 1

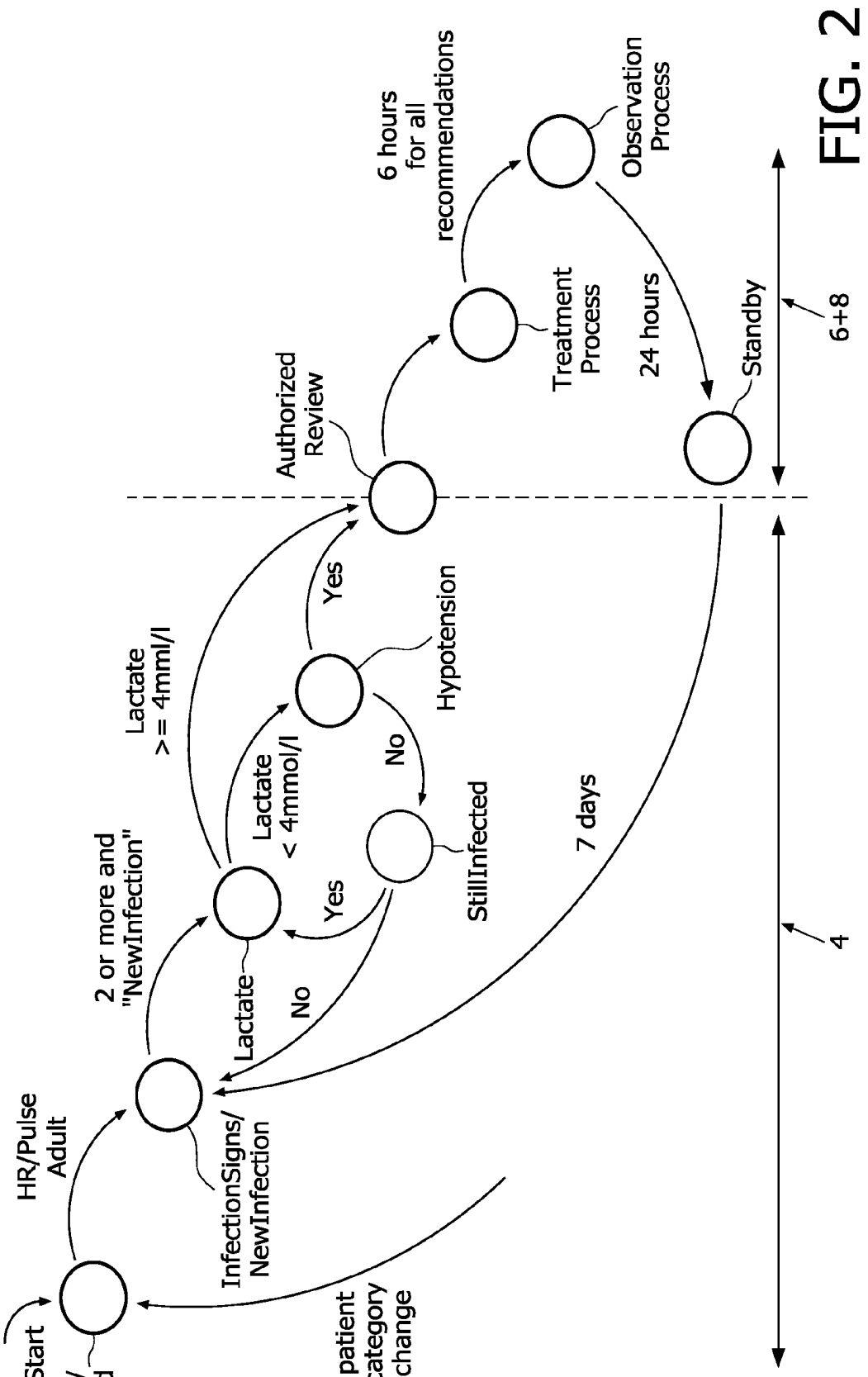

Start
Inactive/
Stopped
HR/Pulse
Adult
InfectionSigns/
NewInfection
2 or more and
"NewInfection"
Lactate
Yes
No
Lactate
< 4mmol/l
Lactate
>= 4mml/l
Yes
Hypotension
No
StillInfected
Authorized
Review
6 hours
for all
recommendations
Treatment
Process
Observation
Process
24 hours
Standby
7 days
patient
category
change
4
6+8

FIG. 2

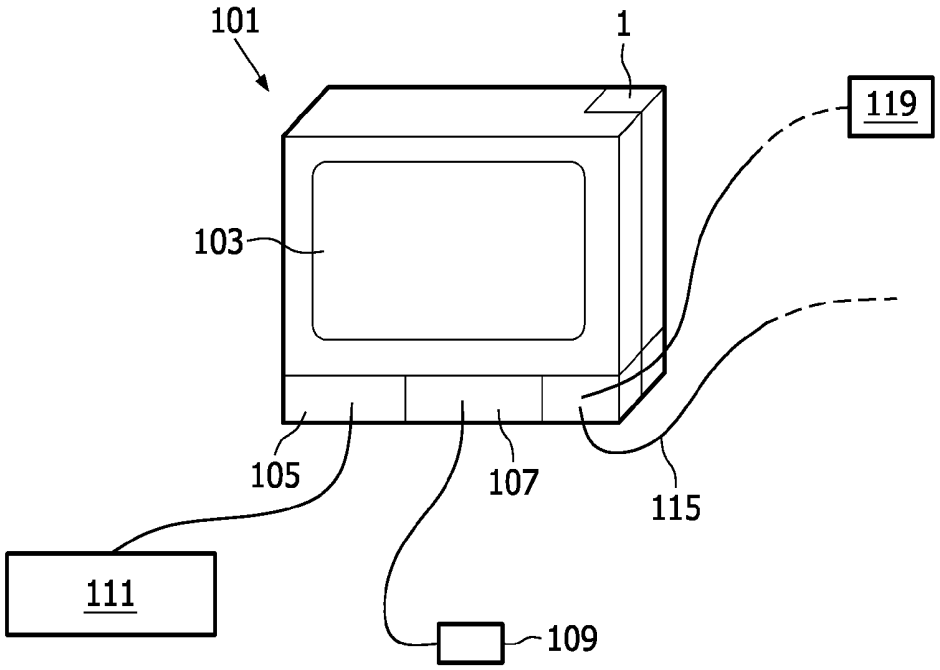


FIG. 3

Clinician support system - Sepsis decision module		X
Which of the following signs and symptoms of infection are both present and new to the patient?		
T<36.0°C (96.8°F) or T>38.3°C (100.9°F)	36.7°C	▒
Tachycardia (HR>90bpm)	60bpm	▒
Tachypnea (RR>20rpm) or mechanically ventilated	20 rpm	☐
WBC >12000/ml or <4000/ml or >10% immature forms		☐
Acutely altered mental status		☐
Chills with rigors		☐
Hyperglycemia (Glucose>120mg/dl)		☐

FIG. 4

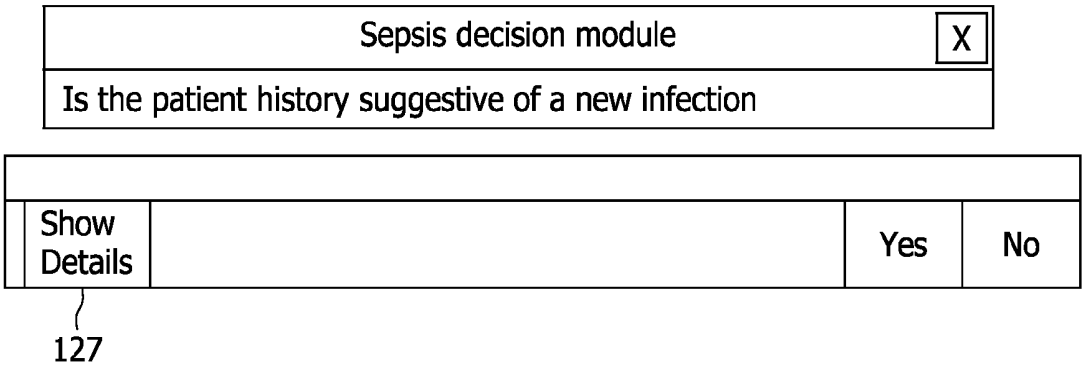


FIG. 5

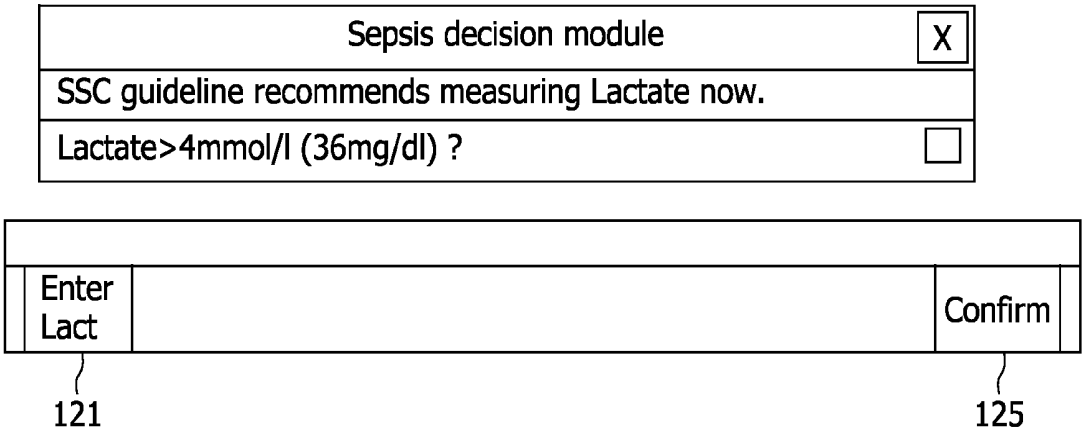


FIG. 6

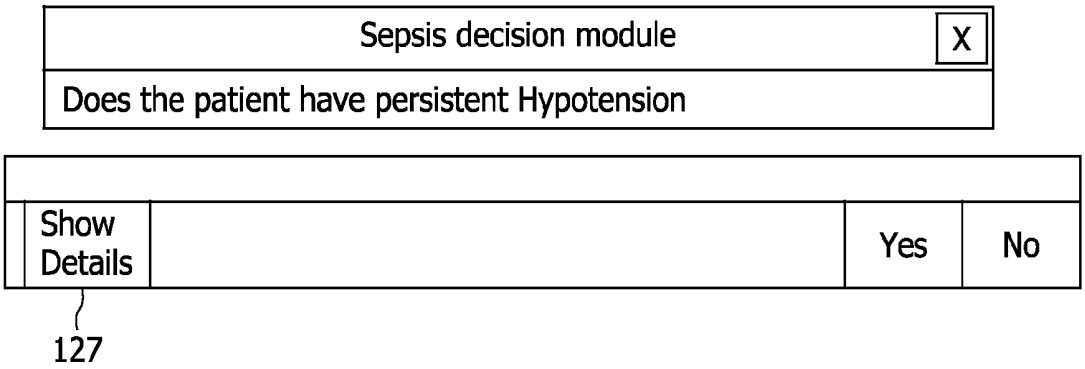


FIG. 7

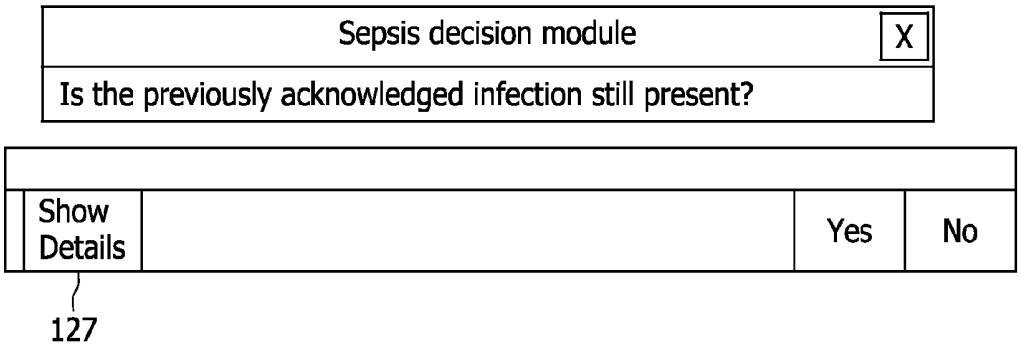

Sepsis decision module
X
Is the previously acknowledged infection still present?
Show Details
Yes
No
127

FIG. 8

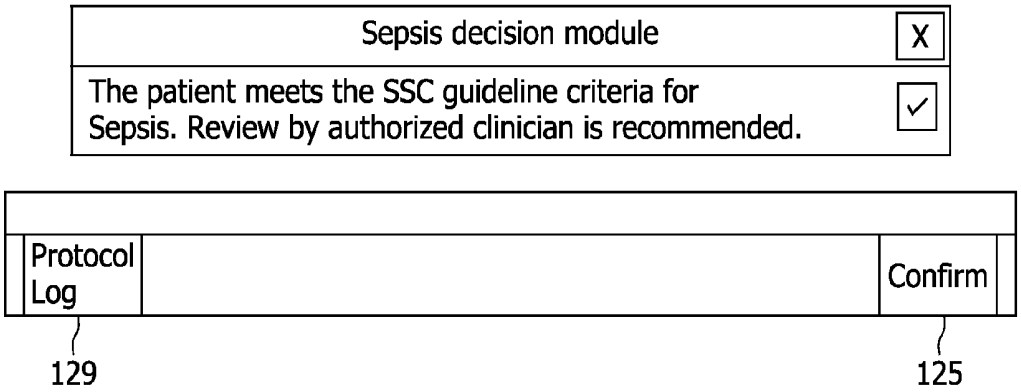

Sepsis decision module
X
The patient meets the SSC guideline criteria for Sepsis. Review by authorized clinician is recommended.
Protocol Log
Confirm
129
125

FIG. 9

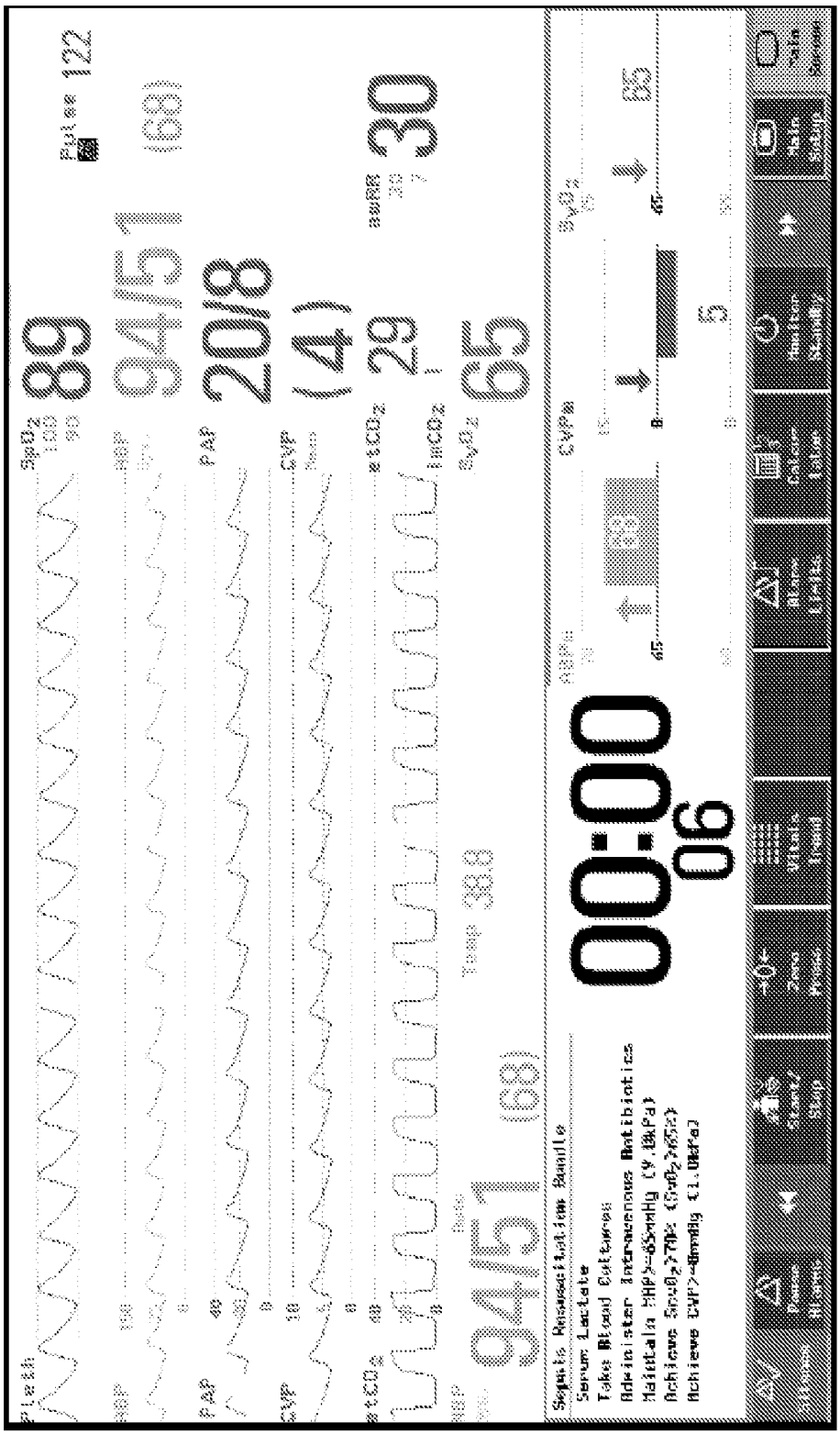

Pleth
SpO2
89
Pulse 122
NBP
94/51 (68)
PAP
20/8 (14)
CVP
etCO2
29
awRR
30
hmCO2
SvO2
65
Temp 38.8
00:00
06
Sepsis Resuscitation Bundle
Serum Lactate
Take Blood Cultures
Administer Intravenous Antibiotics
Maintain MAP>65mmHg (9.3kPa)
Achieve SvO2>70% (SvO2>65%)
Achieve CVP=8mmHg (1.0kPa)

FIG. 10

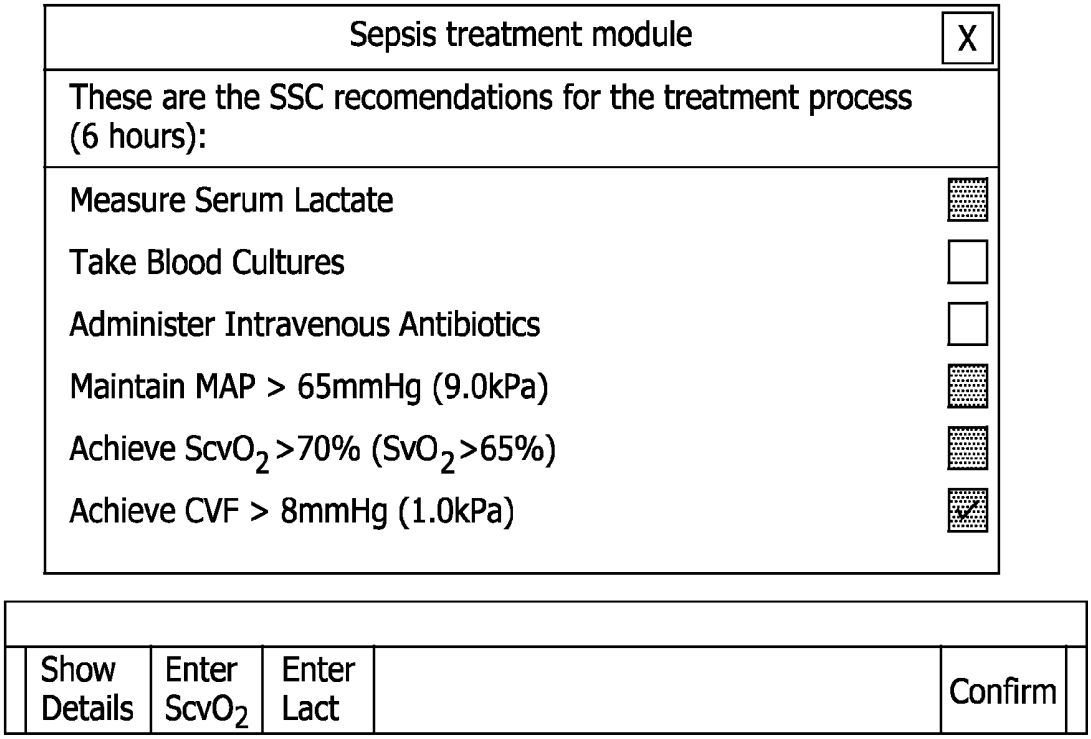

Sepsis treatment module
X
These are the SSC recomendations for the treatment process (6 hours):
Measure Serum Lactate
Take Blood Cultures
Administer Intravenous Antibiotics
Maintain MAP > 65mmHg (9.0kPa)
Achieve ScvO2 >70% (SvO2 >65%)
Achieve CVF > 8mmHg (1.0kPa)
Show Details
Enter ScvO2
Enter Lact
Confirm

FIG. 11

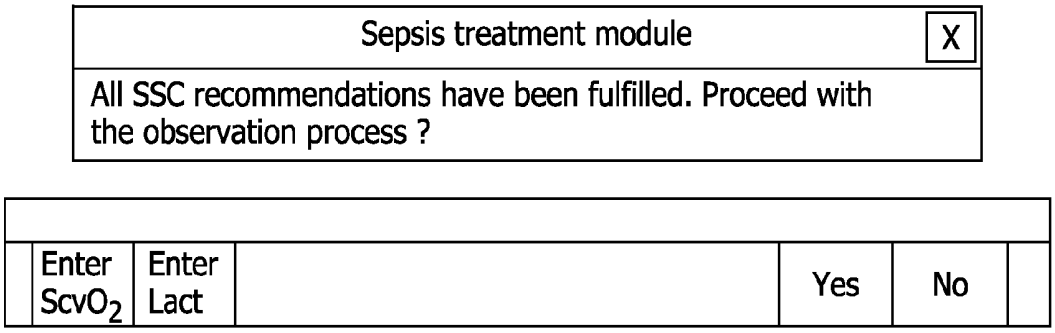

Sepsis treatment module
X
All SSC recommendations have been fulfilled. Proceed with the observation process ?
Enter $ScvO_2$
Enter Lact
Yes
No

FIG. 12

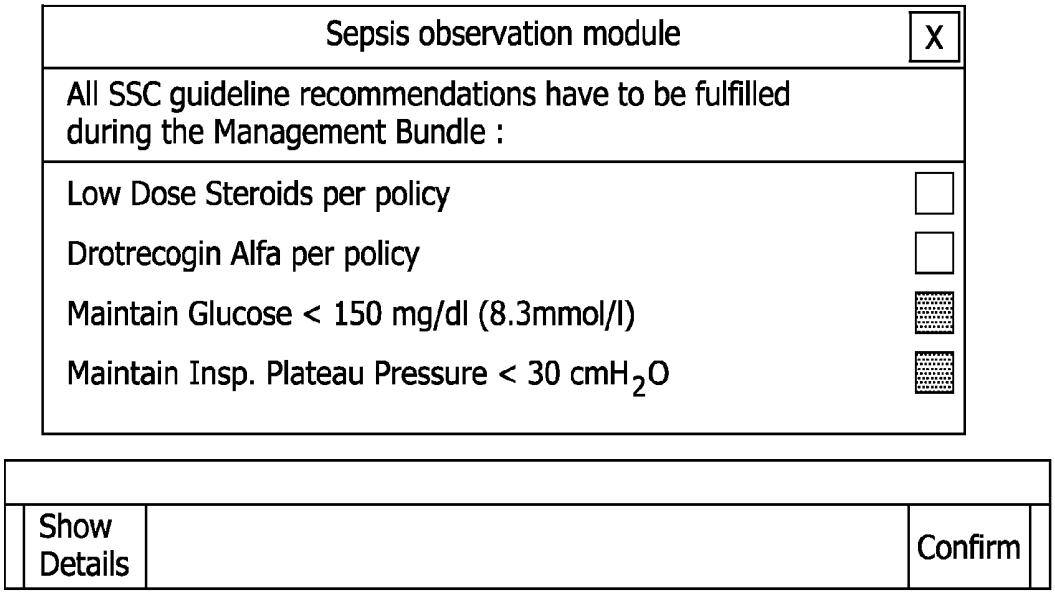

Sepsis observation module
X
All SSC guideline recommendations have to be fulfilled during the Management Bundle :
Low Dose Steroids per policy
Drotrecogin Alfa per policy
Maintain Glucose < 150 mg/dl (8.3mmol/l)
Maintain Insp. Plateau Pressure < 30 cmH_2O
Show Details
Confirm

FIG. 13

No Patient Admitted

SSC Sepsis 31 May 06 10:51:56

31 May 2006 10:50
Log Start

31 May 2006 10:50
Start "Sepsis decision module"

31 May 2006 10:50
Action Required
Which of the following signs and symptoms of infection are both present and new to the patient?

31 May 2006 10:51
Which of the following signs and symptoms of infection are both present and new to the patient?

T<36°C (96.8°F) or T>38.3°C (100.9°F)	☐
Tachycardia (HR>90bpm)	☐
Tachypnea (RR>20rpm) or mechanically ventilated	☑
WBC >12000/µl or <4000/µl or >10% immature forms	☑
Acutely altered mental status	☐
Chills with rigors	☐
Hyperglycemia (Glucose>120mg/dl)	☐

31 May 2006 10:51
Action Required
Is the patient history suggestive of a new infection?

31 May 2006 10:51
Is the patient history suggestive of a new infection? ☑

31 May 2006 10:51
Action Required
SSC guideline recommends measuring Lactate now.

31 May 2006 10:51
Lact = 4.5 mmol/l (31 may 10:51)

31 May 2006 10:51
Action Required
The patient meets the SSC guideline criteria for Sepsis. Review by authorized clinician is recommended.

31 May 2006 10:51
The patient meets the SSC guideline criteria for Sepsis. Review by authorized clinician is recommended. ☑

31 May 2006 10:51
Start "Sepsis treatment module"

FIG. 14

CLINICIAN DECISION SUPPORT SYSTEM

[0001] This invention is directed to a clinician decision support system.

[0002] US 2006/0122869 A9 discloses a system and method for standardizing care in a hospital environment from a remote location. The information concerning the latest care and practice standards for a given condition is provided to a decision support module. The decision support module comprises decision support algorithms that reflect a standardized guideline of practice for a particular medical condition. By means of this system it is possible to provide a 24-hours/7-days-a-week patient monitoring and management service to multiple, geographically dispersed Intensive Care Units. To allow remote visual monitoring of the patients, the system comprises video monitors. The system comprises an interface to allow a physician to get access to a physician resource database. The database comprises diagnosis algorithms. So the physician gets standardized information about a standardized diagnosis algorithm. Further standardized care and treatment is provided by the physician resource database.

[0003] Many medical organizations are active in developing guidelines for recognition of a disease and treatment of the disease, for example "surviving sepsis campaign".

[0004] It is an object of the invention to provide a support device/system to support the medical staff in the use of standardized guidelines and standardized treatment guidelines.

[0005] This object is achieved by means of a clinician support system. The clinician support system comprises at least one of the following modules: a disease-specified decision module, disease-specified treatment module or disease-specified observation module and a first interface for manual patient-related input and a second interface for continuous input of sensor signals. So it is possible to deliver manually measured physiological values by means of the first interface. Further, continuously measured signals are delivered by the second interface. Continuously measured signals are signals measured within predetermined time intervals, and the measured signals will be delivered automatically, without user interaction.

[0006] In one embodiment of the bedside patient monitor of the invention, the clinician support system comprises at least one disease-specified treatment module to support the clinician in the treatment process, the disease-specified treatment module being started only by a qualified manual input trigger signal.

[0007] In one embodiment of the bedside patient monitor, the clinician support system comprises at least one observation support module for observation of the treated patient and the disease-specified observation module is activated by a signal generated through deactivation of the disease-specified treatment module.

[0008] In a further embodiment of the bedside patient monitor, an indicator is provided for signaling a running treatment procedure. So it could be recognized instantly that a treatment procedure is running. This helps the clinician's staff in planning further action for the patient. Further, if a clinician support screen is displayed on the display of the bedside patient monitor the clinician is supported in getting a good overview of the status of the patient. For example the indicator of the running disease-specified module. The icon can be used for indication of the actual running module, if a decision, treatment or observation module is running. Different icons can be used for different diseases.

[0009] In one embodiment of the bedside patient monitor, the clinician support system comprises an information delivery tool. The information delivery tool spreads around a request for information in the case that the requested information is not delivered by the second interface. For example a request is sent to the central station of the hospital, using a network connection, especially wireless connection, to the hospital network or a request is delivered to a remote microbiological institute or center by means of the internet. The request comprises a patient identification to make sure that the information assigned to the correct patient will be delivered. For example, an identification code is provided by a bedside device, for example the bedside patient monitor.

[0010] Especially body fluids or probes are analyzed in remote microbiological centers. So this requested information, if available, is delivered to the clinician support system. Of course the request could comprise patient identification information to make sure that the requested information of the correct patient will be delivered. If the requested information is not available, the information delivery tool generates a pop-up window on the display of the bedside patient monitor to trigger manual input through the first interface. The pop-up window will disappear if the requested information is delivered.

[0011] The bedside patient monitor is used to carry out the clinician support method. During the clinician support method at least one of disease-specified modules to support the decision process, treatment process or observation process are activated. The method comprises the recognition of automatic input and the triggering of manual input to provide the information requested by a running module.

[0012] In one embodiment, the method generates pop-up windows, to trigger the manual input. The pop-up windows are displayed on the display of the patient monitor. In dependence on the requested input, the manual input of different persons will be accepted. For example a manual input of a temperature measurement value carried out by the patient himself could be accepted.

[0013] In one embodiment the method stores the manual input information linked with an identification code. The identification code is assigned to a person or a group of persons. By means of this identification code it is possible to establish which person made the manual input.

[0014] In one embodiment a method is provided, wherein the request for manual input requested by a running treatment process is carried out preferred to a request of a running decision or running observation module.

[0015] In a further embodiment a request generated by a running decision module is carried out preferred to a generated request of a running observation module.

[0016] In one embodiment an unanswered request will appear after a predetermined time. Especially 5, 10 or 15 minutes after closure of the request window, the request will reappear. Especially in dependence on the requested information, different durations for reappearance of the window can be predetermined.

[0017] In the following, the clinician support system and method of clinician support is described in more detail. A very detailed description is given in respect of the disease of sepsis, but the scope of this invention is not limited to the described specific embodiments.

[0018] The clinician support system supports the clinical staff in recognition, treatment and observation of several diseases. There are many activities in the medical society to generate standardized guidelines for treatment of several diseases, for example sepsis.

[0019] The invention is described in more detail hereinafter, especially for the example of sepsis.

[0020] FIG. **1**: Clinician support system

[0021] FIG. **2**: Bedside patient monitor comprising the clinician support system

[0022] FIG. **3**: Flowchart of sepsis decision, treatment and observation process

[0023] FIG. **4**: Infection Signs und Symptoms window

[0024] FIG. **5**: New Infection window

[0025] FIG. **6**: Lactate request window

[0026] FIG. **7**: Hypotension Evaluation request window

[0027] FIG. **8**: Infection confirmation window

[0028] FIG. **9**: Clinician authorized window

[0029] FIG. **10**: Sepsis treatment screen

[0030] FIG. **11**: Sepsis treatment recommendation monitoring window

[0031] FIG. **12**: Sepsis treatment deactivation window

[0032] FIG. **13**: Sepsis observation window

[0033] FIG. **14**: Protocol Log

[0034] Furthermore, the terms first, second, third and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0035] Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other orientations than described or illustrated herein.

[0036] It is to be noticed that the term "comprising", used in the present description and claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. Thus, the scope of the expression "a device comprising means A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B.

[0037] In FIG. **1** the general structure of the clinician support system **1** is shown. The clinician support system comprises a decision support module **3** comprising disease-specified decision modules **11**. Here a disease-specified module is a sepsis decision module **17**. The sepsis decision module is linked with a sepsis treatment module **19**. The sepsis treatment module is one example of a disease-specified treatment module **13**. The disease-specified treatment modules **13** are part of a treatment support module **5**. Disease-specified observation modules **21** are part of an observation support module **7**. A disease-specified observation module **15** could be assigned to a disease-specified treatment module **13**. As shown in FIG. **1**, an treatment, decision and observation modules are not provided for all diseases. The modules **11**, **13**, **15** assigned to the same disease are linked. So the sepsis decision module is linked with the sepsis treatment module. The sepsis treatment module is linked with the sepsis observation module. In the same way, the weaning treatment module **23** is linked with the weaning observation module **25**. It is also possible to use the clinician support system only for the decision process **4** or the treatment process **6** or the observation process **8**.

[0038] The decision support module **3**, treatment support module **5**, observation support module **7** are linked to an information delivery tool **27**. A further storage **31** to store patient related information and to store guidelines supported by the clinician support module such as the Sepsis Resuscitation Bundle, is provided.

[0039] In the following the invention is described for the disease of sepsis/septic shock in more detail. Of course the use of the clinician support system is not limited to this example.

[0040] The clinician support system **1** comprises decision support module **3**, treatment support module **5** and observation support module **7**.

[0041] The decision support module **3** comprises the sepsis decision module **17**. The sepsis decision module **17** provides support in respect of measurement values and evaluation of the patient status compared to the standardized sepsis guidelines criteria.

[0042] The surviving sepsis campaign (SSC) developed a guideline for detection, treatment and observation of septic patients. The clinician support system **1** supports the clinician in using for example the surviving sepsis campaign (SSC) guidelines. The clinician support system **1** assists in recognizing the early signs and symptoms of the specified diseases, for example sepsis, by comparing the detected state of the patient to the guidelines criteria. After recognition of this specific disease, the clinician is guided through the recommended treatment steps as defined in the guideline by the treatment support module **5** comprising disease-specified treatment module **13**, here sepsis treatment module **19**.

[0043] When the sepsis decision module **17** has recognized that the specified criteria have been met, the sepsis decision module **17** triggers to display of a predetermined window. This window requests a confirmation of the presence of infection and sepsis-related organ dysfunction by a qualified person. It is possible to display the window for this request only on a bedside patient monitor **101** assigned to that patient to make sure that the qualified person gets an impression of the acuteness.

[0044] The sepsis treatment module **19** is activated by a qualified trigger signal generated through the manual input **105** of the bedside patient monitor. Only a professional clinician is qualified to generate the qualified manual input trigger signal. The recognition of a manual input trigger signal generated by a qualified person could be approved by a requested identification code, fingerprint and so on.

[0045] The treatment support module **5** supports the treatment of the patient in general, said treatment support module comprises disease-specified treatment modules **13** to provide support in the treatment of a special disease. So to carry out the sepsis treatment guideline named Sepsis Resuscitation Bundle is supported by the sepsis treatment module **19**.

[0046] The sepsis treatment module triggers the display of the surviving sepsis campaign (SSC) recommendations listings for resuscitation on the display of the bedside patient monitor.

[0047] The recommendations can be checked off as they are implemented. After the sepsis treatment module **19** recognizes the achievement of all the resuscitation goals, or after

6 hours at the latest, the sepsis treatment module **19** is completed and the sepsis observation module **21** is activated by a trigger signal generated by the treatment support module **19**.

[0048] The sepsis observation module **21** supports the clinician to carry out the Sepsis Management Bundle—the SSC recommendations to maintain patient status are listed and can be checked off as they are implemented. The Sepsis Management Bundle ends when 24 hours have passed since the Sepsis Resuscitation Bundle began, or if all recommendations of the Management Bundle were checked off, FIG. **2**. If a patient has already been diagnosed as septic before connecting him to the monitor, the septic treatment module can be activated/entered by a qualified manually generated trigger signal.

[0049] In FIG. **3** a bedside patient monitor **101** comprising a clinician support module **1** is shown. The bedside patient monitor **101** comprises a first interface **105** connected to a keyboard **111** and a second interface **107** connected to at least one patient-connected device or sensor. The patient-connected device is used for providing physiological information automatically, for example continuous temperature measurements. The bedside patient monitor comprises a display **103**. The bedside patient monitor comprises the option to establish a connection to a clinical network **115** and/or the Internet. The network connection can be a wireless connection. The Internet connection can be used to update stored clinician recommendations and guidelines on a regular basis automatically. Further, the Internet or clinician network connection can be used to provide patient-related information generated for example at a microbiological laboratory, which could be separate from the hospital.

[0050] If a disease-specific predetermined set of information is recognized by the clinician support system **1**, the disease-specific decision support module **11** is started. In the case of sepsis the sepsis decision module **17** is started as soon as an adult patient is connected to the bedside patient monitor, and heart rate or pulse is being measured. The sepsis decision module **17** triggers to observe heart rate, temperature and respiration rate values in the background. If temperature information or respiration rate information is not measured continuously by way of a sensor **108** connected to a second interface **107** for continuous measurement, a pop-up window will appear at predetermined intervals, for example 4-hour intervals, to trigger the manual measurement and input of the requested information. The information will be delivered to the sepsis decision module by use of the first interface **105** for manual input. The pop-up window can be closed without entering the requested information, but after a predetermined interval, preferably shorter than the normal interval, pop up of this window is triggered again by the sepsis decision module **17**.

[0051] The manually entered values are labeled with the information about the person and time of input. These available values are all compared to the sepsis guideline criteria: HR above 90, Temp above 38.3° C. (100.9° F.) or below 36.0° C. (96.8° F.), respiration rate (RR) above 20.

[0052] If any one of the values fulfils the screening criteria, the sepsis decision module **17** triggers display of an Infection Signs and Symptoms window shown in FIG. **4**.

[0053] The measured value, which has fulfilled the criteria, is shown blinking (in the example shown above it is tachycardia).

[0054] There will be a check box for the infection signs and symptoms listed,

[0055] if the clinician support system received requested information through the second interface **107**, wherein the delivered information meets the guideline criteria, and

[0056] for all signs and symptoms which are not available through the second interface **107** or the information delivery tool **27**.

[0057] The information delivery tool **27** is part of the clinician support system **1** as described before. The information delivery tool **27** sends requests to remote locations to provide the needed information, for example to collect the requested information from a connected central station or a connected remote medical laboratory center. If the requested information is not delivered by the information delivery tool **27**, a window is triggered by the sepsis decision module **17** to trigger a manual input.

[0058] The clinician is requested to check a box whether the sign or symptom in question is both present and new, if so a confirmation is requested by the sepsis decision module **17**. If the patient is mechanically ventilated, the Tachypnea box must be checked. If temperature or respiration rate is measured manually, the measured values can be delivered by using an "Enter RR" key (not shown) for respiration rate input and "Enter Temp" key (not shown) for manual temperature input. By selection of "Confirm" key **125** confirmation information is stored by the clinician support system **1**, here by the sepsis decision module **17**.

[0059] If a request window is closed without input, the request window will be triggered again after a predetermined period of time, especially after less than 15 min or 10 min or 5 min.

[0060] Further, the window will reappear, triggered by the sepsis decision module **17** if the HR, Temp or RR value, which previously fulfilled the criteria, now becomes worse, or after 8 hours, configurable to 12 hours, if at least one infection sign is still present.

[0061] If the sepsis decision module **17** recognized confirmation of two or more infection signs in the Infection Signs and Symptoms window of FIG. **4**, a new pop-up window is triggered by the sepsis decision module **17** shown in FIG. **5**, which window will appear on the display of the bedside patient monitor **101**. In the following, all described windows are displayed on the display of the bedside patient monitor **101**.

[0062] If the sepsis decision module **17** receives a signal representing that "Yes" is selected, the next screen is triggered by the sepsis decision module **17** requesting an input of a lactate measurement value.

[0063] If a signal representing the selection of "No" is received by the sepsis decision module **17**, the decision phase will continue and the Infection Signs and Symptoms window, see FIG. **4**, reappears if the measurement value which previously fulfilled the criteria becomes worse, or after 8 hours (configurable to 12 hours) at the latest if at least one infection sign is still present, which reappearance is triggered by the sepsis decision module.

[0064] Manual lactate input, see FIG. **6**:

[0065] The user is invited to manually enter the Lactate value, see FIG. **6**, by selecting an "Enter Lact" key **121** if the lactate value is not provided to the sepsis decision module by the information delivery tool **27**. If the information is delivered by the information delivery tool **27**, the window of FIG.

5 does not appear. If the value entered is >4 mmol/l, the check box will be automatically checked.

[0066] By selecting "Confirm" **125** the entered value is sent to the sepsis decision module and the confirmation information is stored by the clinician support system. All information delivered during the use of the clinician support system **1** is stored in a storage, which is part of the bedside patient monitor. Additionally, storage of the provided information at a central storage of a connected central station can be made possible.

[0067] If a signal representing a Lactate value >4 mmol/l arrives at the sepsis decision module, the sepsis decision module **17** recognizes that the value meets the SSC guidelines criteria for sepsis. The sepsis decision module **17** triggers the display of a window to request approval by authorized clinician review. By a signal representing the authorized clinician review, the sepsis decision module is deactivated and the sepsis treatment module is activated. The signal representing authorized approval is generated by the manual input **105**.

[0068] If a signal representing a Lactate value ≦4 mmol/l is delivered to sepsis decision module **17**, a further window will appear, triggered by the sepsis decision module **17**, in the case that the blood pressure value is not made available by the second interface **107** for continuous measurement. This window requests manual input of blood pressure values to determine on the basis of blood pressure values whether the patient meets the sepsis guideline criteria for sepsis.

[0069] Hypotension Evaluation

[0070] If the Lactate value was not above 4 mmol/l, the sepsis decision module **17** triggers the next window, see FIG. **7**, to request the input in respect of persistent hypotension.

[0071] Hypotension is defined by the SSC guidelines as:

[0072] SBP <90 mmHg (12.0 kPa), or

[0073] MAP <65 mmHg (9.0 kPa), or

[0074] SBP decrease >40 mmHg (5.0 kPa) below baseline.

[0075] By selecting "Show Details" key **127**, the definition of hypotension defined in the sepsis guidelines will be displayed. By selecting YES, persistent hypotension as defined in the sepsis guidelines is recognized by the sepsis decision module **17**. Then a final window is triggered requesting authorized approval, by which authorized approval a signal is generated to deactivate the sepsis decision module **17** and to activate the sepsis treatment module **19**, FIG. **9**.

[0076] If a signal is generated representing the input that the patient does not have persistent hypotension, the sepsis decision module **17** triggers the appearance of the window shown in FIG. **8** after one hour. Information about the presence of a previously acknowledged infection is requested.

[0077] By inputting "Yes", the checks, see FIG. **6**, FIG. **7**, will be repeated. If "No" is selected, the decision support module **17** will continue—comparing heart rate, temperature and respiration rate values against the SSC criteria.

[0078] It is possible to review the process supported by the sepsis decision module by selection of button "Protocol Log" **129**, which causes a display of the captured information to be triggered. It is possible to print out this documentation, see FIG. **14**.

[0079] The sepsis treatment module **19** to support the clinician during the treatment process can be started by an authorized person only.

[0080] Sepsis Treatment Module

[0081] The clinician is supported to carry out the treatment of the patient in the recommended way proposed by SSC by using the sepsis treatment module **19**. The treatment recommendations from SSC referred to as Sepsis Resuscitation Bundle (SRB) is presented in the display of the bedside patient monitor triggered by the sepsis treatment module **19**, see FIG. **10**. Further, the sepsis treatment module **19** monitors the implementation of the recommendations.

[0082] The sepsis treatment module **19** activates an indicator to show that the sepsis treatment module is activated. In this example the indicator is a yellow alarm displayed by the display of the bedside patient monitor.

[0083] The lower area of the display of the bedside patient monitor contains:

[0084] a reminder list of the treatment recommendations

[0085] a timer showing the time already passed in this phase

[0086] three horizon trends for MAP, CVP and ScvO2 or SvO2, if these measured values are available.

[0087] If ScvO2 or SvO2 are not being continuously delivered through the second interface **107**, a pop-up window will appear at hourly intervals to ask for a manually measured value triggered by the sepsis treatment module **19**. When the window is closed without the requested information having been filled in, a pop-up window will appear after a predetermined time slice. The predetermined time slice is especially 10 or 15 minutes after the first pop up window appeared to request the required information.

[0088] The treatment process **6** according to the SRB supported by the sepsis treatment module **19** is monitored by the clinician support system. The status of all or one of the supported processes will be displayed on the display of the bedside patient monitor, if requested, using protocol log key **129**. A standard clinician support window can be selected, so that the status of the running treatment module is displayed on the screen or display of the bedside patient monitor. If the clinician support window is not displayed, the display can be activated by user input. The clinician support system window **131** is displayed in the lower area of the patient monitor display. If the clinician support system window **131** is not displayed, the status of the running treatment modules, here at least status information about the running sepsis treatment process, appears on the display of the bedside patient monitor automatically once an hour, triggered by the sepsis treatment module **19**.

[0089] In FIG. **11** the window for displaying the status of the treatment process of sepsis supported by the sepsis treatment module is shown. This window is displayed on the screen of the bedside patient monitor. The window content is in conformity with the treatment guidelines proposed by the SSC.

[0090] By selection of "Enter Lact" key or button **121**, the process of manual information input of the lactate value is supported and the information will be stored by the clinician support system. When the lactate value is entered, or if a lactate value has previously been entered or delivered by the information deliver tool **27**, the box will be checked.

[0091] Further, the clinician is supported by the registration of blood cultures that were taken. The information of these blood cultures can be delivered to the sepsis treatment module by manual input. The information expected from the registered blood cultures can be requested automatically after a predetermined time slice by the information delivery tool. By checking the "Administer Intravenous Antibiotics" box the clinician is supported in noting the starting time of broad spectrum antibiotic therapy in a convenient way.

[0092] The remaining three recommendations of the SSC treatment guideline will be automatically compared to the available information by the sepsis treatment module **19**. Therefore, the signals available through the second interface **107** will be checked. A box will be checked when the sepsis treatment module has recognized that the recommendation has been fulfilled.

[0093] If the ScvO2 value is manually measured, the value can be entered in a convenient way by using the "Enter ScvO2" key **123**. The box will be checked automatically on whether the value fulfils the recommendation.

[0094] In the case that MAP ScO2/SvO2 values are not automatically delivered to the sepsis treatment module **19** by the second interface for continuous measurement and neither by the information delivery tool **27**, the sepsis treatment module **19** provides the possibility for manual input, which is possible, at the earliest, when the timer indicates that 4 hours have lapsed since the activation of the sepsis treatment module **19** to ensure that these values are maintained halfway through treatment. The boxes are checked on whether if the recommendation has been fulfilled.

[0095] More details of the recommendations are displayed on the screen of the bedside monitor by choosing "show details" key **127**. This information is stored in the clinician support system storage **31** supporting sepsis. The bedside patient monitor comprises a confirm button. The sepsis treatment module **19** recognizes the activation of the confirm button by an authorized person. Thus it is stored that the check boxes reflect the current treatment status.

[0096] During the sepsis treatment phase an overview window displaying the sepsis treatment status and enabling entries to be made can be opened, see FIG. **11**. The recommendations will be shown as follows:

[0097] Recommendations, which are not yet fulfilled, are shown in black. They also appear in the list in the lower area of the clinician support system screen.

[0098] Recommendations of the SSC guidelines which are overdue, are shown in red.

[0099] In the lower area of the clinician support system screen, all recommendations are displayed. The recommendations that have been carried out are shown in gray.

[0100] Ending Sepsis Treatment Module

[0101] When all recommendations have been fulfilled and confirmed, or when 6 hours have passed since the treatment module was started, the sepsis treatment module **19** is deactivated. A window is generated by the clinician support system **1** to trigger the clinician to generate a confirmation signal to start the sepsis observation module **21**. By pressing the "NO" key a signal is generated to trigger an extension in the active state by 1 hour of the sepsis treatment module **19**.

[0102] Sepsis Observation Module

[0103] After deactivation of the sepsis treatment module the clinician is supported in the observation of the patient's status by the sepsis observation module. The SSC has generated a guideline to observe the status of the patient after finishing the sepsis treatment of the patient. The guideline is named Sepsis Management Bundle (SMB). The parameters of the observation guideline supported by the sepsis observation module **21** are presented and the implementation of the recommendations is monitored. When the sepsis observation phase begins, the clinician support system screen **131** will automatically appear on the monitor (if configured and available on the monitor). In the lower area of the display, the list of recommendations for the observation phase will replace the list for the treatment phase. The timer shows the combined time for the treatment and the observation phases.

[0104] Monitoring the Sepsis Management Bundle Recommendations

[0105] By the selection of the lower area of the clinician support system screen, a signal is generated to trigger the appearance of the sepsis observation window, see FIG. **13**. In the case that the observation is not triggered by manual input, the sepsis observation window will appear automatically once every six hours, triggered by the sepsis observation module **21**, see FIG. **13**.

[0106] This window supports the clinician to check the "Low Dose Steroids" recommendation and/or the "Drotrecognin Alfa" recommendation. These parameters may not be requested if the sepsis observation module **21** or observation support module has been configured not to do so in the actual hospital. The clinician is requested to check the "Low Dose Steroids per policy" box at the time of starting steroid therapy.

[0107] The clinician is requested to check the "Drotrecogin Alfa per policy" box at the time of starting recombinant human activated protein C therapy.

[0108] The clinician is requested by the window shown in FIG. **13** to check the boxes "Glucose" and "Inspiratory Plateau Pressure" when the timer has reached 20 hours to ensure that long-term stabilization of these values is achieved. These boxes should be checked if the recommendations are fulfilled.

[0109] By pressing the details button **127** on the screen, a window containing more details about the recommendations will be opened. The recommendations are stored in the sepsis observation module **21**. Therefore, the clinician support system comprises a storage **31**, which is part of the bedside patient monitor.

[0110] The stored recommendations can be updated from time to time via the internet or the planned maintenance service.

[0111] By pressing the confirm button **125** on the sepsis observation screen, a signal is generated assigned to the actual treatment status reflected by the checked boxes.

[0112] Ending Sepsis Observation Phase

[0113] The sepsis observation phase support provided by the sepsis observation module **21** normally ends 24 hours after the sepsis treatment module **19** is started, as documented by the clinician support system timer on the clinician support system screen.

[0114] The clinician will be asked to confirm with the "Yes" key that normal monitoring should now begin. By selecting "No", the sepsis observation phase supported by the sepsis observation module **21** is extended by a further 6 hours.

[0115] After completion of active observation, and a sepsis standby phase supported by the sepsis observation module begins. The sepsis standby phase allows time for further patient stabilization and recovery. During this phase, the sepsis decision module **17** is suspended. The standby phase is by default 7 days but can be adjusted in the configuration mode of the sepsis observation module **21**.

[0116] In the storage **31** all user interactions, alarms and phase transitions of one disease-specified support are stored. So all user interactions and alarms and phase transitions during the sepsis treatment supported by the sepsis decision, sepsis treatment and sepsis observation module are stored. The user can request to display this stored information on the display of the bedside patient monitor by pressing the protocol log key **129**, and by pressing a print button, this information is printed on a connected printer. The displayed overview

can be restricted, or not, to one disease. So disease-specific overview sheets can be generated by the clinician support system **1**. A sepsis related overview generated by the clinician support system **1** is shown in FIG. **14**. This storage contents is cleared whenever the patient assigned to the bedside monitor is discharged.

[0117] It is essential that patients are discharged when monitoring ends. As a reminder, the clinician support system **1** generates a pop-up window when the monitor has been switched off or is in standby mode, or is not monitoring basic vitals for a predetermined time, especially more than 6, or 12 hours. This window supports the clinician to discharge a patient by asking whether a new patient is being monitored, and offers a pop-up key to discharge the previous patient if this is the case.

[0118] The process of the sepsis decision, sepsis treatment and sepsis observation procedure described before is stored in a history file, which could be displayed and printed. The history file could be used to figure out which person has made for an example a manual entry or checked off recommendations, see FIG. **14**.

REFERENCE NUMERALS

[0119] **1**. clinician support system
[0120] **3**. decision support module
[0121] **4**. decision process
[0122] **5**. treatment support module
[0123] **6**. treatment process
[0124] **7**. observation support module
[0125] **8**. observation process
[0126] **11**. disease-specified decision module
[0127] **13**. disease-specified treatment module
[0128] **15**. disease-specified observation module
[0129] **17**. sepsis decision module
[0130] **19**. sepsis treatment module
[0131] **21**. sepsis observation module
[0132] **23**. weaning treatment module
[0133] **25**. weaning observation module
[0134] **27**. information delivery tool
[0135] **29**. network connection
[0136] **31**. local storage
[0137] **101**. bedside patient monitor
[0138] **103**. display/screen
[0139] **105**. first interface—for manual patient-related input
[0140] **107**. second interface—automated sensor signal input
[0141] **109**. sensor
[0142] **115**. network connection
[0143] **119**. central station
[0144] **121**. Lact key
[0145] **123**. ScvO2 key
[0146] **125**. confirm key
[0147] **127**. details key
[0148] **131**. clinician support window

1. A bedside patient monitor comprising
a clinician support system,
a first interface for manual patient-related input and
a second interface for continuous input of sensor signals, wherein
the clinician support system comprises at least one of the following modules:
a disease specified decision module,
disease-specified treatment module or
disease-specified observation module.

2. A bedside patient monitor as claimed in claim **1**, wherein the clinician support system comprises at least one disease-specified treatment module to support the clinician in the treatment process, wherein the disease-specified treatment module being started only by a qualified manual input trigger signal.

3. A bedside patient monitor as claimed in claim **2**, wherein the clinician support system comprises at least one observation support module for observation of the treated patient, the disease-specified observation module being activated by a signal generated through deactivation of the disease-specified treatment module.

4. A bedside patient monitor as claimed in claim **2**, comprising an indicator for signaling the running treatment procedure.

5. A bedside patient monitor as claimed in claim **1**, wherein the clinician support system comprises an information delivery tool to deliver requested information requested by at least one of the disease-specified modules, wherein the information delivery tool generates a pop-up window to trigger manual input through the first interface if the requested information is not available through the interface for automatic input or connected remote sources.

6. A bedside patient monitor as claimed in claim **5**, wherein the remote resource is a remote central station or remote microanalysis center.

7. A method of clinician support with disease-specified modules to support decision process, treatment process for observation process, wherein
automatic input is recognized and manual input is triggered to deliver non-available information, wherein
the information being requested by the running supported process to deliver the information through the first interface.

8. A method of clinician support as claimed in claim **7**, wherein different disease-specified modules of different diseases could be active in parallel, and only one module of a specified disease is running at the same time.

9. A method of clinician support as claimed in claim **8**, wherein the manual input of information request triggered by a running disease-specified treatment module is executed before a manual input request triggered by a running decision module is executed.

10. A method of clinician support as claimed in claim **8**, wherein a manual input of information request triggered by a running disease-specified decision module is executed before a manual input request triggered by a running disease-specified observation module is executed.

11. A method of clinician support as claimed in claim **7**, wherein an unanswered manual information request will reappear after a predetermined time slice, preferably 5 or 10 minutes.

12. A method as claimed in claim **7**, wherein a status overview of a running module is displayed automatically at least once an hour.

* * * * *

专利名称(译)	临床医师决策支持系统		
公开(公告)号	US20100010319A1	公开(公告)日	2010-01-14
申请号	US12/445366	申请日	2007-10-08
[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
申请(专利权)人(译)	皇家飞利浦电子N.V.		
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IPC分类号	A61B5/00 G06F19/00		
CPC分类号	G06F19/363 G06F19/3481 G16H10/20 G16H20/00 G16H40/63 G16H20/40		
优先权	2006122149 2006-10-12 EP		
其他公开文献	US10650915		
外部链接	Espacenet USPTO		

摘要(译)

床边病人监护仪包括临床医生支持系统。临床医生支持系统包括以下模块中的至少一个：疾病指定的决策模块（11），疾病指定的治疗模块（13）或疾病指定的观察模块（15）。床边监测器包括用于手动患者相关输入的第一接口（105）和用于连续输入传感器信号的第二接口（107）。支持临床医生递送所请求的信息并以临床医生支持系统支持的预定方式执行治疗。