US2006/0173417 discloses a medical device for injection of insulin that can transmit the amount of injected insulin to a remote computer. However, the system described therein does not detect if the device needs service or replacement.

SUMMARY OF INVENTION

In a first aspect of the invention there is provided a method involving a portable medical device for the injection of a medicament, said medical device comprising means for injection of a medicament, said medical device further comprising a cellular radio transceiver and a sensor that is an operations counter, said portable medical device further comprising an injection actuator which a user can use to self-administer a medicament, the method comprising the steps of: a) the portable medical device using the sensor to determine a value for a parameter that is sensed by the sensor, the parameter being the operations counter detecting an injection, and a time point for injection; b) the portable medical device using the cellular radio transceiver to establish a data connection to a remote computer with the use of a cellular network; c) the portable medical device using the data connection to transfer the data from step a) to the remote computer; d) determining the geographical position of the portable medical device, and transferring information about the geographical position to the remote computer; e) the remote computer using the geographical position and the time point to retrieve data for at least one additional parameter; f) the remote computer using the data from step e) to determine whether the portable medical device is in need of scrapping, service or replacement. It further relates to a method comprising the steps of a) providing a portable medical device for the injection of a medicament comprising means for injection of a medicament, a cellular radio transceiver and at least one sensor, said sensor being selected from the group consisting of a temperature sensor, a humidity sensor, an accelerometer and an operations counter, the portable medical device using the sensor to determine a value of a parameter that is sensed by the sensor, b) the portable medical device using the cellular radio transceiver to establish a data connection to a remote computer with the use of a cellular network, c) the portable medical device using the data

connection to transfer the value from step a) to the remote computer and d) the remote computer using the value from step c) to determine whether the portable medical device is in need of scrapping, service or replacement.

Individual patients may be reluctant or may forget to report a malfunctioning device. It is therefore an advantage that the operation of medical devices can be monitored remotely, so that a health provider can take steps so that the medical device is serviced or replaced.

One advantage of the invention is that sensor values are reported to and analysed by a remote computer. The remote computer determines whether the medical device should, for example, be scrapped, serviced or replaced. For example, if a threshold value for temperature is used for the decision, a threshold value is stored in the remote computer. From time to time the threshold value may have to be adjusted. Such adjustments may be triggered by new findings regarding failures of medical devices. For example, it is discovered

The method is preferably carried out by a processing unit in the medical device and by the remote computer.

In a second aspect of the invention it is provided a system for deciding if a portable medical device for the injection of a medicament should be serviced or replaced, said system comprising a portable medical device for injection of a medicament and a remote computer, said portable medical device comprising injection means, a processing unit, a memory and a cellular radio transceiver and at least one sensor, the sensor being an operations counter, said portable device further comprising an injection actuator which a user can use to self-administer a medicament, said portable medical device being configured to use the operations counter to sense injection and to store a time point for injection, in the memory, said remote computer and portable medical device adapted to establish a data connection with the use of a cellular network, the portable medical device being configured to use the data connection to transfer the time of injection to the remote computer, the system being configured to determine the geographical position of the medical device at the time point for injection, the remote computer being configured to use the geographical position and the time point to retrieve data for a parameter and to use the retrieved data to decide whether the portable medical device is in need of scrapping, service or replacement. It further relates to a system for deciding if a portable medical device for the injection of a medicament should be serviced or replaced, said system comprising a portable medical device and a remote computer, said portable medical device comprising injections means and a processing unit, a memory and a cellular radio transceiver and at least one sensor selected from the group consisting of a temperature sensor, a humidity sensor, an accelerometer, and an operations counter, said portable medical device being configured to store data from the at least one sensor in the memory, said remote computer and portable medical device adapted to establish a data connection with the use of a cellular network, the portable medical device being configured to use the data connection to transfer the sensor data to the remote computer, the remote computer configured to use the sensor data to determine whether the portable medical device is in need of scrapping, service or replacement.

The remote computer of the system may have decision rule software, said decision rule software being generated by applying machine learning to a data set, said data set comprising sensor data previously collected from comparable portable medical devices, said data set further comprising data about any previous failures of such comparable portable medical devices.

In a third aspect of the invention there is provided a portable medical device for the injection of a medicament, said medical device comprising means for injection of a medicament, said medical device further comprising a cellular radio transceiver and at least one sensor, said sensor selected from the group consisting of a temperature sensor, a humidity sensor, an accelerometer, and an operations counter, the portable medical device further comprising a processing unit, said device being configured to use the sensor to determine a value for a parameter that is sensed by the sensor, to use the cellular radio transceiver to establish a data connection to a remote computer with the use of a cellular network and to use the data connection to transfer the determined value to the remote computer.

The device may be configured to, after transfer of the determined value to the remote computer, to receive from the remote computer a signal causing the medical device to notify a user of the medical device that the device needs service or replacement, or shutting down the medical device.

In one embodiment at least one sensor is a temperature sensor or a humidity sensor.

The device may have an activation switch, whereby a user can cause the humidity or temperature sensor to measure temperature or humidity and store the temperature value or humidity value in the memory of the medical device. The activation may switch on the medical device or wake it up from sleep. The device can be configured to, when the user has used the activation switch, to wait for further user action during a predetermined waiting period, and, if the user takes further action within the waiting period, establish a data connection to the remote computer and transfer the determined value to the remote computer, and if the user does not take further action within the waiting period, being configured to transfer the determined value the next time a data connection is established with the remote computer. The medical device may be configured to switch off or go to sleep if

the user does not take any action within the waiting period. This has the advantage of saving battery power.

In a fourth aspect of the invention there is provided a remote computer being configured to receive, using a data connection, from a portable medical device for the injection of a medicament, a value for a parameter, the parameter being a time point for injection, and receiving the geographical position of the medical device, the remote computer further being configured to use the geographical position and the time point to retrieve data for at least one additional parameter, and using the data to determine whether the portable medical device is in need of scrapping, service or replacement. It further relates to a remote computer being configured to receive from a portable medical device for the injection of a medicament, using a data connection, a value for a parameter selected from the group consisting of temperature, humidity, acceleration, number of injections carried out or amount of medicament injected, and using the value to determine whether the portable medical device is in need of scrapping, service or replacement. The remote computer may, when determining if the portable medical device is in need of scrapping service or replacement apply a decision rule, said decision rule being generated by applying machine learning to a data set, said data set comprising sensor data previously collected from comparable portable medical devices, said

CLAIMS

1. A method involving a portable medical device (1) for the injection of a medicament, said medical device (1) comprising means (6) for injection of a medicament, said medical device (1) further comprising a cellular radio transceiver (2) and a sensor (5) that is an operations counter (14), said portable medical device further comprising an injection actuator which a user can use to self-administer a medicament, the method comprising the steps of

a) the portable medical device (1) using the sensor (5) to determine a value for a parameter that is sensed by the sensor (5), the parameter being the operations counter detecting an injection, and a time point for injection,

b) the portable medical device (1) using the cellular radio transceiver (2) to establish a data connection to a remote computer (4) with the use of a cellular network (3),

c) the portable medical device (1) using the data connection to transfer the data from step a) to the remote computer (4),

d) determining the geographical position of the portable medical device (1), and transferring information about the geographical position to the remote computer (4),

e) the remote computer using the geographical position and the time point to retrieve data for at least one additional parameter,

f) the remote computer (4) using the data from step e) to determine whether the portable medical device 1 is in need of scrapping, service or replacement,

2. The method according to claim 1 where the parameter is a parameter selected from the group consisting of temperature, humidity, weather, calendar data, air pollution, air pressure and road traffic information.

3. The method according to any one of claim 1 to 2 where step f) involves the remote computer (4) establishing if the value exceeds a threshold value.

4. The method according to any of claims claim 1 to 3 where step f) involves the remote computer (4) applying a decision rule, said decision rule being generated by applying machine learning to a data set (15), said data set (15) comprising data previously collected for comparable portable medical devices, said data set (15) also comprising data about previous failures of the comparable portable medical devices.

5. The method of claim 4 where the data set (15) comprises data for at least one parameter selected from the group consisting of temperature, humidity, acceleration or time in free fall, weather, calendar data, air pollution, air pressure, geographical position, number of operations, amount of medicament injected, time of injection, geographical position at time of injection.

6. The method according to any one of claims 4 to 5 where the data in the dataset (15) has been added to the dataset (15) according to the method of any one of claims 1 to 11.

7. The method according to any one of claims 4 to 6 where the dataset (15) comprises information made available by users of comparative medical devices, said information being from a social network service, and the remote computer in step d) uses information regarding the user of the portable device (1) for which the decision rule is applied, said information made available by the user to the social network service.

8. The method according to any one of claims 1 to 7 where the injection actuator comprises a button that can be pressed by a user.

9. A system (50) for deciding if a portable medical device (1) for the injection of a medicament should be serviced or replaced, said system (50) comprising a portable medical device (1) for injection of a medicament and a remote computer (4), said portable medical device (1) comprising injection means (6), a processing unit (8), a memory (7) and a cellular radio transceiver (2) and at least one sensor (5) the sensor being an operations counter (14), said portable device further comprising an injection actuator which a user can use to self-administer a medicament, said portable medical

device (1) being configured to use the operations counter to sense injection and to store a time point for injection, in the memory (7), said remote computer (4) and portable medical device (1) adapted to establish a data connection with the use of a cellular network (3), the portable medical device (1) being configured to use the data connection to transfer the time of injection to the remote computer (4), the system (50) being configured to determine the geographical position of the medical device (1) at the time point for injection, the remote computer (4) being configured to use the geographical position and the time point to retrieve data for a parameter and to use the retrieved data to decide whether the portable medical device is in need of scrapping, service or replacement

10. The system according to claim 9 where the remote computer (4) comprises decision rule software (10), said decision rule software (10) being generated by applying machine learning to a data set (15), said data set (15) comprising sensor values previously collected from comparable medical devices, said data set (15) further comprising data about any previous failures of the comparable portable medical devices.

11. The system according to any of claims 9 or 10 where the injection actuator comprises a button that can be pressed by a user.

12. A remote computer (4) being configured to receive, using a data connection, from a portable medical device (1) for the injection of a medicament, a value for a parameter, the parameter being a time point for injection, and receiving the geographical position of the medical device, the remote computer further being configured to use the geographical position and the time point to retrieve data for at least one additional parameter, and using the data to determine whether the portable medical device (1) is in need of scrapping, service or replacement.

13. The remote computer (4) according to claim 12 where the determination involves the remote computer (4) applying a decision rule, said decision rule being generated by applying machine learning to a data set (15), said data set (15) comprising sensor data

previously collected from comparable portable medical devices, said data set (15) also comprising data about any previous failures of the comparable portable medical devices.