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(54) **DIAGNOSTIC AND INTERVENTION TOOLS FOR EMERGENCY MEDICAL DISPATCH**

DIAGNOSE- UND INTERVENTIONSINSTRUMENTE FÜR MEDIZINISCHEN NOTMELDER

OUTILS DE DIAGNOSTIC ET D'INTERVENTION POUR RÉPARTITION MÉDICALE D'URGENCE

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**EP 2 152 146 B1**

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## Description

### Technical Field

**[0001]** This invention relates to a dispatch center computer system to assist a dispatcher in responding to a caller regarding a medical emergency of a patient. This invention also relates to a computer implemented method for assisting a dispatcher to respond to an emergency caller regarding a medical emergency of a patient. This invention further relates to a computer readable storage medium having stored thereon computer instruction code to perform the method.

### Background

**[0002]** US 6,004,266 A describes a method and system for receiving, processing and responding to emergency medical calls for patients with heart problems is described. A consistent, standard and systematic process is provided which in combination with adequate training, supervision and quality assurance serves to provide a method for gathering emergency medical information regarding a patients heart problems, categorizing such information into various determinant levels for appropriate response, and for giving qualified emergency medical information to callers thereby permitting "zero time" response by those at the scene. By using this invention properly a dispatcher is guided through the interrogation of callers concerned with heart problems, gathering critical information and giving the appropriate guidance to the caller. This invention specifically guides the dispatcher through the steps of the heart problem protocol, thereby identifying the degree of urgency of heart problem complaints and appropriately dispatching emergency medical responders.

**[0003]** US 6,076,065 A describes a method and system for receiving, processing and responding to emergency medical calls for patients with pregnancy related medical problems is described. A consistent, standard and systematic process is provided which in combination with adequate training, supervision and quality assurance serves to provide a method for gathering emergency medical information regarding a patients pregnancy problems, categorizing such information into various determinant levels for appropriate response, and for giving qualified emergency medical information to callers thereby permitting "zero time" response by those at the scene. By using this invention properly a dispatcher is guided through the interrogation of callers concerned with pregnancy, childbirth or miscarriage medical problems, gathering critical information and giving the appropriate guidance to the caller. This invention specifically guides the dispatcher through the steps of the pregnancy/childbirth/miscarriage protocol, thereby identifying the degree of urgency of such complaints and appropriately dispatching emergency medical responders.

**[0004]** US 5,857,966 A describes a method and sys-

tem for receiving, processing and responding to emergency medical calls for patients who have fainted or are unconscious is described. A consistent, standard and systematic process is provided which in combination with adequate training, supervision and quality assurance serves to provide a method for gathering emergency medical information regarding providing emergency medical dispatch services to patients who are unconscious or have fainted, categorizing such information into various determinant levels for appropriate response, and for giving qualified emergency medical information to callers thereby permitting "zero time" response by those at the scene. By using this invention properly a dispatcher is guided through the interrogation of callers concerned with patients who are unconscious or have fainted, gathering critical information and giving the appropriate guidance to the caller. This invention specifically guides the dispatcher through the steps of the unconsciousness protocol, thereby identifying the degree of urgency of such complaints and appropriately dispatching emergency medical responders.

**[0005]** US 6,594,634 A describes an event reporting program which electronically records information critical to reconstructing events occurring during an emergency incident. The event reporting program includes an event recording component for recording events as they occur during the incident, and a post-processing component for further processing the events recorded by the event recording component after completion of the incident. The event recording component enables an emergency service provider to input a plurality of event records describing each event as it occurs and the time at which each event takes place. The event recording component also enables an emergency service provider to input a predefined protocol of expected event records. Each expected event record identifies an event which is expected to occur during the incident and a time at which the event is expect to occur. Finally, the event recording component also includes a number of tools for providing and/or recording information in addition to the event records to the emergency service provider, e.g., an address book, drug guidelines, a narrative recorder, etc. The post-processing component, on the other hand, enables the user to modify or add to the event records and other information previously recorded by the event recording component. In addition, the post-processing component exports event records to and imports event records from external devices, such as a remote computer or medical electronic device. Finally, the post-processing component generates a run report including the recorded event records and information related to the incident.

**[0006]** US 2006/122520 A1 describes a medical device that measures vital signs (e.g., blood pressure, pulse oximetry, and heart rate) from a patient using at least two optical modules. Each optical module typically features two light sources (red, infrared) and a photodetector. Both optical modules are configured to measure time-dependent signals describing the patient's flowing blood.

A processor analyzes the time-dependent signals to determine the patient's vital signs. Once the vital signs are measured, a wireless transmitter in the body-worn device transmits them to an external device. Processing signals from least two optical modules compensates for motion-related artifacts and noise normally present in signals used to determine vital signs from a device featuring just a single optical module.

**[0007]** US 2006/173500 A1 describes system in which patient data, such as an electrocardiogram ("ECG") signal or a chest impedance measurement signal, collected by a defibrillator device during a resuscitation event is analyzed and processed by a computing device to provide an assessment of CPR administered during the event. The CPR assessment results in one or more CPR figures of merit that relate to temporal characteristics of the CPR relative to the duration of the event. In one embodiment, the CPR figure of merit represents a percentage of the event period during which chest compressions were administered to the patient.

#### Summary of the Invention.

**[0008]** According to an aspect of the invention, there is provided a dispatch center computer system according to claim 1.

**[0009]** According to an aspect of the invention, there is provided a computer implemented method according to claim 10.

**[0010]** According to an aspect of the invention, there is provided a computer readable storage medium according to claim 19.

**[0011]** Further features according to embodiments of the invention are set out in the dependent claims.

#### Brief Description of the Drawings

**[0012]** Non-limiting and non-exhaustive embodiments of the disclosure are described, including various embodiments of the disclosure with reference to the figures, in which:

FIG. 1 is a block diagram of an embodiment of an emergency medical dispatch system;

FIGS. 2A-2F illustrate an embodiment of an interface of a breathing detector tool;

FIGS. 3A-3D illustrate an embodiment of an interface of a pulse check tool;

FIGS. 4A-4D illustrate an embodiment of an interface of a pregnancy contractions timer tool; and

FIGS. 5A-5D illustrate an embodiment of an interface of a compressions monitor tool.

#### Detailed Description

**[0013]** The embodiments of the disclosure will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout. It will be readily understood that the components of the disclosed embodiments, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations. Thus, the following detailed description of the embodiments of the systems and methods of the disclosure is not intended to limit the scope of the disclosure, as claimed, but is merely representative of possible embodiments of the disclosure. In addition, the steps of a method do not necessarily need to be executed in any specific order, or even sequentially, nor need the steps be executed only once, unless otherwise specified.

**[0014]** In some cases, well-known features, structures or operations are not shown or described in detail. Furthermore, the described features, structures, or operations may be combined in any suitable manner in one or more embodiments. It will also be readily understood that the components of the embodiments as generally described and illustrated in the figures herein could be arranged and designed in a wide variety of different configurations.

**[0015]** Several aspects of the embodiments described will be illustrated as software modules or components. As used herein, a software module or component may include any type of computer instruction or computer executable code located within a memory device and/or transmitted as electronic signals over a system bus or wired or wireless network. A software module may, for instance, comprise one or more physical or logical blocks of computer instructions, which may be organized as a routine, program, object, component, data structure, etc., that performs one or more tasks or implements particular abstract data types.

**[0016]** In certain embodiments, a particular software module may comprise disparate instructions stored in different locations of a memory device, which together implement the described functionality of the module. Indeed, a module may comprise a single instruction or many instructions, and may be distributed over several different code segments, among different programs, and across several memory devices. Some embodiments may be practiced in a distributed computing environment where tasks are performed by a remote processing device linked through a communications network. In a distributed computing environment, software modules may be located in local and/or remote memory storage devices. In addition, data being tied or rendered together in a database record may be resident in the same memory device, or across several memory devices, and may be linked together in fields of a record in a database across a network.

**[0017]** Suitable software to assist in implementing the invention is readily provided by those of skill in the per-

tinient art(s) using the teachings presented here and programming languages and tools, such as Java, Pascal, C++, C, database languages, APIs, SDKs, assembly, firmware, microcode, and/or other languages and tools. Suitable signal formats may be embodied in analog or digital form, with or without error detection and/or correction bits, packet headers, network addresses in a specific format, and/or other supporting data readily provided by those of skill in the pertinent art(s).

**[0018]** A medical dispatch system disclosed herein may be computer-implemented in whole or in part on a digital computer. The digital computer includes a processor performing the required computations. The computer further includes a memory in electronic communication with the processor for storing a computer operating system. The computer operating systems may include MS-DOS, Windows, Unix, AIX, CLIX, QNX, OS/2, and Apple. Alternatively, it is expected that future embodiments will be adapted to execute on other future operating systems. The memory also stores application programs including a Computer Aided Dispatch (CAD) program, an emergency medical dispatch protocol, and a user interface program, and data storage. The computer further includes an output device, such as a display unit, for viewing the displayed instructions and inquiries and as a user input device for inputting response data.

**[0019]** Referring to Figure 1, one embodiment of a computer-aided medical dispatch system 100 is shown. At a dispatcher center 102, a dispatcher 104 operates a computer 106 that executes an emergency medical dispatch protocol 108 to enable the dispatcher to rapidly and consistently address a medical emergency. The emergency medical dispatch protocol 108 provides a logic tree with questions, possible responses from a caller, and instructions to a caller. The responses may route to subsequent questions and/or instructions to the caller. The responses are processed according to predetermined logic to both provide the correct emergency medical dispatch response and the appropriate doctor-approved post-dispatch instructions to the call taker before professional help arrives. Exemplary embodiments of such medical dispatch protocols are disclosed in U.S. Patent Nos. 5,857,966, 5,989,187, 6,004,266, 6,010,451, 6,053,864, 6,076,065, 6,078,894, 6,106,459, 6,607,481, and 7,106,835.

**[0020]** The computer 106 operates a determinant value calculator 110 to calculate a determinant value from the caller's responses to protocol questions. The computer 106 presents the determinant value to generate an appropriate emergency response. Since the questions asked and the recommendations that are made deal directly with life and death decisions, the protocols used shall have passed through a rigorous medical review by a panel of doctors and EMS public safety experts who specialize in emergency medicine.

**[0021]** Since many calls for medical service are not true medical emergencies, it is important to prioritize the calls in several ways. First, calls that are true emergen-

cies should be dispatched first. Second, if an agency has units with different capabilities, the more severe medical problems should receive the more advanced units. And finally, if lights-and-siren are not needed from a medical standpoint, they should not be used, thereby increasing the safety of all those on the road and in the emergency vehicles. While many medical calls are not true emergencies, all situations can benefit from medical evaluation and instruction. Prior to the arrival of professional help on-scene, the dispatch system provides instructions that are appropriate to the type of call, from minor lacerations to someone who is not breathing.

**[0022]** The determinant value provides a categorization code of the type and level of the incident, the code is provided to a Computer Aided Dispatch (CAD) system 112, which is a tool used by dispatchers to track and allocate emergency response resources, for processing. The CAD system 112 may operate in whole or in part on a separate computer in communication with computer 106. The primary information used in this task is location information of both the incident and units, unit availability and the type of incident. CAD systems may use third party solutions, such as E-911, vehicle location transponders and MDT's for automating the location and availability tasks.

**[0023]** The computer 106 may include a reporting module 114 to statistically measure the performance of individual staff and overall center performance. These statistics include compliance rates, call processing statistics, and peer measurements.

**[0024]** The dispatch center 102 includes telephony equipment 116 to answer emergency calls. A call into the dispatch center 102 from a caller 118 initiates creation of a medical call incident. The dispatcher 104 identifies the call as requiring an emergency medical dispatch, and the emergency medical dispatch protocol 108 is accessed. Some protocol questions are readily answered, whereas others are more difficult. Certain diagnostic inquiries may be difficult for the untrained caller to determine. The protocol 108 may provide instructions that are expertly drafted to assist a novice caller in diagnosing a patient's condition. The protocol 108 may also provide expertly drafted first aid instructions to assist a patient prior to the arrival of emergency responders.

**[0025]** In addition to instructions, the medical dispatch system 100 may provide computer-implemented diagnostic tools 120. The diagnostic tools 120 may be stored in the memory of the computer 106 and initiated and executed as required. The diagnostic tools 120 may be embodied as computer executable software applications and associated data. The protocol 108 may call on a diagnostic tool 120 to assist in an interrogatory and may route to a diagnostic tool 120 when needed. The diagnostic tools 120 allow a dispatcher 104 to provide consistent, expert advice to assist a caller in determining a vital sign.

**[0026]** The medical dispatch system 100 may automatically, i.e., without dispatcher intervention, initiate a diag-

nostic tool 120. This may occur when the emergency medical dispatch protocol 108 arrives at such a diagnosis step and initiates a corresponding diagnostic tool 120. The system 100 may also allow the dispatcher 104 the option to call upon a diagnostic tool 120 as desired. Icons may be displayed in a tool bar, or other convenient location on a user interface to allow the dispatcher 104 to initiate a corresponding diagnostic tool 120.

**[0027]** In determining vital signs, the diagnostic tools 120 are computer implemented software modules to provide consistent instruction and reliable timing. One of the benefits of the diagnostic tools 120 is the computer aided timing of techniques to determine the vital signs. In highly stressful conditions, the diagnostic tools provide a necessary resource to reading critical signs.

**[0028]** Diagnostic tools 120 discussed herein include a breathing detector 122, pulse check 124, a pregnancy contractions timer, and a CPR compressions monitor 126. The diagnostic tools 120 are each discussed in reference to figures of graphical user interfaces that exemplify certain embodiments. One of skill in the art will appreciate that such interfaces may be implemented and designed in various ways and still be within the scope of the invention.

**[0029]** Referring to Figure 2A, an embodiment of a graphical user interface 200 for a breathing detector is shown. The interface 200 may include instructions 202 that the dispatcher 104 reads to the caller 118. The instructions 202 require that the caller 118 indicate each time a patient takes a breath starting immediately. The interface 200 may include a start button 204 to initiate the detection process. The dispatcher 104 clicks on the start button 204 which starts a timer 206. The timer 206 records the entire time of the detection process.

**[0030]** The interface 200 includes a breath button 208 which the dispatcher 104 clicks each time the caller indicates that a breath is taken. Initially, the breath button 208 may state "1<sup>st</sup> breath" to indicate the first breath of a patient. After clicking once, the breath button 208 may then state "2<sup>nd</sup> breath" and so forth to indicate the number of breaths. The interface 200 may include an urgent stop button 210 to terminate the detection process. The interface 200 further includes a clear/recheck button 212 to clear the received data and begin the detection process again. A breathing rate field 214 indicates breaths per minute based on breathing intervals. A pattern analysis field 216 provides a determined average breathing rate.

**[0031]** A bar chart 218 is provided which provides feedback on breathing intervals. Each bar 220 corresponds to a breathing interval and indicates the quality of the interval. An interval timer 222 records the duration of the present interval. The interval timer 222 is reset each time a breath is recorded to then illustrate the duration of the next interval. As illustrated, four breathing intervals may be recorded for a detection process. The interface 200 includes a recommendations field 224 which displays recommendations and instruction generated by the breathing detector 122 upon termination of the process.

**[0032]** In the illustrated embodiment, a dispatcher 104 may click on the start button to initiate 204 once and the breath button five times to define four intervals. After reviewing the recommendations field 224, the dispatcher 104 may act immediately to generate a dispatch response. A dispatcher 104 may also return to the protocol 108 and enter a result of the detection process which will affect protocol outcome. Thus, the resulting determinant value may be based on the outcome of the detection process. In one embodiment, a determinant value may be automatically generated based on the outcome of the detection process.

**[0033]** The interface 200 may also include a close button 226. When operated, the close button terminates execution of the breathing detector 122. The dispatcher 104 may then return to the protocol 108.

**[0034]** Figures 2B through 2E illustrate different results of a detection process performed by the breathing detector. In Figure 2B, the timed values of different intervals are shown are shown in field 214 with corresponding, approximate breath-per-minute rates. An average breathing rate based on the breath intervals is displayed in pattern analysis field 216. The pattern analysis field 216 may also indicate that a breath rate is within normal limits. Each bar 220 may be filled to a level corresponding to an interval value. A bar 220 may be filled with a color indicating whether an interval is acceptable or troubling. For example, a bar 220 may have a fill color of red for dangerous, yellow for troubling, or green for acceptable. The recommendations field 224 provides a result of the detection process. The recommendations field 224 may be filled with color to indicate a danger level. As shown, the breathing is considered normal or possibly abnormal depending on the conditions. The interface 200 may also display recommendation instructions 228 which clarify the provided recommendation.

**[0035]** Figure 2C illustrates a breathing pattern with irregularly spaced breathing intervals and with a breathing rate that falls below acceptable limits. The spacing and rate used by the breathing detector 122 are predetermined by experts to provide consistency and reliability. The recommendations field 224 outputs an abnormal or irregular indication. The instructions 228 provide further information about the result and the patient's condition. The result of this detection process will likely result in a higher priority for an emergency medical response.

**[0036]** Figure 2D illustrates a breathing pattern where only one interval is recorded. If any breath interval extends too long, the breathing detector 122 may interrupt the process and determine that breathing is ineffective. In the illustrated example, the second breath interval is at least ten seconds. Subsequent measurements of breath intervals are not needed, as the patient has exceeded an agonal limit. The recommendations field 224 states that breathing is ineffective or agonal, which will likely result in a high priority emergency medical response.

**[0037]** In Figure 2E, another example of an ineffective

or agonal breathing result is shown. All four breathing intervals are recorded, but the breath rate is below an acceptable range.

**[0038]** In Figure 2F, an example of an excessive breath rate is shown. The recorded breath intervals provide a breath rate average of 45 breaths per minute. As this rate exceeds an acceptable range, the recommendations field 224 indicates an above normal rate.

**[0039]** Based on the results of the breathing detector, the priority of an emergency medical response is determined. The dispatcher 104 may also provide instructions to the caller 118 to assist a patient. These instructions may be referred to herein as post-dispatch, or pre-arrival instructions to indicate that they are given after responders are dispatched and/or before the responders arrive on the scene. In one example, where ineffective breathing is detected, a dispatcher 104 may provide intervention instructions to instruct a caller 118 to inspect the patient for any throat blockage. As can be appreciated, various intervention instructions may be provided to assist a patient.

**[0040]** Referring to Figure 3A, an embodiment of a graphical user interface 300 is shown for a pulse check 124. The interface 300 may provide instructions to assist a caller 118 in measuring a pulse rate. The caller 118 may or may not be the patient. Instruction buttons 302 may be provided to initiate display of pulse-taking instructions for the neck, umbilical cord, or some other body part. By clicking on an instruction button 302, pulse-taking instructions are displayed to the dispatcher 104.

**[0041]** The interface 300 provides a timer 304 which runs for a predetermined amount of time. In one embodiment, the timer runs for 15 seconds. A start button 306 is provided and, when clicked, begins the timer 304. Upon initiation, the dispatcher 104 instructs the caller 118 to begin counting pulses. During the time interval, the caller 118 counts the number of pulses. The interface 300 indicates to the dispatcher 104 when the time interval is expired. Upon expiration, the dispatcher 104 instructs the caller 118 to stop counting and asks for the final number.

**[0042]** A common count input field 308 is provided for the dispatcher 104 to enter the number of pulses provided by the caller 118. The illustrated field 308 allows a dispatcher 104 to click on the correct number. If the correct number is not shown in the input field 308, the field 308 allows for typed entry of the number of pulses as shown.

**[0043]** A beats-per-minute (BPM) field 310 displays the rate based on the dispatcher's input to the count input field 308. The calculation is performed by the pulse check 124 based on the predetermined time interval. A recommendations field 312 displays a result of pulse check process based on the number of pulses inputted. A close button 314 closes the interface 300 and terminates operation of the pulse check 124.

**[0044]** Figures 3B, 3C, and 3D illustrate different pulse rate results. In Figure 3B, the timer 304 has run for 15 seconds which is its predetermined interval. The dis-

patcher 104 selects the number of pulses counted, which in this example is 20. Upon entering the number of pulses, the BPM field 310 displays the beats per minute. The recommendations field 312 provides a rate range which may be used to determine a determinant value for a priority in an emergency response. The illustrated range is acceptable and does not, by itself, indicate a medical issue. **[0040]** In Figure 3C, the dispatcher 104 has selected the "neck" instruction button 302 and corresponding instructions 316 are displayed to the dispatcher 104. The dispatcher 104 reads the instructions 316 to the caller 118 to assist in finding a pulse and measuring a rate. The timer 304 is shown as having run for 15 seconds. The count inputted into the count input field 308 is 11. The BPM field 310 returns with a rate, and the recommendation field 312 provides a resulting range. In the given example, the rate of 44 beats per minute is in a range that is low. After a result is provided, the start button 306 may display a clear/restart option to allow a repeat of the process to take a pulse.

**[0045]** The recommendation field 312 may be filled with a color to indicate whether or not the range is acceptable. The color indication assists the dispatcher 104 in quickly confirming a range and whether or not the rate is an issue in the medical emergency. As with the breathing detector 122, the pulse check 124 provides a result that may be used by the dispatcher 104 to determine a determinant value and/or set an emergency medical response priority. The result may also be automatically used by the calculator 110 in setting a determinant value. **[0042]** In Figure 3D, the timer 304 is shown as having run for 15 seconds. The count inputted into the count input field 308 is 31. The BPM field 310 returns with a rate of 124 beats per minute. The recommendation field 312 provides a resulting range. The rate may be provided to the protocol 108 and/or to emergency responders prior to their arrival.

**[0046]** Referring to Figure 4A, an embodiment of a graphical user interface 400 for a pregnancy contractions timer 126 is shown. The interface 400 includes a number input 402 to indicate the number of the current pregnancy. In the illustrated embodiment, the dispatcher 104 may select that this is either the first pregnancy or that the patient has had at least one previous pregnancy. The interface 400 may also include instructions 404 that the dispatcher reads to the caller 118 to assist in measuring contraction intervals. The interface 400 includes a start button 406 to begin a timer 408 and to initiate contraction timing. A caller 118 tells the dispatcher 104 each time a contraction occurs. The dispatcher 104 clicks a contraction button 410 when the dispatcher 104 is told of a contraction.

**[0047]** A clear/recheck button 412 allows the dispatcher 104 to terminate the timing process and begin again. An urgent stop button 414 may be provided to immediately terminate the process, close the interface 400, and return to the protocol 108. A contractions interval field 416 lists the duration of contraction intervals. A pattern

analysis field 418 provides an average contraction rate. A bar chart 420 includes bars 422 with each bar indicating an interval between contractions. As illustrated, the number of bars and intervals to be recorded is two, although this number may be varied as desired. An interval timer 424 displays the time of the current interval. A recommendations field 426 displays a result after a predetermined number of intervals have been recorded. A close button 428 may be provided to terminate the pregnancy contractions timer 126 and close the interface 400.

**[0048]** In Figure 4B, two intervals between contractions have been recorded. As shown in field 416, the contraction intervals are at five minutes each. This is also indicated in the bar chart 420. The bars 422 may be filled to indicate the duration of an interval. The pattern analysis field 418 provides a contraction rate which is an average of the two intervals. The field 418 also indicates that this is a regular contraction pattern as the two intervals are similar in duration. The recommendation field 426 provides a result based on the contraction intervals. The result is determined by the monitor 128 to be a normal labor. The recommendation field 426 may also be filled with a color to indicate a time to deliver. The interface 400 may further provide result instructions 430 to clarify the provided result. **[0046]** In Figure 4C, the contraction intervals are at two minutes each. As can be appreciated, the contraction intervals may vary from one another, and those illustrated herein are for exemplary purposes only. The contraction interval field 416, pattern analysis field 418, and bar chart 420 all reflect the measured contraction intervals. The recommendations field 426 displays a result that the patient is near delivery labor.

**[0049]** In Figure 4D, the contraction intervals are at approximately 30 seconds. The fields 416, 418 and bar chart 420 display each interval length and an average of the two intervals. The recommendation field 426 displays the result that delivery is imminent. As can be expected, the results provided by the monitor 128 may be used to determine the priority of an emergency medical response and instructions to the caller 118 to assist the patient.

**[0050]** The diagnostic tools provide a reliable method for determining a time-based vital sign. The computer-operated timer ensures reliability which may not be provided by a caller inexperienced in measuring vital signs and faced with a highly stressful situation non-visually over the phone. Use of the diagnostic tools requires correspondence between a dispatcher and a caller to effectively take time-based measurements. As can be appreciated, reliable vital signs greatly enhances the entire emergency dispatch decision-making process and responder operation.

**[0051]** Referring once again to Figure 1, the computer 106 used in the system 100 may further include an intervention tool to assist a caller 118 or other party in administering aid to a patient. The intervention tool may be a compressions monitor 128 to assist in a CPR or like procedure. When a caller 118 indicates that a medical emergency requiring CPR intervention is occurring, the dis-

patcher 104 may initiate the compression monitor 128 to provide a timing guideline.

**[0052]** Referring to Figure 5A, an embodiment of a graphical user interface 500 generated by the compressions monitor 128 is shown. The interface 500 includes an age input field 502 which may include a plurality of buttons 504 for a dispatcher 104 to select. Each button 504 corresponds to a different age or age group of a patient. Alternatively, the age input field 502 may allow the dispatcher 104 to type in an age or age group of the patient. The age of the patient is used by the compressions monitor 128 to determine an appropriate compressions rate.

**[0053]** The interface 500 also includes a compressions bar 506 which may include a plurality of compression buttons 508. Each compression button 508 corresponds to a number of predetermined number of compressions that are to be administered to the patient. The number of compressions may be listed on the corresponding button 508. Selecting a compression button 508 starts a timer of the compressions monitor 128, and administration of the selected number of compressions is to begin. In selecting the compression button 508, the dispatcher 104 tells the caller 118 to begin administering compressions. The interface 500 may alternatively provide a start button (not shown) to begin a timer for actual time to administer the compressions.

**[0054]** The interface 500 may include a pause button 510 that pauses the timer for any reason. The interface 500 includes a finished button 512 that terminates the timer. The finished button 512 is selected by the dispatcher 104 when the caller 118 indicates that the selected number of compressions is completed.

**[0055]** The interface 500 further includes an ideal compressions field 514 which may list the number of compressions administered, an ideal stop time to administer a selected number of compressions, and the actual time that elapsed to administer the compressions. The interface 500 may further include an actual compression rate field 516 to display a calculated compression rate. The interface 500 includes a recommendation field 518 which displays a result of the calculated compression rate. The recommendation field 518 may be filled with a color or highlighted to provide a visual indication about the compression rate. A close button 520 is provided to terminate the compressions monitor 128 and close the interface 500.

**[0056]** In Figure 5B, a compressions button 508 corresponding to 100 compressions has been selected. As shown in the ideal compressions field 514, the ideal time was 50 seconds, but the actual time to complete 100 compressions was done in 30 seconds. The actual compression rate field 516 indicates a rate of 200 compressions per minute which is too fast. The recommendation field 518 displays a result of "too fast" to indicate that the caller 118, or other individual administering the compressions, is going too fast. The selected compressions button 508 may display a "clear/restart" label to indicate that

selection will clear the timer, field 514, and the result to begin again. The field 516 may retain the compressions per minute to compare against the next process.

[0057] In Figure 5C, the process is repeated for 100 compressions. As shown, the actual elapsed time in field 514 is 48 seconds. The actual elapsed time is not equal to the ideal time, but is close enough to be considered by the compressions monitor 128 to be acceptable. The compression rate is displayed in field 516 along with the previous compression rate. The recommendations field 518 displays the result to be "O.K."

[0058] In Figure 5D, the process is repeated again for 100 compressions. The elapsed time, shown in field 514, is one minute and ten seconds. The compression rate of 86 compressions per minute is displayed in field 516. This compression rate is displayed with the previous compression rates to provide comparison. The dispatcher 104 can thereby provide feedback to the caller 118 about the compression rate. As indicated in field 518, the compression rate is too slow.

[0059] The compressions monitor 128 provides a timer and feedback for each compression rate to improve intervention performance. A computer-implemented timer and a trained dispatcher 104 provide a stable measurement of a compression rate to improve performance. The dispatcher 104 and the caller 118 maintain communication to ensure proper start and stop times. In this manner, a CPR technique may be effectively administered to a patient prior to the arrival of emergency responders. Even an inexperienced caller 118, or other individual, may then administer compressions at a preferred and correct rate.

[0060] The diagnostic and intervention tools provide a user-friendly interface to assist the dispatcher in responding to an emergency call. The interface may include text, audio, video, and combinations thereof to assist a caller in finding vital signs and/or providing compressions in a CPR technique. The tools provide a timer for timing and recording body functions, such as breaths, pulses, and pregnancy contractions. The tools provide a timer for timing a CPR compression rate. Furthermore, all information taken by the tools may be stored by the system 100 and conveyed to the determinant value calculator 110, the reporting module 114, the CAD system 112 and to emergency responders. This information may be used to assist emergency responder prior to arrival. The tools greatly improve information collection and intervention for emergency medical response situations and will be an aid in saving lives.

**Claims**

- 1. A dispatch center computer system (100) to assist a dispatcher in responding to a caller regarding a medical emergency of a patient, the dispatch center computer system comprising:

a processor; and

a memory in electrical communication with the processor, and having stored thereon: an emergency medical dispatch protocol (108) including a plurality of interrogatories for a dispatcher to ask a caller for generating an emergency medical dispatch response,

**characterized by:**

a plurality of diagnostic tools (120) stored on the memory to determine a vital sign of a patient, comprising a breathing detector diagnostic tool (122) adapted to measure the breathing rate of the patient and a pregnancy contractions timer diagnostic tool (126) adapted to measure intervals between contractions, in relation to a computer-aided timer (206, 424); wherein the processor is adapted to execute one or more of the diagnostic tools (120) to:

- provide a respective user interface (200, 400) on the dispatch center computer, the user interface configured to receive input to initiate the timer indicative of the start time of the caller;
- in response to the timer initiation, run the timer;
- while the timer is running, receive vital sign related data which is repeatedly input by the dispatcher corresponding to caller relayed information, the vital sign being one of a breath or a pregnancy contraction, the vital sign related data being repeatedly inputted by the dispatcher using a breath button (208) of the user interface where the vital sign is a breath and the vital sign related data being repeatedly inputted by the dispatcher using a contraction button (410) of the user interface where the vital sign is a pregnancy contraction;
- stop the timer;
- determine a rate or interval of said repeatedly inputted vital sign related data;
- determine a patient diagnosis from said repeatedly inputted vital sign related data and the determined rate or interval of the vital sign, further comprising a determinant value calculator (110) stored on the memory to calculate a determinant value used to prioritize an emergency response, based on the patient diagnosis; and
- the dispatch center computer system further comprising means for displaying a recommendation (224, 228, 426, 430) on the user interface based on said repeatedly inputted vital sign related data,

wherein the breathing detector diagnostic tool (122) user interface (200) is adapted to provide an input means comprising said breath button (208) to receive an input for each patient breath after initiating the timer (206) and is adapted to measure intervals between each patient breath to determine a breath rate; or is adapted to de-

termine a pattern based on the breath rate and displaying the pattern (218) on the user interface,

wherein the recommendation (224) is based on the breath rate or a pattern based on the breath rate and the recommendation (224) is selected from one of the following:

normal or possibly abnormal;  
abnormal or irregular; and  
ineffective or agonal, and

wherein, the determinant value calculator (110) is adapted to calculate the determinant value based on the recommendation indicative of breath rate.

2. The computer system of claim 1, further comprising a pulse check diagnostic tool (124) adapted to measure the pulse rate of the patient, and a further said respective user interface (300) wherein:  
the pulse check diagnostic tool (124) user interface (300) is adapted to provide a means to receive a count input (308) and is adapted to terminate the timer (304) after a predetermined amount of time and wherein means are adapted to calculate a pulse rate in response to the count input and based on the predetermined amount of time.
3. The computer system of claim 1, wherein:  
the pregnancy contractions diagnostic tool (126) user interface (400) is adapted to provide a means comprising said contraction button (410) to receive an input for each contraction after initiating the timer (424) and is adapted to measure intervals between each contraction to determine a contraction pattern.
4. The computer system of claim 1, further comprising a reporting module (114) to measure a performance of a dispatcher.
5. The computer system of any of claims 1 to 4, further comprising a compressions monitor (128) intervention tool to assist in aiding a patient, comprising a user interface (500) adapted to provide means (506) to receive a start input to start a timer, so as to run the timer in response to the start input and simultaneously with the administration of a predetermined number of compressions to the patient's chest, adapted to provide means to receive a finished input (512) on the user interface to terminate the timer in response to completion of the predetermined number of compressions, further comprising means to record a final time recorded by the timer, and adapted to determine a recommendation based on the predetermined number of compressions and in relation to the final time.

6. The computer system of claim 1, wherein the user interface (200) is adapted to provide any one or more of the following:

5 a clear input (212), and means for resetting the timer and clearing said repeatedly inputted vital sign related data in response to the clear input; a close input (226), and means for terminating operation in response to the close input; and  
10 patient age input (502), and means for determining performance of an intervention tool based on the age input.

7. The computer system of claim 2, wherein the user interface (300) is adapted to provide any one or more of the following:

an instruction (316) for taking a pulse; and  
a display (310) of the pulse rate.

8. The computer system of claim 3, wherein the user interface (400) is adapted to provide any one or more of the following;

25 input (402) for the pregnancy number;  
a display (416) of the duration of the intervals of contractions; and  
a display of (420) of the length of each contraction.

9. The computer system of claim 5, wherein the user interface (500) is adapted to provide any one or more of the following:

35 a plurality of predetermined number inputs (506), wherein each predetermined number input corresponds with the number of compressions to be administered to the patient;  
a display of the final time and an ideal final time(514); and  
40 a display (516) of an actual compression rate.

10. A computer implemented method for assisting a dispatcher to respond to an emergency caller regarding a medical emergency of a patient, the method comprising:

45 providing a database storing an emergency medical dispatch protocol (108) including a plurality of interrogatories to be displayed to the dispatcher to ask the caller for generating an emergency medical dispatch response;

**characterized by:**

55 initiating a diagnostic tool (120) on a dispatch center (102) computer being one of a plurality of diagnostic tools (120) stored in memory to determine a vital sign of a patient, comprising a breathing detector diagnostic tool (122) adapted

to measure the breathing rate of the patient and a pregnancy contractions timer diagnostic tool (126) adapted to measure intervals between contractions, in relation to a computer-aided timer (206, 424);

receiving input at a respective user interface (200, 400) on the dispatch center computer, to initiate the timer indicative of the start time of the caller;

in response to the timer initiation, running the timer;

while the timer is running, receiving vital sign related data which is repeatedly input by the dispatcher corresponding to caller relayed information, the vital sign being one of a breath or a pregnancy contraction, the vital sign related data being repeatedly inputted by the dispatcher using a breath button (208) of the user interface where the vital sign is a breath and the vital sign related data being repeatedly inputted by the dispatcher using a contraction button (410) of the user interface where the vital sign is a pregnancy contraction, wherein the breathing detector diagnostic tool (122) user interface (200) provides an input means comprising said breath button (208) to receive an input for each patient breath after initiating the timer (206) and measures intervals between each patient breath to determine a breath rate; or determines a pattern based on the breath rate and displaying the pattern (218) on the user interface;

stopping the timer;

determining a rate or interval of said repeatedly inputted vital sign related data;

determining a patient diagnosis from said repeatedly inputted vital sign related data and the determined rate or interval of the vital sign, further calculating a determinant value used to prioritize an emergency response, based on the patient diagnosis; and

displaying a recommendation (224, 228, 426, 430) on the user interface based on said repeatedly inputted vital sign related data, wherein the recommendation (224) is based on the breath rate or a pattern based on the breath rate and the recommendation (224) is selected from one of the following: normal or possibly abnormal; abnormal or irregular; and ineffective or agonal, wherein, calculating the determinant value is based on the recommendation indicative of breath rate.

11. The computer implemented method of claim 10, further comprising:

initiating a diagnostic tool (120) comprising a pulse check diagnostic tool (124) adapted to measure the pulse rate of the patient;

a pulse check diagnostic tool (124) user interface (300) providing a means to receive a count input (308);

terminating the timer (304) after a predetermined amount of time; and

providing means to calculate a pulse rate in response to the count input and based on the predetermined amount of time.

12. The computer implemented method of claim 10, further comprising:  
the pregnancy contractions diagnostic tool (126) user interface (400) providing:

means comprising said contraction button (410) to receive an input for each contraction after initiating the timer (424); and

means to measure intervals between each contraction to determine a contraction pattern.

13. The computer implemented method of claim 10, further comprising a reporting module (114) measuring the performance of a dispatcher.

14. The computer implemented method of any of claims 10 to 13, further comprising monitoring compressions (128) by:

the user interface (500) receiving a start input (506) to initiate a timer;

running the timer in response to the start input and simultaneously with the administration of a predetermined number of compressions to the patient's chest;

receiving a finished input (512) on the user interface to terminate the timer in response to completion of the predetermined number of compressions;

recording a final time recorded by the timer, and determining a recommendation based on the predetermined number of compressions and in relation to the final time.

15. The computer implemented method of claim 10, further comprising the user interface (200) providing any one or more of the following:

a clear input (212), and means for resetting the timer and clearing said repeatedly inputted vital sign related data in response to the clear input; a close input (226), and means for terminating operation in response to the close input; and patient age input (502), and means for determining performance of an intervention tool based on the age input.

16. The computer implemented method of claim 11, further comprising the user interface (300) providing

any one or more of the following:

an instruction (316) for taking a pulse; and  
a display (310) of the pulse rate.

17. The computer implemented method of claim 12, further comprising the user interface (400) providing any one or more of the following;

an input (402) for the pregnancy number;  
a display (416) of the duration of the intervals of contractions; and  
a display (420) of the length of each contraction.

18. The computer implemented method of claim 14, further comprising the user interface (500) providing any one or more of the following:

a plurality of predetermined number inputs (506), wherein each predetermined number input corresponds with the number of compressions to be administered to the patient;  
a display of the final time and an ideal final time (514); and  
a display (516) of an actual compression rate.

19. A computer readable storage medium having stored thereon computer instruction code which, when the instruction code is executed by a computer, causes the computer to perform a method according to any one of claims 10 to 18.

## Patentansprüche

1. Leitstellenrechnersystem (100) zum Unterstützen eines Disponenten beim Reagieren auf einen Anrufer bezüglich eines medizinischen Notfalls eines Patienten, wobei das Leitstellenrechnersystem umfasst:

einen Prozessor; und  
einen Speicher, der mit dem Prozessor in elektrischer Verbindung steht und auf dem gespeichert ist:  
ein notfallmedizinisches Abfertigungsprotokoll (108) mit einer Vielzahl von Abfragemöglichkeiten für einen Disponenten, um einen Anrufer für ein Erzeugen einer notfallmedizinischen Abfertigungsmaßnahme zu befragen,

**gekennzeichnet durch:**

eine Vielzahl von in dem Speicher gespeicherten Diagnosewerkzeugen (120), umfassend ein Atemzugsdetektordiagnosewerkzeug (122), das dazu eingerichtet ist, die Atemzugsfrequenz

des Patienten zu messen und ein Schwangerschaftskontraktionszeitmesserdiagnosewerkzeug (126), das dazu eingerichtet ist, in Bezug auf einen rechnergestützten Zeitgeber (205, 424) Intervalle zwischen Kontraktionen zu messen;  
wobei der Prozessor dazu eingerichtet ist, eines oder mehrere der Diagnosewerkzeuge (120) auszuführen zum:

Bereitstellen einer entsprechenden Benutzerschnittstelle (200, 400) auf dem Leitstellenrechner, wobei die Benutzerschnittstelle eingerichtet ist zum Empfangen einer Eingabe zum Auslösen des die Startzeit des Anrufers anzeigenden Zeitgebers;  
infolge der Auslösung des Zeitgebers, Ausführen des Zeitgebers;  
während des Ausführens des Zeitgebers, Empfangen von lebenszeichenbezogenen Daten, die wiederholt vom Anrufer weitergeleiteten Informationen entsprechend durch den Disponenten eingegeben werden, wobei das Lebenszeichen entweder ein Atemzug oder eine Schwangerschaftskontraktion ist, wobei die lebenszeichenbezogenen Daten wiederholt von dem Disponenten unter Verwendung einer Atemzugstaste (208) der Benutzerschnittstelle eingegeben werden, sofern das Lebenszeichen ein Atemzug ist und die lebenszeichenbezogenen Daten wiederholt von dem Disponenten unter Verwendung einer Kontraktionstaste (410) der Benutzerschnittstelle eingegeben werden, sofern das Lebenszeichen eine Schwangerschaftskontraktion ist;  
Stoppen des Zeitgebers;  
Bestimmen eine Rate oder eines Intervalls der wiederholt eingegebenen lebenszeichenbezogenen Daten;  
Bestimmen einer Patientendiagnose aus den wiederholt eingegebenen lebenszeichenbezogenen Daten und der bestimmten Rate oder dem bestimmten Intervall des Lebenszeichens, ferner umfassend einen in dem Speicher gespeicherten Determinantenwertberechner (110) zum Berechnen eines zum Priorisieren einer Notfallmaßnahme aufgrund der Patientendiagnose verwendeten Determinantenwerts; und  
wobei das Leitstellenrechnersystem ferner Mittel zum Anzeigen einer Empfehlung (224, 228, 426, 430) auf der Benutzerschnittstelle beruhend auf den wiederholt eingegebenen lebenszeichenbezogenen Daten umfasst,

- wobei die Benutzerschnittstelle (200) des Atemzugsdetektordiagnosewerkzeugs (122) zum Bereitstellen eines Eingabemittels mit der Atemzugstaste (208) eingerichtet ist zum Empfangen einer Eingabe für jeden Patientenatemzug nach einem Auslösen des Zeitgebers (206) und zum Messen von Intervallen zwischen jedem Patientenatemzug zum Bestimmen einer Atemzugsfrequenz eingerichtet ist; oder zum Bestimmen eines Musters aufgrund der Atemzugsfrequenz und zum Anzeigen des Musters (213) auf der Benutzerschnittstelle eingerichtet ist, wobei die Empfehlung (224) auf der Atemzugsfrequenz oder einem auf der Atemzugsfrequenz beruhenden Muster beruht und die Empfehlung (224) aus einer der folgenden ausgewählt wird:
- normal oder möglicherweise anormal; anormal oder unregelmäßig; und wirkungslos oder agonal, und
- wobei der Determinantenwertberechner (110) dazu eingerichtet ist, den Determinantenwerts beruhend auf der die Atemzugsfrequenz anzeigenden Empfehlung zu berechnen.
2. Rechnersystem nach Anspruch 1, ferner umfassend ein zum Messen der Pulsrate des Patienten eingerichtetes Pulsprüfdiagnosewerkzeug (124) und ferner die jeweilige Benutzerschnittstelle (300), wobei: die Pulsprüfdiagnosewerkzeugs-(124)-Benutzerschnittstelle (300) zum Bereitstellen eines Mittels zum Empfangen einer Zähl eingabe (308) eingerichtet ist und zum Stoppen des Zeitgebers (304) nach einer vorbestimmten Zeitdauer eingerichtet ist, und wobei Mittel zum Berechnen einer Pulsrate infolge der Zähl eingabe und aufgrund der vorbestimmten Zeitdauer eingerichtet sind.
  3. Rechnersystem nach Anspruch 1, wobei: die Benutzerschnittstelle (400) des Schwangerschaftskontraktionsdiagnosewerkzeugs (126) zum Bereitstellen eines Mittels eingerichtet ist, das die Kontraktionstaste (410) umfasst, zum Empfangen einer Eingabe für jede Kontraktion nach Auslösen des Zeitgebers (424), und zum Messen von Intervallen zwischen jeder Kontraktion zum Bestimmen eines Kontraktionsmusters eingerichtet ist.
  4. Rechnersystem nach Anspruch 1, ferner umfassend ein Berichtsmodul (114) zum Messen der Leistung eines Disponenten.
  5. Rechnersystem nach einem der Ansprüche 1 bis 4, ferner umfassend ein Kompressionsüberwachung-(128)-Interventionswerkzeug zum Unterstützen bei Hilfeleistung für einen Patienten, umfassend eine Benutzerschnittstelle (500), die eingerichtet ist zum Bereitstellen von Mitteln (506) zum Empfangen einer Starteingabe zum Auslösen eines Zeitgebers, um den Zeitgeber infolge der Starteingabe und zeitgleich mit einer Verabreichung einer vorbestimmten Anzahl von Kompressionen des Brustkorbs des Patienten zu betreiben, eingerichtet zum Bereitstellen von Mitteln zum Empfangen einer Abschlusseingabe (512) auf der Benutzerschnittstelle, um den Zeitgeber infolge einer Vollendung der vorbestimmten Anzahl von Kompressionen anzuhalten, ferner umfassend Mittel zum Aufzeichnen einer durch den Zeitgeber aufgezeichneten Endzeit, und eingerichtet zum Bestimmen einer auf der vorbestimmten Anzahl von Kompressionen beruhenden und im Zusammenhang mit der Endzeit stehenden Empfehlung.
  6. Rechnersystem nach Anspruch 1, wobei die Benutzerschnittstelle (200) eingerichtet ist zum Bereitstellen von einer oder mehreren der folgenden:
    - einer Löscheingabe (212) und von Mitteln zum Zurücksetzen des Zeitgebers und zum Löschen der wiederholt eingegebenen lebenszeichenbezogenen Daten infolge der Löscheingabe; eine Abschlusseingabe (220) und von Mitteln zum Einstellen des Betriebs infolge der Abschlusseingabe; und
    - Patientenalterseingabe (502) und von Mitteln zum Bestimmen einer Leistung eines Interventionswerkzeugs aufgrund der Alterseingabe.
  7. Rechnersystem nach Anspruch 2, wobei die Benutzerschnittstelle (300) eingerichtet ist zum Bereitstellen von einer oder mehreren der folgenden:
    - einer Anweisung (310) zum Aufnehmen eines Pulses; und
    - einer Anzeige (310) der Pulsrate.
  8. Rechnersystem nach Anspruch 3, wobei die Benutzerschnittstelle (400) eingerichtet ist zum Bereitstellen von einer oder mehreren der folgenden:
    - einer Eingabe (402) für die Schwangerschaftszahl;
    - eine Anzeige (416) der Dauer der Kontraktionsintervalle; und
    - eine Anzeige (420) der Länge jeder Kontraktion.
  9. Rechnersystem nach Anspruch 5, wobei die Benutzerschnittstelle (500) eingerichtet ist zum Bereitstellen von einer oder mehreren der folgenden:
    - einer Vielzahl von vorbestimmten Zahleneingaben (506), wobei jede vorbestimmte Zahleneingabe der Anzahl der dem Patienten zu verabreichenden Kompressionen entspricht;

einer Anzeige der Endzeit und einer idealen Endzeit (514); und  
einer Anzeige (516) einer tatsächlichen Kompressionsrate.

10. Rechnerimplementiertes Verfahren zum Unterstützen eines Disponenten beim Reagieren auf einen Notfallanrufer bezüglich eines medizinischen Notfalls eines Patienten, wobei das Verfahren umfasst:

Bereitstellen einer Datenbank, die ein notfallmedizinisches Abfertigungsprotokoll (108) mit einer Vielzahl von Abfragemöglichkeiten speichert, die dem Disponent angezeigt werden sollen, um den Anrufer für ein Erzeugen einer notfallmedizinischen Abfertigungsmaßnahme zu befragen; **gekennzeichnet durch:**

Initiieren eines Diagnosewerkzeugs (120) einer Vielzahl von in einem Speicher gespeicherten Diagnosewerkzeugen (120) zum Bestimmen eines Lebenszeichens eines Patienten auf einem Leitstellen-(102)-Rechner, umfassend ein Atemzugsdetektordiagnosewerkzeug (122), das dazu eingerichtet ist, die Atemzugsfrequenz des Patienten zu messen, und ein Schwangerschaftskontraktionszeitmesserdiagnosewerkzeug (126), das dazu eingerichtet ist, in Bezug auf einen rechnergestützten Zeitgeber (205, 424) Intervalle zwischen Kontraktionen zu messen;

Erhalten einer Eingabe an einer entsprechenden Benutzerschnittstelle (200, 400) auf dem Leitstellenrechner zum Auslösen des die Startzeit des Anrufers anzeigenden Zeitgebers; infolge der Auslösung des Zeitgebers, Ausführen des Zeitgebers;

während des Ausführens des Zeitgebers, Empfangen von lebenszeichenbezogenen Daten, die wiederholt vom Anrufer weitergeleiteten Informationen entsprechend durch den Disponenten eingegeben werden, wobei das Lebenszeichen entweder ein Atemzug oder eine Schwangerschaftskontraktion ist, wobei die lebenszeichenbezogenen Daten wiederholt von dem Disponenten unter Verwendung einer Atemzugstaste (208) der Benutzerschnittstelle eingegeben werden, sofern das Lebenszeichen ein Atemzug ist und die lebenszeichenbezogenen Daten wiederholt von dem Disponenten unter Verwendung einer Kontraktionstaste (410) der Benutzerschnittstelle eingegeben werden, sofern das Lebenszeichen eine Schwangerschaftskontraktion ist, wobei die Benutzerschnittstelle (200) des Atemzugsdetektordiagnosewerkzeugs (122) ein Eingabemittel mit der Atemzugstaste (208) bereitstellt zum Empfangen einer Eingabe für jeden Patientenatemzug nach einem Auslösen des Zeitgebers (206) und

zum Messen von Intervallen zwischen jedem Patientenatemzug zum Bestimmen einer Atemzugsfrequenz; oder zum Bestimmen eines Musters, aufgrund der Atemzugsfrequenz und zum Anzeigen des Musters (218) auf der Benutzerschnittstelle;

Stoppen des Zeitgebers;

Bestimmen eine Rate oder eines Intervalls der wiederholt eingegebenen lebenszeichenbezogenen Daten;

Bestimmen einer Patientendiagnose aus den wiederholt eingegebenen lebenszeichenbezogenen Daten und der bestimmten Rate oder dem bestimmten Intervall des Lebenszeichens, ferner Berechnen eines zum Priorisieren einer Notfallmaßnahme aufgrund der Patientendiagnose verwendeten Determinantenwerts; und Anzeigen einer Empfehlung (224, 228, 426, 430) auf der Benutzerschnittstelle beruhend auf den wiederholt eingegebenen lebenszeichenbezogenen Daten,

wobei die Empfehlung (224) auf der Atemzugsfrequenz oder einem auf der Atemzugsfrequenz beruhenden Muster beruht und die Empfehlung (224) aus einer der folgenden ausgewählt wird: normal oder möglicherweise anormal; anormal oder unregelmäßig; und wirkungslos oder agonal,

wobei ein Berechnen des Determinantenwertes auf der die Atemzugsfrequenz anzeigenden Empfehlung beruht.

11. Rechnerimplementiertes Verfahren nach Anspruch 10, das ferner umfasst:

Initiieren eines Diagnosewerkzeugs (120) mit einem zum Messen der Pulsrate des Patienten eingerichteten Pulsüberprüfungsdiagnosewerkzeugs (124);

eine Pulsprüfungsdiagnosewerkzeugs-(124)-Benutzerschnittstelle (300) zum Bereitstellen eines Mittels zum Empfangen einer Zählung (308);

Stoppen des Zeitgebers (304) nach einer vorbestimmten Zeitspanne; und

Bereitstellen von Mitteln zum Berechnen einer Pulsrate infolge der Zählung und aufgrund der vorbestimmten Zeitdauer.

12. Rechnerimplementiertes Verfahren nach Anspruch 10, ferner umfassend:

die Schwangerschaftskontraktionsdiagnosewerkzeugs-(120)-Benutzerschnittstelle (400) zum Bereitstellen:

eines Mittels, das die Kontraktionstaste (410) umfasst, zum Empfangen einer Eingabe für jede Kontraktion nach Auslösen des Zeitgebers

- (424), und; und  
eines Mittels zum Messen von Intervallen zwischen jeder Kontraktion zum Bestimmen eines Kontraktionsmusters.
13. Rechnerimplementiertes Verfahren nach Anspruch 10, ferner umfassend ein die Leistung eines Disponenten messendes Berichtsmodul (114). 5
14. Rechnerimplementiertes Verfahren nach einem der Ansprüche 10 bis 13, ferner umfassend reine Kompressionsüberwachung (128) durch:
- Empfangen einer Starteingabe zum Auslösen eines Zeitgebers durch eine Benutzerschnittstelle (500);  
Betreiben des Zeitgebers infolge der Starteingabe und zeitgleich mit einer Verabreichung einer vorbestimmten Anzahl von Kompressionen des Brustkorbs des Patienten;  
Empfangen einer Abschlusseingabe (512) auf der Benutzerschnittstelle, um den Zeitgeber infolge einer Vollendung der vorbestimmten Anzahl von Kompressionen anzuhalten;  
Aufzeichnen einer durch den Zeitgeber aufgezeichneten Endzeit, und  
Bestimmen einer auf der vorbestimmten Anzahl von Kompressionen beruhenden und im Zusammenhang mit der Endzeit stehenden Empfehlung. 10 15 20 25 30
15. Rechnerimplementiertes Verfahren nach Anspruch 10, ferner umfassend die Benutzerschnittstelle (200) zum Bereitstellen von einer oder mehreren der folgenden:
- einer Löscheingabe (212) und von Mitteln zum Zurücksetzen des Zeitgebers und zum Löschen der wiederholt eingegebenen lebenszeichenbezogenen Daten infolge der Löscheingabe;  
eine Abschlusseingabe (220) und von Mitteln zum Einstellen des Betriebs infolge der Abschlusseingabe; und  
Patientenalterseingabe (502) und von Mitteln zum Bestimmen einer Leistung eines Interventionswerkzeugs aufgrund der Alterseingabe. 35 40 45
16. Rechnerimplementiertes Verfahren nach Anspruch 11, ferner umfassend die Benutzerschnittstelle (300) zum Bereitstellen von einer oder mehreren der folgenden:
- einer Anweisung (310) zum Aufnehmen eines Pulses; und  
einer Anzeige (310) der Pulsrate. 50 55
17. Rechnerimplementiertes Verfahren nach Anspruch 12, ferner umfassend die Benutzerschnittstelle (400)
- zum Bereitstellen von einer oder mehreren der folgenden:
- einer Eingabe (402) für die Schwangerschaftszahl;  
eine Anzeige (416) der Dauer der Kontraktionsintervalle; und  
eine Anzeige (420) der Länge jeder Kontraktion.
18. Rechnerimplementiertes Verfahren nach Anspruch 14, ferner umfassend die Benutzerschnittstelle (500) zum Bereitstellen von einer oder mehreren der folgenden:
- einer Vielzahl von vorbestimmten Zahleneingaben (506), wobei jede vorbestimmte Zahleneingabe der Anzahl der dem Patienten zu verabreichenden Kompressionen entspricht;  
einer Anzeige der Endzeit und einer idealen Endzeit (514); und  
einer Anzeige (516) einer tatsächlichen Kompressionsrate.
19. Rechnerlesbares Speichermedium, auf dem ein Rechneranweisungskode gespeichert ist, der, wenn der Anweisungskode von einem Rechner ausgeführt wird, den Rechner dazu veranlasst, ein Verfahren nach einem der Ansprüche 10 bis 18 durchzuführen.

## Revendications

1. Système informatique de centre de répartition (100) pour aider un répartiteur à répondre à un appelant concernant une urgence médicale d'un patient, le système informatique de centre de répartition comprenant :

un processeur ; et  
une mémoire en communication électrique avec le processeur et sur laquelle est stocké :  
un protocole de répartition médicale d'urgence (108) comportant une pluralité d'interrogatoires pour un répartiteur afin qu'il demande à un appelant de générer une réponse de répartition médicale d'urgence,

### caractérisé par :

une pluralité d'outils de diagnostic (120) stockés sur la mémoire pour déterminer un signe vital d'un patient, comprenant un outil de diagnostic de détecteur de respiration (122) adapté pour mesurer le rythme respiratoire du patient et un outil de diagnostic de temporisateur de contractions de grossesse (126) adapté pour mesurer des intervalles entre les contractions, par rapport à un temporisateur assisté par ordinateur

(206, 424) ;  
dans lequel le processeur est adapté pour exécuter un ou plusieurs des outils de diagnostic (120) pour :

fournir une interface utilisateur respective (200, 400) sur l'ordinateur de centre de répartition, l'interface utilisateur étant configurée pour recevoir une entrée pour déclencher le temporisateur indiquant le temps de début de l'appelant ;

en réponse au déclenchement du temporisateur, mettre en marche le temporisateur ; pendant que le temporisateur est en marche, recevoir des données relatives à un signe vital qui sont entrées de manière répétée par le répartiteur correspondant aux informations relayées par l'appelant, le signe vital étant l'une d'une respiration et

d'une contraction de grossesse, les données relatives à un signe vital étant entrées de manière répétée par le répartiteur en utilisant un bouton de respiration (208) de l'interface utilisateur où le signe vital est une

respiration et les données relatives à un signe vital étant entrées de manière répétée par le répartiteur en utilisant un bouton de contractions (410) de l'interface utilisateur où le signe vital est une contraction de

grossesse ;

arrêter le temporisateur ;

déterminer un débit ou un intervalle desdites données relatives à un signe vital entrées de manière répétée ;

déterminer un diagnostic de patient à partir desdites données relatives à un signe vital entrées de manière répétée et du débit ou de l'intervalle déterminé du signe vital, comprenant en outre un calculateur de valeur déterminante (110) stocké sur la mémoire pour calculer une valeur déterminante utilisée pour donner la priorité à une réponse d'urgence, sur la base du diagnostic du patient ; et

le système informatique de centre de répartition comprenant en outre des moyens pour afficher une recommandation (224, 228, 426, 430) sur l'interface utilisateur sur la base desdites données relatives à un signe vital entrées de manière répétée,

dans lequel l'interface utilisateur (200) d'outil de diagnostic de détecteur de respiration (122) est adaptée pour fournir un moyen d'entrée comprenant ledit bouton de respiration (208) pour recevoir une entrée pour chaque respiration de patient après le déclenchement du temporisateur (206) et est adaptée pour mesurer des in-

tervalles entre chaque respiration de patient pour déterminer un rythme respiratoire ; ou est adaptée pour déterminer un schéma basé sur le rythme respiratoire et afficher le schéma (218) sur l'interface utilisateur,

dans lequel la recommandation (224) est basée sur le rythme respiratoire ou un schéma basé sur le rythme respiratoire et la recommandation (224) est choisie parmi ce qui suit :

normal ou éventuellement anormal ;  
anormal ou irrégulier ; et  
inefficace ou agonique, et

dans lequel, le calculateur de valeur déterminante (110) est adapté pour calculer la valeur déterminante sur la base de la recommandation indiquant le rythme respiratoire.

2. Système informatique de la revendication 1, comprenant en outre un outil de diagnostic de vérification du pouls (124) adapté pour mesurer la fréquence du pouls du patient, et une interface utilisateur respective supplémentaire (300) dans lequel :

l'interface utilisateur (300) d'outil de diagnostic de vérification du pouls (124) est adaptée pour fournir un moyen pour recevoir une entrée de comptage (308) et est adaptée pour interrompre le temporisateur (304) après une durée prédéterminée et où des moyens sont adaptés pour calculer une fréquence du pouls en réponse à l'entrée de comptage et sur la base de la durée prédéterminée.

3. Système informatique de la revendication 1, dans lequel :

l'interface utilisateur (400) d'outil de diagnostic de contractions de grossesse (126) est adaptée pour fournir un moyen comprenant ledit bouton de contractions (410) pour recevoir une entrée pour chaque contraction après le déclenchement du temporisateur (424) et est adaptée pour mesurer des intervalles entre chaque contraction pour déterminer un schéma des contractions.

4. Système informatique de la revendication 1, comprenant en outre un module de rapport (114) pour mesurer une performance d'un répartiteur.

5. Système informatique de l'une des revendications 1 à 4, comprenant en outre un outil d'intervention de moniteur de compressions (128) pour contribuer à aider un patient, comprenant une interface utilisateur (500) adaptée pour fournir des moyens (506) pour recevoir une entrée de démarrage pour démarrer un temporisateur, de manière à mettre en marche le temporisateur en réponse à l'entrée de démarrage et simultanément à l'administration d'un nombre prédéterminé de compressions à la poitrine du patient,

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adaptée pour fournir des moyens pour recevoir une entrée finie (512) sur l'interface utilisateur pour interrompre le temporisateur en réponse à l'achèvement du nombre prédéterminé de compressions, comprenant en outre des moyens pour enregistrer un temps final enregistré par le temporisateur, et adaptée pour déterminer une recommandation sur la base du nombre prédéterminé de compressions et par rapport au temps final.

6. Système informatique de la revendication 1, dans lequel l'interface utilisateur (200) est adaptée pour fournir l'une quelconque ou plusieurs de ce qui suit :

une entrée d'effacement (212), et des moyens pour réinitialiser le temporisateur et effacer lesdites données relatives à un signe vital entrées de manière répétée en réponse à l'entrée d'effacement ;

une entrée de fermeture (226), et des moyens pour mettre fin au fonctionnement en réponse à l'entrée de fermeture ; et

une entrée d'âge du patient (502), et des moyens pour déterminer une performance d'un outil d'intervention sur la base de l'entrée d'âge.

7. Système informatique de la revendication 2, dans lequel l'interface utilisateur (300) est adaptée pour fournir l'un(e) quelconque ou plusieurs de ce qui suit :

une instruction (316) pour la prise du pouls ; et un affichage (310) de la fréquence du pouls.

8. Système informatique de la revendication 3, dans lequel l'interface utilisateur (400) est adaptée pour fournir l'un(e) quelconque ou plusieurs de ce qui suit :

une entrée (402) pour le numéro de grossesse ; un affichage (416) de la durée des intervalles de contractions ; et

un affichage (420) de la longueur de chaque contraction.

9. Système informatique de la revendication 5, dans lequel l'interface utilisateur (500) est adaptée pour fournir l'un(e) quelconque ou plusieurs de ce qui suit :

une pluralité d'entrées de nombre prédéterminé (506), où chaque entrée de nombre prédéterminé correspond au nombre de compressions à administrer au patient ;

un affichage du temps final et d'un temps final idéal (514) ; et

un affichage (516) d'un taux de compression réel.

10. Procédé mis en œuvre par ordinateur pour aider un répartiteur à répondre à un appelant d'urgence concernant une urgence médicale d'un patient, le procédé comprenant le fait :

de fournir une base de données stockant un protocole de répartition médicale d'urgence (108) comportant une pluralité d'interrogatoires à afficher au répartiteur afin qu'il demande à l'appelant de générer une réponse de répartition médicale d'urgence ;

**caractérisé par** le fait :

d'initier un outil de diagnostic (120) sur un ordinateur de centre de répartition (102) qui est l'un d'une pluralité d'outils de diagnostic (120) stockés en mémoire pour déterminer un signe vital d'un patient, comprenant un outil de diagnostic de détecteur de respiration (122) adapté pour mesurer le rythme respiratoire du patient et un outil de diagnostic de temporisateur de contractions de grossesse (126) adapté pour mesurer des intervalles entre les contractions, par rapport à un temporisateur assisté par ordinateur (206, 424) ;

de recevoir une entrée au niveau d'une interface utilisateur respective (200, 400) sur l'ordinateur de centre de répartition, pour déclencher le temporisateur indiquant le temps de début de l'appelant ;

en réponse au déclenchement du temporisateur, de mettre en marche le temporisateur ;

pendant que le temporisateur est en marche, de recevoir des données relatives à un signe vital qui sont entrées de manière répétée par le répartiteur correspondant aux informations relayées par l'appelant, le signe vital étant l'une d'une respiration et d'une contraction de grossesse, les données relatives à un signe vital étant entrées de manière répétée par le répartiteur en utilisant un bouton de respiration (208) de l'interface utilisateur où le signe vital est une respiration et les données relatives à un signe vital étant entrées de manière répétée par le répartiteur en utilisant un bouton de contractions (410) de l'interface utilisateur

où le signe vital est une contraction de grossesse, où l'interface utilisateur (200) d'outil de diagnostic de détecteur de respiration (122) fournit un moyen d'entrée comprenant ledit bouton de respiration (208) pour recevoir une entrée pour chaque respiration de patient après le déclenchement du temporisateur (206) et mesure des intervalles entre chaque respiration de patient pour dé-

terminer un rythme respiratoire ; ou détermine un schéma basé sur le rythme respiratoire et affiche le schéma (218) sur l'interface utilisateur ;

d'arrêter le temporisateur ;

de déterminer un débit ou un intervalle desdites données relatives à un signe vital entrées de manière répétée ;

de déterminer un diagnostic de patient à partir desdites données relatives à un signe vital entrées de manière répétée et du débit ou de l'intervalle déterminé du signe vital, de calculer en outre une valeur déterminante utilisée pour donner la priorité à une réponse d'urgence, sur la base du diagnostic du patient ; et

d'afficher une recommandation (224, 228, 426, 430) sur l'interface utilisateur sur la base desdites données relatives à un signe vital entrées de manière répétée, où la recommandation (224) est basée sur le rythme respiratoire ou un schéma basé sur le rythme respiratoire et la recommandation (224) est choisie parmi ce qui suit : normal ou éventuellement anormal ; anormal ou irrégulier ; et inefficace ou agonique,

où, le calcul de la valeur déterminante est basé sur la recommandation indiquant le rythme respiratoire.

11. Procédé mis en œuvre par ordinateur de la revendication 10, comprenant en outre le fait :

d'initier un outil de diagnostic (120) comprenant un outil de diagnostic de vérification du pouls (124) adapté pour mesurer la fréquence du pouls du patient ;

de fournir, par le biais d'une interface utilisateur (300) d'outil de diagnostic de vérification du pouls (124), un moyen pour recevoir une entrée de comptage (308) ;

d'interrompre le temporisateur (304) après une durée prédéterminée ; et

de fournir des moyens pour calculer une fréquence du pouls en réponse à l'entrée de comptage et sur la base de la durée prédéterminée.

12. Procédé mis en œuvre par ordinateur de la revendication 10, comprenant en outre le fait :

de fournir, par le biais de l'interface utilisateur (400) d'outil de diagnostic de contractions de grossesse (126) :

des moyens comprenant ledit bouton de contractions (410) pour recevoir une entrée pour chaque contraction après le déclenchement du temporisateur (424) ; et

des moyens pour mesurer des intervalles entre chaque contraction pour déterminer un schéma des contractions.

- 5 13. Procédé mis en œuvre par ordinateur de la revendication 10, comprenant en outre un module de rapport (114) mesurant la performance d'un répartiteur.

- 10 14. Procédé mis en œuvre par ordinateur de l'une des revendications 10 à 13, comprenant en outre la surveillance des compressions (128) par :

la réception, par le biais de l'interface utilisateur (500), d'une entrée de démarrage (506) pour déclencher un temporisateur ;

la mise en marche du temporisateur en réponse à l'entrée de démarrage et simultanément à l'administration d'un nombre prédéterminé de compressions à la poitrine du patient ;

la réception d'une entrée finie (512) sur l'interface utilisateur pour interrompre le temporisateur en réponse à l'achèvement du nombre prédéterminé de compressions ;

l'enregistrement d'un temps final enregistré par le temporisateur, et

la détermination d'une recommandation sur la base du nombre prédéterminé de compressions et par rapport au temps final.

- 30 15. Procédé mis en œuvre par ordinateur de la revendication 10, comprenant en outre le fait de fournir, par le biais de l'interface utilisateur (200), l'une quelconque ou plusieurs de ce qui suit :

une entrée d'effacement (212), et des moyens pour réinitialiser le temporisateur et effacer lesdites données relatives à un signe vital entrées de manière répétée en réponse à l'entrée d'effacement ;

une entrée de fermeture (226), et des moyens pour mettre fin au fonctionnement en réponse à l'entrée de fermeture ; et

une entrée d'âge du patient (502), et des moyens pour déterminer une performance d'un outil d'intervention sur la base de l'entrée d'âge.

- 50 16. Procédé mis en œuvre par ordinateur de la revendication 11, comprenant en outre le fait de fournir, par le biais de l'interface utilisateur (300), l'un(e) quelconque ou plusieurs de ce qui suit :

une instruction (316) pour la prise du pouls ; et un affichage (310) de la fréquence du pouls.

- 55 17. Procédé mis en œuvre par ordinateur de la revendication 12, comprenant en outre le fait de fournir, par le biais de l'interface utilisateur (400), l'un(e) quelconque ou plusieurs de ce qui suit :

une entrée (402) pour le numéro de grossesse ;  
 un affichage (416) de la durée des intervalles  
 de contractions ; et  
 un affichage (420) de la longueur de chaque  
 contraction.

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- 18.** Procédé mis en œuvre par ordinateur de la revendication 14, comprenant en outre le fait de fournir, par le biais de l'interface utilisateur (500), l'un(e) quelconque ou plusieurs de ce qui suit :

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une pluralité d'entrées de nombre prédéterminé (506), où chaque entrée de nombre prédéterminé correspond au nombre de compressions à administrer au patient ;  
 un affichage du temps final et d'un temps final idéal (514) ; et  
 un affichage (516) d'un taux de compression réel.

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- 19.** Support de stockage lisible par ordinateur sur lequel est stocké un code d'instruction d'ordinateur qui, lorsque le code d'instruction est exécuté par un ordinateur, amène l'ordinateur à réaliser un procédé selon l'une quelconque des revendications 10 à 18.

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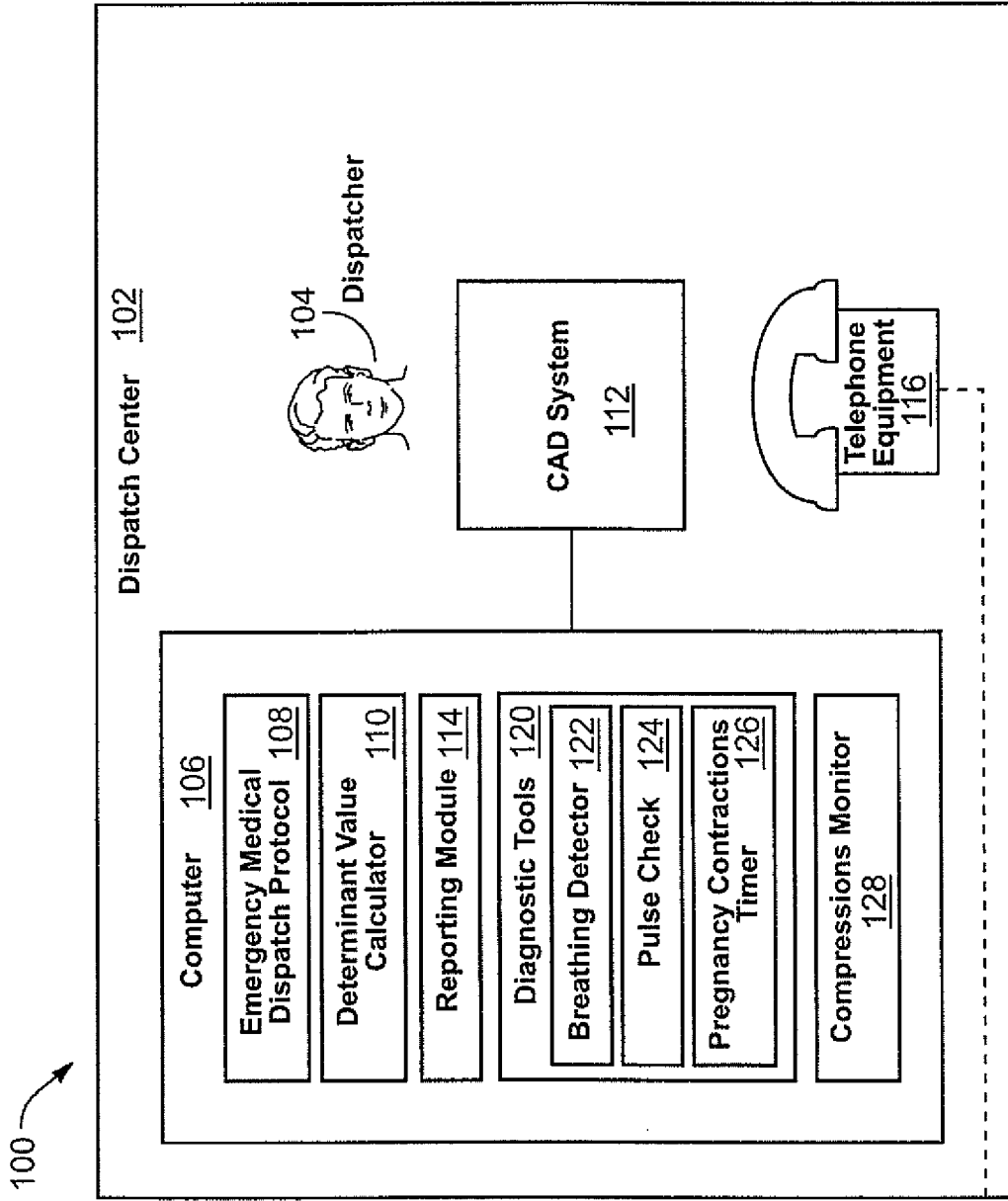


FIG. 1

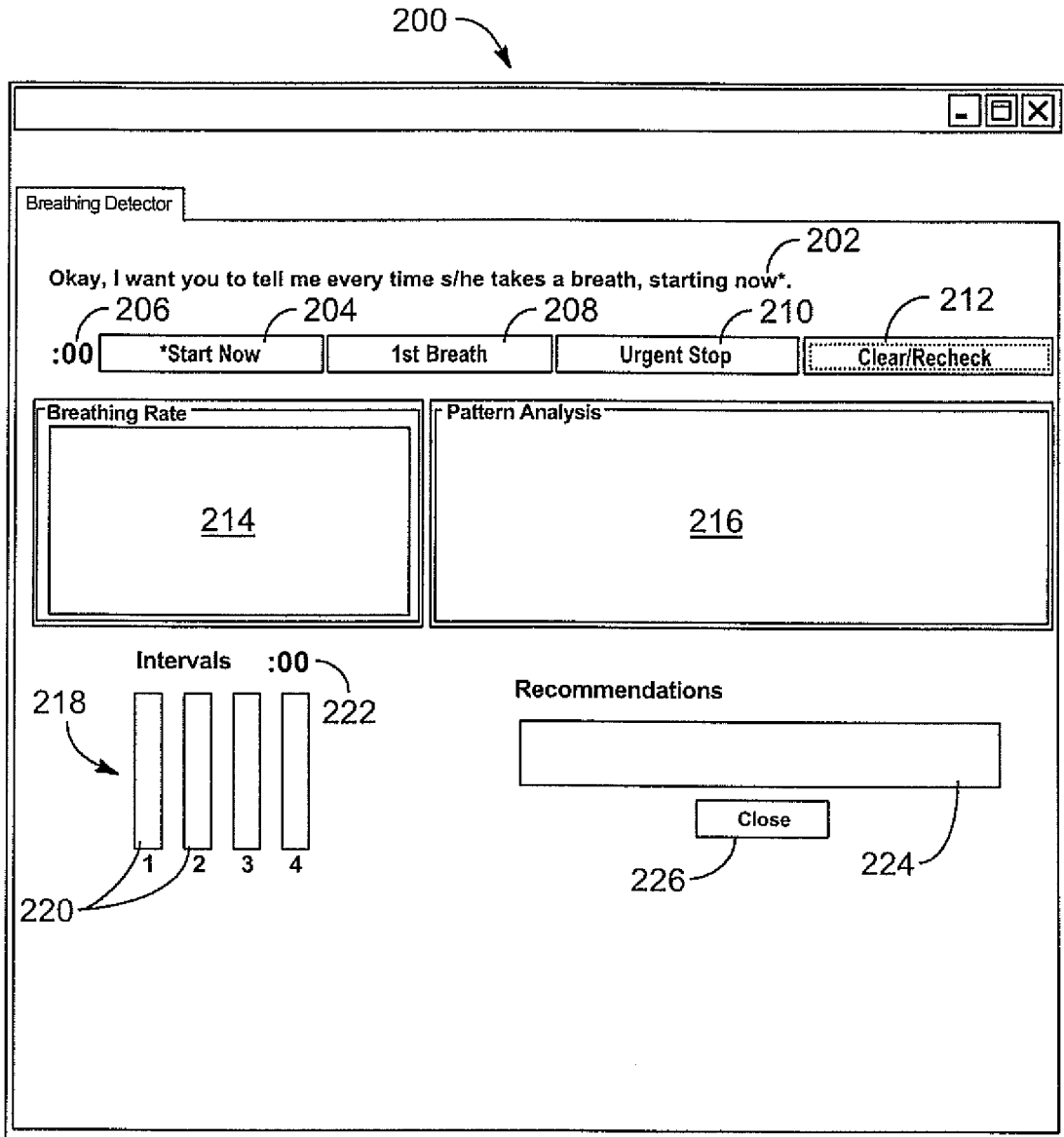


FIG. 2A

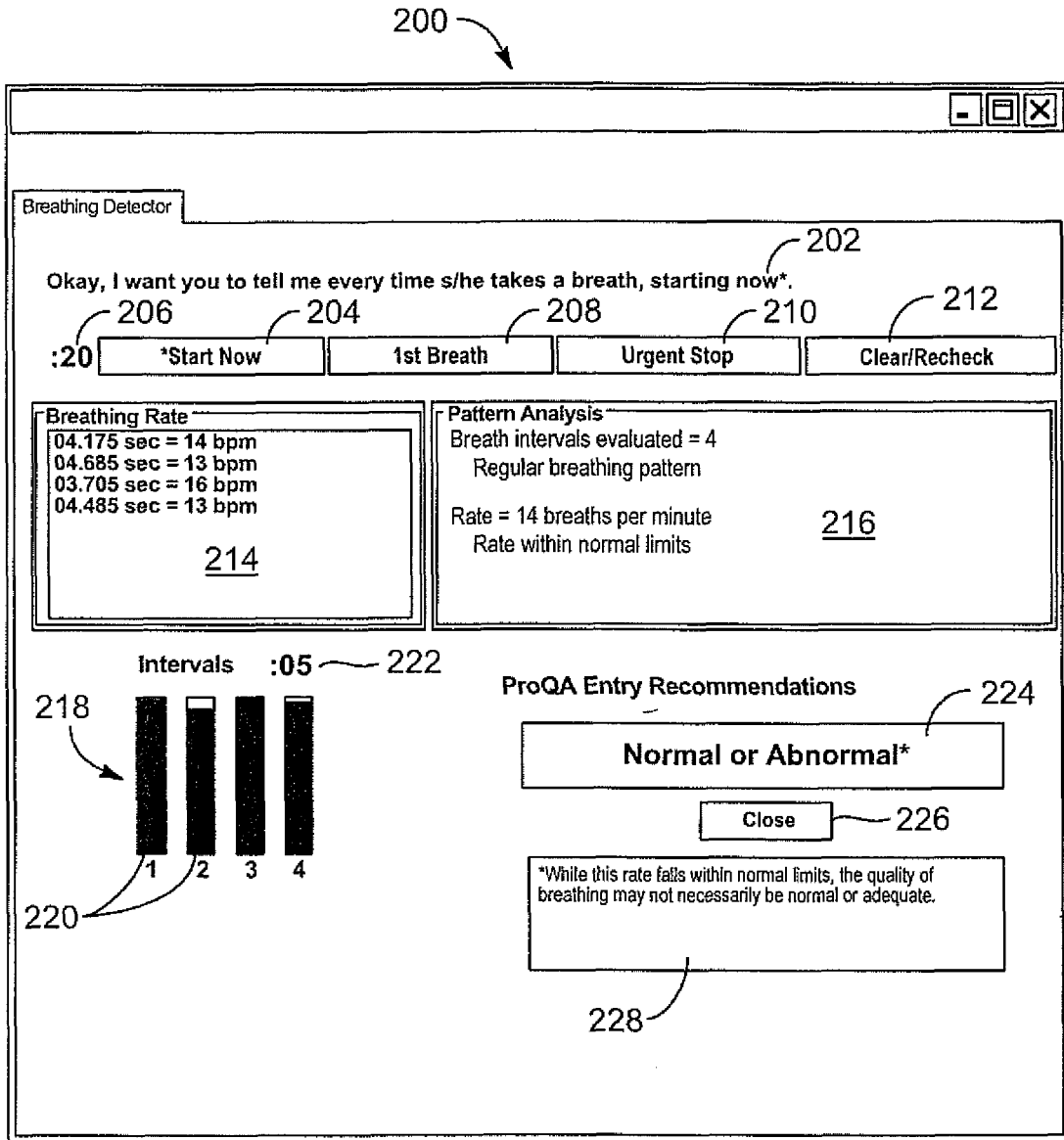


FIG. 2B

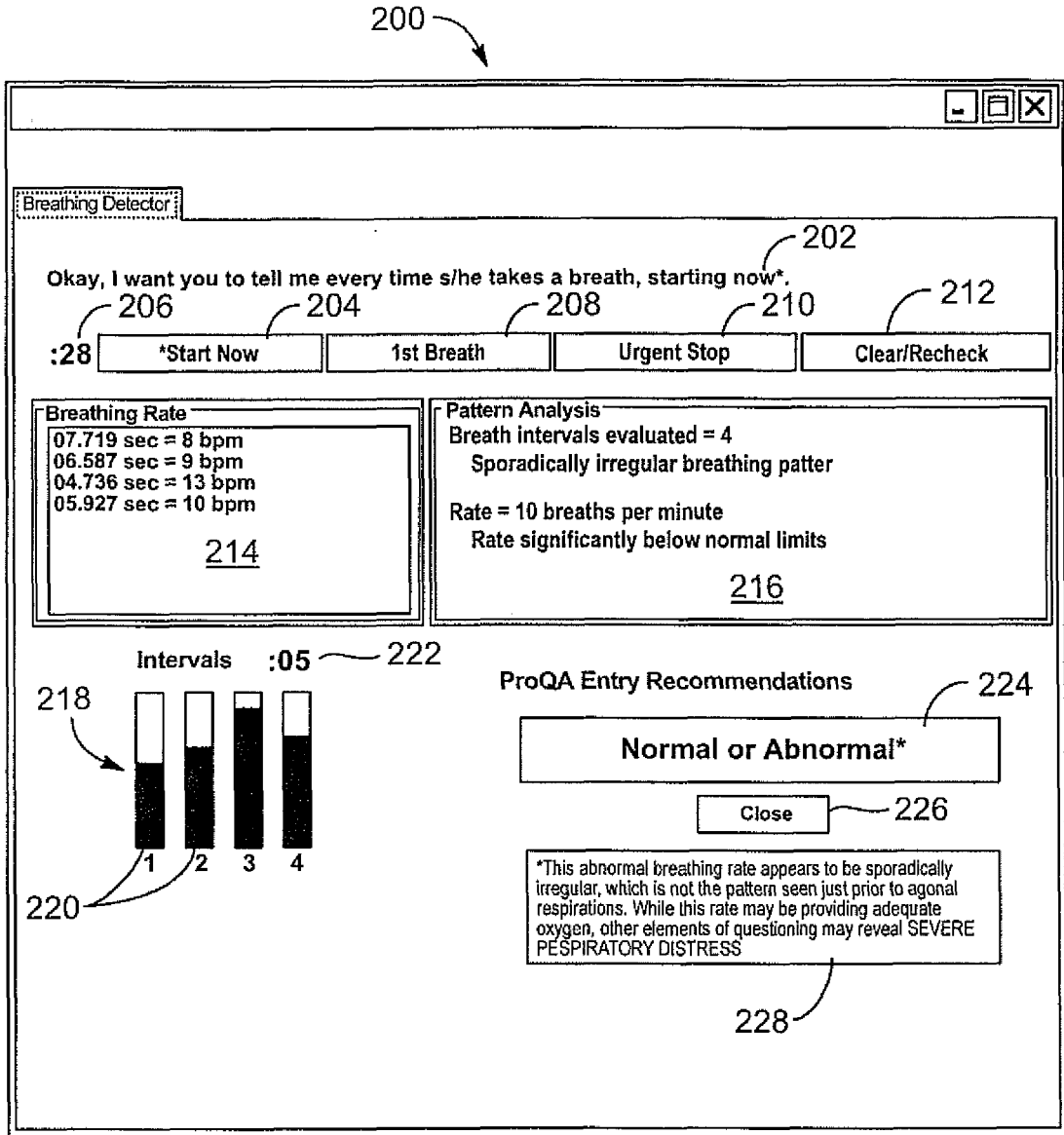


FIG. 2C

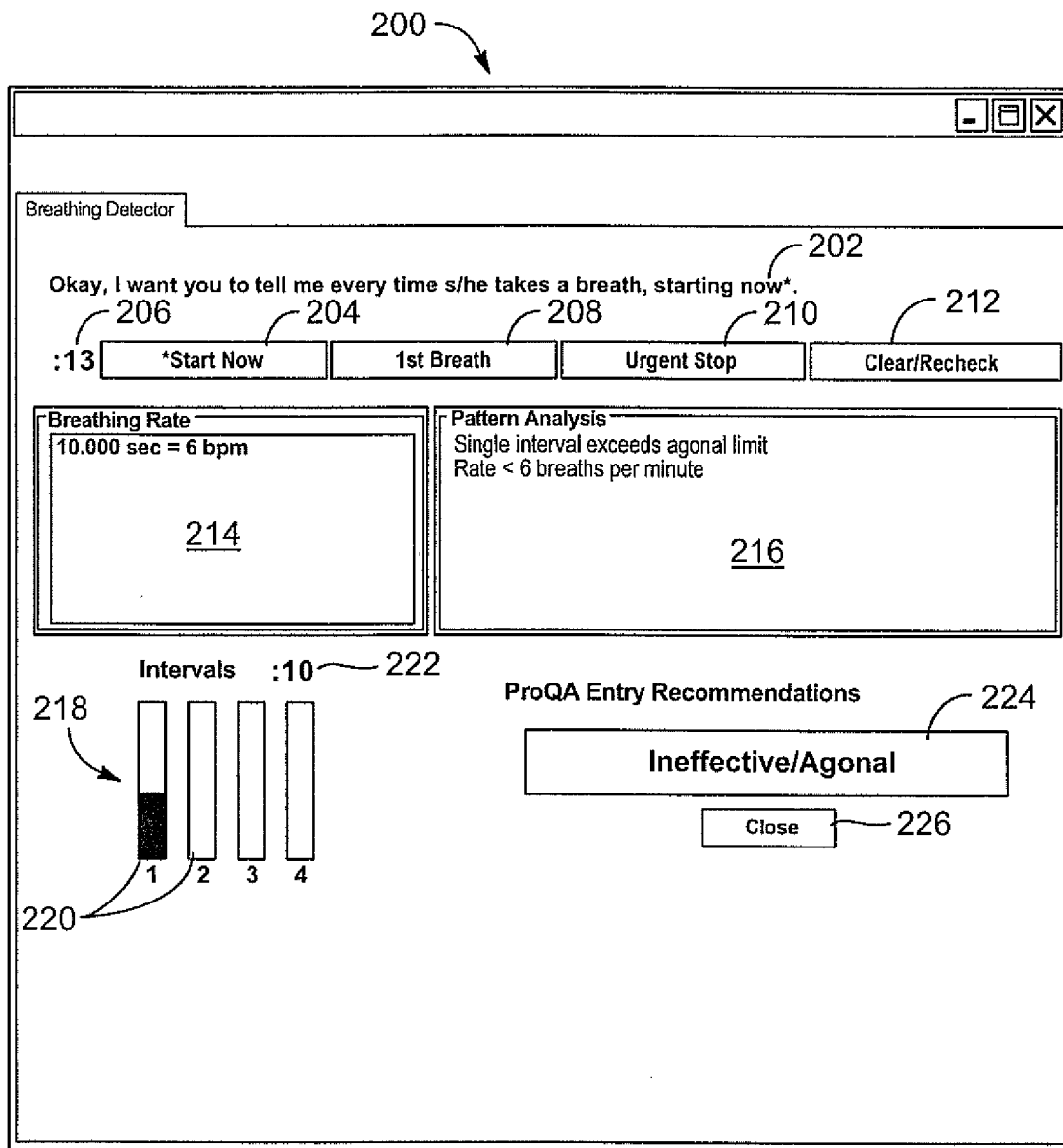


FIG. 2D

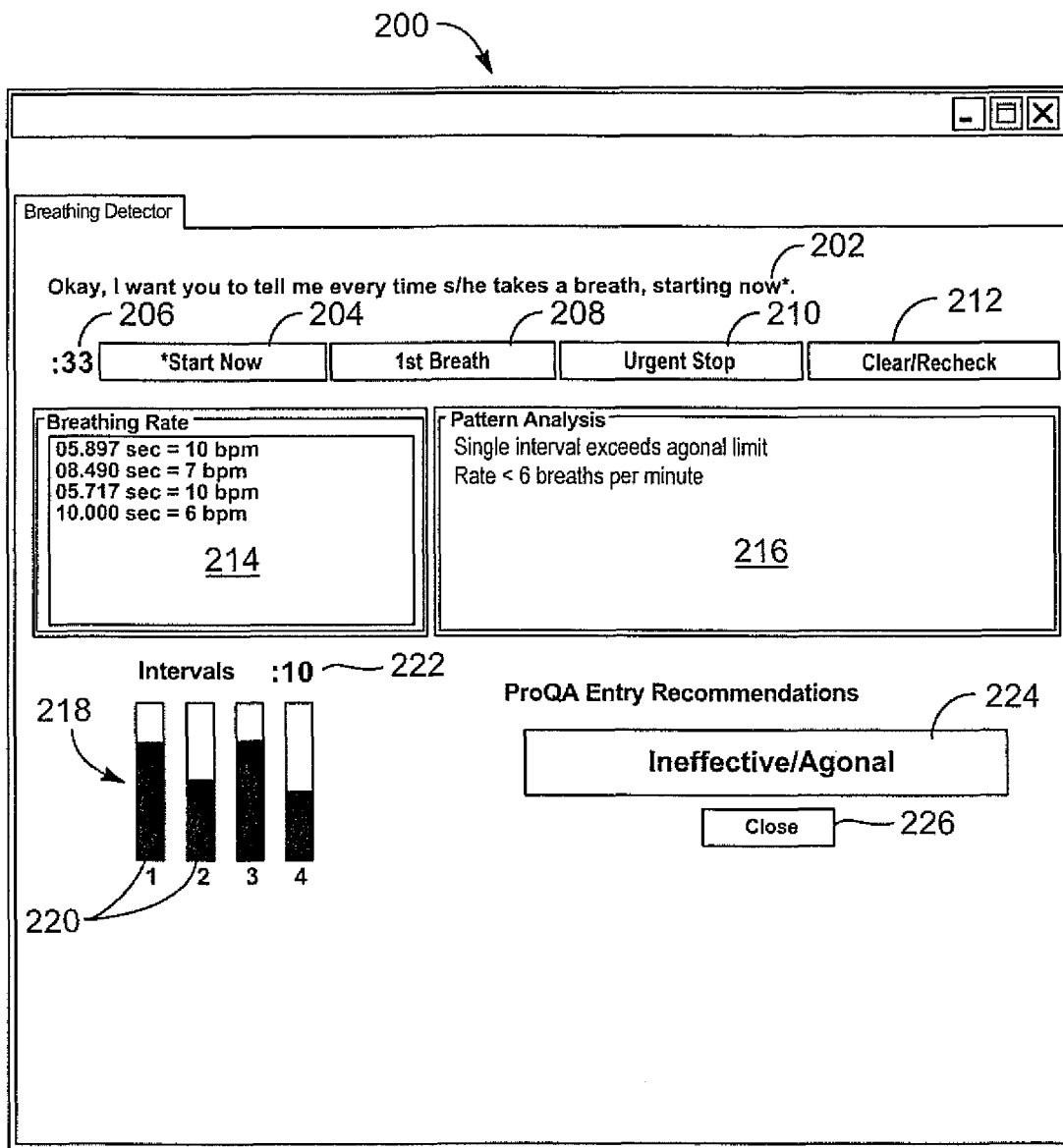


FIG. 2E

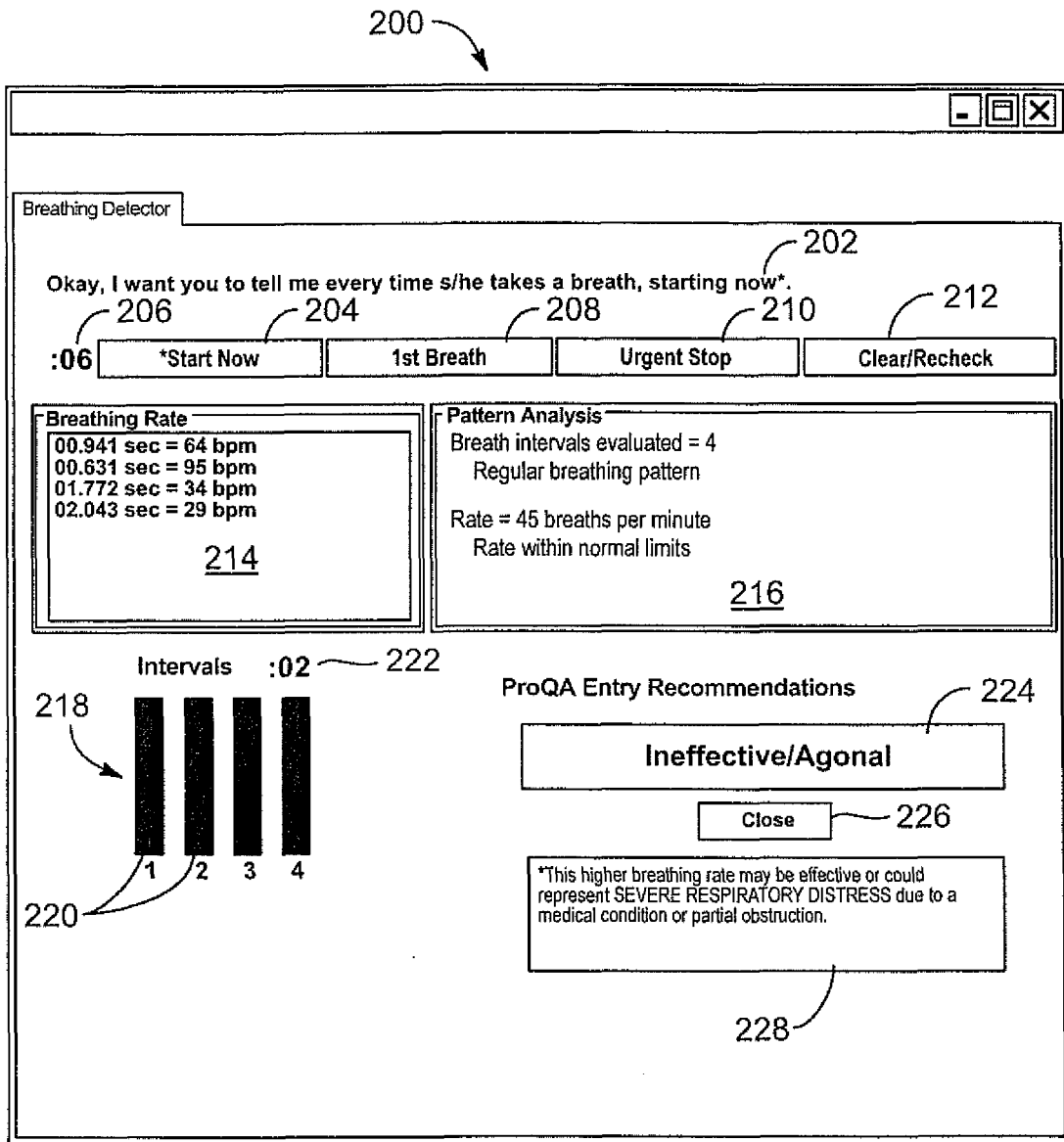


FIG. 2F

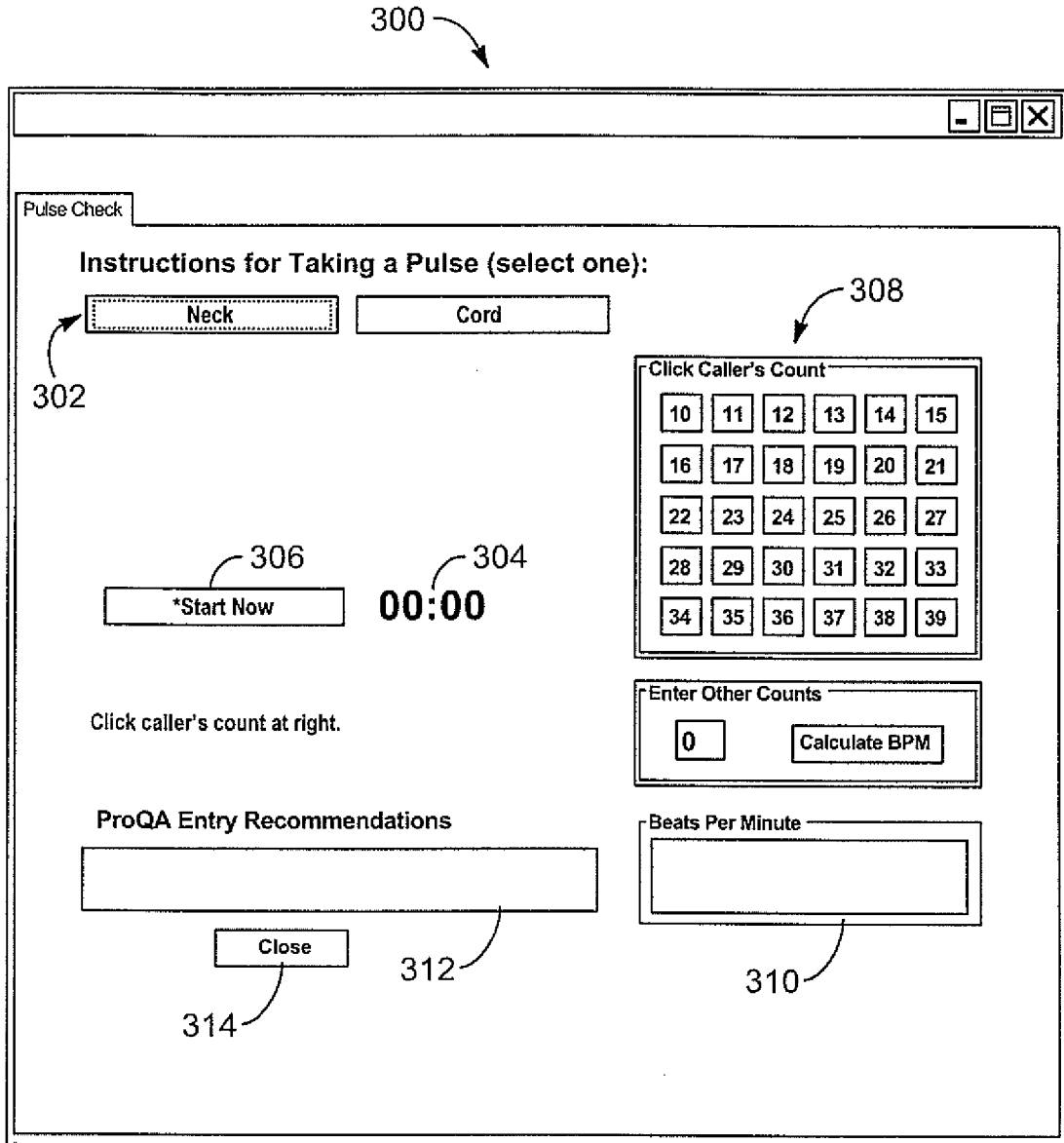


FIG. 3A

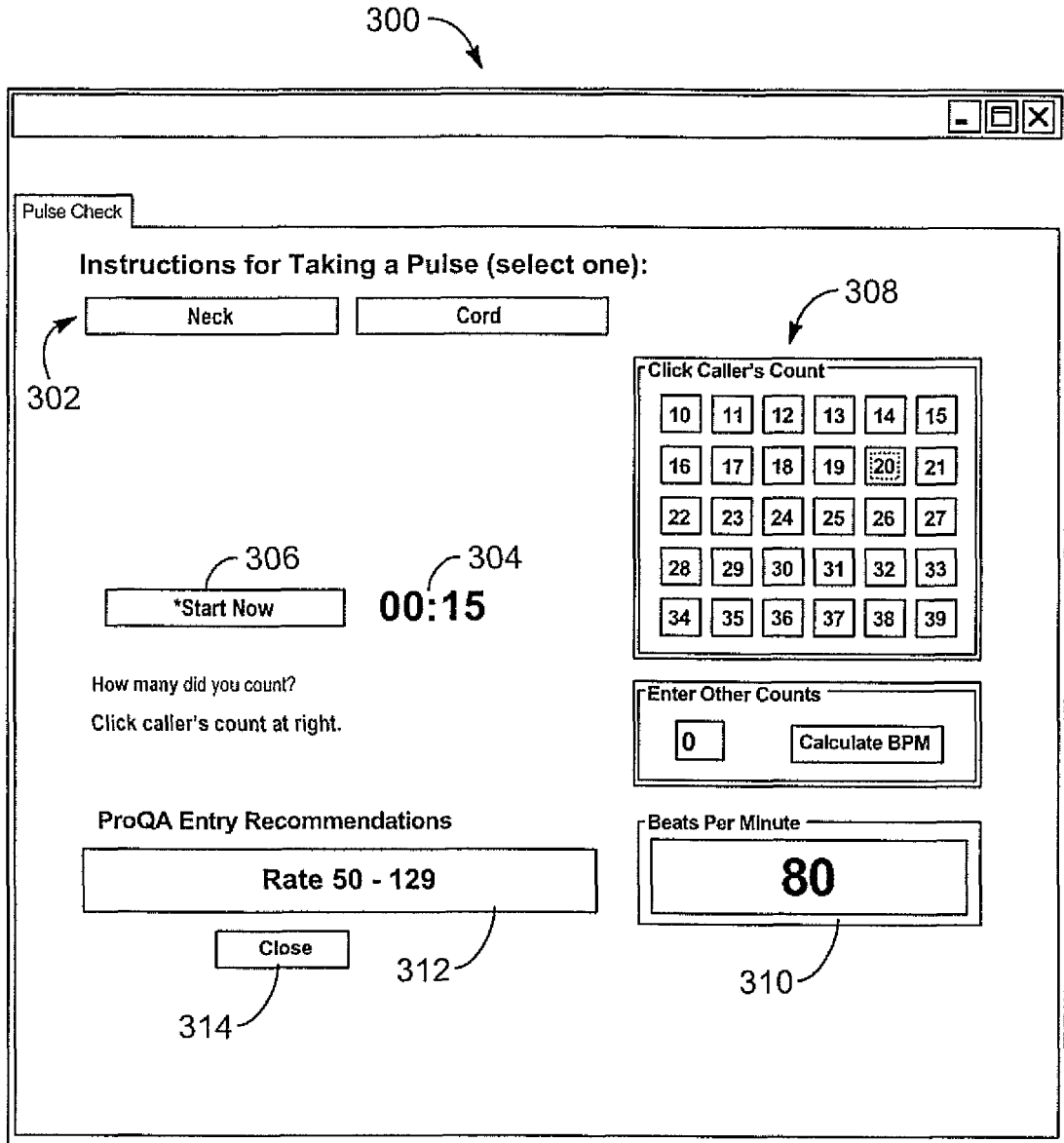


FIG. 3B

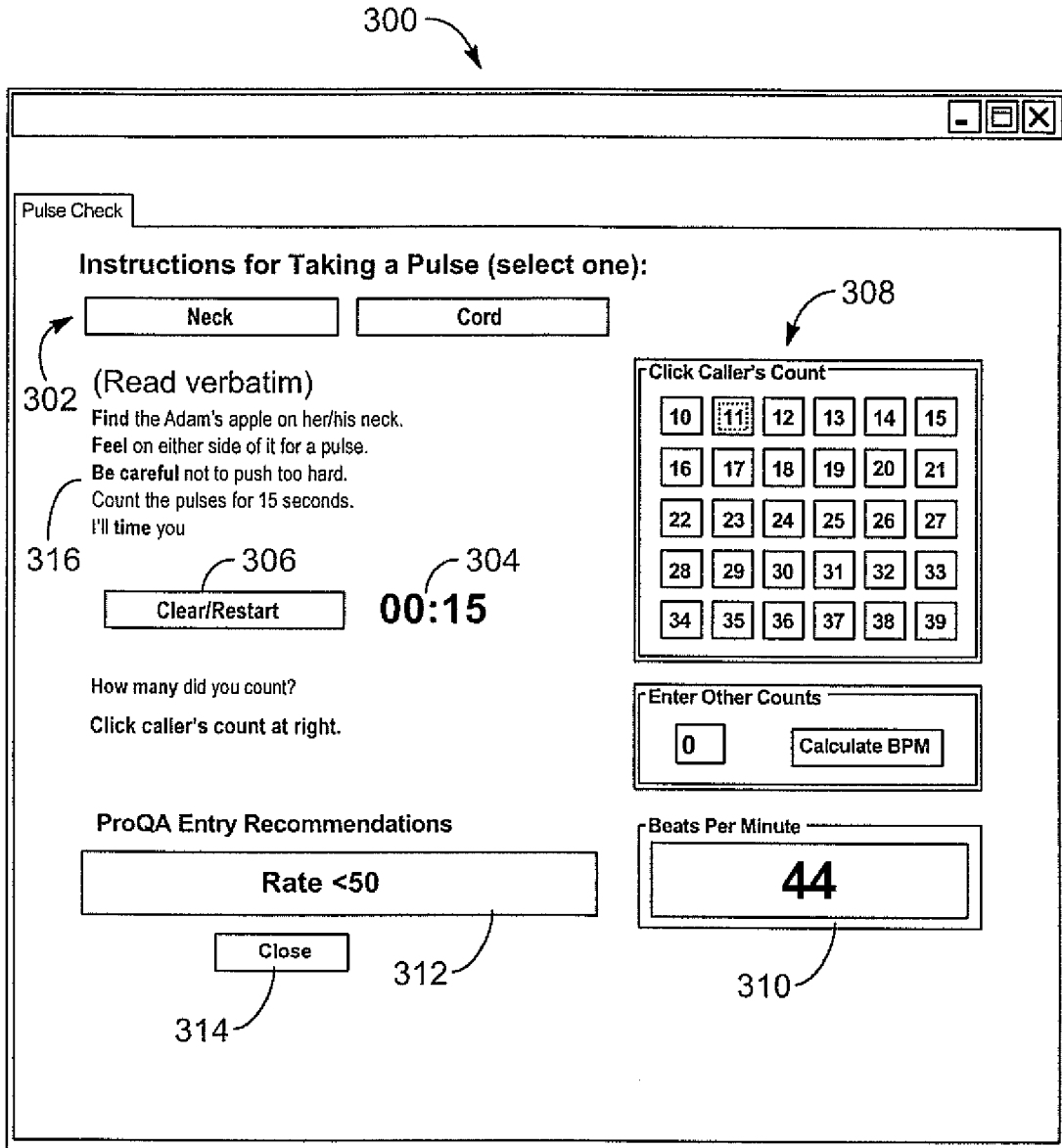


FIG. 3C

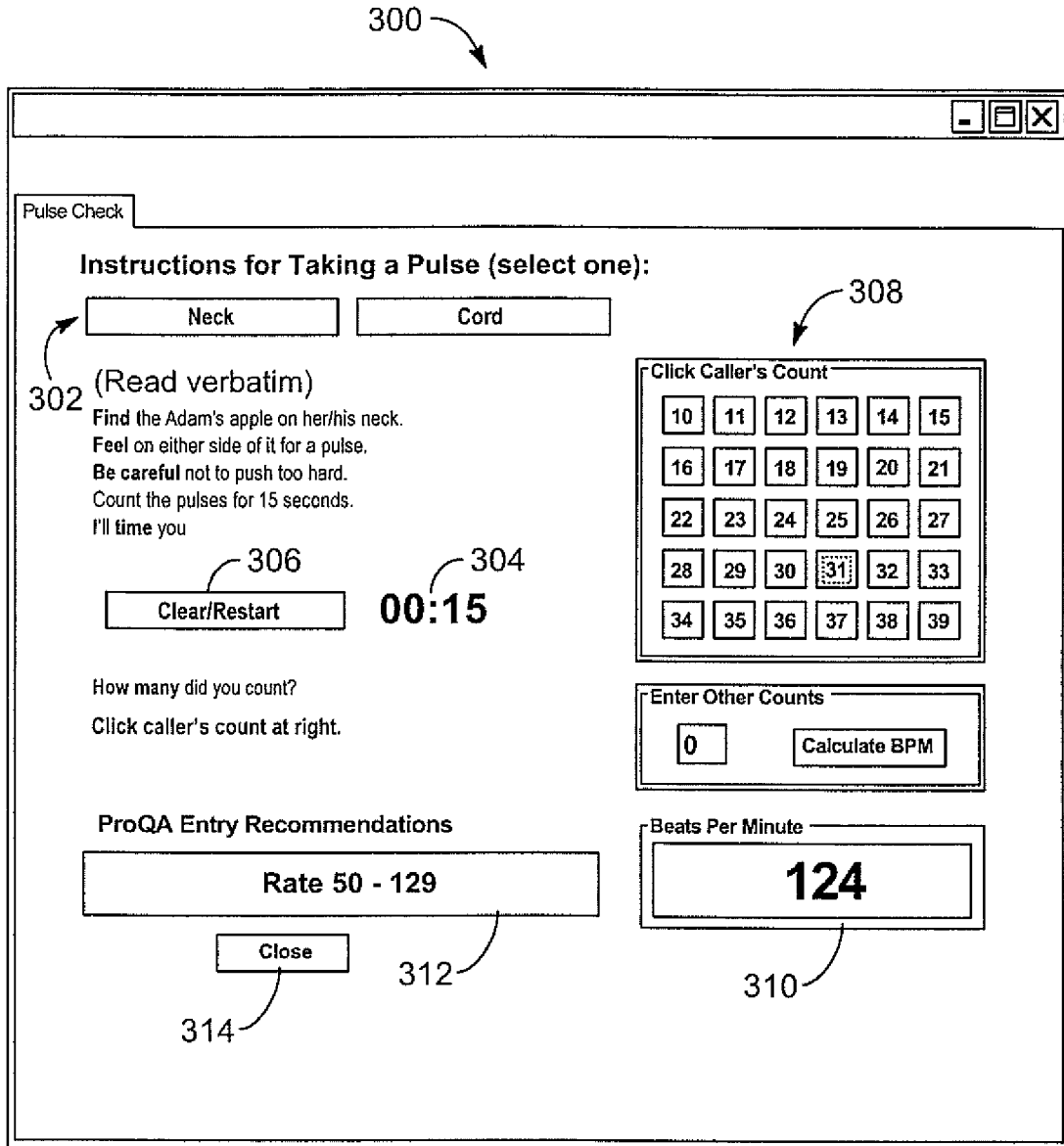


FIG. 3D

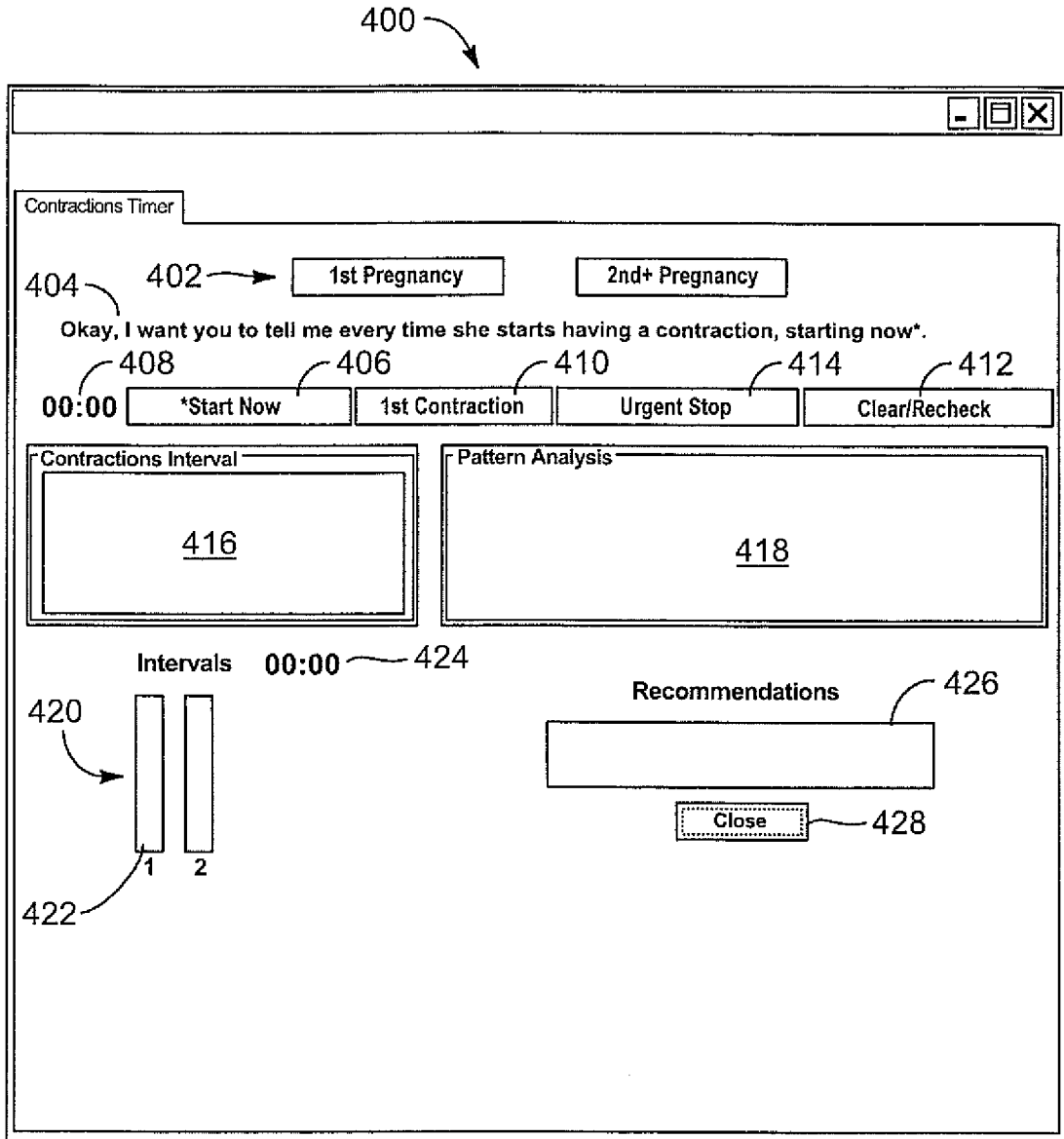


FIG. 4A

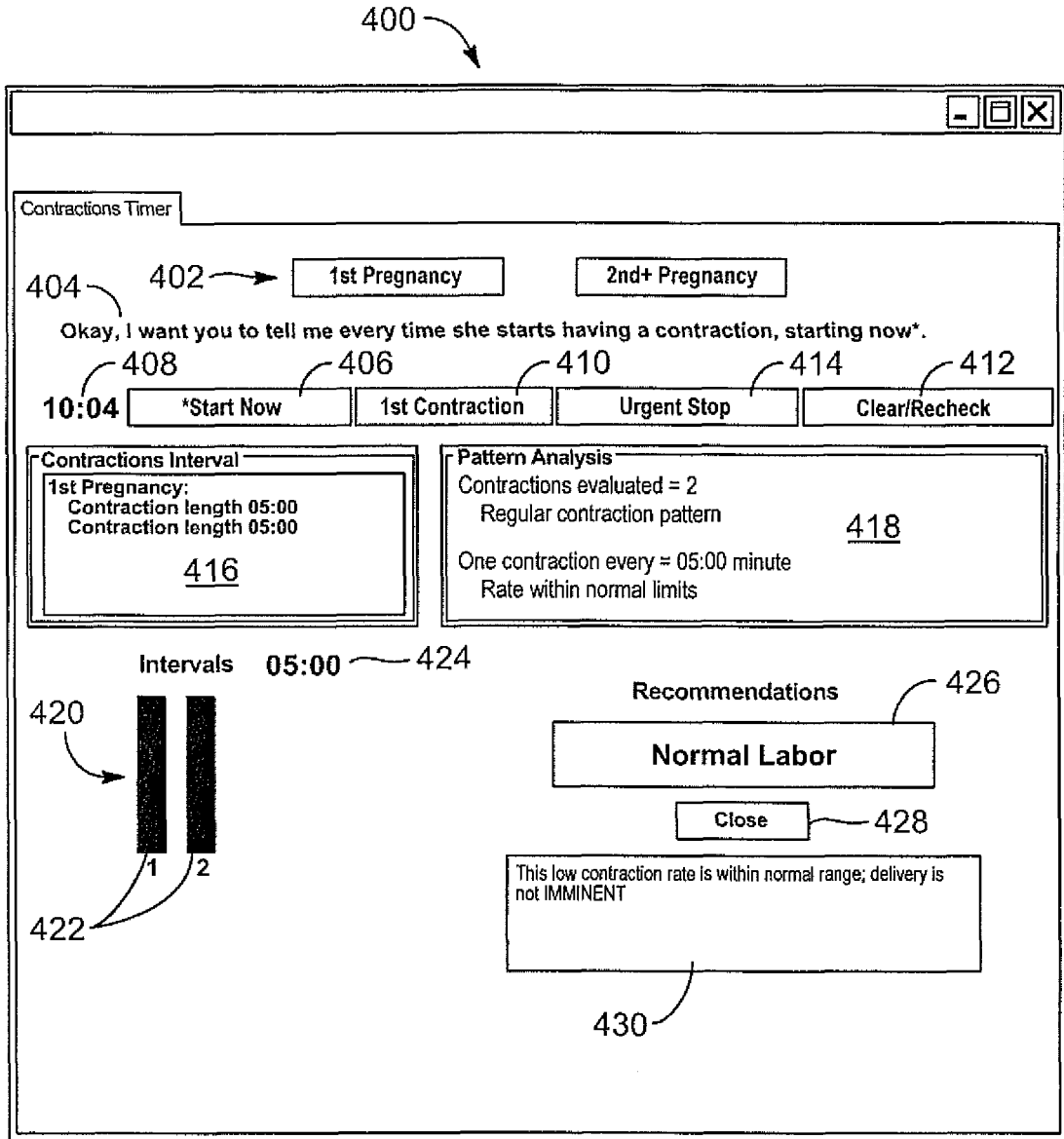


FIG. 4B

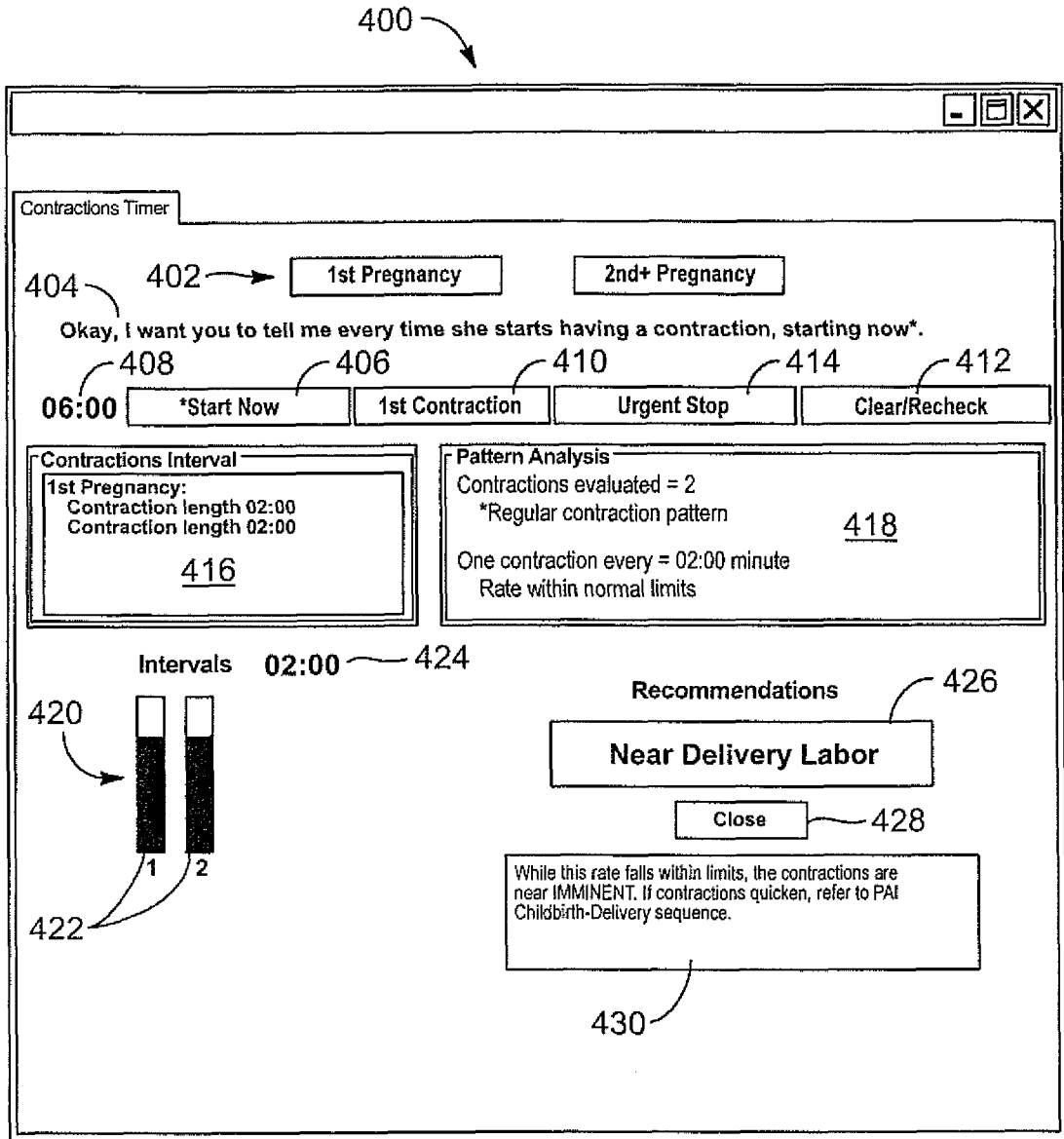


FIG. 4C

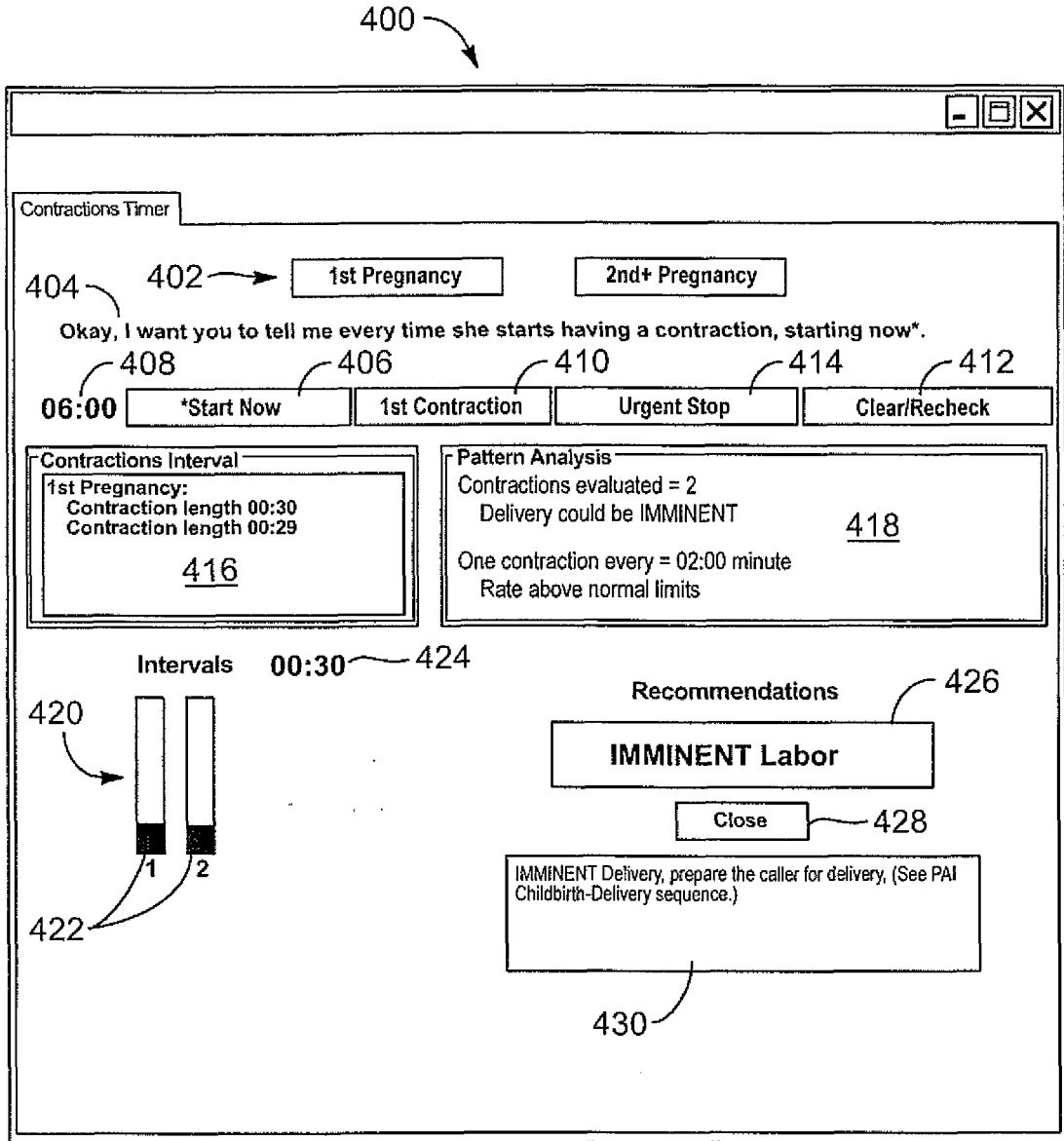


FIG. 4D

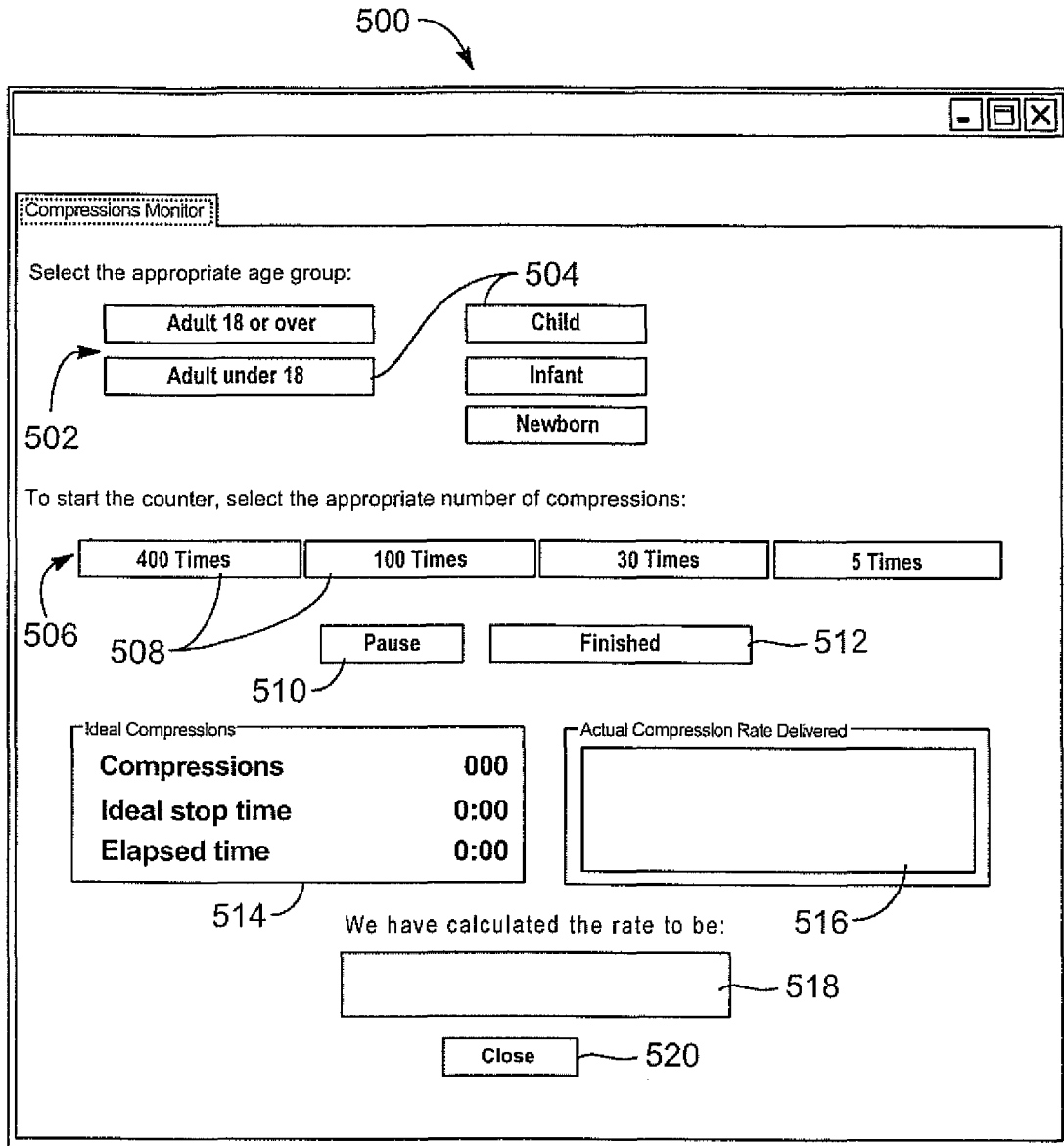


FIG. 5A

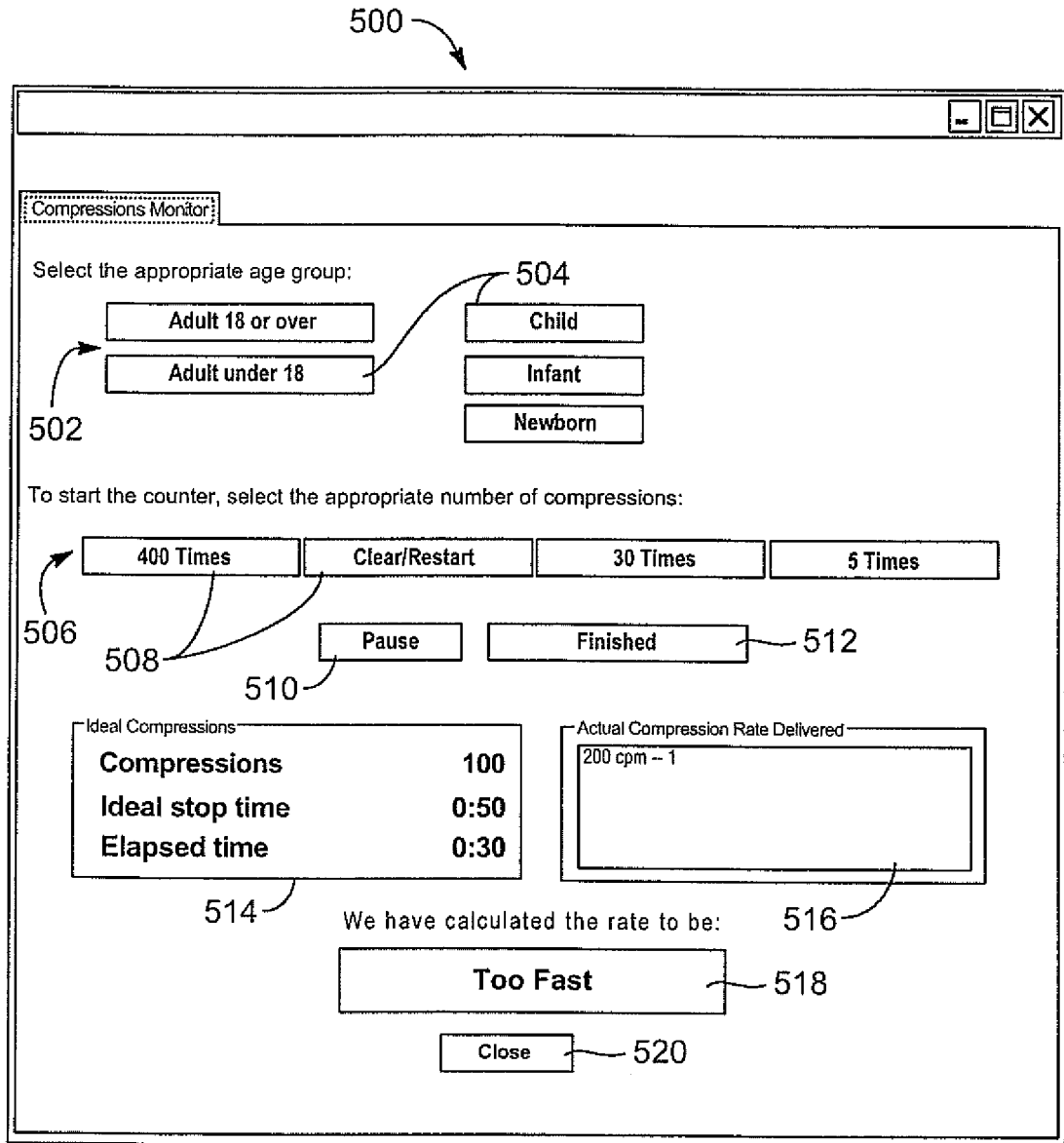


FIG. 5B

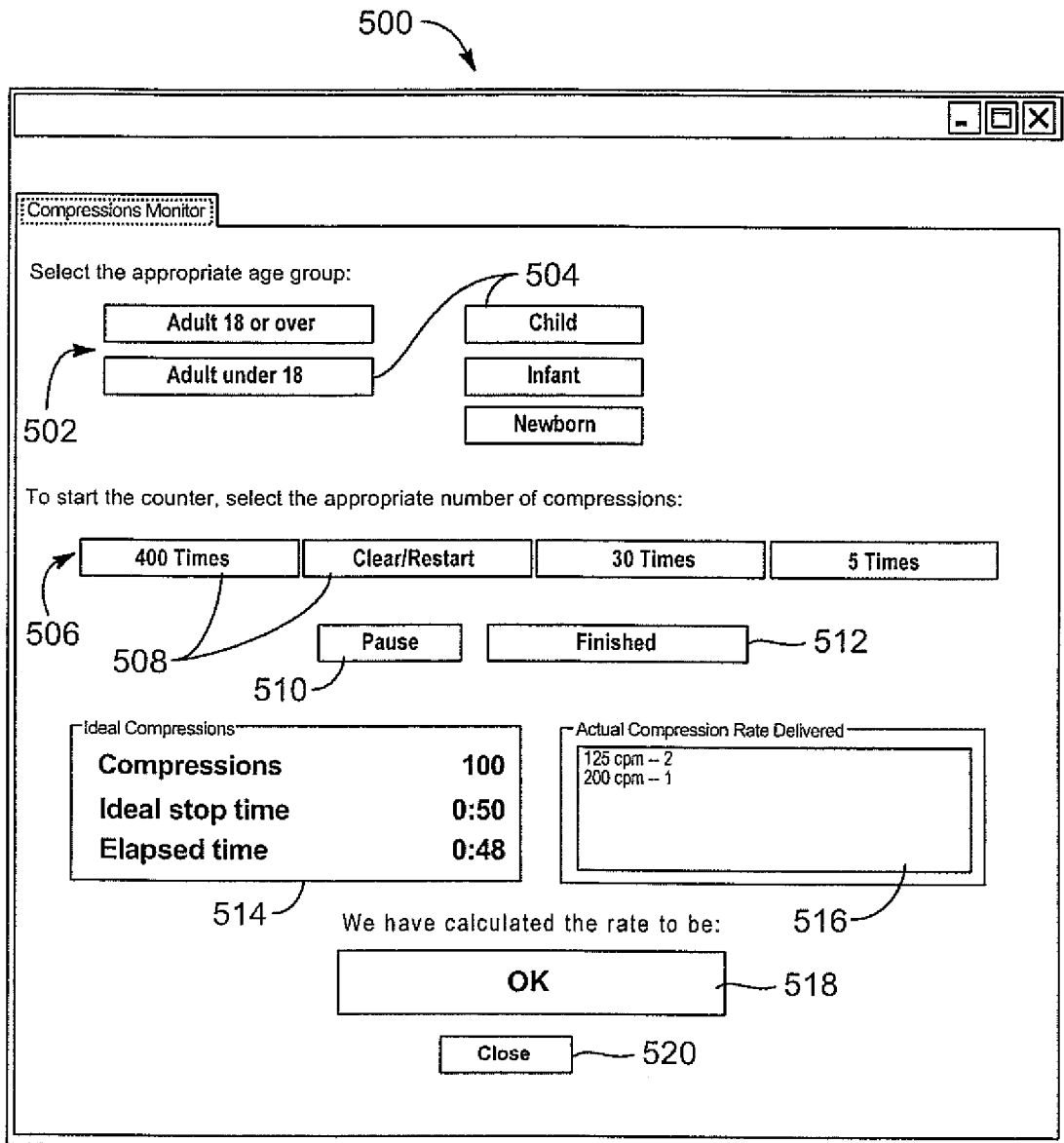


FIG. 5C

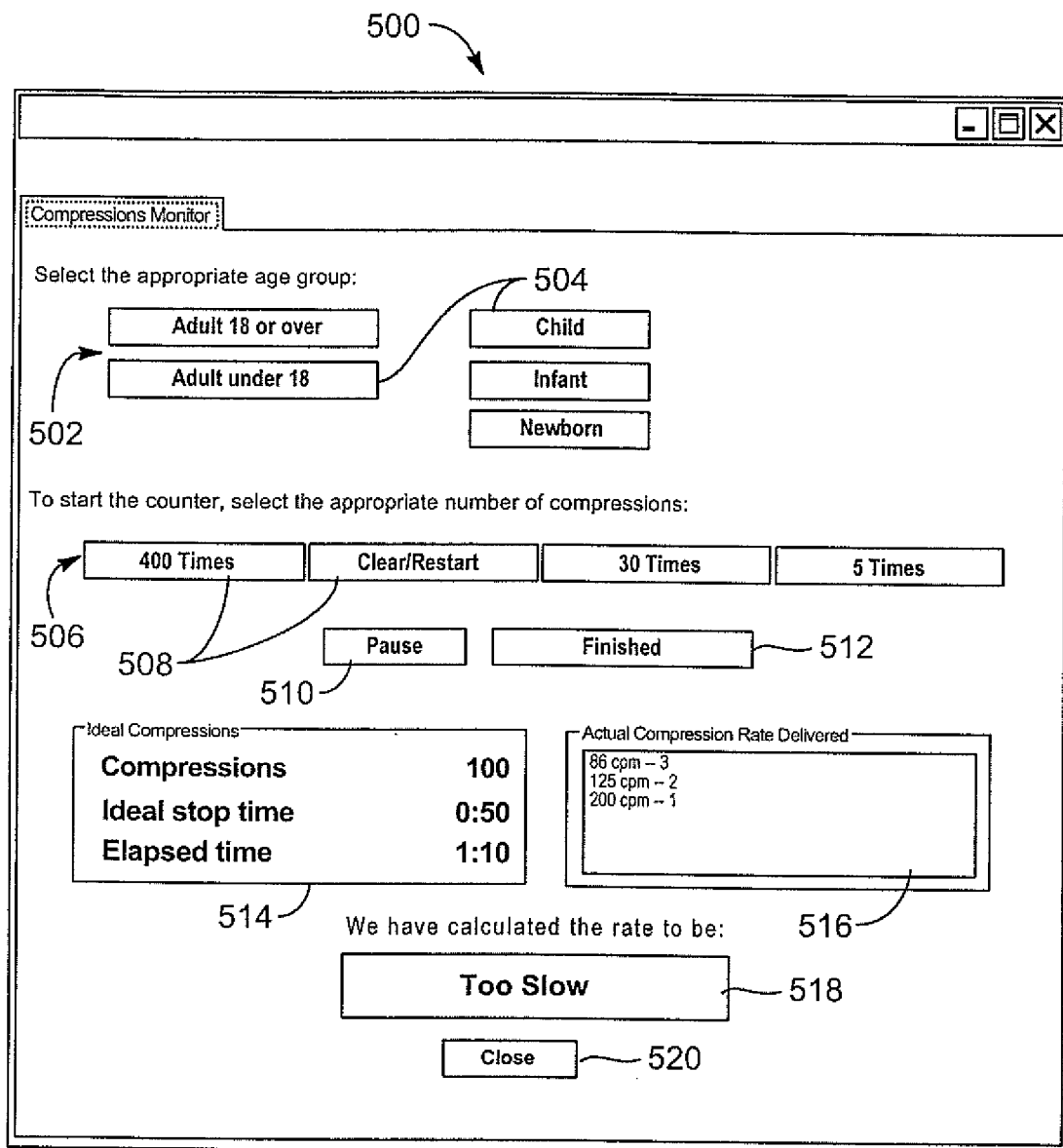


FIG. 5D

**REFERENCES CITED IN THE DESCRIPTION**

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专利名称(译)	用于紧急医疗调度的诊断和干预工具		
公开(公告)号	<a href="#">EP2152146A1</a>	公开(公告)日	2010-02-17
申请号	EP2008730736	申请日	2008-02-26
[标]申请(专利权)人(译)	杰弗里·J·克劳森		
申请(专利权)人(译)	克劳森, JEFFREY J.		
当前申请(专利权)人(译)	克劳森, JEFFREY J.		
[标]发明人	CLAWSON JEFFREY J		
发明人	CLAWSON, JEFFREY J.		
IPC分类号	A61B5/00 A61B5/02 A61B5/08 G06F19/00 G16H10/60 H04M3/51		
CPC分类号	A61B5/0002 A61B5/024 A61B5/0816 A61B5/742 A61B2560/0271 G06Q50/24 G16H20/40 G16H40/63 G16H50/20 G16H50/30 H04M3/5116 H04M11/04 H04M2203/357 H04M2203/401 H04M2242/04		
优先权	11/818181 2007-06-13 US		
其他公开文献	EP2152146A4 EP2152146B1		
外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

一种系统和方法协助紧急医疗调度员响应紧急呼叫。计算机实现的紧急医疗调度协议包括用于调度员询问呼叫者生成适当响应的询问器。提供了一种诊断工具，用于基于计时器和呼叫者中继的有关患者的信息来确定患者的生命体征。提供了一种干预工具，用于基于计时器和呼叫者中继信息来管理协助并确定压缩率。