Abstract: A method for filtering blood glucose measurements and associated contextual data of a user on a handheld blood glucose meter (12) is described. The method comprises storing by the blood glucose meter (12) a plurality of blood glucose measurements (56) each having an associated date and time, an event (62), and a sub-event (64) associated with the event; selecting (112) data filtering by the user; selecting (114) a predetermined range for blood glucose measurements; selecting (116) from a plurality of event indicators (58) an event indicator by the user; selecting (118) from a plurality of sub-event indicators (60) associated with the selected event indicator a sub-event indicator by the user; and displaying (120) a plurality of blood glucose measurements (56) within the predetermined range that have both the event (62) and sub-event (64) that correspond to the event indicator (58) and sub-event indicator (60) selected by the user.

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BLOOD GLUCOSE METER SUPPORTING CONTEXTUAL DATA FILTERING

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims priority to United States Patent Application No. 14/275455, filed May 12, 2014, which is hereby incorporated by reference in its entirety.

FIELD

This disclosure relates to handheld in vitro blood glucose meters that store and display blood glucose measurements and related data.

BACKGROUND

Diabetes mellitus, often referred to as diabetes, is a chronic condition in which a person has elevated blood glucose levels that result from the body's inability to produce insulin, use insulin, or both. There are three main types of diabetes. Type 1 diabetes usually strikes children and young adults and is linked to conditions such as autoimmune, genetic, environmental, or a combination. Type 2 diabetes accounts for 90-95% of diabetes cases and is linked to obesity and physical inactivity. Gestational diabetes is a form of glucose intolerance diagnosed during pregnancy that usually resolves soon after delivery.

According to the International Diabetes Foundation Diabetes Atlas, in 2013 some 382 million people worldwide were estimated to have diabetes, and an estimated 5.1 million people between the ages of 20 and 79 die from diabetes annually. In the United States, nearly 24 million Americans have diabetes with an estimated 25 percent of seniors age 60 and older being affected, according to The Centers for Disease Control and Prevention. Diabetes costs are estimated to be $174 billion in the United States alone every year, according to the National Diabetes Information Clearinghouse. Without treatment, diabetes can lead to severe complications such as heart disease, stroke, blindness, kidney failure, amputations, and death related to pneumonia and flu.

Handheld blood glucose meters are used by persons with diabetes in a self-monitoring environment, such as at home and work, to periodically measure their blood glucose to obtain diagnostic information for therapy decisions. Blood glucose measurements are typically
associated with a date and time but limited other information. For persons who test frequently, it is easy to get lost in the data because it can be difficult to select and view this data in a meaningful way. An example of a self-monitoring blood glucose meter is described in Roche, Accu-Chek® Nano Owner’s Booklet for Self-Testing Only (2013). Other manufacturers of self-testing blood glucose meters include LifeScan, Inc. and Abbott Diabetes Care.

Some blood glucose meters provide pattern recognition that typically notify a user immediately when a current blood glucose measurement matches a pattern such as higher than the target range or lower than the target range and whether a collection of blood glucose measurement are trending toward higher than target range or trending toward lower than target range. Typically, blood glucose meter pattern recognition, once enabled, operates in the background on the meter without the need for user interaction other than to perhaps acknowledge when a pattern was recognized. An example of a handheld blood glucose meter with pattern recognition is described in the Life Scan, Inc., OneTouch Verio IQ Blood Glucose Monitoring System, Owner’s Booklet (2011), and U.S. Patent Pub. No. 2013/0318439, Analyte Testing Method and System with High and Low Analyte Trends Notification, published Nov. 28, 2013, assigned to Life Scan, Inc.

There is a need for a handheld blood glucose meter that selectively filters blood glucose measurements for interpretation by the user for improved health care decisions.
SUMMARY

Specific embodiments described herein provide for a method for filtering blood glucose measurements and associated contextual data of a user on a handheld blood glucose meter. In at least one embodiment, the method comprises storing by the blood glucose meter a plurality of blood glucose measurements with each of the blood glucose measurements having an associated date and time, an event, and a sub-event associated with the event, the blood glucose meter having a meter display. The method further comprises selecting data filtering on the meter display by the user, selecting a predetermined range for blood glucose measurements; selecting from a plurality of event indicators on the meter display an event indicator by the user; selecting from a plurality of sub-event indicators on the meter display associated with the selected event indicator a sub-event indicator by the user, and displaying the plurality of blood glucose measurements within the predetermined range that have both the event and sub-event that correspond to the event indicator and sub-event indicator selected by the user. In at least one embodiment, the method may further comprise receiving by a computing device from the blood glucose meter the plurality of blood glucose measurements.

In at least one embodiment of the present disclosure, the method comprises:
(a) obtaining a blood glucose measurement with a blood glucose meter operated by the user and the blood glucose meter associates a date and time with the blood glucose measurement;
(b) displaying a plurality of event indicators on the meter display;
(c) selecting an event indicator by the user from the plurality of event indicators;
(d) associating the blood glucose measurement with an event that corresponds to the event indicator;
(e) displaying a plurality of sub-event indicators on the meter display associated with the selected event indicator;
(f) selecting a sub-event indicator by the user from the plurality of sub-event indicators;
(g) associating the blood glucose measurement with a sub-event corresponding to the selected sub-event indicator; and
repeating (a) - (g) by the user to create a plurality of blood glucose measurements with associated events and sub-events.
In at least one embodiment of the present disclosure, the predetermined range is selected from one of a low data range that is below a target range and a high data range that is above the target range. The low data range in at least one embodiment may be selected from within a first range from about 50 mg/dL to about 100 mg/dL and the high data in at least one embodiment may be selected from within a second range from about 101 mg/dL to about 200 mg/dL.

In at least one embodiment of the present disclosure, the event indicator is selected from one of before meal, after meal, fasting, bedtime, felt hypoglycemic, exercise, and alcohol. Further, the sub-event indicator in at least one embodiment may be selected from one of breakfast, lunch, dinner, snack, coffee break, walking, running, cycling, and swimming.

In at least one embodiment of the present disclosure, the method further comprises determining after the user selects the predetermined range on the meter display that a target range is disabled and no stored blood glucose measurements have target range markers; stopping data filtering because no stored blood glucose measurements have target range markers; and displaying that data filtering has been stopped because no stored blood glucose measurements have target range markers on the meter display.

In at least one embodiment of the present disclosure, the method further comprises determining after the user selects the predetermined range on the meter display that no stored blood glucose measurements are within the predetermined range; stopping data filtering because no stored blood glucose measurements are within the predetermined range; and displaying that data filtering has been stopped because no stored blood glucose measurements are within the predetermined range.

In at least one embodiment of the present disclosure, the handheld blood glucose meter with contextual data filtering has a display and is operated by a user to obtain blood glucose measurements. The handheld blood glucose meter is configured to perform at least one embodiment of the method of the present disclosure. In at least one embodiment, the meter transmits these blood glucose measurements to a computing device, such as a mobile phone, that performs contextual filtering of blood glucose measurements as described above. Use of embodiment of the meter described in the present disclosure may aid the user in making healthcare decisions.
BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the embodiments of the present disclosure, and the manner of attaining them, will be more apparent and better understood by reference to the following descriptions taken in conjunction with the accompanying figures.

Fig. 1 shows a self-monitoring environment for a person with diabetes;

Fig. 2 shows a blood glucose meter with a test strip and a computing device with a diabetes management application;

Fig. 3 shows an electrical block diagram of a handheld blood glucose meter;

Fig. 4 shows an electrical block diagram of a computing device;

Fig. 5 shows a flowchart for contextual data filtering on a handheld blood glucose meter;

Fig. 6 shows selected user interface navigation screens for selecting an event and a sub-event;

Fig. 7 shows a flowchart for contextual data filtering with a computing device; and

Fig. 8 shows selected user interface navigation screens for conditions that stop contextual data filtering.

DETAILED DESCRIPTION

Fig. 1 shows a person with diabetes 10 in a self-testing environment with a handheld blood glucose meter 12, showing a displayed blood glucose measurement 13, test strip container 14, test strip 15, lancet 16, and computing devices 18. The person with diabetes 10 is typically the user 10 of the blood glucose meter 12; however, the user 10 can also be a clinician, health care provider, family member, or other person. The meter 12 is operated by inserting a disposable test strip 15 into the meter 12. The user lances typically a finger to obtain a small drop of blood that is placed on a test strip 15 collection site. The meter 12 performs electrochemical analysis of the blood and displays the blood glucose measurement 13. A current displayed blood glucose measurement 13 may be used for therapy decisions such as insulin dosage and carbohydrate consumption. Typically, a person with diabetes 10 will have a blood glucose target range, and a blood glucose measurement outside of the target range, which may be relevant to making therapy adjustments. Past or retrospective blood
glucose measurements may also be useful for providing insights regarding flagged or labeled events that can influence blood glucose measurements such as whether the blood glucose measurements were taken before meal or after meal. Other events that can influence blood glucose measurements may or may not be flagged such as emotional state, illness, exercise, and medication changes. If these events are not flagged, the person with diabetes 10 often has awareness of these events through their personal memory or through other records such as a personal calendar. When a person with diabetes 10 has an appointment with a clinician to assess therapy, past blood glucose measurements may be filtered according to at least one embodiment of the present disclosure to aid in the understanding of both flagged and not flagged circumstances adversely affecting the person's therapy and potential changes to improve the therapy.

Fig. 2 shows a handheld blood glucose meter 12 and a computing device 18, shown as a mobile phone, with a diabetes management application 20. The blood glucose meter or "bG meter" 12 comprises a meter housing 22, meter display 24, meter user input buttons 26, a test strip port 28 and a test strip 15. The meter display 24 functions to display information for the user 10 to interpret and to highlight for selection and can be a dot matrix black and white display, a liquid crystal display (LCD), a Thin-Film-Transistor (TFT) LCD, and the like. User input buttons 26, in at least one embodiment, may include an up-scroll button 32, a down-scroll button 34, a selection button 36, and a back button 38. The up-scroll button 32 and down-scroll button 34 in at least one embodiment function to move to and highlight predetermined portions of the meter display 24 that can then be selected with the selection button 36. The up-scroll button 32 and down-scroll button 34 may also function to scroll through blood glucose measurements presented on the meter display 24. The selection button 36, sometimes referred to as a confirmation button, generally functions for the user 10 to select a highlighted entry by instructing the meter 12 to store the highlighted entry in memory for further operations by the processor. The back button 38 functions to move to the previous screen, so the user 10 has the opportunity to change the highlighted information. The meter 12 is capable of wirelessly transmitting blood glucose records to a computing device 18 such as a mobile phone, a tablet computer, or a personal computer. An example of transferring information from a meter 12 to a computing device 18 is shown in U.S. Patent Application No. 13/794,985, Transferring Blood Glucose Measures Seamlessly from a Handheld Glucose Meter, filed March 12, 2013, assigned to Roche Diagnostics Operations, Inc.
The computing device 18 generally has components that correspond to the handheld blood glucose meter 12 however without a strip port 28 and the capability to perform blood glucose measurements 56 (Fig. 3). In at least one embodiment, the computing device 18 may be a mobile phone, a tablet computer, a laptop computer, or a desktop computer. The computing device 18 comprises a device housing 40, a device display 42, device user input buttons 44, and a diabetes management application 20. The computing device 18 is also capable of wirelessly or via USB connection receiving blood glucose results from the meter 12. An example of blood glucose meter 12 or mobile phone 18 that performs blood glucose level pattern recognition is shown in U.S. Patent Application No. 13/936,535, Reminder, Classification, and Pattern Identification Systems and Methods for Handheld Diabetes Management Devices, filed July 8, 2013, assigned to Roche Diagnostics Operations, Inc., which is hereby incorporated by reference. An example of a blood glucose meter 12 or mobile phone 18 that assesses a user’s risk for hypoglycemia and hyperglycemia is shown in U.S. Patent Application No. 14/039,762, High/Low Blood Glucose Risk Assessment Systems and Methods, filed September 27, 2013, assigned to Roche Diagnostics Operations, Inc., which is hereby incorporated by reference. An example of a diabetes management application 20 for a computing device is shown in U.S. Patent Pub. No. 2013/0172688, Diabetes Management Application for Mobile Phone, published July 4, 2013, assigned to Roche Diagnostics Operations, Inc.

Fig. 3 shows a block diagram of a handheld blood glucose meter 12. The meter 12 comprises a strip port 28, a measurement module 46, a meter microprocessor 48, meter memory 50, meter user interface features 52, and a meter wireless transceiver 54. The meter memory 50 comprises a blood glucose (bG) measurement 56, event indicator 58, sub-event indicator 60, event 62, sub-event 64, bG range 66, and target range 68. The meter user interface features 52 comprise a meter display 72, such as liquid crystal display (LCD) controller and LCD, a meter backlight driver 74, meter buttons 76, and a beeper 80. The wireless transceiver 54 can be a Bluetooth low energy radio coupled to an antenna that communicates using a Continua Alliance compliant protocol such as described in U.S. Patent Application No. 14/155,954, Low Energy wireless Communication Systems and Methods for Medical Devices, filed January 15, 2014, assigned to Roche Diagnostics Operations, Inc.

Blood glucose measurements 56 are stored in memory 50 such as a circular buffer that can hold blood glucose records indefinitely provided there is storage space before beginning to write over the oldest blood glucose measurements 56 that exceed the storage limit. For
example, storage space hold a maximum of 500 blood glucose measurements 56 before
beginning to write over the oldest blood glucose measurements 56. Blood glucose
measurements 56 include a sequence number, date and time, and can also include additional
contextual information such as related to a target range 68, events 62 and sub-events 64. If
the target range function is enabled, the blood glucose measurements 56 can also include a bit
fill or flag representing whether the blood glucose measurement 56 was within the target
range, higher than the target range, lower than the target range, hyperglycemic, or
hypoglycemic. The blood glucose measurement 56 contextual information for an event 62 or
sub-event 64 can also be represented with a bit fill or flag.

Fig. 4 shows a block diagram of a computing device 18. The computing device 18
comprises a device microprocessor 82, device memory 84, device user interface features 86, a
device wireless transceiver 88, and a diabetes management program 20. The device memory
84 comprises a blood glucose measurement 56, event indicator 58, sub-event indicator 60,
event 62, sub-event 64, bG range 66, and target range 68. The device 18 user interface
features 86 comprise a device display 90, device backlight driver 92, device buttons 94. The
wireless transceiver 88 can be a Bluetooth low energy radio coupled to an antenna that, after
pairing, communicates with the blood glucose meter using a Continua Alliance compliant
protocol.

Fig. 5 shows a flowchart of a method for filtering blood glucose measurements 56 and
associated contextual data of a user 10 on a handheld blood glucose meter 12 embodiment.
The method comprises obtaining a blood glucose measurement (exemplary step 96),
displaying a plurality of event indicators (exemplary step 98), selecting an event indicator
(exemplary step 100), associating the blood glucose measurement 56 with an event
(exemplary step 102), displaying a plurality of sub-event indicators (exemplary step 104),
selecting a sub-event indicator (exemplary step 106), associating the blood glucose
measurement 56 with a sub-event (exemplary step 108), repeating the previous elements to
create a plurality of blood glucose measurements (exemplary step 110) with associated events
62 and sub-events 64, selecting data filtering (exemplary step 112), selecting a predetermined
range of blood glucose measurements (exemplary step 114), selecting one of the event
indicators (exemplary step 116), selecting one of the sub-event indicators (exemplary step
118), and displaying a plurality of blood glucose measurements 56 within the predetermined
range (exemplary step 120). A simplified portion of the above process is shown in Fig. 6
with certain related user interface 26 navigation screens for selecting an event 62 and a sub-event 64.

Creating Blood Glucose Measurement with Contextual Data

The user 10 obtains a blood glucose measurement 56 with a blood glucose meter 12 having a meter display 24. The user 10 inserts a test strip 15 in the strip port 28 of the blood glucose meter 12, lances typically a finger, and places a small drop of blood on the test strip 15. The test strip 15 reacts chemically with the blood, and the measurement module 46 performs an electro-chemical or photometric analysis of the strip 15 to determine the blood glucose measurement 56. The blood glucose measurement 56 is generated by the measurement module 46 and the date and time along with the sequence number are added.

After performing the blood glucose measurement 56, the meter processor 48 reads the blood glucose measurement from the measurement module 46, writes the blood glucose measurement 56 to memory 50 and writes a glucose measurement for display 13 to the meter display 24 that includes a comments field. The user operates the up-scroll button 32 or down-scroll button 34 to highlight the comment field. The user then operates the selection button 36 to request the meter processor 48 to read from memory 50 a plurality of event indicators 58 that are then written to the meter display 24. Each of the event indicators 58 is associated with set of sub-event indicators 60 in memory 50 that are not yet displayed. The event indicator 58 appears on the meter display and represents events 62 that are relevant for better understanding of conditions when blood glucose was measured. Examples of event indicators 58 are before meal, after meal, fasting, bedtime, felt hypoglycemic, exercise, alcohol, and the like. The user 10 operates the up-scroll button 32 or down-scroll button 34 to highlight the desired event indicator 58. The user 10 then operates the selection button 36 to request the meter processor 48 write the event 62 to memory 50 that is associated with the event indicator 58. The meter processor 48 associates the blood glucose measurement 56 with an event 62 that corresponds to the event indicator 58, and stores the event 62 and the event's association with the blood glucose measurement 56 in the meter's memory 50.

The meter processor 48 then reads from memory 50 and writes to the meter display 24 a plurality of sub-event indicators 60 associated with the selected event indicator 60 that provide further relevant information for a better understanding of the conditions or context of the blood glucose measurement 56. The user 10 operates the up-scroll button 32 or down-scroll button 34 to highlight the desired sub-event indicator 60. The previously selected
event indicators 58 of before meal and after meal each have the associated sub-event indicator 60 selected from one of breakfast, lunch, dinner, and snack. The selected event indicator 58 of exercise has the associated sub-event indicators 60 selected from one of walking, running, cycling, and swimming. The user 10 then operates the selection button 36 to request the meter processor 48 to write the sub-event 64 to memory 50 that is associated with the sub-event indicator 60. The processor 48 associates the blood glucose measurement 56 with a sub-event 64 that corresponds to the sub-event indicator 60, and stores the sub-event 64 association with the blood glucose measurement 56 in the meter's memory 50. Table 1 below summarizes the previously described events 62 and associated with sub-events 64 provides additional events 62 and sub-events 64 along with their association.

<table>
<thead>
<tr>
<th>Events</th>
<th>Sub-Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Meal</td>
<td>Breakfast</td>
</tr>
<tr>
<td></td>
<td>Lunch</td>
</tr>
<tr>
<td></td>
<td>Dinner</td>
</tr>
<tr>
<td></td>
<td>Snack</td>
</tr>
<tr>
<td></td>
<td>Coffee Break</td>
</tr>
<tr>
<td>After Meal</td>
<td>Breakfast</td>
</tr>
<tr>
<td></td>
<td>Lunch</td>
</tr>
<tr>
<td></td>
<td>Dinner</td>
</tr>
<tr>
<td></td>
<td>Snack</td>
</tr>
<tr>
<td></td>
<td>Coffee Break</td>
</tr>
<tr>
<td>Exercise</td>
<td>Walking</td>
</tr>
<tr>
<td></td>
<td>Running</td>
</tr>
</tbody>
</table>
The user repeats the steps of obtaining a blood glucose measurement (exemplary step 96), displaying a plurality of event indicators (exemplary step 98), selecting an event indicator (exemplary step 100), associating the blood glucose measurement 56 with an event (exemplary step 102), displaying a plurality of sub-event indicators (exemplary step 104), selecting a sub-event indicator (exemplary step 106), and associating the blood glucose measurement 56 with a sub-event (exemplary step 108). By repeating these steps (exemplary step 110), the user creates a plurality of blood glucose measurements 56 with associated events 62 and sub-events 64.

Filtering Blood Glucose Measurements with Contextual Data

The user begins the process of filtering blood glucose measurements 56 from the meter main menu by highlighting and selecting My Data that displays data filtering (exemplary step 112) with a display indicator such as "Low/High Data." The meter then displays predetermined ranges of blood glucose measurements 56 such as high data, low data, hypoglycemic and hyperglycemic (exemplary step 116). In one embodiment, the predetermined range is selected from one of a low data range that is below a target range and a high data range that is above a target range (exemplary step 116). The low data range selected from within a first range from about 50 mg/dL to about 100 mg/dL, and the high data range selected from within a second range from about 101 mg/dl to about 200 mg/dl. Table 2 below summarizes the previously described predetermined range for blood glucose measurements 56 and provides additional predetermined ranges.

### TABLE 2

<table>
<thead>
<tr>
<th>Predetermined Range</th>
<th>Blood Glucose Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Data</td>
<td>Below Target</td>
</tr>
<tr>
<td>Predetermined Range</td>
<td>Blood Glucose Range</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>High Data</td>
<td>Above Target</td>
</tr>
<tr>
<td>Hypoglycemic</td>
<td>Below Target and Hypoglycemic Limit</td>
</tr>
<tr>
<td>Hyperglycemic</td>
<td>Above Target and Hyperglycemic Limit</td>
</tr>
</tbody>
</table>

The user operates the up-scroll button 32 or down-scroll button 34 to highlight the desired predetermined range of blood glucose measurements 56. The user then operates the selection button 36 to request the meter processor 48 to write the highlighted predetermined range to memory 50 for operation by the processor 48.

The meter processor 48 then writes to the display 24 event indicators 58 available for selection. The user operates the up-scroll button 32 or down-scroll button 34 to highlight the desired event indicator 58. The user then operates the selection button 36 to request the meter processor 48 to write the event 62 associated with the event indicator 58 to memory 50 for operation by the processor 48. The meter processor 48 then writes to the display 24 sub-event indicators 60 available for selection. The user operates the up-scroll button 32 or down-scroll button 34 to highlight the desired sub-event indicator 60. The user then operates the selection button 36 to request the meter processor 48 to write the sub-event 64 associated with the sub-event indicator 60 to memory 50 for operation by the processor 48.

The meter 12 displays a plurality of blood glucose measurements (exemplary step 118) within the predetermined range that have both the selected event 62 and the selected sub-event 64 in a tabular format. In at least one embodiment, the plurality of blood glucose measurements 56 with contextual data is not typically stored in memory to ensure that the measurements 56 are current. In addition to the event 62, sub-event 64, and predetermined range 116, the meter 12 can be configured to show blood glucose measurements over a time period such as 90 days. The plurality of blood glucose measurements 56 displayed would typically be ordered with the most recent blood glucose measurement 56 meeting the
selection criteria displayed first, and the user would scroll through the older blood glucose measurements 56.

In at least one embodiment, the blood glucose meter 12 does not need to create a plurality of blood glucose measurements 110 with associated events 62 and sub-events 64 because they are already stored in meter memory 50. In this embodiment, the user 10 would begin the process of filtering blood glucose measurements 56 from the meter main menu by highlighting and selecting My Data and follow the process discussed above.

Fig. 7 shows a flowchart of at least one embodiment of a method for filtering blood glucose measurements 56 and associated contextual data of a user 10 on a computing device 18. In at least one embodiment, the blood glucose meter 12 does not need to create a plurality of blood glucose measurements 110 with associated events 62 and sub-events 64 because they are already stored in meter memory 50. The meter 12 transmits these blood glucose measurements 122 to a computing device 18, such as a mobile phone, tablet or other computer, and the computing device 18 has a diabetes management application 20 that performs the remaining elements. The user 10 operates the computing device 18 according to the computing device’s user interface 86 to select data filtering 112, select a predetermined range of blood glucose measurement 116, select an event indicator 100, select as associated sub-event indicator 106 to display blood glucose measurements 13 within the selected predetermined range 116 that have both the associated event 62 and sub-event 64.

Fig. 8 shows certain user interface navigation screens related to stopping the contextual data filtering process. Under certain conditions such as when the blood glucose measurement 56 target range 68 is disabled or if there are no stored blood glucose measurements 56 within the predetermined range, the blood glucose meter 12 or computing device 18 will not display a plurality of blood glucose measurements 56 in the predetermined range. To reduce user irritation under these conditions, the blood glucose meter 12 or computing device 18 will halt data filtering and return to a home screen. If the blood glucose meter 12 or computing device 18 continued with data filtering, the user 10 would waste time by performing more actions when there will be no blood glucose measurements 56 that meet the selection criteria. If the user selects the predetermined range on the meter display and the meter determines that the target range is disabled (exemplary step 124) and there are no stored blood glucose measurements 56 having target range markers, data filtering is stopped (exemplary step 126) because no blood glucose measurements 56 will meet the selection criteria.
criteria. If the user selects the predetermined range and there are no stored blood glucose measurements 56 within the predetermined range (exemplary step 128), data filtering is stopped (exemplary step 130) because no blood glucose measurements 56 will meet the selection criteria.

While various embodiments of handheld blood glucose meters and methods for their use have been described in considerable detail herein, the embodiments are merely offered by way of non-limiting examples of the disclosure described herein. It will therefore be understood that various changes and modifications may be made, and equivalents may be substituted for elements thereof, without departing from the scope of the disclosure. Indeed, this disclosure is not intended to be exhaustive or to limit the scope of the disclosure.

Further, in describing representative embodiments, the disclosure may have presented a method and/or process as a particular sequence of steps. However, to the extent that the method or process does not rely on the particular order of steps set forth herein, the method or process should not be limited to the particular sequence of steps described. Other sequences of steps may be possible. Therefore, the particular order of the steps disclosed herein should not be construed as limitations of the present disclosure. In addition, disclosure directed to a method and/or process should not be limited to the performance of their steps in the order written. Such sequences may be varied and still remain within the scope of the present disclosure.
What is claimed is:

1. A method for filtering blood glucose measurements and associated contextual data of a user on a handheld blood glucose meter (12), comprising:
   - storing by the blood glucose meter (12) a plurality of blood glucose measurements (56) with each of the blood glucose measurements (56) having an associated date and time, an event (62), and a sub-event (64) associated with the event, the blood glucose meter (12) having a meter display (24);
   - selecting (112) data filtering on the meter display (24) by the user;
   - selecting (114) a predetermined range for blood glucose measurements;
   - selecting (116) from a plurality of event indicators (58) on the meter display (24) an event indicator by the user;
   - selecting (118) from a plurality of sub-event indicators (60) on the meter display (24) associated with the selected event indicator a sub-event indicator by the user;
   - and
   - displaying (120) a plurality of blood glucose measurements (56) within the predetermined range that have both the event (62) and sub-event (64) that correspond to the event indicator (58) and sub-event indicator (60) selected by the user.

2. The method of claim 1, further comprising receiving by a computing device (18) from the blood glucose meter (12) the plurality of blood glucose measurements.

3. The method of claim 1, further comprising:
   - (a) obtaining (96) a blood glucose measurement with a blood glucose meter (12) operated by the user and the blood glucose meter (12) associates a date and time with the blood glucose measurement;
   - (b) displaying (98) a plurality of event indicators (58) on the meter display (24);
   - (c) selecting (100) an event indicator by the user from the plurality of event indicators;
   - (d) associating (102) the blood glucose measurement with an event that corresponds to the event indicator;
(e) displaying (104) a plurality of sub-event indicators (60) on the meter display (24) associated with the selected event indicator;
(f) selecting (106) a sub-event indicator by the user from the plurality of sub-event indicators;
(g) associating (108) the blood glucose measurement with a sub-event corresponding to the selected sub-event indicator; and
repeating (a) - (g) (110) by the user to create a plurality of blood glucose measurements with associated events and sub-events.

4. The method according to one of the preceding claims, wherein the predetermined range is selected from one of a low data range that is below a target range and a high data range that is above the target range.

5. The method according to claim 4, wherein the low data range is selected from within a first range from about 50 mg/dL to about 100 mg/dL and the high data is selected from within a second range from about 101 mg/dL to about 200 mg/dL.

6. The method according to one of the preceding claims, wherein the event indicator (58) is selected from one of before meal, after meal, fasting, bedtime, felt hypoglycemic, exercise, and alcohol.

7. The method according to one of the preceding claims, wherein the sub-event indicator (60) is selected from one of breakfast, lunch, dinner, snack, coffee break, walking, running, cycling, and swimming.

8. The method according to one of the preceding claims, further comprising:
   determining (124) after the user selects the predetermined range on the meter display that a target range is disabled and no stored blood glucose measurements have target range markers;
   stopping (126) data filtering because no stored blood glucose measurements have target range markers; and
   displaying that data filtering has been stopped because no stored blood glucose measurements have target range markers on the meter display.
9. The method according to one of claims 1-7, further comprising:

determining (128) after the user selects the predetermined range on the meter display that no stored blood glucose measurements are within the predetermined range;

stopping (130) data filtering because no stored blood glucose measurements are within the predetermined range; and

displaying that data filtering has been stopped because no stored blood glucose measurements are within the predetermined range.
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
INTERNATIONAL SEARCH REPORT

International application No. PCT/US 15/30311

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8)   - A61B 5/15, 5/157 (2015.01)
CPC     - A61B 5/15, 5/14532

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) Classification(s): A61B 5/15, 5/157 (2015.01)
CPC Classification(s): A61B 5/15, 5/14532; G01N 33/66; G06F 3/14, 17/30029, 19/3481

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google/Google Scholar, ProQuest; EBSCO

C. DOCUMENTS CONSIDERED □ BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>US 20140068487 A1 (STEIGER, B et al.) 06 March 2014; Figures 3, 4, 9, 10; Paragraphs [0006], [0033], [0049], [0050], [0057], [0061], [0063], [0069], [0103], [0104]</td>
<td>1-3</td>
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<td>Y</td>
<td>WO 2011026053 A1 (ABBOTT DIABETES CARE INC) 03 March 2011; Paragraphs [0087], [0088]</td>
<td>4, 5</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search 16 July 2015 (16.07.2015)

Name and mailing address of the ISA/Authorized officer
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300
PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)
**INTERNATIONAL SEARCH REPORT**

<table>
<thead>
<tr>
<th>Box No. II</th>
<th>Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)</th>
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<tr>
<td></td>
<td>This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:</td>
</tr>
<tr>
<td>1. ☒ Claims Nos.:</td>
<td>because they relate to subject matter not required to be searched by this Authority, namely:</td>
</tr>
<tr>
<td>2. ☐ Claims Nos.:</td>
<td>because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:</td>
</tr>
<tr>
<td>3. ☒ Claims Nos.: 6-9</td>
<td>because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).</td>
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<tr>
<th>Box No. III</th>
<th>Observations where unity of invention is lacking (Continuation of item 3 of first sheet)</th>
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<tr>
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<td>This International Searching Authority found multiple inventions in this international application, as follows:</td>
</tr>
<tr>
<td>1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.</td>
<td></td>
</tr>
<tr>
<td>2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.</td>
<td></td>
</tr>
<tr>
<td>3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:</td>
<td></td>
</tr>
<tr>
<td>4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:</td>
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</table>

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2015)