(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 536 729 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
21.03.2012 Bulletin 2012/12

(21) Application number: **03749508.2**

(22) Date of filing: **10.09.2003**

(51) Int Cl.:
G06F 19/00 *(2011.01)* ***A61B 5/145*** *(2006.01)*

(86) International application number:
PCT/US2003/028075

(87) International publication number:
WO 2004/023972 (25.03.2004 Gazette 2004/13)

(54) **MONITORING BLOOD GLUCOSE INCLUDING CONVENIENT DISPLAY OF MEASUREMENT VALUES AND AVERAGES**

BLUTZUCKERÜBERWACHUNG MIT ZWECKMÄSSIGER ANZEIGE DER MESSWERTE UND MITTELWERTE

APPAREIL ET PROCEDE DESTINE A MESURER LES NIVEAUX DE GLUCOSE DANS LE SANG COMPRENANT UN AFFICHAGE PRATIQUE DES VALEURS CONSTITUANTES ET MOYENNES DE GLUCOSE DANS LE SANG

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **11.09.2002 US 409965 P**

(43) Date of publication of application:
08.06.2005 Bulletin 2005/23

(73) Proprietor: **Becton Dickinson and Company**
Franklin Lakes, New Jersey 07417 (US)

(72) Inventor: **GINSBERG, Barry, H.**
Wycoff, NJ 07481-1712 (US)

(74) Representative: **von Kreisler Selting Werner**
Deichmannhaus am Dom
Bahnhofsvorplatz 1
50667 Köln (DE)

(56) References cited:
EP-A- 1 369 688
DE-A1- 4 315 532
US-A- 4 475 158
US-A- 4 731 726
US-A- 4 838 275
US-A- 5 410 474
US-A- 5 899 855
US-A- 5 899 855
US-A- 6 024 699
US-A- 6 124 134
US-A- 6 159 155

EP 1 536 729 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Field of the Invention:

[0001] The invention relates generally to blood glucose meters and glucose monitoring for managing diabetes and, more particularly, to presentation of glucose data to a user in a convenient format, including an effective meal average and its constituent values and/or a measure of variability among the constituent values.

Background of the Invention:

[0002] A number of blood glucose monitoring systems are available which generally include a blood glucose meter. The blood glucose meter can be configured to receive and read a test strip inserted therein on which a drop of a patient's blood has been deposited, or can be adapted for subcutaneous readings, for example.

[0003] Blood glucose meters generally comprise a memory for storing measured blood glucose values, along with other data such as the corresponding dates and times of day the values were measured. Blood glucose meters are generally also provided with a display screen, and user input buttons with which a user can specify which of the stored values to display.

[0004] Some blood glucose meters also provide statistical data relating to the stored measured blood glucose values such as 7-day, 14-day and 30-day averaging of glucose levels at one or more selected times of day (e.g., breakfast, lunch, dinner and nighttime). Examples of such blood glucose meters are Accu-check meters available from Roche Diagnostics USA and One Touch meters available from LifeScan. These blood glucose meters, however, are disadvantageous because the length of the period of time over which the averages are calculated is too long when a patient is using the averaging to adjust his insulin dosage, and particularly when the current average blood glucose values are too low.

[0005] The Ascensia Dex2 glucose meter available from Bayer Healthcare provides four daily averages, that is, averages of measured blood glucose values taken during a particular period of time such as a two hour window around a selected mealtime. No existing blood glucose meter, however, provides an average blood glucose value over a selected bin or period of time, as well as convenient access to the constituent values used to derive the average value and optionally an indication of variability among the constituent values. As will be described in more detail below, an indication of variability or at least knowledge of constituent values used to derive a mealtime average, is important information to have when adjusting insulin dosage.

[0006] Blood glucose monitoring can be combined with a diabetes management system comprising software (e.g., for installation on a personal computer (PC) or personal data assistant (PDA)) for collecting and analyzing meter readings and generating summaries and graphical results (e.g., pie charts, histograms and the like) to assist the patient in understanding trends in their blood glucose levels and insulin regimen. These systems, however, also do not provide a patient with immediate and convenient access to averages of blood glucose levels at a mealtime or during another specified time period and to the constituent levels used to generate these averages. For example, the One Touch diabetes management software available from LifeScan can provide mealtime averages in a computer generated logbook table; however, the measured levels from which the averages were calculated are merely provided by a separate glucose tracking time table on a different screen. Accordingly, it is not always clear to a patient as to which values are the constituent values of a particular average. This is disadvantageous when a patient is determining whether an adjustment is needed in his insulin dosage. This problem is illustrated by the following hypothetical situations.

[0007] By way of an example, if a lunchtime average was calculated at 180 mg/dl, and the constituent values of the lunchtime average were 162 mg/dl, 204 mg/dl and 174 mg/dl, a patient could safely increase the breakfast dose of a short acting insulin by a small amount since the constituent values had little variation. If, however, the constituent values varied significantly (e.g., were 75 mg/dl, 297 mg/dl and 168 mg/dl), the patient could not safely increase the breakfast dose of a short acting insulin, not even by a small amount. A patient would need to instead decide why there was so much variation, whether it be changes in diet, exercise or stress level. Thus, a need exists for a glucose monitoring device that provides a patient with convenient and immediate access to glucose level averages over relatively short periods of time and to the constituent values that generated the averages in order to make meaningful and timely decisions regarding his insulin regimen and other diabetes management techniques.

US 4,731,726 A discloses a monitor system, which includes means for measuring blood glucose values and for generating glucose data signals. Monitor means are coupled to the measuring means. Patient data can be input and a glucose data signal can be computed in connection with administration treatment for diabetes mellitus.

US 6,124,134 A discloses a method and apparatus for determining stable and labile glycated compound levels in blood. Electromagnetic energy covering a multiplicity of wavelength bands is directed into a sample volume containing blood. Portions of the energy representative of both resource energy and energy after interacting with material within the sample volume are collected. Selected groups of data signals are processed in accordance with chemometric models developed

from analysis of such data signals together with known values of the analytes. The analyte signals may be stored and displayed in a form suitable for medical use.

US 5,899,855 discloses a modular self-care health monitoring system comprising a microprocessor-based unit such as a video game system of the type that includes switches for controlling device operation and a program cartridge. The program cartridge adapts the microprocessor-based unit for operation with a glucose monitor. The microprocessor-based unit processes data supplied by the glucose monitor to supply signals for displaying relevant information on a display unit that may be included in the microprocessor-based unit or may be a separate unit such as a television or video display monitor.

DE 43 15 532 A1 discloses a blood glucose monitor having a data processing unit for visualizing changes in the blood glucose level.

EP 1 369 688 A2, which is comprised in the state of the art according to Art. 54 (3) EPC, discloses a testing device for testing analyte levels in bodily fluids such as blood glucose. A memory is provided for storing data, in particular analyte data related to analyte measurements carried out by the meter and lifestyle data. Initiation means are provided for initiating immediate entry of data related to a specific category of lifestyle data. Navigation means are provided for entry and navigation of said data and transfer means are provided for transferring said data to said memory.

SUMMARY OF THE INVENTION

[0008] The subject matter of the invention is defined by each of independent claims 1 and 24.

[0009] In accordance with the invention, a method for annunciating a patient's medical data levels using a medical data level monitoring device comprises the steps of: (1) storing medical data levels with the corresponding dates and times of day the respective medical data levels were taken; (2) calculating an average medical data level from at least a first medical data level and a second medical data level selected from the stored medical data levels; (3) annunciating the average medical data level; (4) receiving a first user input to annunciate the first medical data level; (5) annunciating the first medical data level; (6) receiving a second user input to annunciate the second medical data level; and (7) annunciating the second medical data level. The annunciating steps for annunciating the average medical data level, the first medical data level and the second medical data level, respectively, can be performed by displaying them on a display device, or by generating an audible sound via a speaker. The medical data levels are blood glucose levels, and the medical data level monitoring device is a blood glucose meter. More than two medical data levels can be used, that is, n medical data levels wherein n is greater than 2.

[0010] In accordance with another aspect of the present invention, a variability indicator is provided that indicates the variability between the n medical data levels used to generate the average medical data level. The variability indicator is at least one of a scalar value, and a statistical parameter selected from the group consisting of a standard deviation and a coefficient of variance.

[0011] In accordance with yet another aspect of the present invention, the average medical data level and the constituent values are displayed on a display screen. The display screen comprises a first area for displaying one of the average medical data level and the constituent values, and a second area configured to have n indicators corresponding to respective ones of the n medical data levels. Each of the n indicators is displayed as a nonflashing item when the first area is displaying the average medical data level. The corresponding one of the n indicators is flashed when its corresponding n medical data level is being displayed as one of the constituent values. The display screen comprises a third area for displaying a time of day and a date for a corresponding one of the n medical data levels when it is being displayed as a constituent value in the first area.

[0012] In accordance with still yet another aspect of the present invention, calculating the average comprises selecting the stored medical data levels used to determine the average medical data level based on the date and time of day the stored medical data levels were taken. A user can define a time period during a day when the average medical data level is desired for that time period on each of a selected number of days (e.g., preferably three days). Calculating the average further comprises the steps of: (1) receiving a user input requesting an average medical data level of the time period for a selected number of days beginning with the current day; (2) determining if the time period has been entered or passed on the current day; (3) using a reading of an medical data level taken during the time period for the current day when determining the average medical data level if the time period has been entered or has passed for the current day; and (4) selecting a stored medical data level taken on the previous day when determining the average medical data level if the time period has yet not been entered or passed for the current day. The using step (3) further comprises the step of selecting one of the earliest and the most recent of a plurality of readings taken on the current day during the time period based on their respective times of day. The selecting step (4) further comprises the step of selecting one of the earliest and the most recent of a plurality of readings taken on the previous day during the time period based on their respective times of day. The using step (3) further comprises the step of using a stored medical data level from the previous day if no valid medical data levels are available from the time period for the current day. The selecting step (4) further comprises the step of using a stored medical data level from the day before the previous day if no valid medical

data levels are available from the time period for the previous day.

[0013] In accordance with an embodiment of the present invention, an apparatus for blood glucose monitoring comprises: (1) a reader for measuring a selected blood glucose level for the patient; (2) a memory device for storing a plurality of the blood glucose levels along with their respective dates and time of day they were taken; (3) an annunciator; (4) a user input device; and (5) a processing device connected to the reader, the memory device, the annunciator and the user input device and programmed to calculate an average blood glucose level from at least a first blood glucose level and a second blood glucose level selected from the stored blood glucose levels in the memory device, to annunciate the average blood glucose level via the annunciator, to receive a first user input from the user input device to annunciate the first blood glucose level, to annunciate the first blood glucose level in response to the first user input, to receive a second user input from the user input device to annunciate the second blood glucose level, and to annunciate the second blood glucose level in response to the second user input.

The programming device is further programmed to select the stored blood glucose levels used to determine the average blood glucose level based on the date and time of day the stored blood glucose levels were taken, and it is operable to allow a user to define a time period during a day when the average blood glucose level is desired for that time period on each of a selected number of days, and the processing device is programmed to receive a user input requesting an average blood glucose level of said time period for a selected number of days beginning with the current day, to use a reading of a blood glucose level taken during the time period for said current day when determining the average blood glucose level if said time period has been entered or has passed for the current day, and to select a stored blood glucose level taken on the previous day when determining the average blood glucose level if said time period has yet not been entered or passed for the current day.

Brief Description of the Drawings:

[0014] These and other objects, advantages and novel features of the present invention will be readily appreciated from the following detailed description when read in conjunction with the accompanying drawings, in which:

[0015] Fig. 1 is a perspective view of an exemplary blood glucose meter in accordance with an embodiment of the present invention;

[0016] Fig. 2 is a block diagram of the blood glucose meter of Fig. 1;

[0017] Fig. 3 depicts a display configuration for a blood glucose meter in accordance with an embodiment of the present invention;

[0018] Fig. 4 is a flow chart depicting a sequence of operations for selection of effective meal average constituent values in accordance with an embodiment of the present invention;

[0019] Fig. 5 is a flow chart depicting a sequence of operations for generating displays to communicate an effective meal average and its constituent values in accordance with an embodiment of the present invention; and

[0020] Figs. 6 and 7 illustrate a series of exemplary screens generated by a blood glucose meter in accordance with an embodiment of the present invention.

[0021] Throughout the drawing figures, like reference numerals will be understood to refer to like parts and components.

Detailed Description of the Preferred Embodiments:

[0022] In accordance with the present invention, a blood glucose meter 100 is provided with advantageous operations, including the determination and display of an effective mealtime average (EMA) or similar average over another user-defined period, the convenient and immediate display of the constituent values used to determine the average, and optional determination and display of variability among the constituent values (e.g., a standard deviation value). The blood glucose meter 100 is exemplified by the Logic™ blood glucose monitor and the Latitude™ diabetes management system available from Becton Dickinson and Company.

[0023] With reference to Fig. 1, the blood glucose meter 100 of the present invention has a blood glucose sensing area 150 for the monitoring of glucose within a patient. Blood glucose sensing area 150 may utilize a variety of well known means for the monitoring of glucose within a patient. One method may be the use of a disposable strip with reagents applied thereto for the sensing of glucose within a bodily fluid. In an alternate embodiment of the present invention, sensing area 150 could utilize well known non-invasive sensing methods for the determination of glucose within a patient's body. Sensing of glucose by sensing area 150 can be intermittent or continuous. Blood glucose meter 100 also can be configured to be wearable by the patient.

[0024] With reference to Figs. 1 and 2, blood glucose meter 100 also has a liquid crystal display (LCD) or other type of display device 160 which communicates data within the blood glucose meter 100 to the patient through a variety of menus programmed within the software/program instructions contained within the microprocessor 170 (Fig. 2) of blood glucose meter 100 or stored in the memory device 190 for execution by the microprocessor 170. Alternatively, the meter 100 can annunciate blood glucose values and other information audibly via a speech processing device and speaker.

The memory device 190 can store the blood glucose values measured by the reader or other sensing device 150, along with the dates and times of day they were measured, the stored blood glucose values that are selected to be constituent values of an average, and calculated values such as the averages and indicators of variability, among other information. It is to be understood that other memory configurations can be used without departing from the scope of the present invention.

[0025] Blood glucose meter 100 also has a variety of input buttons 110, 120, 130 which allow the patient to move through various screens displayed on LCD 160 to view various data within blood glucose meter 100. Forward button 110 and backward button 120 allow patients to move forward and backward through the menu screens shown on LCD 160. Also shown on blood glucose meter 100 is a memory button 130 which allows the user to enter the various menus generated by the software/program instructions of blood glucose meter 100. At least one input button is required; however, alternate embodiments which contain one or more input buttons with different functions are still within the scope of the present invention. Accordingly, a user input device is indicated generally at 180 in Fig. 2.

[0026] The present invention provides an advantageous presentation of glucose data to a person with diabetes from a glucose meter, monitor or continuous glucose sensor 100 in which an effective meal average (EMA) value is presented, followed by two or more of the individual values (i.e., hereinafter referred to as the constituent values) that make up the effective meal average. The effective meal average is comprised of an average value and its constituent values and/or a measure of the variability of the range. The effective meal average encompasses those values that occur at specified times (i.e., herein after referred to as the effective meal average timeframe or EMAT). The EMAT can be, for example, one hour before and one hour after a specified meal time, although the length of time before and after the meal could be different (e.g., 30 minutes or up to three hours), or during a specified interval such as from 10 AM to 2 PM. The average can also be for a post-meal timeframe. The effective meal average is calculated over a limited number of days that occurred previous to the calculation and is preferably calculated over three days, although the calculation can include as many as 13 days. The EMA has a minimum number of values that must be obtained within the time and date ranges, which is preferably three values, although the EMA can be based on as few as two values or as many values as were measured during the date range. The microprocessor 170 also employs an algorithm for excluding any given reading from the average. For example, patients may not want to include values taken after meals (i.e., post-prandial values) or control solution readings done during the specified time range. Patients can use from one to eight effective meal averages on any given date range, but preferably use four EMAs determined, for example, for the breakfast, lunch, supper and bedtime snack time periods. The additional four averages can be used for post-meal averages and an average in the middle of the night. The effective meal average provides improved feedback data for clinical decisions by patients with diabetes who use insulin and need to alter their dose of insulin.

[0027] The advantages of the present invention are illustrated by the following examples:

EXAMPLE 1

[0028] A Lunchtime EMA is calculated at 180 mg/dl and displayed on the LCD 160. The constituent values of the EMA are 162 mg/dl, 204 mg/dl and 174 mg/dl, which are displayed to the patient on the LCD 160 of the blood glucose meter 100. The EMA and the constituent values are preferably displayed via a series screens, each with a respective one of the values, as will be described below in connection with Figs. 6 and 7. It is to be understood that displays can be generated with different groupings of the EMA and its constituent values and remain within the scope of the present invention. Since the EMA is 180 and the individual values have little variation, at 162, 204 and 174, a patient could safely increase the breakfast dose of a short acting insulin by a small amount, for example, 1 unit.

EXAMPLE 2

[0029] A Lunchtime EMA is calculated at 180 mg/dl. The constituent values of the EMA are 75 mg/dl, 297 mg/dl and 168 mg/dl which are displayed to the patient on the LCD 160 of the blood glucose meter 100 preferably via a series of screens. Since the EMA is 180 and the individual values have significant variation, at 75, 297 and 168, a patient could not safely increase the breakfast dose of a short acting insulin, even by a small amount such as 1 unit. A patient could then decide why there is so much variation, whether it be changes in diet, exercise or stress level.

EXAMPLE 3

[0030] A Lunchtime EMA is calculated at 180 mg/dl. The constituent values of the EMA are 162 mg/dl, 204 mg/dl and 174 mg/dl which are displayed to the patient on the LCD 160 of the blood glucose meter 100, along with an EMA indicator (e.g., a standard deviation). Since the EMA is 180 and the individual values have little variation, at 162, 204 and 174, as indicated by the EMA indicator, a patient could safely increase the breakfast dose of a short acting insulin by a small amount, for example, 1 unit.

EXAMPLE 4

[0031] A Lunchtime EMA is calculated at 180 mg/dl. The constituent values of the EMA are 75 mg/dl, 297 mg/dl and 168 mg/dl which are displayed to the patient on the LCD 160 of the blood glucose meter 100, along with an EMA indicator (e.g., a standard deviation). Since the EMA is 180 and the individual values have great variation, at 75, 297 and 168, as indicated by the EMA indicator, a patient could not safely increase the breakfast dose of a short acting insulin, even by a small amount such as 1 unit. A patient could then decide why there is so much variation, whether it be changes in diet, exercise or stress level.

[0032] As indicated by the foregoing examples, in accordance with one aspect of the present invention, the EMA is an array which consists of the average of a series of specific (i.e., with respect to time and other criteria) blood glucose measurements , along with the values which constitute the average. In accordance with another embodiment of the present invention, the EMA is an average of a series of specific (i.e., with respect to time and other criteria) blood glucose measurements, along with an indicator of the variability of the specific measurements.

[0033] Prior art devices such as the Glucometer DEX2 mentioned in the background section above create averages for specific user settable times, but do not give the patient any indication of the inherent variability of the readings within the specific times. The patent is then unable to make clinical decisions based on the data. The patient only has an average of the readings of the last 14 days and may make a mistake in judgement with respect to the amount of change of insulin dosage. By contrast, the present invention advantageously communicates the variability dimension of the data. The present invention provides an apparatus and a method to present the data in such a format such that the patient has an average of the glucose readings, the constituent values used to generate the average, and optionally an indication of the variability in readings over the period in question (e.g., the effective meal average timeframe). Also, in accordance with another advantageous aspect of the present invention, the period of data for review is much shorter than existing blood glucose monitoring devices, allowing for a clinical judgement which is based on more recent and relevant data, rather than a running average provided by the existing devices.

[0034] Reference is now made to Fig. 3, which depicts an illustrative display configuration for LCD or other display device 160 to display an EMA, or a constituent value or other blood glucose measurement data point, as indicated at 340. Also shown on LCD 160 are first indicator block 310, second indicator block 320, and third indicator block 330. Time value 350 displays the time of the glucose measurement represented by data value 340. A date value can optionally be provided, as indicated at 360. As stated above, it is to be understood that displays can be generated with different groupings of the EMA and its constituent values and remain within the scope of the present invention.

[0035] With reference to Figs. 3 and 5, in order to indicate the EMA, indicator blocks 310, 320, 330 are all displayed and non-flashing. When the first constituent value of the EMA is displayed as data value 340, as denoted by box 510 in Fig 5, the first constituent value's measured time is displayed as time value 350, and first indicator block 310 is flashing. When the second constituent value of the EMA is displayed as data value 340, as denoted by box 520 in Fig 5, the second constituent value's measured time is displayed as time value 350, and second indicator block 320 is flashing. When the third constituent value of the EMA is displayed as data value 340, as denoted by box 530 in Fig 5, the third constituent value's measured time is displayed as time value 350, and third indicator block 330 is flashing.

[0036] Fig. 4 is a flowchart depicting a sequence of operations for the selection of EMA constituent values by the microprocessor 170. The software/program instructions for the meter 100 enters an EMA calculation mode. A single data point is read (step 410) from stored data (step 420) such as data stored in the memory device 190. The stored data is preferably an array of values representing blood glucose measurements, and associated time code information for each measurement, and various other flags. Each data point is compared to criteria (step 430) for checking the data point for its suitability for use in a specific EMA calculation. These criteria can include values and flags corresponding to specific time frames corresponding to the desired EMAT, date information, calibration check information, post-prandial measurement, and specifically user-flagged values, among other criterion. Preferably, in order for the data point to be used as a constituent value for the EMA, the data point is within the EMAT, a pre-prandial measurement, not a calibration check, and not specifically flagged by the user. Once a data point is found that meets the criteria in step 430, the software/program instructions provide for storing the data point (step 440) to a corresponding buffer indicated at 450. The process is repeated (step 460) n times until n EMA constituent values are stored to the constituent value buffer 450, where n can be from 2 to 14, for example, and more preferably n is 3. When n values have been selected, the microprocessor 170 executing the software/program instructions calculates population parameters (step 470) of the constituent values within the constituent values buffer 450, and stores the population parameters (step 480) to a population parameters buffer indicated at 490. At a minimum, the population parameters buffer 490 contains the average of the constituent values 450. Population parameters buffer 490 can additionally contain a standard deviation of the constituent values 450 or another statistical parameter (e.g., scalar value, coefficient of variance, and the like) which represents the variation of the constituent values 450.

[0037] As shown in Fig. 5, a series of menu screens are preferably displayed by LCD 160 of the blood glucose meter 100. The effective mealtime average is communicated to the patient via LCD 160. The patient navigates the menus

displayed on the LCD 160 by depressing the input buttons 110,120,130. The effective meal average screen in Fig 5 is represented by box 500. Once at the effective meal average screen 500, which displays an average of the readings for the effective meal average timeframe, the user can then look at the data values which comprise the effective meal average by depressing backward button 120 to reach effective the meal average first constituent value screen denoted by box 510. If the user depresses the forward button 110, the LCD 160 displays the effective meal average screen 500 again. While on effective meal average first value screen 510, if the user depresses backward button 120, the LCD 160 displays a effective meal average second constituent value screen 520. With another press of backward button 120, the LCD 160 displays an effective meal average third constituent value screen 530. With another press of backward button 120, an end marker screen 540 is displayed, which indicates to the patient that the last value seen was the last value of the EMA. While on end marker screen 540, if the user depresses backward button 120, LCD 160 reverts to the effective meal average screen 500 at which point the patient has seen all constituent values from which the effective meal average was derived. Alternatively, this process can be repeated as needed to display any number of constituent values. The constituent values can also be displayed substantially simultaneously with the average blood glucose level (e.g., on the same screen), or substantially immediately before and after the average blood glucose level using sequential display screens for respective ones of the average blood glucose level and the constituent values that can be generated in a round robin manner.

[0038] In accordance with an embodiment of the present invention, effective meal average calculation and display are enabled when a Setup.Average function is set to 'ON' within the software/program instructions of the meter 100. Four effective meal averages corresponding to four effective meal average timeframes are preferably viewed in sequence. Preferably, the time span covered in an effective meal average is defined as the center time of that average, plus or minus one hour. For example, a mealtime average whose 'center time' is 7:15AM covers blood glucose readings from 6:15AM to 8:15 AM. In an alternate embodiment of the invention, the center time of the effective meal average timeframes is settable by the user.

[0039] In accordance with an embodiment of the present invention, each average is calculated preferably using three readings. One reading is selected per day and begins with the current day if the current time has already entered or passed the time span for that time block. If the current time has not yet entered the time span covered in the specified time block (e.g., the EMAT), then the software/program instructions begin with that same time span on the previous day. If there is more than one reading within the time span on a given day, the software/program instructions select the most recent unmarked reading. In an alternative embodiment, the earliest reading is selected. Marked readings are excluded from averages such as control solution readings, which are marked with a "C" at 350 (Fig. 3) of the LCD 160, as shown in Fig. 6. Other marked readings to be excluded (e.g., by choice of the patient) are marked with an "*". If, on a given day, no readings are found within the time span, the software/program instructions for the meter 100 searches the readings from the previous day. The software/program instructions go back a maximum of five days from the first and most recent time span searched. If fewer than three valid readings are found, the software/program instructions control the display device 160 to appear as "---" for that meal time average, indicating that there were not enough readings available to calculate an average from that time block. If there are three valid readings, the meal time average is calculated.

[0040] In an alternate embodiment of the invention, the meter 100 can display a standard deviation or other statistical parameter of the EMA data to the patient to indicate the variability of the average for the effective meal average timeframe in question. This indicator of variability is preferably referred to as an EMA indicator. Such statistical parameters can be either a standard parameter (e.g., a standard deviation, coefficient of variance, and the like), or a scalar value (e.g., a scaled value from 1 to 10 etc.), which represents the variability inherent in the data.

[0041] Reference is now made to the exemplary series of display screens on a display device 160 depicted in Figs. 6 and 7. Screen 0.0 depicts the different possible screen areas that are selectively populated with information, as illustrated throughout Figs. 6 and 7, depending on the mode selected by the user. The series of display screens indicated generally at 602 in Fig. 6 are for viewing individual blood glucose readings and are accessed by depressing the memory button 130. For example, screen 3.1 is the most recent glucose reading. The forward and backward keys 110 and 120, respectively, can be used to navigate among the most recent readings (e.g., 30 readings) in the memory device 190. These screens comprise "MEM" to indicate that a stored value is being viewed, the glucose level in units mg/dl, and the date and time of the reading. Screens 3.2 and 3.3 illustrate marked readings that are not used for averaging, as indicated by the "*" and the "C" in their respective screens.

[0042] The series of display screens indicated generally at 604 in Fig. 6 are for viewing insulin injections and are preferably only visible when insulin is set to be "ON" during set-up of the meter 100. They can be accessed, for example, by depressing the memory button 130 when the current glucose reading is displayed. The large numerals are indicated along with a syringe icon, and alternate between displaying the pen number and the insulin dose, which is also indicated along with a "U". The date and time of day of the injection are also indicated.

[0043] The memory button 130 can be depressed again to obtain a 7-day average reading, and depressed again to obtain a 14-day average reading. Screen 3.14 provides a 7-day average, and includes the reading in units mg/dl and the indication of "7 day". Screen 3.15 provides a 14-day average, and includes the reading in units mg/dl and the indication

of "14 day".

[0044] With reference to Fig. 7, the memory button 130 can be depressed again to obtain a time block average (e.g., an EMA). A first screen 3.16 provides a breakfast EMA. The forward and backward keys 110 and 120 allow the user to view the constituent values on the screens 3.17 through 3.19, which represent valid data taken over the most recent three days (e.g., Feb. 10, 11 and 12) and during the breakfast EMAT for each day. Another depression of the memory button 130 provides a lunchtime EMA screen 3.20. The forward and backward keys 110 and 120 allow the user to view the constituent values on the screens 3.21 through 3.23, which represent valid data taken over the most recent three days (e.g., Feb. 9, 10 and 11) and during the lunchtime EMAT for each day. Another depression of the memory button 130 provides a dinnertime EMA screen 3.24. The forward and backward keys 110 and 120 allow the user to view the constituent values on the screens 3.25 through 3.27, which represent valid data taken over the most recent three days (e.g., Feb. 9, 11 and 12) and during the dinnertime EMAT for each day. As stated above, if no valid data is available for the dinnertime EMAT on a given day (e.g., Feb. 10), then the microprocessor 170 is programmed to use data from the previous day, Feb. 9. Finally, another depression of the memory button 130 provides a nighttime EMA screen 3.28. The forward and backward keys 110 and 120 allow the user to view the constituent values on the screens 3.29 through 3.31, which represent valid data taken over the most recent three days (e.g., Feb. 8, 10 and 12) and during the nighttime EMAT for each day.

[0045] It is to be understood that the toggling between viewing modes (e.g., individual blood glucose readings, insulin injection readings, 7-day average reading, 14-day average reading, and time block averages (e.g., EMAs) by depressing the memory button can be ordered differently than shown in Figs. 6 and 7, or include more or fewer information viewing modes. Further, the meter 100 can be provided with different user buttons or other input devices that allow direct access to any of the information viewing modes (e.g., selection from a menu of information display options provided on the LCD 160).

[0046] The following represents exemplary code for implementing an embodiment of the present invention.

1.1.1 Meal Time Average Button Functions

1.1.1.1 static DisplayMealBars(void)

[0047] This function displays meal bar annunciators.

```
Turn ON meal bar 1, 2 and 3 annunciators
If record counter = 1
   Enable flashing for meal bar 1 annunciator
   Disable flashing for meal bar 2 annunciator
   Disable flashing for meal bar 3 annunciator

Else if record counter = 2
    Disable flashing for meal bar 1 annunciator
    Enable flashing for meal bar 2 annunciator
    Disable flashing for meal bar 3 annunciator

Else if record counter = 3
    Disable flashing for meal bar 1 annunciator
    Disable flashing for meal bar 2 annunciator
    Enable flashing for meal bar 3 annunciator
```

1.1.1.2 static void M_UiMealTimeAverage(TBNum)

[0048] This function displays the Time Block's center time and average. If the average cannot be calculated, the meter displays '---'.

```
Input: TBNum, time block number

Display Setup.CTime[TBNum] .Hours
Display Setup.CTime[TBNum] .Minutes
Call IntervalAverage routine, to calculate time block average
If IntervalAverage result < 0 Display'---'
Else
    Display IntervalAverage result
    Clear record counter
```

```
Call DisplayMealBars, to display meal bar annunciators
```

1.1.1.3 static void LUiMealThneAverage(TBNum)

[0049] This function displays an older glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.

Action	Current Display	Next Display
Left arrow Button press	'---' (Can't calculate average)	No change
	Time Block Average	Glucose Record No. 1
	Glucose Record No. 1	Glucose Record No. 2
•	Glucose Record No. 2	Glucose Record No. 3
	Glucose Record No. 3	'End'
	'End'	Time Block Average

```
Input: TBNum, time block number
If IntervalAverage result > 0
    Increment record counter
    Clear display
    If record counter> 4
           Clear record counter
           Display Setup.CTime[TBNum] .Hours
           Display Setup.CTime[TBNum] .Minutes
           Display IntervalAverage result
           Call DisplayMealBars, to display meal bar annunciators
    Else if record counter = 4
           Display 'End'
    Else
           Display glucose record indexed by the record counter
           Call DisplayMealBars, to display meal bar annunciators
```

1.1.1.4 static void R_UiMealThneAverage(1'BNum)

[0050] This function displays a newer glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.

Action	Current Display	Next Display
Right arrow Button press	'---' (Can't calculate average)	No change
	Time Block Average	No change
	Glucose Record No. 1	Time Block Average
	Glucose Record No. 2	Glucose Record No. 1
	Glucose Record No. 3	Glucose Record No. 2
	'End'	Glucose Record No. 3

```
    Input: TBNum, time block number

If IntervalAverage result> 0
    Decrement record counter
    If record counter < 1
        Clear record counter
       Display Setup.CTime[TBNum].Hours
       Display Setup.CTime[TBNum].Minutes
       Display IntervalAverage result
```

```
        Else
           Display glucose record indexed by the record counter
           Call DisplayMealBars, to display meal bar annunciators
```

1.1.2 A1 Time Block Average

[0051] The meter enters this state when Setup.Average is ON, the meter is in the 14-day Average state and the user held the Mode button less than 1.5 seconds.

1.1.2.1 static void MUiMealTimelAverage(void)

[0052] If Set-up.Average is ON, this function displays the time block average. If the average cannot be calculated, the meter displays '---'. If Setup.Average is OFF, this function resets the state machine to the Individual Glucose Reading Review state.

```
Global Parameters used:
        Setup . Average

    If Setup.Average is ON
        Call M_UiMealTimeAverage(0), to calculate and display block average
    Else
        UiState = kStatel
        Call M UiRecallResults, back to Individual Blood Glucose Readings
```

1.1.2.2 static void L_UiMealTimelAverage(void)

[0053] This function displays an older glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
Call L UiMealTimeAverage(0), to display older averaging glucose record

1.1.2.3 static void R_UiMealTimelAverage(void)

[0054] This function displays a newer glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---' .
[0055] Call R_UiMealTimeAverage(0), to display newer averaging glucose record

1.1.3 A2 Time Block Average

[0056] The meter enters this state when the meter is in the A1 Time Block Average state and the user held the Mode button less than 1.5 seconds.

1.1.3.1 static void M_UiMealTime2Average(void)

[0057] This function displays the time block average. If the average cannot be calculated, the meter displays '---'.
[0058] Call M_UiMealTimeAverage(1), to calculate and display block average

1.1.3.2 static void L_UiMealTime2Average(void)

[0059] This function displays an older glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0060] Call L_UiMealTimeAverage(1), to display older averaging glucose record

1.1.3.3 static void R_UiMealTime2Average(void)

[0061] This function displays a newer glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0062] Call R_UiMealTimeAverage(1), to display newer averaging glucose record

1.1.4 A3 Time Block Average

[0063] The meter enters this state when the meter is in the A2 Time Block Average state and the user held the Mode button less than 1.5 seconds.

1.1.4.1 static void MUiMealTime3Average(void)

[0064] This function displays the time block average. If the average cannot be calculated, the meter displays '---'.
[0065] Call M_UiMealTimeAverage(2), to calculate and display block average

1.1.4.2 static void L_UiMealTime3Average(void)

[0066] This function displays an older glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0067] Call L_UiMealTimeAverage(2), to display older averaging glucose record

1.1.4.3 static void R_UiMealTime3Average(void)

[0068] This function displays a newer glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0069] Call R_UiMealTimeAverage(2), to display newer averaging glucose record

1.1.5 A4 Time Block Average

[0070] The meter enters this state when the meter is in the A3 Time Block Average state and the user held the Mode button less than 1.5 seconds. In this state, if the Mode button is held less than 1.5 seconds, the state machine resets to the Individual Blood Glucose Results Review state.

1.1.5.1 static void M_UiMealTime4Average(void)

[0071] This function displays the time block average. If the average cannot be calculated, the meter displays '---'.
[0072] Call M_UiMealTimeAverage(3), to calculate and display block average

1.1.5.2 static void L_UiMealTime4Average(void)

[0073] This function displays an older glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0074] Call LUiMealTimeAverage(3), to display older averaging glucose record

1.1.5.3 static void R_UiMealTime4Average(void)

[0075] This function displays a newer glucose record used for averaging or the time block average. If the average cannot be calculated, the meter displays '---'.
[0076] Call R UiMealTimeAverage(3), to display newer averaging glucose record
[0077] Although the present invention has been described with reference to preferred embodiments thereof, it will be understood that the invention is not limited to the details thereof. Various modifications and substitutions will occur to those of ordinary skill in the art. All such substitutions are intended to be embraced within the scope of the invention as defined in the appended claims.

Claims

1. A method of annunciating a patient's blood glucose levels using a blood glucose meter configured to perform the steps of:

   storing blood glucose levels with the corresponding dates and times of day the respective blood glucose levels were taken;
   calculating an average blood glucose level from at least a first blood glucose level and a second blood glucose

level selected from the stored blood glucose levels by:

selecting the stored blood glucose levels used to determine said average blood glucose level based on the date and time of day the stored blood glucose levels were taken,
defining a time period during a day when the average blood glucose level is desired for that time period on each of a selected number of days,
receiving a user input requesting an average blood glucose level of said time period for a selected number of days beginning with the current day;
determining if said time period has been entered or passed on said current day;
using a reading of a blood glucose level taken during the time period for said current day when determining said average blood glucose level if said time period has been entered or has passed for the current day; and selecting a stored blood glucose level taken on the previous day when determining said average blood glucose level if said time period has yet not been entered or passed for the current day;
annunciating said average blood glucose level;
receiving a first user input to annunciate said first blood glucose level;
annunciating said first blood glucose level;
receiving a second user input to annunciate said second blood glucose level; and
annunciating said second blood glucose level.

2. A method as claimed in claim 1, wherein each of the three said annunciating steps for annunciating said average blood glucose level, said first blood glucose level and said second blood glucose level, respectively, can be performed by one of displaying on a display device (160), and generating an audible sound via a speaker.

3. A method as claimed in claim 1, further comprising the steps of:

receiving a third user input to annunciate a value; and
annunciating said average blood glucose level.

4. A method as claimed in claim 1, wherein the average blood glucose level calculation uses n of said stored blood glucose levels, where n is an integer greater than 2 and said n stored blood glucose levels comprise said first blood glucose level and said second blood glucose level.

5. A method as claimed in claim 4, further comprising the step of annunciating a variability indicator that indicates the variability between said n stored blood glucose levels.

6. A method as claimed in claim 4, wherein said n stored blood glucose levels are considered constituent values (450) of the average blood glucose level, and further comprising the steps of:

receiving another user input to annunciate the next blood glucose level among said n stored blood glucose levels after said first blood glucose level and said second blood glucose level;
annunciating the next blood glucose level; and
repeating the receiving step for receiving another user input to annunciate the next blood glucose level among the n blood glucose levels, and annunciating the next blood glucose level until each of said constituent values (450) have been annunciated.

7. A method as claimed in claim 6, wherein said repeating step comprises the step of annunciating the average blood glucose level after the last blood glucose level among said constituent values (450) has been annunciated.

8. A method as claimed in claim 4, wherein said average blood glucose level and said constituent values (450) are displayed on a display screen, the display screen comprising a first area for displaying one of the average blood glucose level and said constituent values (450), and a second area configured to have n indicators corresponding to respective ones of said n stored blood glucose levels.

9. A method as claimed in claim 8, further comprising the step of displaying each of said n indicators as nonflashing items when said first area is displaying said average blood glucose level, and flashing the corresponding one of said n indicators when its corresponding n blood glucose level is being displayed as one of the constituent values (450).

10. A method as claimed in claim 8, wherein said display screen comprises a third area for displaying a time of day and a date, and further comprising the step of displaying the time of day and date stored with a corresponding one of said n stored blood glucose levels in said third area when it is being displayed as a constituent value in said first area.

11. The method as claimed in claim 1, wherein
said average blood glucose level is calculated from at least three of the stored blood glucose levels as the constituent values (450); and
said annunciating is performed by displaying said average, first and second blood glucose levels on a display device (160) of said blood glucose meter (100).

12. A method as claimed in claim 11, further comprising the steps of:

receiving a third user input to display the third one of the constituent values (450);
displaying the third one of the constituent values (450) in response to the third user input;
receiving another user input to display a value; and
displaying the average blood glucose level again.

13. A method as claimed in claim 12, wherein said blood glucose meter (100) comprises forward and backward arrow keys (110,120) for navigation forward and backward, respectively, among the different displayed constituent values (450).

14. A method as claimed in claim 11, wherein the display screen comprises a first area for displaying one of the average blood glucose level and the constituent values (450), and a second area configured to have three indicators corresponding to respective ones of the three constituent values (450).

15. A method as claimed in claim 14, further comprising the step of displaying each of said three indicators as nonflashing items when said first area is displaying the average blood glucose level, and flashing the corresponding one of said three indicators when its corresponding constituent value is being displayed.

16. A method as claimed in claim 1 or 11, wherein said calculating step further comprises the step of using stored blood glucose levels from as many as a selected maximum number of previous days if no valid blood glucose levels are available for said current day.

17. A method as claimed in claim 16, wherein said selected maximum number of days is five.

18. A method as claimed in claim 11, further comprising the step of displaying a variability indicator that indicates the variability between said constituent blood glucose levels.

19. A method as claimed in claim 5 or 18, wherein the variability indicator is at least one of a scalar value, and a statistical parameter selected from the group consisting of a standard deviation and a coefficient of variance.

20. A method as claimed in claim 1, wherein said selected number of days is three.

21. A method as claimed in claim 1 or 11, wherein said using step further comprises the step of selecting one of the earliest and the most recent of a plurality of readings taken on said current day during said time period based on their respective times of day.

22. A method as claimed in claim 1 or 11, wherein said selecting step further comprises the step of selecting one of the earliest and the most recent of a plurality of readings taken on said previous day during said time period based on their respective times of day.

23. A method as claimed in claim 1 or 11, wherein said using step further comprises the step of using a stored blood glucose level from the previous day if no valid blood glucose levels are available from said time period for the current day, and said selecting step further comprises the step of using a stored blood glucose level from the day before said previous day if no valid blood glucose levels are available from said time period for the previous day.

24. A blood glucose meter (100) for patient condition monitoring comprising:

a reader for measuring a selected blood glucose level for said patient;
a memory device (190) for storing a plurality of the blood glucose levels along with their respective dates and time of day they were taken;
an annunciator;
a user input device; and
a processing device connected to said reader, said memory device (190),
said annunciator and said user input device and programmed to calculate an average blood glucose level from at least a first blood glucose level and
a second blood glucose level selected from the stored blood glucose levels in said memory device (190), to annunciate the average blood glucose level via said annunciator, to receive a first user input from said user input device to annunciate the first blood glucose level, to annunciate the first blood glucose level in response to said first user input, to receive a second
user input from said user input device to annunciate the second blood glucose level, and to annunciate the second blood glucose level in response to said second user input,
wherein said processing device is
programmed to select the stored blood glucose levels used to determine said average blood glucose level based on the date and time of day the stored blood glucose levels were taken, and
operable to allow a user to define a time period during a day when the average blood glucose level is desired for that time period on each of a selected number of days,
characterized in that
said processing device is programmed to receive a user input requesting an average blood glucose level of said time period for a selected number of days beginning with the current day, to determine if said time period has been entered or passed on said current day, to use a reading of a blood glucose level taken during the time period for said current day when determining the average blood glucose level if said time period has been entered or has passed for the current day, and to select a stored blood glucose level taken on the previous day when determining the average blood glucose level if said time period has yet not been entered or passed for the current day.

25. A blood glucose meter (100) as claimed in claim 24, wherein said annunciator is at least one of a display device (160) and a speaker, and said processing device is operable to annunciate by one of displaying on said display device (160), and generating an audible sound via said speaker.

26. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is further programmable to receive a third user input via said user input device to annunciate a value, and to annunciate the average blood glucose level.

27. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is programmable to use n of the stored blood glucose levels to calculate the average blood glucose level, where n is an integer greater than 2 and the n stored blood glucose levels comprise said first blood glucose level and said second blood glucose level.

28. A blood glucose meter (100) as claimed in claim 27, wherein said processing device is programmable to determine and annunciate a variability indicator via said annunciator that indicates the variability between the n stored blood glucose levels.

29. A blood glucose meter (100) as claimed in claim 28, wherein the variability indicator is at least one of a scalar value, and a statistical parameter selected from the group consisting of a standard deviation and a coefficient of variance.

30. A blood glucose meter (100) as claimed in claim 27, wherein the n stored blood glucose levels are considered constituent values (450) of the average blood glucose level, and said processing device is further programmable to receive another user input via said user input device to annunciate the next blood glucose level among the n blood glucose levels after said first blood glucose level and said second blood glucose level, to annunciate the next blood glucose level in response to said another user input, to repeat the operations of receiving another user input to annunciate the next blood glucose level among the n blood glucose levels and annunciating the next blood glucose level until each of the constituent values (450) has been annunciated via the annunciator.

31. A blood glucose meter (100) as claimed in claim 30, wherein said processing device is further programmable to annunciate the average blood glucose level after the last blood glucose level among the constituent values (450) has been annunciated.

32. A blood glucose meter (100) as claimed in claim 27, wherein said annunciator is a display screen and the average blood glucose level and the constituent values (450) are displayed on said display screen, said display screen comprising a first area for displaying one of the average blood glucose level and the constituent values (450), and a second area configured to have n indicators corresponding to respective ones of the n blood glucose levels.

33. A blood glucose meter (100) as claimed in claim 32, wherein, said processing device is programmable to display each of said n indicators as nonflashing items when said first area is displaying the average blood glucose level, and flash the corresponding one of said n indicators when its corresponding n blood glucose level is being displayed as one of the constituent values (450).

34. A blood glucose meter (100) as claimed in claim 32, wherein said display screen comprises a third area for displaying a time of day and a date, said processing device being further programmable to display the time of day and date stored with a corresponding one of the n stored blood glucose levels in said third area when it is being displayed as a constituent value in said first area.

35. A blood glucose meter (100) as claimed in claim 24, wherein said selected number of days is three.

36. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is programmable to select one of the earliest and the most recent of a plurality of readings taken on said current day during said time period based on their respective times of day.

37. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is programmable to select one of the earliest and the most recent of a plurality of readings taken on said previous day during said time period based on their respective times of day.

38. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is programmable to use a stored blood glucose level from the previous day if no valid blood glucose levels are available from said time period for the current day, and, when selecting a stored blood glucose level taken on the previous day, to use a stored blood glucose level from the day before said previous day if no valid blood glucose levels are available from said time period for the previous day.

39. A blood glucose meter (100) as claimed in claim 24, wherein said processing device is programmable to use stored blood glucose levels from as many as a selected maximum number of previous ago if no valid blood glucose levels are available for said current day.

40. A blood glucose meter (100) as claimed in claim 39, wherein said selected maximum number of days is five.

41. A blood glucose meter (100) as claimed in claim 24, wherein said user input device comprises forward and backward arrow keys (110,120) for navigation forward and backward, respectively, among the annunciated said constituent values (450).

Patentansprüche

1. Verfahren zum Anzeigen der Blutzuckerspiegel eines Patienten mittels eines Blutzuckermessgeräts, welches zur Durchführung der folgenden Schritte ausgebildet ist:

Speichern von Blutzuckerspiegeln mit den entsprechenden Daten und Tageszeiten, zu denen die Blutzuckerspiegel gemessen wurden;
Berechnen eines durchschnittlichen Blutzuckerspiegels aus mindestens einem ersten Blutzuckerspiegel und einem zweiten Blutzuckerspiegel, die aus den gespeicherten Blutzuckerspiegeln ausgewählt wurden, durch:

Auswählen der zur Bestimmung des durchschnittlichen Blutzuckerspiegels verwendeten gespeicherten Blutzuckerspiegel auf der Basis des Datums und der Tageszeit der Messung der gespeicherten Blutzukkerspiegel,
Definieren eines Zeitraums während eines Tages, wenn der durchschnittliche Blutzuckerspiegel für diesen Zeitraum an jedem einer gewählten Anzahl von Tagen gewünscht wird,
Empfangen einer Benutzereingabe, die einen durchschnittlichen Blutzuckerspiegel während des genannten

Zeitraums für eine ausgewählte Anzahl von Tagen beginnend mit dem laufenden Tag anfordert,
Feststellen, ob der genannte Zeitraum an dem laufenden Tag läuft oder abgelaufen ist,
Verwenden eines Messwerts eines während des genannten Zeitraums an dem laufenden Tag gemessenen Blutzuckerspiegels bei der Bestimmung des durchschnittlichen Blutzuckerspiegels, wenn der Zeitraum an dem laufenden Tag läuft oder abgelaufen ist, und
Wählen eines an dem vorhergehenden Tag gemessenen Blutzuckerspiegels bei der Bestimmung des durchschnittlichen Blutzuckerspiegels, wenn der genannte Zeitraum an dem laufenden Tag noch nicht läuft oder noch nicht abgelaufen ist,
Anzeigen des durchschnittlichen Blutzuckerspiegels,
Empfangen einer ersten Benutzereingabe zur Anzeige des ersten Blutzuckerspiegels,
Anzeigen des ersten Blutzuckerspiegels,
Empfangen einer zweiten Benutzereingabe zum Anzeigen des zweiten Blutzuckerspiegels, und
Anzeigen des zweiten Blutzuckerspiegels.

2. Verfahren nach Anspruch 1, bei welchem jeder der drei Anzeigeschritte zum Anzeigen des durchschnittlichen Blutzuckerspiegels, des ersten Blutzuckerspiegels bzw. des zweiten Blutzuckerspiegels, entweder durch das Anzeigen auf einer Anzeigevorrichtung (160) oder durch das Erzeugen eines hörbaren Tons über einen Lautsprecher erfolgen kann.

3. Verfahren nach Anspruch 1, ferner mit den folgenden Schritten:

Empfangen einer dritten Benutzereingabe zur Anzeige eines Wertes; und
Anzeigen des durchschnittlichen Blutzuckerspiegels.

4. Verfahren nach Anspruch 1, bei welchem die Berechnung des durchschnittlichen Blutzuckerspiegels n der gespeicherten Blutzuckerspiegel verwendet, wobei n eine ganze Zahl größer 2 ist und die n gespeicherten Blutzuckerspiegel den ersten Blutzuckerspiegel und den zweiten Blutzuckerspiegel umfassen.

5. Verfahren nach Anspruch 4, ferner mit dem Schritt des Anzeigens eines Variabilitätsindikators, der die Variabilität zwischen den n gespeicherten Blutzuckerspiegeln angibt.

6. Verfahren nach Anspruch 4, bei welchem die n gespeicherten Blutzuckerspiegel als Einzelwerte (450) des durchschnittlichen Blutzuckerspiegels gelten, und ferner mit den folgenden Schritten:

Empfangen einer weiteren Benutzereingabe zur Anzeige des auf den ersten Blutzuckerspiegel und den zweiten Blutzuckerspiegel folgenden nächsten Blutzuckerspiegels unter den n Blutzuckerspiegeln;
Anzeigen des nächsten Blutzuckerspiegels; und
Wiederholen des Empfangsschritts zum Empfangen einer weiteren Benutzereingabe zum Anzeigen des nächsten Blutzuckerspiegels unter den n Blutzuckerspiegeln, und Anzeigen des nächsten Blutzuckerspiegels bis jeder der Einzelwerte (450) angezeigt wurde.

7. Verfahren nach Anspruch 6, bei welchem der Schritt des Wiederholens den Schritt des Anzeigens des durchschnittlichen Blutzuckerspiegels nach der Anzeige des letzten Blutzuckerspiegels unter den Einzelwerten (450) umfasst.

8. Verfahren nach Anspruch 4, bei welchem der durchschnittliche Blutzuckerspiegel und die Einzelwerte (450) auf einem Anzeigebildschirm angezeigt werden, wobei der Anzeigebildschirm einen ersten Bereich zum Anzeigen entweder des durchschnittlichen Blutzuckerspiegels oder der Einzelwerte (450) und einen zweiten Bereich aufweist, der mit n Indikatoren ausgebildet ist, welche jeweils einem der n gespeicherten Blutzuckerspiegel entsprechen.

9. Verfahren nach Anspruch 8, ferner mit dem Schritt des Anzeigens jedes der n Indikatoren als nichtblinkendes Element, wenn der erste Bereich den durchschnittlichen Blutzuckerspiegel anzeigt, und des blinkenden Anzeigens des entsprechenden der n Indikatoren, wenn der diesem entsprechende der n Blutzuckerspiegel als einer der Einzelwerte (450) angezeigt wird.

10. Verfahren nach Anspruch 8, bei welchem der Anzeigebildschirm einen dritten Bereich zum Anzeigen der Tageszeit und des Datums aufweist, und ferner mit dem Schritt des Anzeigens der Tageszeit und des Datums, die mit einem entsprechenden der n gespeicherten Blutzuckerspiegel gespeichert sind, in dem dritten Bereich, wenn dieser als Einzelwert in dem ersten Bereich angezeigt wird.

11. Verfahren nach Anspruch 1, bei welchem
der durchschnittliche Blutzuckerspiegel aus mindestens drei der gespeicherten Blutzuckerspiegel als Einzelwerte (450) berechnet wird, und
das Anzeigen durch das Anzeigen des durchschnittlichen, des ersten und des zweiten Blutzuckerspiegels auf einer Anzeigevorrichtung (160) des Blutzuckermessgeräts (100) angezeigt wird.

12. Verfahren nach Anspruch 11, ferner mit den folgenden Schritten:

Empfangen einer dritten Benutzereingabe zur Anzeige des dritten der Einzelwerte (450);
Anzeigen des dritten der Einzelwerte (450) in Reaktion auf die dritte Benutzereingabe;
Empfangen einer weiteren Benutzereingabe zur Anzeige eines Wertes; und
erneutes Anzeigen des durchschnittlichen Blutzuckerspiegels.

13. Verfahren nach Anspruch 12, bei welchem das Blutzuckermessgerät (100) Vorwärts- und Rückwärts-Pfeiltasten (110, 120) zum Vorwärts- bzw. Rückwärtsbewegen zwischen den verschiedenen angezeigten Einzelwerten (450) aufweist.

14. Verfahren nach Anspruch 11, bei welchem der Anzeigebildschirm einen ersten Bereich zum Anzeigen entweder des durchschnittlichen Blutzuckerspiegels oder der Einzelwerte (450) und einen zweiten Bereich aufweist, der mit drei Indikatoren ausgebildet ist, welche einem jeweiligen der drei Einzelwerte (450) entsprechen.

15. Verfahren nach Anspruch 14, ferner mit dem Schritt des Anzeigens jedes der drei Indikatoren als nichtblinkende Elemente, wenn der erste Bereich den durchschnittlichen Blutzuckerspiegel anzeigt, und des blinkenden Anzeigens des entsprechenden der drei Indikatoren, wenn der diesem entsprechende Einzelwert angezeigt wird.

16. Verfahren nach Anspruch 1 oder 11, bei welchem der Schritt des Berechnens ferner den Schritt des Verwendens gespeicherter Blutzuckerspiegel aus bis zu einer gewählten Höchstzahl von vorhergehenden Tagen, wenn für den laufenden Tag keine gültigen Blutzuckerspiegel verfügbar sind, beinhaltet.

17. Verfahren nach Anspruch 16, bei welchem die gewählte Höchstzahl von Tagen fünf beträgt.

18. Verfahren nach Anspruch 11, ferner mit dem Schritt des Anzeigens eines Variabilitätsindikators, welcher die Variabilität unter den einzelnen Blutzuckerspiegeln angibt.

19. Verfahren nach Anspruch 5 oder 18, bei welchem der Variabilitätsindikator ein skalarer Wert und/oder ein statistischer Parameter ist, welcher aus der Gruppe gewählt ist, welche aus einer Standardabweichung und einem Varianzkoeffizienten gebildet ist.

20. Verfahren nach Anspruch 1, bei welchem die gewählte Anzahl von Tagen drei beträgt.

21. Verfahren nach Anspruch 1 oder 11, bei welchem der Schritt des Verwendens ferner den Schritt des Auswählens des frühesten oder des letzten von mehreren an dem laufenden Tag während des genannten Zeitraums gemessenen Messwerten basierend auf deren jeweiligen Tageszeiten umfasst.

22. Verfahren nach Anspruch 1 oder 11, bei welchem der Schritt des Auswählens ferner den Schritt des Auswählens einen der frühesten und der letzten von mehreren an dem vorhergehenden Tag während des genannten Zeitraums gemessenen Messwerten basierend auf deren jeweiligen Tageszeiten umfasst.

23. Verfahren nach Anspruch 1 oder 11, bei welchem der Schritt des Verwendens ferner den Schritt des Verwendens eines gespeicherten Blutzuckerspiegels des vorhergehenden Tages umfasst, wenn aus dem genannten Zeitraum des laufenden Tages keine gültigen Blutzuckerspiegel zur Verfügung stehen, und der Schritt des Auswählens ferner den Schritt des Verwendens eines gespeicherten Blutzuckerspiegels des Tages vor dem vorhergehenden Tag umfasst, wenn aus dem genannten Zeitraum des vorhergehenden Tages keine gültigen Blutzuckerspiegel zur Verfügung stehen.

24. Blutzuckermessgerät (100) zur Überwachung des Zustands eines Patienten, mit:

einer Ableseeinrichtung zum Messen eines gewählten Blutzuckerspiegels des Patienten;

einer Speichervorrichtung (190) zum Speichern mehrerer Blutzuckerspiegel zusammen mit deren jeweiligen Daten und Tageszeiten, zu denen sie gemessen wurden;
einer Anzeige;
einer Benutzereingabevorrichtung; und
einer Verarbeitungsvorrichtung, die mit der Ableseeinrichtung, der Speichervorrichtung (190), der Anzeige und der Benutzereingabevorrichtung verbunden ist, und die derart programmiert ist, dass sie einen durchschnittlichen Blutzuckerspiegel aus mindestens einem ersten Blutzuckerspiegel und einem zweiten Blutzuckerspiegel, die aus den in der Speichervorrichtung (190) gespeicherten Blutzuckerspiegeln gewählt sind, berechnet, dass sie den durchschnittlichen Blutzuckerspiegel über die Anzeige anzeigt, dass sie von der Benutzereingabevorrichtung eine erste Benutzereingabe zum Anzeigen des ersten Blutzuckerspiegels empfängt, dass sie den ersten Blutzuckerspiegel in Reaktion auf die erste Benutzereingabe anzeigt, dass sie über die Benutzereingabevorrichtung eine zweite Benutzereingabe zum Anzeigen des zweiten Blutzuckerspiegels empfängt, und dass sie den zweiten Blutzuckerspiegel in Reaktion auf die zweite Benutzereingabe anzeigt,
wobei die Verarbeitungsvorrichtung
programmiert ist, um die zur Bestimmung des durchschnittlichen Blutzuckerspiegels verwendeten gespeicherten Blutzuckerspiegel basierend auf dem Datum und der Tageszeit, zu der die gespeicherten Blutzuckerspiegel gemessen wurden, zu wählen, und
derart betreibbar ist, dass sie dem Benutzer ermöglicht, einen Zeitraum während eines Tages zu definieren, wenn der durchschnittliche Blutzuckerspiegel für diesen Zeitraum an jedem einer gewählten Anzahl von Tagen gewünscht ist,
dadurch gekennzeichnet, dass
die Verarbeitungsvorrichtung programmiert ist, um eine Benutzereingabe zu empfangen, welche einen durchschnittlichen Blutzuckerspiegel während des genannten Zeitraums für eine gewählte Anzahl von Tagen beginnend mit dem laufenden Tag anfordert, zu bestimmen, ob an dem laufenden Tag der genannte Zeitraum läuft oder abgelaufen ist, einen Messwert eines während des genannten Zeitraums an dem laufenden Tag gemessenen Blutzuckerspiegels bei der Bestimmung des durchschnittlichen Blutzuckerspiegels zu verwenden, wenn der genannte Zeitraum läuft oder an dem laufenden Tag beendet ist, und bei der Bestimmung des durchschnittlichen Blutzuckerspiegels einen an dem vorhergehenden Tag gemessenen gespeicherten Blutzuckerspiegel zu verwenden, wenn der Zeitraum an dem laufenden Tag noch nicht läuft oder abgelaufen ist.

25. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Anzeige eine Anzeigevorrichtung (160) und/oder ein Lautsprecher ist und die Verarbeitungsvorrichtung betreibbar ist, um eine Anzeige entweder mittels der Anzeigevorrichtung (160) oder durch Erzeugen eines hörbaren Tons durch den Lautsprecher zu bewirken.

26. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung ferner programmierbar ist, eine dritte Benutzereingabe zur Anzeige eines Wertes über die Benutzereingabevorrichtung zu empfangen und den durchschnittlichen Blutzuckerspiegel anzuzeigen.

27. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung programmierbar ist, zur Berechnung des durchschnittlichen Blutzuckerspiegels n der gespeicherten Blutzuckerspiegel zu verwenden, wobei n eine ganze Zahl größer als 2 ist und die n gespeicherten Blutzuckerspiegel den ersten Blutzuckerspiegel und den zweiten Blutzuckerspiegel umfasst.

28. Blutzuckermessgerät (100) nach Anspruch 27, bei welchem die Verarbeitungsvorrichtung programmierbar ist, um einen die Variabilität zwischen den n gespeicherten Blutzuckerspiegeln angebenden Variabilitätsindikator zu bestimmen und über die Anzeige anzuzeigen.

29. Blutzuckermessgerät (100) nach Anspruch 28, bei welcher der Variabilitätsindikator ein skalarer Wert und/oder ein statistischer Parameter ist, welcher aus der Gruppe gewählt ist, welche aus einer Standardabweichung und einem Varianzkoeffizienten gebildet ist.

30. Blutzuckermessgerät (100) nach Anspruch 27, bei welchem die n gespeicherten Blutzuckerspiegel als Einzelwerte (450) des durchschnittlichen Blutzuckerspiegels gelten, und die Verarbeitungsvorrichtung ferner derart programmierbar ist, dass sie eine weitere Benutzereingabe zur Anzeige des auf den ersten Blutzuckerspiegel und den zweiten Blutzuckerspiegel folgenden nächsten Blutzuckerspiegels unter den n Blutzuckerspiegeln empfängt, dass sie den nächsten Blutzuckerspiegel in Reaktion auf die weitere Benutzereingabe anzeigt, und dass sie die Vorgänge des Empfangens einer weiteren Benutzereingabe zum Anzeigen des nächsten Blutzuckerspiegels unter den n Blutzuckerspiegeln und des Anzeigens des nächsten Blutzuckerspiegels wiederholt, bis jeder der Einzelwerte (450)

angezeigt wurde.

31. Blutzuckermessgerät (100) nach Anspruch 30, bei welchem die Verarbeitungsvorrichtung ferner derart programmierbar ist, dass sie den durchschnittlichen Blutzuckerspiegel anzeigt, nachdem der letzte Blutzuckerspiegel unter den Einzelwerten (450) angezeigt wurde.

32. Blutzuckermessgerät (100) nach Anspruch 27, bei welchem die Anzeige ein Anzeigebildschirm ist und der durchschnittliche Blutzuckerspiegel und die Einzelwerte (450) auf dem Anzeigebildschirm angezeigt werden, wobei der Anzeigebildschirm einen ersten Bereich zum Anzeigen entweder des durchschnittlichen Blutzuckerspiegels oder der Einzelwerte (450) und einen zweiten Bereich aufweist, der mit n Indikatoren ausgebildet ist, die jeweiligen der n Blutzuckerspiegel entsprechen.

33. Blutzuckermessgerät (100) nach Anspruch 32, bei welchem die Verarbeitungsvorrichtung derart programmierbar ist, dass sie jeden der n Indikatoren als nichtblinkende Elemente anzeigt, wenn der erste Bereich den durchschnittlichen Blutzuckerspiegel anzeigt, und den entsprechenden der n Indikatoren blinkend anzeigt, wenn der entsprechende der n Blutzuckerspiegel als einer der Einzelwerte (450) angezeigt wird.

34. Blutzuckermessgerät (100) nach Anspruch 32, bei welchem der Anzeigebildschirm einen dritten Bereich zum Anzeigen der Tageszeit und des Datums aufweist, wobei die Verarbeitungsvorrichtung ferner derart programmierbar ist, dass sie die Tageszeit und das Datum, die mit einem entsprechenden der n gespeicherten Blutzuckerspiegel gespeichert sind, in dem dritten Bereich anzeigt, wenn dieser als Einzelwert in dem ersten Bereich angezeigt wird.

35. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die gewählte Anzahl von Tagen drei ist.

36. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung derart programmierbar ist, dass sie entweder den frühesten oder den letzten von mehreren an dem laufenden Tag während des genannten Zeitraums gemessenen Messwerten basierend auf deren jeweiligen Tageszeiten auswählt.

37. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung derart programmierbar ist, dass sie entweder den frühesten oder den letzten von mehreren an dem vorhergehenden Tag während des genannten Zeitraums gemessenen Messwerten basierend auf deren jeweiligen Tageszeiten auswählt.

38. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung derart programmierbar ist, dass sie einen gespeicherten Blutzuckerspiegel des vorhergehenden Tages verwendet, wenn aus dem genannten Zeitraum des laufenden Tages keine gültigen Blutzuckerspiegel zur Verfügung stehen, und dass sie einen gespeicherten Blutzuckerspiegel des Tages vor dem vorhergehenden Tag verwendet, wenn aus dem genannten Zeitraum des vorhergehenden Tages keine gültigen Blutzuckerspiegel zur Verfügung stehen.

39. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Verarbeitungsvorrichtung derart programmierbar ist, dass sie gespeicherte Blutzuckerspiegel aus bis zu einer gewählten Höchstzahl von vorhergehenden Tagen verwendet, wenn für den laufenden Tag keine gültigen Blutzuckerspiegel verfügbar sind.

40. Blutzuckermessgerät (100) nach Anspruch 39, bei welchem die gewählte Höchstzahl von Tagen fünf beträgt.

41. Blutzuckermessgerät (100) nach Anspruch 24, bei welchem die Benutzereingabevorrichtung Vorwärts- und Rückwärts-Pfeiltasten (110, 120) zum Vorwärts- bzw. Rückwärtsbewegen zwischen den verschiedenen angezeigten Einzelwerten (450) aufweist.

Revendications

1. Procédé pour indiquer les taux de glycémie d'un patient en utilisant un lecteur de glycémie configuré pour réaliser les étapes consistant à :

stocker des taux de glycémie avec les dates et les heures correspondantes de la journée où les taux de glycémie respectifs ont été mesurés ;
calculer un taux de glycémie moyen à partir d'au moins un premier taux de glycémie et un deuxième taux de glycémie sélectionnés parmi les taux de glycémie stockés :

en sélectionnant les taux de glycémie stockés utilisés pour déterminer ledit taux de glycémie moyen en se basant sur la date et l'heure de la journée où les taux de glycémie stockés ont été mesurés,
en définissant une période de temps dans une journée où le taux de glycémie moyen est souhaité dans cette période de temps pour chacun d'un nombre de jours sélectionnés,
en recevant une entrée utilisateur demandant un taux de glycémie moyen de ladite période de temps pour un nombre de jours sélectionnés en commençant par le jour actuel ;
en déterminant si ladite période de temps est en cours ou passée pour ledit jour actuel ;
en utilisant un relevé du taux de glycémie mesuré pendant la période de temps pour ledit jour actuel lors de la détermination dudit taux de glycémie moyen si ladite période de temps est en cours ou passée pour le jour actuel ; et
en sélectionnant un taux de glycémie stocké mesuré le jour précédent lors de la détermination dudit taux de glycémie moyen si ladite période de temps n'est pas encore en cours ou passée pour le jour actuel ;
en indiquant ledit taux de glycémie moyen ;
en recevant une première entrée utilisateur pour indiquer ledit premier taux de glycémie ;
en indiquant ledit premier taux de glycémie ;
en recevant une deuxième entrée utilisateur pour indiquer ledit deuxième taux de glycémie ; et
en indiquant ledit deuxième taux de glycémie.

2. Procédé selon la revendication 1, dans lequel chacune des trois dites étapes d'indication pour indiquer ledit taux de glycémie moyen, ledit premier taux de glycémie et ledit deuxième taux de glycémie, respectivement, peut être réalisée par un élément parmi un affichage sur un dispositif d'affichage (160) et la génération d'un son audible via un haut-parleur.

3. Procédé selon la revendication 1, comprenant en outre les étapes consistant à :

recevoir une troisième entrée utilisateur pour indiquer une valeur ; et
indiquer ledit taux de glycémie moyen.

4. Procédé selon la revendication 1, dans lequel le calcul du taux de glycémie moyen utilise n desdits taux de glycémie stockés, où n est un nombre entier supérieur à 2, et lesdits n taux de glycémie stockés comprennent ledit premier taux de glycémie et ledit deuxième taux de glycémie.

5. Procédé selon la revendication 4, comprenant en outre l'étape consistant à indiquer un indicateur de variabilité qui indique la variabilité entre lesdits n taux de glycémie stockés.

6. Procédé selon la revendication 4, dans lequel lesdits n taux de glycémie stockés sont considérés comme des valeurs constituantes (450) du taux de glycémie moyen, et comprenant en outre les étapes consistant à :

recevoir une autre entrée utilisateur pour indiquer le taux de glycémie suivant parmi lesdits n taux de glycémie stockés après ledit premier taux de glycémie et ledit deuxième taux de glycémie ;
indiquer le taux de glycémie suivant ; et
répéter l'étape de réception pour recevoir une autre entrée utilisateur afin d'indiquer le taux de glycémie suivant parmi les n taux de glycémie, et indiquer le taux de glycémie suivant jusqu'à ce que chacune desdites valeurs constituantes (450) ait été annoncée.

7. Procédé selon la revendication 6, dans lequel ladite étape de répétition comprend l'étape consistant à indiquer le taux de glycémie moyen après que le dernier taux de glycémie parmi lesdites valeurs constituantes (450) ait été annoncé.

8. Procédé selon la revendication 4, dans lequel ledit taux de glycémie moyen et lesdites valeurs constituantes (450) sont affichés sur un écran d'affichage, l'écran d'affichage comprenant une première zone pour afficher un élément parmi le taux de glycémie moyen et lesdites valeurs constituantes (450), et une deuxième zone configurée pour comporter n indicateurs correspondant aux indicateurs respectifs desdits n taux de glycémie stockés.

9. Procédé selon la revendication 8, comprenant en outre l'étape consistant à afficher chacun desdits n indicateurs sous la forme d'items non clignotants lorsque ladite première zone affiche ledit taux de glycémie moyen, et à faire clignoter l'indicateur correspondant desdits n indicateurs lorsque son n taux de glycémie correspondant est affiché en tant que l'une des valeurs constituantes (450).

10. Procédé selon la revendication 8, dans lequel ledit écran d'affichage comprend une troisième zone pour afficher une heure de la journée et une date, et comprenant en outre l'étape consistant à afficher l'heure de la journée et la date stockées avec un taux correspondant desdits n taux de glycémie stockés dans ladite troisième zone lorsqu'il est affiché en tant qu'une valeur constituante dans ladite première zone.

11. Procédé selon la revendication 1, dans lequel
ledit taux de glycémie moyen est calculé à partir d'au moins trois des taux de glycémie stockés en tant que valeurs constituantes (450) ; et
ladite indication est réalisée en affichant lesdits taux de glycémie moyen et premier et deuxième taux de glycémie sur un dispositif d'affichage (160) dudit lecteur de glycémie (100).

12. Procédé selon la revendication 11, comprenant en outre les étapes consistant à :

recevoir une troisième entrée utilisateur pour afficher la troisième des valeurs constituantes (450);
afficher la troisième des valeurs constituantes (450) en réponse à la troisième entrée utilisateur ;
recevoir une autre entrée utilisateur pour afficher une valeur ; et
afficher à nouveau le taux de glycémie moyen.

13. Procédé selon la revendication 12, dans lequel ledit lecteur de glycémie (100) comprend des touches fléchées avant et arrière (110, 120) pour naviguer en avant et en arrière, respectivement, parmi les différentes valeurs constituantes (450) affichées.

14. Procédé selon la revendication 11, dans lequel l'écran d'affichage comprend une première zone pour afficher un élément parmi le taux de glycémie moyen et les valeurs constituantes (450), et une deuxième zone configurée pour comporter trois indicateurs correspondant aux indicateurs respectifs des trois valeurs constituantes (450).

15. Procédé selon la revendication 14, comprenant en outre l'étape consistant à afficher chacun desdits trois indicateurs sous la forme d'items non clignotants lorsque ladite première zone affiche le taux de glycémie moyen, et à faire clignoter l'indicateur correspondant desdits trois indicateurs lorsque sa valeur constituante correspondante est affichée.

16. Procédé selon la revendication 1 ou 11, dans lequel ladite étape de calcul comprend en outre l'étape consistant à utiliser des taux de glycémie stockés parmi autant de jours d'un nombre maximum de jours précédents sélectionnés si aucun taux de glycémie valide n'est disponible pour ledit jour actuel.

17. Procédé selon la revendication 16, dans lequel ledit nombre maximum de jours sélectionnés est de cinq.

18. Procédé selon la revendication 11, comprenant en outre l'étape consistant à afficher un indicateur de variabilité qui indique la variabilité entre lesdits taux de glycémie constituants.

19. Procédé selon la revendication 5 ou 18, dans lequel l'indicateur de variabilité est au moins un élément parmi une valeur scalaire et un paramètre statistique sélectionné dans le groupe consistant en un écart-type et un coefficient de variance.

20. Procédé selon la revendication 1, dans lequel ledit nombre de jours sélectionnés est de trois.

21. Procédé selon la revendication 1 ou 11, dans lequel ladite étape d'utilisation comprend en outre l'étape consistant à sélectionner un relevé parmi le plus ancien et le plus récent d'une pluralité de relevés mesurés ledit jour actuel pendant ladite période de temps en se basant sur leurs heures respectives de la journée.

22. Procédé selon la revendication 1 ou 11, dans lequel ladite étape de sélection comprend en outre l'étape consistant à sélectionner un relevé parmi le plus ancien et le plus récent d'une pluralité de relevés mesurés ledit jour précédent pendant ladite période de temps en se basant sur leurs heures respectives de la journée.

23. Procédé selon la revendication 1 ou 11, dans lequel ladite étape d'utilisation comprend en outre l'étape consistant à utiliser un taux de glycémie stocké du jour précédent si aucun taux de glycémie valide n'est disponible pour ladite période de temps du jour actuel, et ladite étape de sélection comprend en outre l'étape consistant à utiliser un taux de glycémie stocké du jour qui précède ledit jour précédent si aucun taux de glycémie valide n'est disponible dans

ladite période de temps du jour précédent.

24. Lecteur de glycémie (100) pour surveiller l'état d'un patient, comprenant :

un lecteur pour mesurer un taux de glycémie sélectionné pour ledit patient ;
un dispositif de mémorisation (190) pour stocker une pluralité de taux de glycémie avec leurs dates et heures respectives de la journée où ils ont été mesurés ;
un indicateur ;
un dispositif d'entrée utilisateur ; et
un dispositif de traitement connecté audit lecteur, audit dispositif de mémorisation (190), audit indicateur et audit dispositif d'entrée utilisateur, et
programmé pour calculer un taux de glycémie moyen à partir d'au moins un premier taux de glycémie et un deuxième taux de glycémie sélectionnés parmi les taux de glycémie stockés dans ledit dispositif de mémorisation (190), pour indiquer le taux de glycémie moyen via ledit indicateur, pour recevoir une première entrée utilisateur à partir dudit dispositif d'entrée utilisateur afin d'indiquer le premier taux de glycémie, pour indiquer le premier taux de glycémie en réponse à ladite première entrée utilisateur, pour recevoir une deuxième entrée utilisateur à partir dudit dispositif d'entrée utilisateur afin d'indiquer le deuxième taux de glycémie, et pour indiquer le deuxième taux de glycémie en réponse à ladite deuxième entrée utilisateur,
où ledit dispositif de traitement est
programmé pour sélectionner les taux de glycémie stockés utilisés pour déterminer ledit taux de glycémie moyen en se basant sur la date et l'heure de la journée où les taux de glycémie stockés ont été mesurés, et
fonctionnel pour permettre à un utilisateur de définir une période de temps au cours d'une journée où le taux de glycémie moyen est souhaité dans cette période de temps pour chacun d'un nombre de jours sélectionnés,
caractérisé en ce que
ledit dispositif de traitement est programmé pour recevoir une entrée utilisateur demandant un taux de glycémie moyen de ladite période de temps pour un nombre de jours sélectionnés en commençant par le jour actuel, pour déterminer si ladite période de temps est en cours ou passée pour ledit jour actuel, pour utiliser un relevé d'un taux de glycémie mesuré pendant la période de temps pour ledit jour actuel lors de la détermination du taux de glycémie moyen si ladite période de temps est en cours ou passée pour le jour actuel, et pour sélectionner un taux de glycémie stocké mesuré le jour précédent lors de la détermination du taux de glycémie moyen si ladite période de temps n'est pas encore en cours ou passée pour le jour actuel.

25. Lecteur de glycémie (100) selon la revendication 24, où ledit indicateur est au moins un élément parmi un dispositif d'affichage (160) et un haut-parleur, et ledit dispositif de traitement est fonctionnel pour fournir une indication par un élément parmi un affichage sur ledit dispositif d'affichage (160) et la génération d'un son audible via ledit haut-parleur.

26. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est en outre programmable pour recevoir une troisième entrée utilisateur via ledit dispositif d'entrée utilisateur afin d'indiquer une valeur, et pour indiquer le taux de glycémie moyen.

27. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est programmable pour utiliser n des taux de glycémie stockés afin de calculer le taux de glycémie moyen, où n est un nombre entier supérieur à 2, et les n taux de glycémie stockés comprennent ledit premier taux de glycémie et ledit deuxième taux de glycémie.

28. Lecteur de glycémie (100) selon la revendication 27, où ledit dispositif de traitement est programmable pour déterminer et indiquer un indicateur de variabilité via ledit indicateur, qui indique la variabilité entre les n taux de glycémie stockés.

29. Lecteur de glycémie (100) selon la revendication 28, où l'indicateur de variabilité est au moins un élément parmi une valeur scalaire et un paramètre statistique sélectionné dans le groupe consistant en un écart-type et un coefficient de variance.

30. Lecteur de glycémie (100) selon la revendication 27, où les n taux de glycémie stockés sont considérés comme des valeurs constituantes (450) du taux de glycémie moyen, et ledit dispositif de traitement est en outre programmable pour recevoir une autre entrée utilisateur via ledit dispositif d'entrée utilisateur pour indiquer le taux de glycémie suivant parmi les n taux de glycémie après ledit premier taux de glycémie et ledit deuxième taux de glycémie, pour indiquer le taux de glycémie suivant en réponse à ladite autre entrée utilisateur, pour répéter les opérations de

réception d'une autre entrée utilisateur afin d'indiquer le taux de glycémie suivant parmi les n taux de glycémie et pour indiquer le taux de glycémie suivant jusqu'à ce que chacune des valeurs constituantes (450) ait été annoncée via l'indicateur.

31. Lecteur de glycémie (100) selon la revendication 30, où ledit dispositif de traitement est en outre programmable pour indiquer le taux de glycémie moyen une fois que le dernier taux de glycémie parmi les valeurs constituantes (450) ait été annoncé.

32. Lecteur de glycémie (100) selon la revendication 27, où ledit indicateur est un écran d'affichage et le taux de glycémie moyen et les valeurs constituantes (450) sont affichés sur ledit écran d'affichage, ledit écran d'affichage comprenant une première zone pour afficher un élément parmi le taux de glycémie moyen et les valeurs constituantes (450), et une deuxième zone configurée pour comporter n indicateurs correspondant aux indicateurs respectifs des n taux de glycémie.

33. Lecteur de glycémie (100) selon la revendication 32, dans lequel ledit dispositif de traitement est programmable pour afficher chacun desdits n indicateurs sous la forme d'items non clignotants lorsque ladite première zone affiche le taux de glycémie moyen, et pour faire clignoter l'indicateur correspondant desdits n indicateurs lorsque son n taux de glycémie correspondant est affiché en tant que l'une des valeurs constituantes (450).

34. Lecteur de glycémie (100) selon la revendication 32, où ledit écran d'affichage comprend une troisième zone pour afficher une heure de la journée et une date, ledit dispositif de traitement étant en outre programmable pour afficher l'heure de la journée et la date stockées avec un taux correspondant des n taux de glycémie stockés dans ladite troisième zone lorsqu'il est affiché en tant qu'une valeur constituante dans ladite première zone.

35. Lecteur de glycémie (100) selon la revendication 24, où ledit nombre de jours sélectionnés est de trois.

36. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est programmable pour sélectionner un relevé parmi le plus ancien et le plus récent d'une pluralité de relevés mesurés ledit jour actuel pendant ladite période de temps en se basant sur leurs heures respectives de la journée.

37. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est programmable pour sélectionner un relevé parmi le plus ancien et le plus récent d'une pluralité de relevés mesurés ledit jour précédent pendant ladite période de temps en se basant sur leurs heures respectives de la journée.

38. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est programmable pour utiliser un taux de glycémie stocké du jour précédent si aucun taux de glycémie valide n'est disponible pour ladite période de temps du jour actuel, et, lors de la sélection d'un taux de glycémie stocké mesuré le jour précédent, pour utiliser un taux de glycémie stocké du jour qui précède ledit jour précédent si aucun taux de glycémie valide n'est disponible dans ladite période de temps du jour précédent.

39. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif de traitement est programmable pour utiliser les taux de glycémie stockés parmi autant de jours d'un nombre maximum de jours précédents sélectionnés si aucun taux de glycémie valide n'est disponible pour ledit jour actuel.

40. Lecteur de glycémie (100) selon la revendication 39, où ledit nombre maximum de jours sélectionnés est de cinq.

41. Lecteur de glycémie (100) selon la revendication 24, où ledit dispositif d'entrée utilisateur comprend des touches fléchées avant et arrière (110, 120) pour naviguer en avant et en arrière, respectivement, parmi lesdites valeurs constituantes indiquées (450).

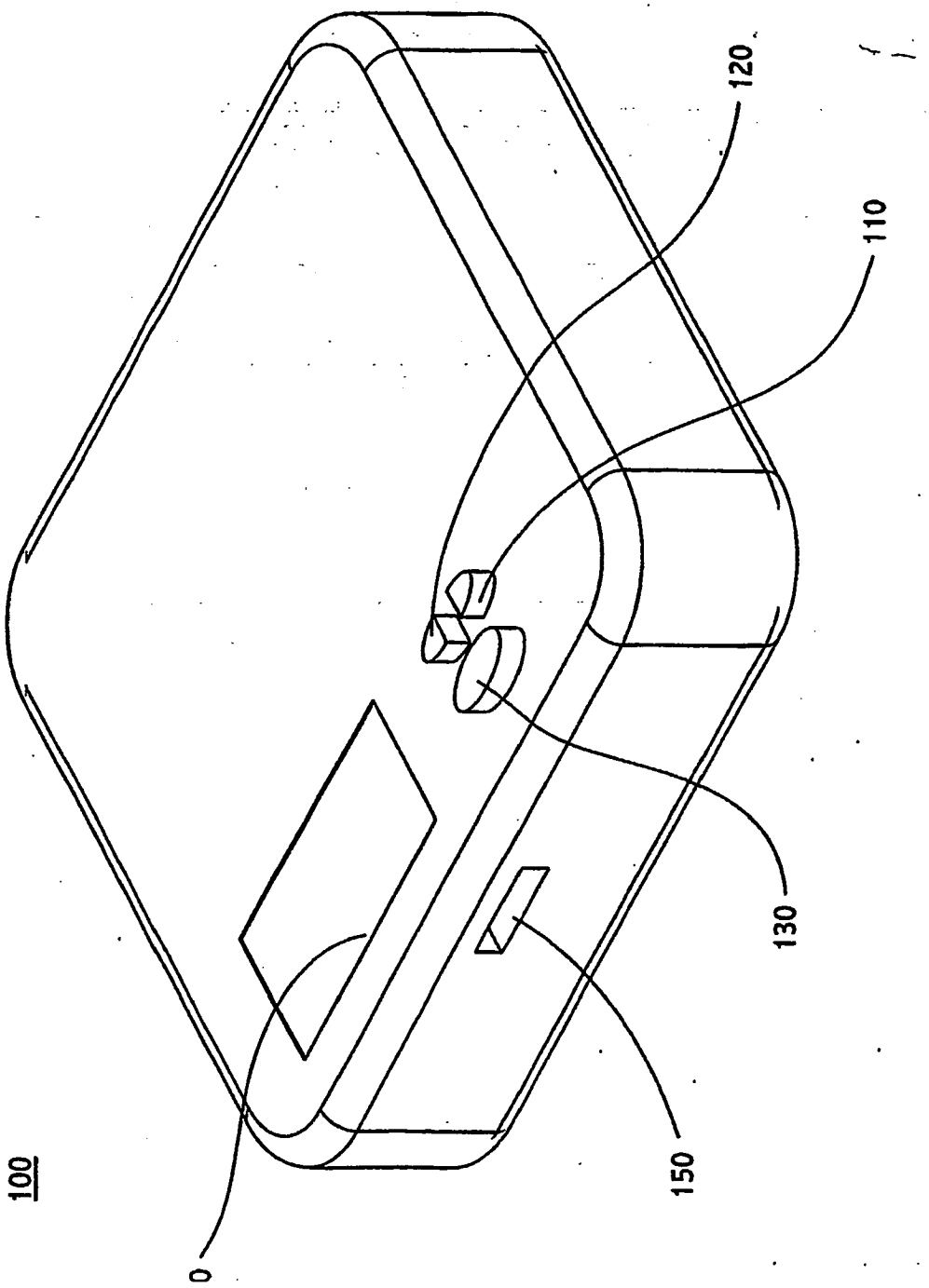


FIG. 1

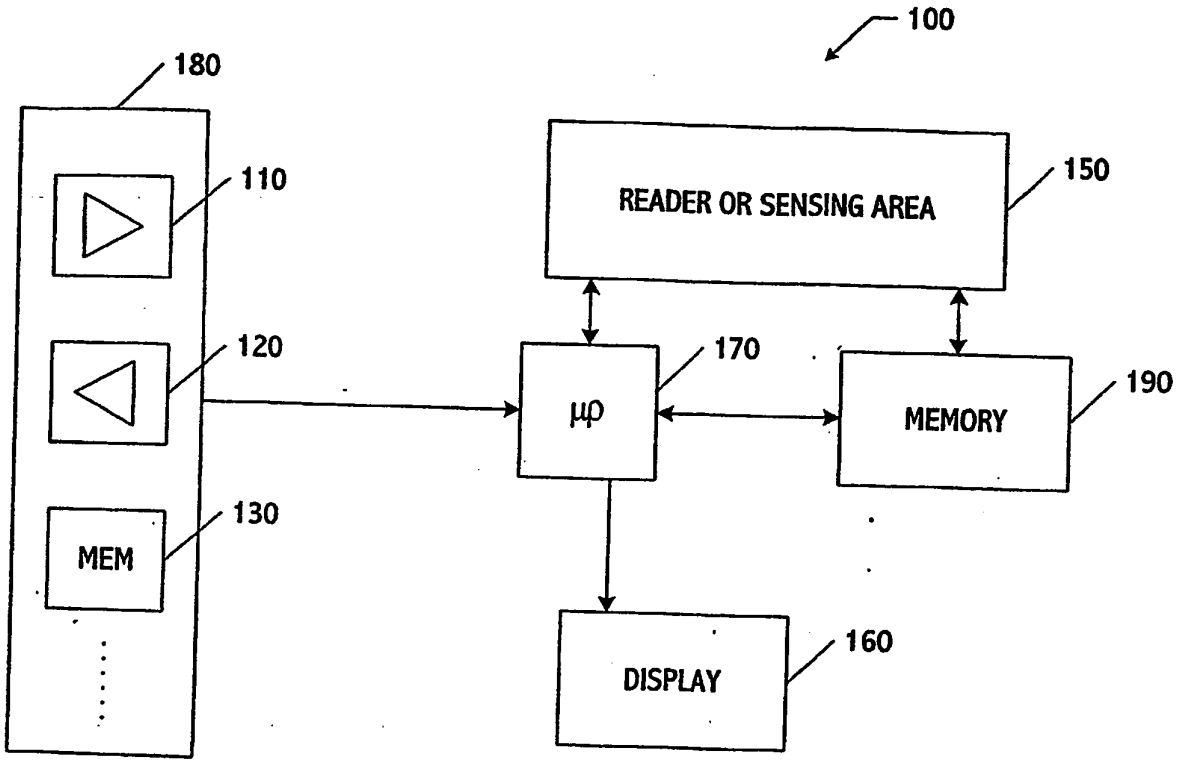

100
180
110
120
130
MEM
READER OR SENSING AREA
150
170
μp
MEMORY
190
DISPLAY
160

FIG. 2

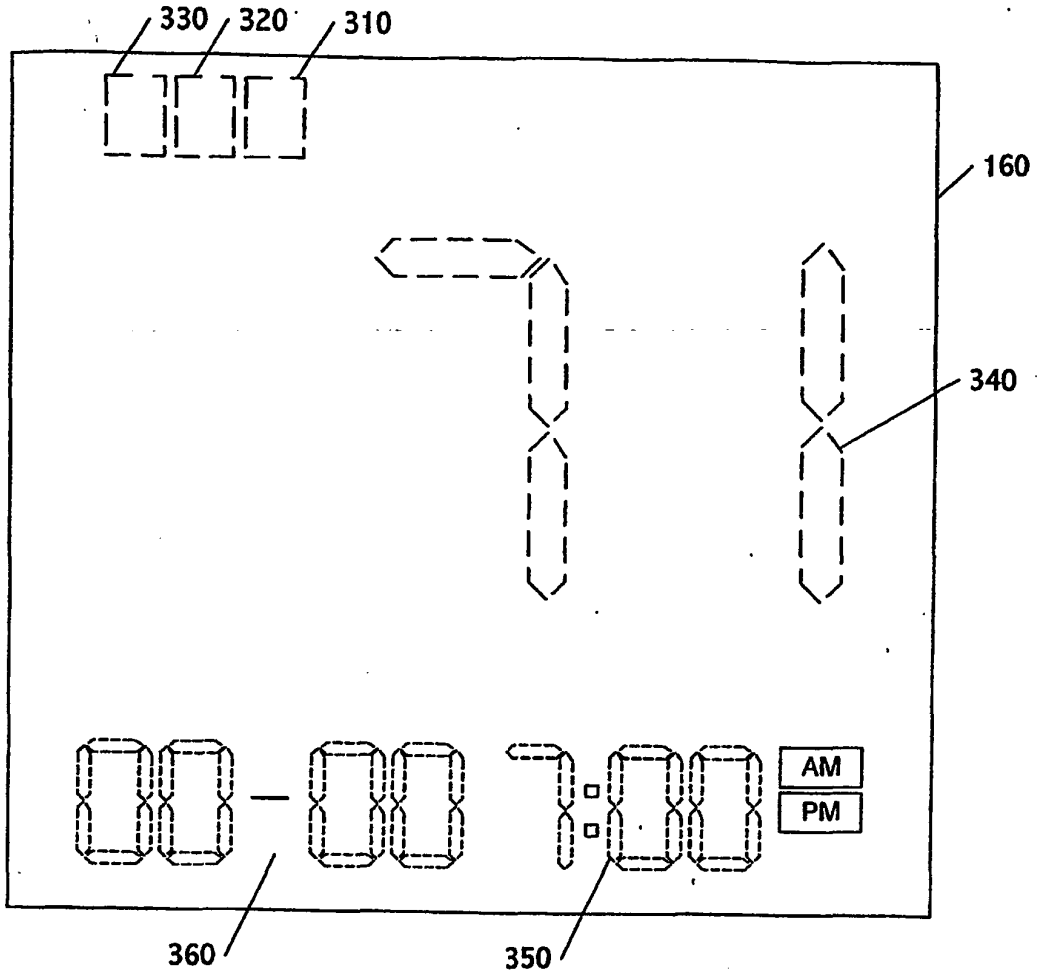
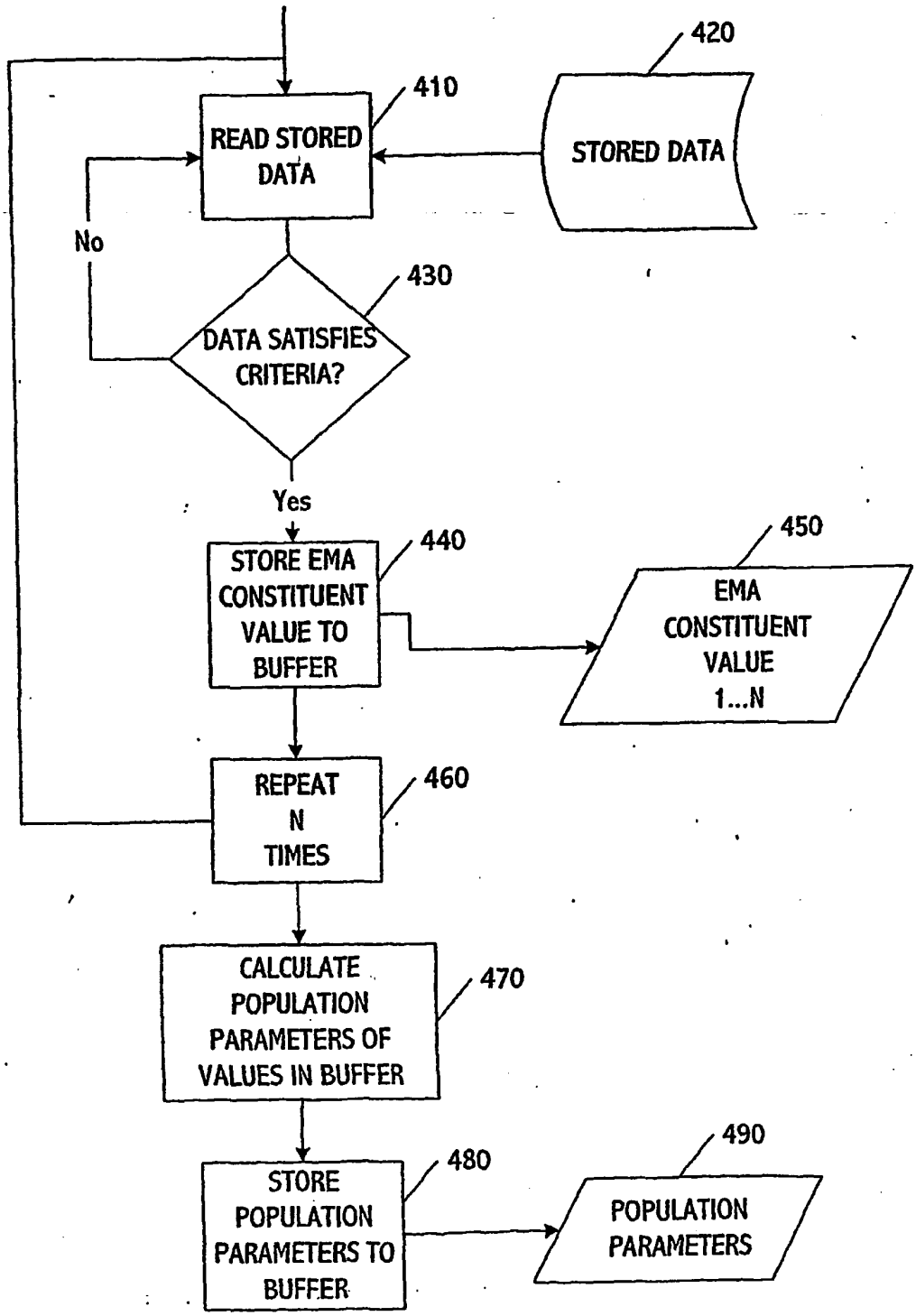


FIG. 3

FIG. 4


420
410
READ STORED DATA
STORED DATA
No
430
DATA SATISFIES CRITERIA?
Yes
440
450
STORE EMA CONSTITUENT VALUE TO BUFFER
EMA CONSTITUENT VALUE 1...N
REPEAT N TIMES
460
CALCULATE POPULATION PARAMETERS OF VALUES IN BUFFER
470
480
490
STORE POPULATION PARAMETERS TO BUFFER
POPULATION PARAMETERS

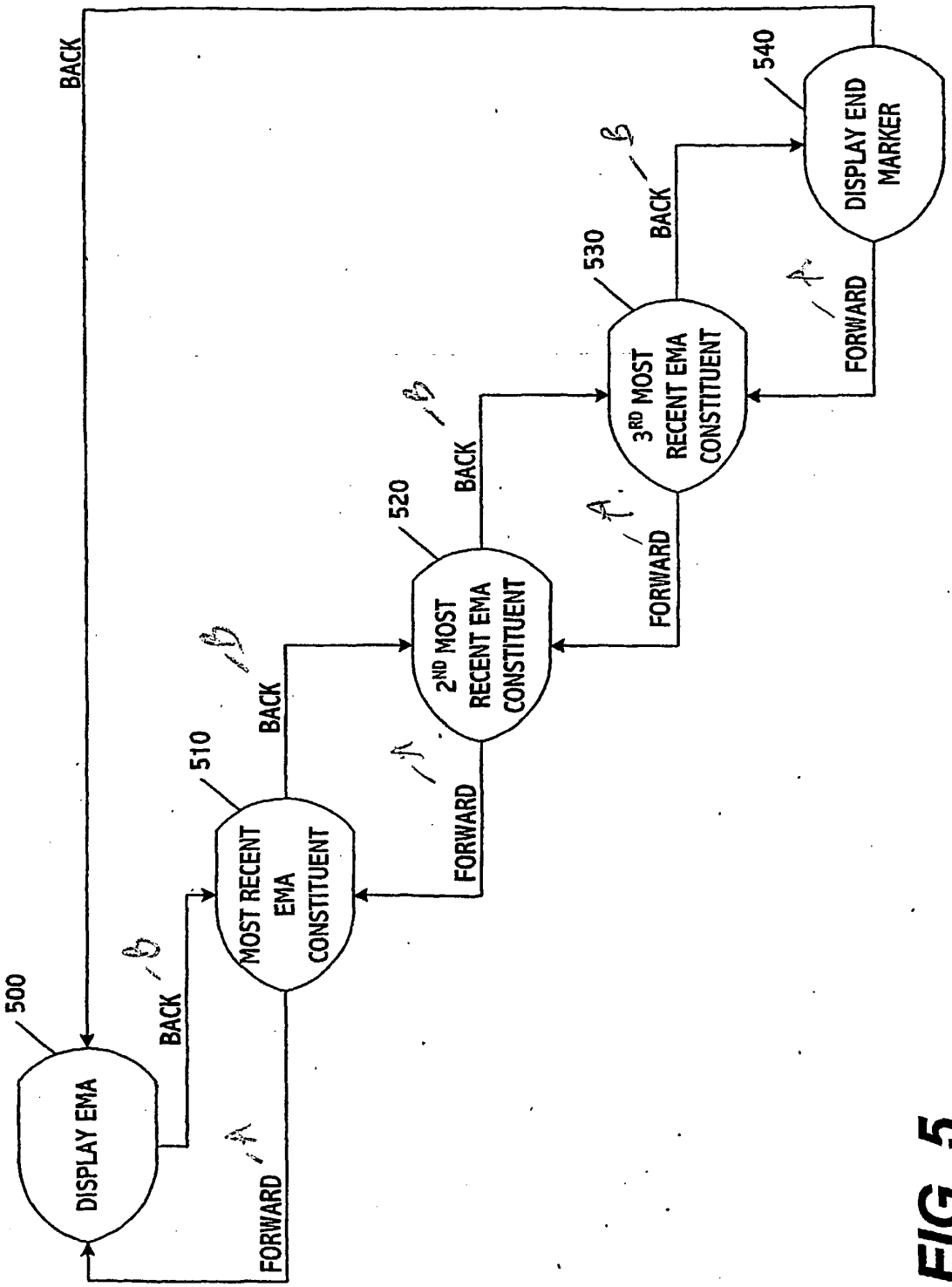

500
DISPLAY EMA
BACK
FORWARD
510
MOST RECENT EMA CONSTITUENT
BACK
FORWARD
520
2ND MOST RECENT EMA CONSTITUENT
BACK
FORWARD
530
3RD MOST RECENT EMA CONSTITUENT
BACK
FORWARD
540
DISPLAY END MARKER

FIG. 5

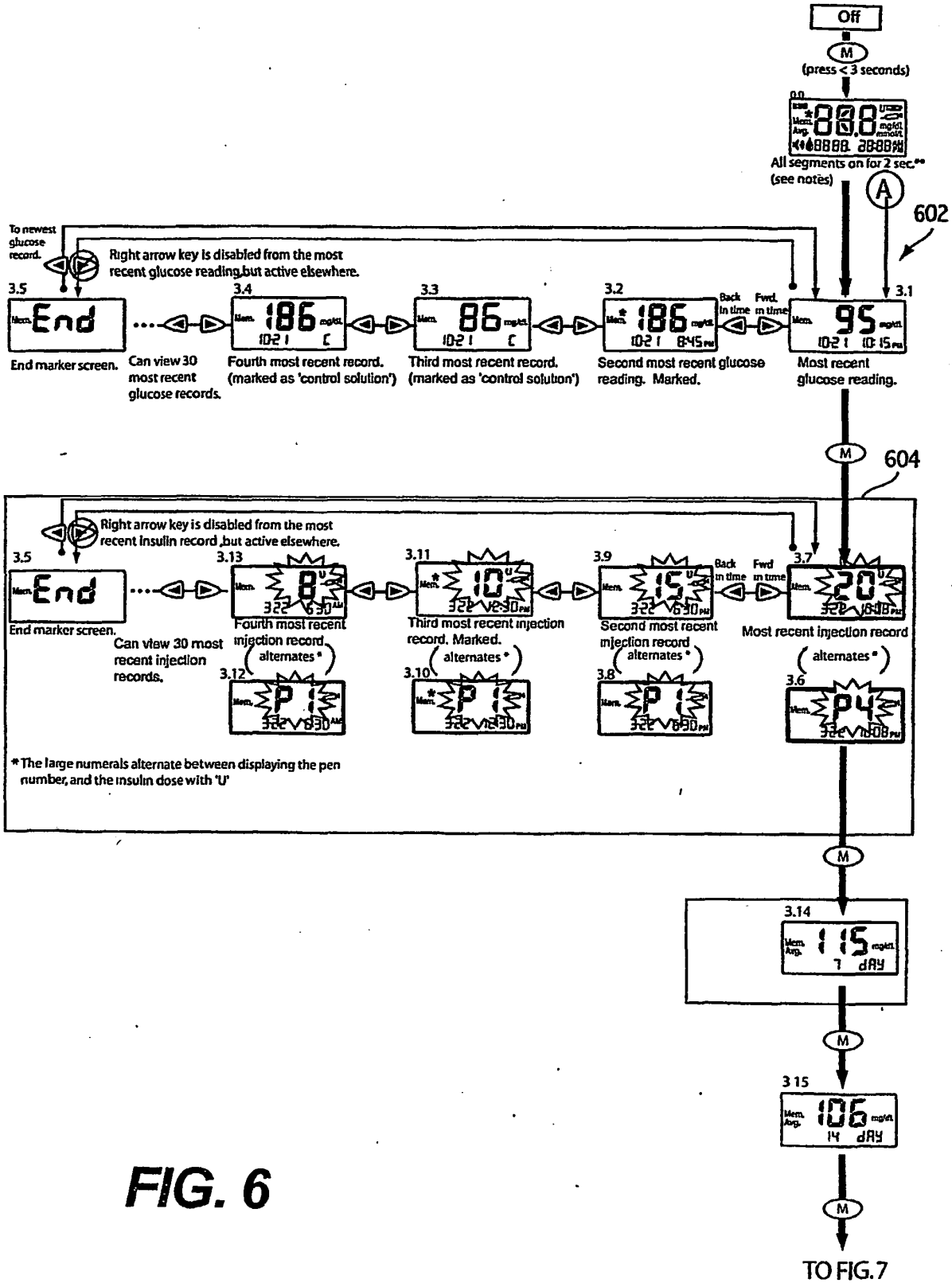

Off
M
(press < 3 seconds)
All segments on for 2 sec.**
(see notes)
A
602
To newest glucose record.
Right arrow key is disabled from the most recent glucose reading,but active elsewhere.
3.5
End
End marker screen.
Can view 30 most recent glucose records.
3.4
Fourth most recent record. (marked as 'control solution')
3.3
Third most recent record. (marked as 'control solution')
3.2
Second most recent glucose reading. Marked.
Back in time
Fwd. in time
3.1
Most recent glucose reading.
M
604
Right arrow key is disabled from the most recent insulin record ,but active elsewhere.
3.5
End
End marker screen.
Can view 30 most recent injection records.
3.13
Fourth most recent injection record.
alternates *
3.12
3.11
Third most recent injection record. Marked.
alternates *
3.10
3.9
Second most recent injection record
alternates *
3.8
Back in time
Fwd in time
3.7
Most recent injection record
alternates *
3.6
* The large numerals alternate between displaying the pen number, and the insulin dose with 'U'
M
3.14
7 dAY
M
3 15
14 dAY
M
TO FIG.7

FIG. 6

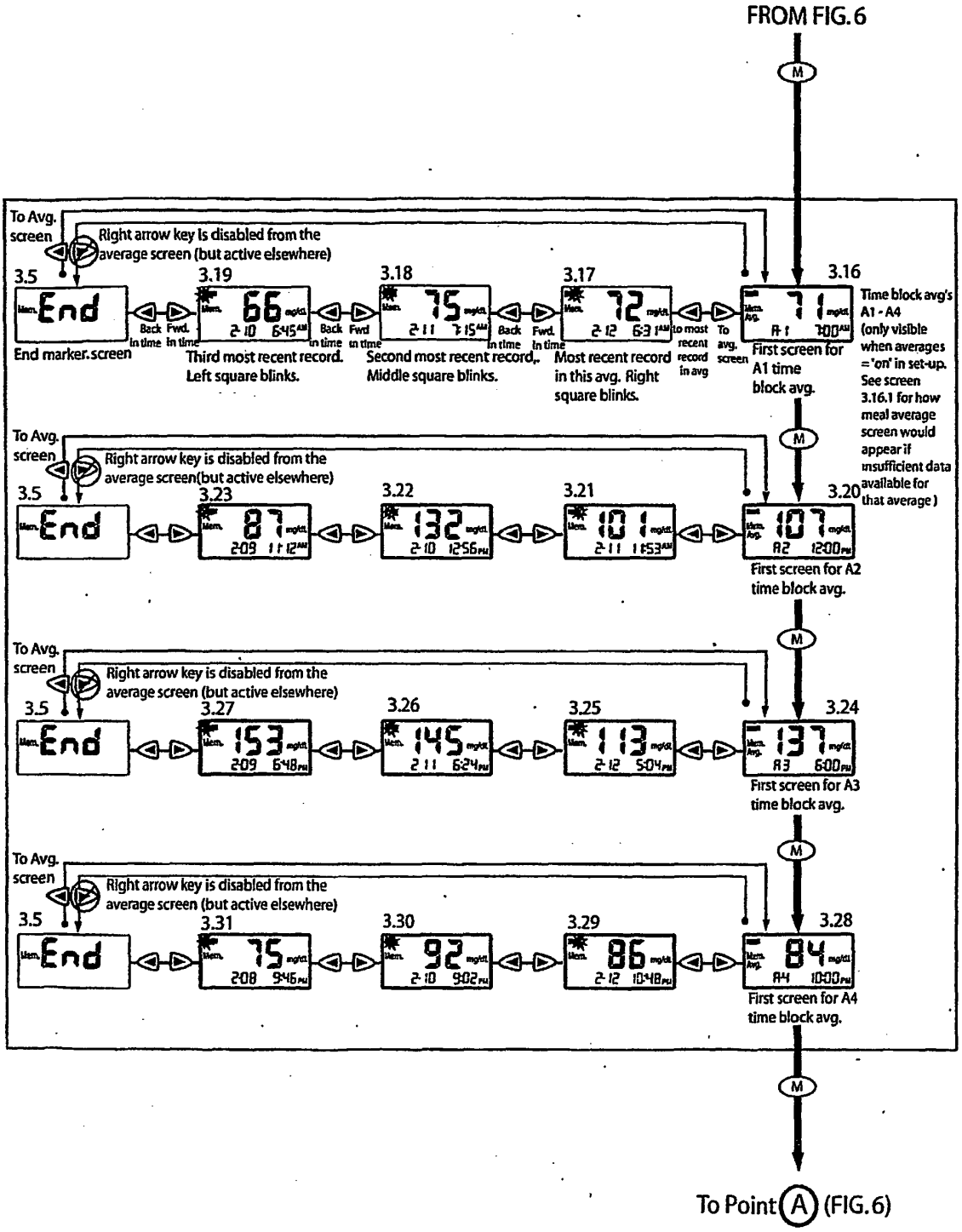

FROM FIG. 6
To Avg. screen
Right arrow key is disabled from the average screen (but active elsewhere)
3.5
End
End marker. screen
Back in time
Fwd. in time
3.19
66
Third most recent record. Left square blinks.
3.18
75
Second most recent record. Middle square blinks.
3.17
72
Most recent record in this avg. Right square blinks.
To most recent record in avg
To avg. screen
3.16
71
A1
First screen for A1 time block avg.
Time block avg's A1 - A4 (only visible when averages = 'on' in set-up. See screen 3.16.1 for how meal average screen would appear if insufficient data available for that average)
To Avg. screen
Right arrow key is disabled from the average screen(but active elsewhere)
3.5
End
3.23
87
3.22
132
3.21
101
3.20
107
A2
First screen for A2 time block avg.
To Avg. screen
Right arrow key is disabled from the average screen (but active elsewhere)
3.5
End
3.27
153
3.26
145
3.25
113
3.24
137
A3
First screen for A3 time block avg.
To Avg. screen
Right arrow key is disabled from the average screen (but active elsewhere)
3.5
End
3.31
75
3.30
92
3.29
86
3.28
84
A4
First screen for A4 time block avg.
M
To Point (A) (FIG. 6)

FIG. 7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4731726 A **[0007]**
- US 6124134 A **[0007]**
- US 5899855 A **[0007]**
- DE 4315532 A1 **[0007]**
- EP 1369688 A2 **[0007]**

专利名称(译)	监测血糖，包括方便显示测量值		
公开(公告)号	EP1536729A4	公开(公告)日	2009-03-18
申请号	EP2003749508	申请日	2003-09-10
[标]申请(专利权)人(译)	贝克顿·迪金森公司		
申请(专利权)人(译)	流式细胞Dickinson公司		
当前申请(专利权)人(译)	流式细胞Dickinson公司		
[标]发明人	GINSBERG BARRY H		
发明人	GINSBERG, BARRY, H.		
IPC分类号	G01N33/66 G06F19/00 A61B5/00 A61B5/145 A61B5/05		
CPC分类号	A61B5/742 A61B5/14532 A61B5/6801 A61B5/7271 A61B5/7405 A61B5/7445 A61B5/746 A61B5/7475 A61B2560/0475 A61B2562/0295 G16H10/60 G16H40/63		
代理机构(译)	WEBER，THOMAS DR.		
优先权	60/409965 2002-09-11 US		
其他公开文献	EP1536729B1 EP1536729A2		
外部链接	Espacenet		

摘要(译)

提供了一种从血糖仪向糖尿病患者呈现葡萄糖数据的方法，其中呈现了有效膳食平均（EMA）值，然后是构成EMA的两个或多个个体值，以提供改进的反馈 需要更改胰岛素剂量的患者进行临床决策的数据。 EMA还可以包括其组成值的可变性的度量。 EMA包含在指定时间（例如，指定进餐时间之前1小时和之后1小时）出现的那些值。 EMA是在计算之前的有限天数（例如3天）内计算的，并且必须在时间和日期范围内获得最少数量的值。 一种算法允许从平均值中排除任何给定的读数（例如餐后或对照溶液的读数）。 患者可以在任何给定的日期范围内使用1到8 EMA（例如，最好使用4 EMA，即早餐，午餐，晚餐和就寝时间的零食）。

Action	Current Display	Next Display
Left arrow Button press	'---' (Can't calculate average)	No change
	Time Block Average	Glucose Record No. 1
	Glucose Record No. 1	Glucose Record No. 2
•	Glucose Record No. 2	Glucose Record No. 3
	Glucose Record No. 3	'End'
	'End'	Time Block Average