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# A Healthcare Monitoring System

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THIS INVENTION relates to a healthcare monitoring system, and more particularly concerns a system allowing a user to monitor his or her health and communicate with a variety of healthcare providers, such as physicians, in an effective and convenient fashion.

Several systems for the formation and maintenance of electronic healthcare records have been proposed, some of which incorporate the use of a smart card or other data storage device to store records relating to a carrier of the storage device. Other known systems employ a central server to store medical records relating to a group of individual healthcare users, which records can be accessed (upon the successful completion of any authentication procedures) by the healthcare users and also by associated healthcare providers.

However, such systems typically amount to little more than an electronic substitute for traditional paper medical records, and do little, beyond providing convenient access to medical records, to facilitate the necessary interaction between healthcare users and healthcare providers.

It is an object of the present invention to seek to provide an improved healthcare monitoring system.

Accordingly, one aspect of the present invention a portable healthcare monitoring device having: a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver; and a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the memory device, the arrangement being such that a recent data set relating to a period of

time immediately before the present is stored on the portable memory device, the recent data set being available for retrieval in the event of an emergency.

Another aspect of the present invention provides a healthcare monitoring system, comprising: a portable healthcare monitoring device having: a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver; and a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the portable memory device; and a processing machine having a connection to a network, the monitor having a docking port allowing the monitor to dock to a cooperating docking port on the memory device receiver or the processing machine to allow the transfer of data from the monitor to the memory device receiver or the processing machine.

Advantageously, the processing machine is a desktop PC, a laptop PC, a notebook PC, a personal digital assistant or a portable tablet PC.

Preferably, the portable memory device is a smart card.

Conveniently, the monitor measures the blood pressure, $SPO_2$, body temperature, blood glucose levels, pulse rate, ECG parameters, haemoglobin concentration, blood glucose levels, cholesterol or urine acid levels of the user

Advantageously, data gathered by the monitor is transmitted to the memory device receiver by a wireless link, a dedicated communication line or a common communication line.

Preferably, the receiver writes data to the portable memory device in an encrypted form.

Conveniently, the healthcare monitoring system further comprises an authentication device operable to gather input allowing the system to authenticate the identity of the user.

Advantageously, the authentication device comprises a keypad allowing a password to be entered.

Alternatively, the authentication device comprises a fingerprint reading device.

Preferably, the authentication of the identity of the user provides a digital signature.

Conveniently, wherein the network is the Internet.

A further aspect of the present invention provides a portable healthcare monitoring device comprising: a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver; a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the portable memory device; an authentication device operable to gather input allowing the apparatus to authenticate the identity of the user; and a video conferencing facility operable to allow video conferencing between the user and a healthcare provider over a network upon authentication of the identity of the user, the portable healthcare monitoring device being operable to transmit data stored on the portable memory device to the healthcare provider over the network.

Another aspect of the present invention provides a healthcare collaboration system, comprising: a first healthcare server, associated with a

plurality of healthcare users, healthcare records relating to the healthcare users being stored on the first healthcare server; a second healthcare server, associated with at least one healthcare provider; an authentication system associated with the healthcare provider; and a network connecting the healthcare monitoring systems and authentication systems, the first server being operable to transmit at least selected portions of the medical records relating to one of the healthcare users to the second healthcare server for review by the healthcare provider upon authentication of the identity of the healthcare provider by the authentication system.

Advantageously, a record of the review of the medical records by the healthcare provider is stored in the medical records relating to the one of the healthcare users.

Preferably, the medical records relating to the one of the healthcare users that are transmitted to the second healthcare server not stored on the second server once the healthcare provider has reviewed the medical records.

Conveniently, amendments to the medical records relating to the one of the healthcare users may be made by the healthcare provider and transmitted back to the first healthcare server for storage.

Advantageously, the first healthcare server is operable to transmit healthcare records relating to a healthcare user associated with the first healthcare server to the second healthcare server for review by the healthcare user upon authentication of the identity of the healthcare user by the authentication system.

Preferably, healthcare records are transmitted from the first healthcare server to the second healthcare server in a standard format.

Conveniently, wherein a record of the review of the medical records by the healthcare provider is stored in the medical records relating to the one of the healthcare users.

Advantageously, the network is the Internet.

Preferably, the identity of the healthcare user or the healthcare provider is authenticated by inputting a password.

Alternatively, the identity of the healthcare user or the healthcare provider is authenticated by analysis of a fingerprint.

Conveniently, the healthcare collaboration system further comprises a translation server connected to the network, which translation server is operable to translate messages passing between the healthcare user and the healthcare provider from one language into another.

Advantageously, the first or second healthcare server allows healthcare users to sign up for healthcare packages on-line.

Preferably, the first or second healthcare server allows healthcare users to view claim processing status.

Conveniently, the first or second healthcare server allows healthcare users to view billing information.

A further aspect of the present invention provides a computer program comprising computer program code adapted to: read data from and write data to a portable memory device; and gather data relating to at least one physiological parameter of a user and write the data to the memory device, the arrangement being such that a recent data set relating to a period of time

immediately before the present is stored on the portable memory device, the recent data set being available for retrieval in the event of an emergency, when said computer program is run on a computer.

Advantageously, the computer program is further adapted to translate data transmitted over the network from one language into another.

Another aspect of the present invention provides a computer program according to the above, stored on a computer-readable medium.

In order that the present invention may be more readily understood, examples thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a schematic representation of a healthcare monitoring system embodying the present invention;

Figure 2 shows a portable healthcare monitoring device suitable for use with embodiments of the present invention;

Figure 3 shows a further view of the portable healthcare monitoring device of Figure 2;

Figure 4 shows a healthcare monitoring system embodying the present invention;

Figure 5 shows a monitor suitable for use with embodiments of the present invention;

Figures 6a – 6e show differing views of an alternative healthcare monitoring system embodying the present invention;

Figure 7 shows a schematic view of an authentication and communication system suitable for use with embodiments of the present invention;

Figure 8 shows a schematic representation of a healthcare group utilising an embodiment of the present invention;

Figures 9a and 9b show schematic representations of conferences between a healthcare user and a healthcare provider;

Figure 10 shows a schematic representation of components of a healthcare collaboration system embodying the present invention;

Figure 11 shows a schematic representation of healthcare providers to which a healthcare user may gain access when using embodiments of the present invention; and

Figures 12 to 16 show alternative healthcare monitoring apparatuses suitable for use with embodiments of the present invention.

Referring to Figure 1, a healthcare monitoring apparatus 1 embodying the present invention comprises a portable healthcare monitoring device 2. Preferably, the portable healthcare monitoring device 2 is small, light and unobtrusive, and can be carried with minimal inconvenience.

The portable healthcare monitoring device 2 comprises a receiver 3 for communicating with a portable memory device (not shown). In a preferred embodiment of the present invention, the portable memory device comprises a smart card, and in this embodiment the receiver 3 comprises a slot of suitable dimensions to receive the smart card. Other types of portable memory device,

including devices which may be written to and read from by the receiver in a contactless manner, may also be used with the present invention. The receiver 3 is operable to read data from, and write data to, the portable memory device.

The portable healthcare monitoring device 2 further comprises communication links to at least one monitor 4, the or each monitor 4 comprising a sensor which gathers data relating to at least one physiological parameter of a user of the apparatus 1. For example, a monitor 4 may measure the blood pressure, $SPO_2$, body temperature, blood glucose levels, pulse rate, ECG parameters, haemoglobin concentration, blood glucose levels, cholesterol or urine acid levels of the user, but the invention is not limited to the measurement of these quantities.

The communication links between a monitor 4 and the portable healthcare monitoring device 2 may comprise a common communication line 5, docking ports 6, wireless links 7 or a dedicated communication line 8. A skilled person will appreciate that any suitable method of transferring data from a monitor 4 to the portable healthcare monitoring device 2 may be utilised.

Preferably, the healthcare monitoring apparatus 1 is powered by an internal battery or batteries (not shown), and hence requires no external power source to operate. The healthcare monitoring apparatus 1 may be docked to, for example, a mains power supply 29, to recharge the internal battery or batteries. The healthcare monitoring apparatus may also be connectable directly to an external power source, for instance the mains, in addition to or instead of battery power.

The healthcare monitoring apparatus further comprises a processing machine 9, which is operable to communicate with the portable healthcare monitoring device 2 via any suitable means, such as a direct link, a wireless or wired LAN, a docking port, and so on. The processing machine 9 preferably

comprises a PC, and conveniently the PC is a laptop PC, notebook PC, personal digital assistant (PDA) or tablet PC. The processing machine 9 has a link to the Internet or other network, and is operable to transmit and receive information over the link. Alternatively, the portable healthcare monitoring device 2 may have a link 28 to the Internet or other network.

The processing machine 9 preferably comprises a video conferencing facility, and so is preferably equipped with a camera, microphone, speaker and the necessary software to facilitate video conferencing.

Figures 2 and 3 show a portable healthcare monitoring device 2 suitable for use with embodiments of the present invention, and these Figures show a blood pressure sensing module 11, a $SP0_2$ sensing module 12, a temperature sensing module 13, a smart card receiver 3, an LCD display 14, a blood pressure port 15, an ECG communication port 16, a blood glucose communication port 17, a temperature communication port 18 and a common communication port 19 for $SP0_2$ and temperature readings.

Figure 4 shows the portable healthcare monitoring device 2 docked to the processing machine 9, to form a healthcare monitoring apparatus 1 embodying the present invention. Figure 5 shows views of a portable monitor 4 suitable for measuring the blood glucose levels of a healthcare user. Figures 6a – 6e show an alternative portable healthcare monitoring device 2, which comprises a compartment 20 for storing various monitors 4, the lid 21 of the compartment 20 having a large screen 22 for video conferencing purposes, an LCD display 14, a smart card receiver 13 and a removable cover 23 to allow access to a number of communication ports (not shown). The alternative portable healthcare monitoring device 2 has a keyboard compartment 36 from which a keyboard 37 can be extended, and is generally compact.

In use of the healthcare monitoring apparatus 1, a healthcare user wears one or more monitors 4, which continuously or sporadically gather data relating to physiological parameters of the user. The data is stored on a portable memory device inserted into or otherwise associated with the receiver 3, and may (if the processing machine is connected to the Internet or other network) transmit the data in real time over the Internet or other network to a server (described below) for storage. If data cannot be transmitted to the server for storage, the data is preferably stored until such time as it can be successfully transmitted to the server for storage. If the portable memory device 3 is approaching full memory capacity, the user is prompted to gain access to the Internet or other network to transmit data to the server for storage to avoid full capacity being reached and thereby obviate the need for some data to be discarded.

In preferred embodiments, the portable memory device stores data relating to a period of time immediately before the present (optionally including details of the advice/treatment given by healthcare providers during a predetermined number of consultations before the present), regardless of whether this data has also been transmitted for storage elsewhere. This data may prove useful to emergency services if the user suffers a medical emergency, as data relating to the physiological parameters of the user immediately before the emergency may be read by the emergency services, without the need to attempt to access the server from the scene of the emergency to obtain this information (the access of various personnel to information stored on the portable memory device will be described in greater detail below). The information stored on the portable memory device may well allow the emergency services to make a swifter or more accurate diagnosis of the condition of the user, and thus to administer appropriate treatment.

The length of time before the present, in relation to which data is stored on the portable memory device for emergency retrieval purposes, may be fixed,

may be set by a user, or alternatively may be limited by the memory capacity of the portable memory device - i.e. the oldest data is continually deleted to make room for new data.

Figure 7 shows an authentication and communication system 24 for use by a healthcare provider, for instance a physician, nurse or surgeon, in use of a system embodiment of the present invention. The authentication and communication system 24 shares many components with the healthcare monitoring apparatus 1, but has no portable healthcare monitoring device 2. Instead, the authentication and communication system 24 comprises a receiver 3 for receiving a portable memory device (again such as a smart card) and a processing machine 9, which has a link 30 to the Internet or another network, and which is operable to allow video conferencing.

The system architecture of the present invention for a healthcare group and other groups allied thereto will now be described. The system is able to accommodate, for example, multiple physicians in a clinic, multiple clinics in a healthcare group, multiple alliance healthcare groups, and related healthcare service providers, such as hospitals, insurance companies, and so forth.

With reference to Figure 8, each physician in the system architecture is assigned an authentication and communication system 24. All healthcare applications and medical records of healthcare users within the healthcare group are managed by a group portal server 25, database servers or their combinations. Suitable switches and firewalls 26 are provided between components of the architecture, for instance between groups of authentication systems 24 and the group portal server 25.

The memory of the portable memory device carried by a user is preferably partitioned into four sectors. A first sector stores general health records, such as the patient's blood group, height, weight, gender, name, next

of kin, and so forth. Information relating to critical illnesses may also be stored in the first sector, with the permission of the healthcare user. The memory of the first sector can preferably be read by any suitable reader, without any security measures being in place to prevent this. Hence, the information stored in the first sector is available for general purposes.

A second sector of the memory of the portable memory device stores, as mentioned above, a string of recent data gathered from monitors 4 attached to the healthcare user. Such storage is used for the purpose of emergency medical data retrieval, or retrieval of data when the Internet or other network is down or otherwise inaccessible. It is also envisaged that this feature will be found very useful when using the healthcare monitoring apparatus 1 at a location which has no connection to the Internet or other network.

A third sector of the memory of the portable memory device stores, as indicated above, information relating to the advice and/or treatment given to the healthcare user by healthcare providers during a predetermined most recent number of consultations. This information may also be retrieved by, for example, emergency service personnel, as it may be of assistance in formulating a rapid diagnosis of a condition in an emergency situation.

Finally, a fourth sector of the memory of the portable memory device stores a password of the healthcare user, which is preferably stored in an encrypted form.

While the healthcare monitoring apparatus 1 is connected to the Internet or other network, the string of data stored in the secondary sector of the portable memory device will be transferred across the Internet or other network for storage.

Only authorised healthcare monitoring apparatuses 1 and authorised healthcare providers such as physicians and emergency services are able to gain access to the second, third or fourth sector of the memory and authenticate the identity of the healthcare user therefrom.

In the present invention, a healthcare user may visit any clinic within the healthcare group or an alliance clinic overseas, and carry out face-to-face diagnostics with a physician. The healthcare user's medical records can be retrieved accurately from the portal server 25 of the healthcare user's healthcare group for use by the physician during the visit. Before the diagnostics are commenced, the authentication of the identity of the healthcare user via the user's portable memory device, using the user's ID, password and/or fingerprint is compulsory, and this may be performed on the physician's authentication system 24, which will receive the healthcare user's portable memory device. The identity of the physician will also be authenticated, again through the physician's authentication and communication system 24.

The authentication of the identity of the healthcare user provides a "digital signature" (or virtual key) which allows healthcare records relating to the healthcare user to be retrieved from the portal server 25 of the healthcare user's healthcare group and reviewed during a video conferencing session or a face-to-face meeting. Preferably, while the healthcare records can be viewed by the physician, the physician is unable to download or store the healthcare records. This means that respective healthcare groups are not required to share healthcare records with each other, and it will be understood that this feature will be welcomed in view of the sensitive nature of healthcare records. In advantageous embodiments, however, the physician may print a hard copy or save a soft copy of the advice and/or treatment that has been given to the patient at that consultation.

Preferably, the healthcare records relating to the healthcare user will be presented to the physician in a standard format, and updates or amendments to the healthcare records may also be made in a standard format. Along with use of standardised readers for reading data from and writing data to portable memory devices, it is envisaged the use of such a standard format will allow an overseas traveller to benefit from the services of a physician associated with an allied healthcare group with a minimum of disruption to the routine of either the healthcare user or the physician.

During the diagnostics, the physician is authorised able to view, analyse, and comment upon the user's medical records through healthcare portal 25 of the healthcare user's healthcare group. Typically, the physician will explain to the healthcare user the current status of his or her health, and may prescribe new medication or other treatment.

The identity of the healthcare provider or alliance healthcare provider will also be captured and authenticated by his in-house portal server; and later submitted to the portal server 25 of the healthcare user's healthcare group. As such, the health record of the healthcare user is securely managed, and all transactions between patient and physician are recorded.

The present invention preferably allows the patient to view his health record through a collaborative healthcare monitoring apparatus 1 (advantageously during video conferencing or another non face-to-face interaction); or through a physician's authentication and communication system 24 during diagnostics. The system may also allow the healthcare user to view his or her own medical records retrieved from the portal server 25, through a network browser by submitting his or her user ID and associated password over the Internet or other network.

A healthcare user may make an appointment with a preferred physician, either locally or overseas through the healthcare user's own healthcare monitoring apparatus 1, or another such apparatus within the healthcare group. Confirmation of the appointment will generally be required before any contact between the healthcare user and any healthcare provider is initiated.

This arrangement is beneficial to a healthcare user who, for whatever reason, meets with one or more overseas physicians face-to-face or via video conferencing. The consultations can be recorded and made known to his or her employer and other healthcare providers, and the physician's consultation and medical bills can immediately be submitted electronically to a claim processing department via the Internet or other network.

Figures 9a and 9b show the use of the components of a healthcare collaboration system as described above, when used in relation to consultations between a healthcare user and a healthcare provider, whether face to face or via video conferencing. Figure 10 shows a schematic representation of components of the system, particularly with reference to the holding of video conferencing between a healthcare user and healthcare providers.

This arrangement is beneficial to a healthcare group, since general healthcare user medical records are made available in the user's portable memory device for emergency purposes, and real time medical data stored in the second and third sectors of the portable memory device are available for emergency retrieval during a network failure. Further, important healthcare user medical records are made available only to the healthcare user, but are managed by the healthcare group. The input/commenting format and terminology of the users' medical records can easily be standardised (as mentioned above) with a common understanding established between the healthcare group and its alliances, or the healthcare smart card centre.

In preferred embodiments, only healthcare providers (i.e. healthcare professionals) are able to comment or edit a user's medical records.

As illustrated in Figure 10, each healthcare group manages its own portal server. The portal server can be a combination of application and database servers inter-connected, each of the servers being, for example: a healthcare user medical record database, a healthcare application, or a language translation server.

Each healthcare group manages a network of in-house physicians or a clinical chain, and forms alliances with other healthcare groups. The alliances may be a network of physicians/clinics, nursing care centres, hospitals, medical device/equipment suppliers, drug & pharmacy suppliers, emergency service providers, healthcare device/equipment suppliers, nutritional food suppliers, health-care libraries, medical research laboratories & specialists, medication distribution & delivery service providers, or their combinations.

Figure 10 shows the network line linked from a physician's authentication and communication system 24 to the internal physician network of healthcare group B and the alliance physician network of healthcare group A.

Also, each healthcare group may have connectivity with a Ministry of Health, or other appropriate local authority, in order to have access to real-time updates on, for example, healthcare finance policy and planning.

Preferably, each healthcare group has connectivity with insurance companies or personal health assistants to obtain updated information on insurance plans of healthcare users within the group, as well as the status of present claim processing and important information regarding insurance.

Preferably, each healthcare group has connectivity with banks to obtain the necessary financial assistance to strengthen and improve its financial status. Also, each healthcare group preferably has connectivity with banks or personal financial assistants of the healthcare users within the group to assist in the application of any financial assistance schemes.

Each healthcare group preferably has connectivity with, for example, a healthcare smart card centre for advanced identity authentication of either healthcare users or healthcare providers. Also, value-added software upgrades and on-line technical support on healthcare apparatuses may be gained through this link. It is to be noted that, in preferred embodiments, each healthcare portal server 25 has its own identity authentication capability.

The steps taken during the making of an appointment for, and holding of, a consultation between a healthcare user of healthcare group A and an alliance physician from healthcare group B via video conferencing will typically be as follows. Firstly, the healthcare user inserts his or her portable memory device (in the present example, the portable memory device will be considered to be a smart card) into the healthcare user's healthcare monitoring apparatus 1, or another such apparatus within healthcare group A or B. The identity of the healthcare user will be verified, by requiring the healthcare user to enter a user ID and password (which is preferably held in an encrypted state in the fourth sector of the memory of the smart card). The entered password is compared against an encrypted password held in the memory of the smart card. Optionally, the identity of the healthcare user may be authenticated through the healthcare portal server 25. If it is deemed necessary, advanced identity authentication, for instance comprising AI algorithms, or a confident level scoring system, may be employed through the healthcare smart card centre. This may be desirable, for example, in the event of a healthcare user initiating connectivity overseas. Once the advanced identity authentication has been

completed, the healthcare smart card centre provides authentication information to the healthcare portal server 25 of healthcare group A.

In embodiments of the invention, the healthcare user may be required to provide fingerprints, and fingerprint verification may be carried out through a bio-metric reader. Aside from video conferencing applications, it is envisaged that this will be particularly useful for emergency purposes, if the healthcare user is unconscious or otherwise unable to provide his or her user ID and password.

Preferably, a healthcare user's portable healthcare monitoring apparatus comprises a dedicated authentication device which, as discussed herein, may comprise means to input a password, a fingerprint, or any other information which will allow accurate authentication of a party.

Via the healthcare portal 25 of healthcare group A, the healthcare user selects a physician on duty from a clinic within the healthcare group, or from an alliance clinic. To initiate a connection with a physician, the patient will generally need to have made an appointment on-line in advance, and this may be performed through his or her healthcare monitoring apparatus 1 or through such apparatus within the healthcare group. Confirmation of the appointment from the selected physician will usually be required before a connection can be initiated.

The selected physician, who is within healthcare group B, logs in to the healthcare portal 25 of healthcare group B. The identity of the physician is authenticated through healthcare portal server B, with the physician's user ID and password being required, as described above. The healthcare portal server 25 of healthcare group B submits physician authentication information, as well as the IP address of the physician's authentication and communication system

24 and the associated appointment schedule, to the healthcare portal server 25 of healthcare group A.

Then, the healthcare user initiates video conferencing with the selected physician at the scheduled time through the healthcare portal of healthcare group A.

It is envisaged that, if the healthcare user and the selected physician do not share a common language, appropriate translation may be performed automatically, for example by a dedicated translation server, and messages, comprising translations of the advice provided by the physician, will be presented in the form of a voice or message text to the healthcare user by the healthcare portal server 25 of healthcare group A. Translation in the other direction, i.e. for the benefit of the physician, may also be performed, and this translation may also be applied to the healthcare user's medical records to allow the physician to review the records.

During the video conference, the selected physician is able to view the medical records of the healthcare user and comment on the current health of the healthcare user, and new medication or other treatment may be prescribed. Data gathered from the healthcare user by the monitors 4 may be made available to the physician for review via the healthcare portal server 25 of healthcare group A. As noted above, the physician may not be permitted to download or otherwise store the records relating to the healthcare user.

In embodiments of the invention, a physician from healthcare group B may be permitted to log in (through the portal server 25 of healthcare group B) to the healthcare portal server 25 of healthcare group A, and view or amend the records of the healthcare user within this server 25, and this may be achieved by providing the physician with a special hyperlink.

If necessary, a connection may be made to an insurance company, a bank or the appropriate Ministry of Health, to make requests for information (rfi's), requests for instructions, to give instructions, or to seek approval for a course of action.

Referring to Figure 11, it can be seen that the present invention provides a connection between healthcare users and healthcare providers, and some of the healthcare providers are shown. The healthcare service providers may include, but not limited to: physician clinics, nursing care centres, hospitals, medical device/equipment suppliers, drug & pharmacy suppliers, emergency services, healthcare device/equipment suppliers, nutritional food suppliers, healthcare libraries, medical research laboratories & specialists, an appropriate Ministry of Health, medication distribution & delivery services, insurance, personal health assistants, banks & personal financial assistants, and a healthcare smart card centre.

The present invention further provides a collaborative monitoring apparatus, comprising at least two collaborative healthcare monitoring apparatuses; or a collaborative healthcare monitoring apparatus and a physician's authentication system 24 interlinked via a one-stop healthcare portal. This apparatus further enables healthcare user and physician identity authentication, universal healthcare portable memory device access, the ability to make appointments with in-house or alliance physicians, the retrieval of medical records from the healthcare user's healthcare group, language translation in favour of the healthcare user, a video conferencing capability, real-time health data gathering and monitoring via sensing modules, real-time health data storage in the portable memory device, and real-time transmission of data gathered from a monitor to the healthcare portal server 25.

The healthcare collaboration system may also provide the ability to answer rfi's from related healthcare service providers, the ability to sign up for

healthcare packages on-line, the ability to view claim processing status, and the ability to view updated billing information.

With reference to Figures 12 to 16, alternative healthcare monitoring apparatuses embodying the present invention are shown. Common components with the above-described healthcare monitoring apparatus 1 are designated by common reference numerals. However, as can be seen from the alternative healthcare monitoring apparatuses, a wireless LAN card 31 may be employed to communicate with a processing machine 9 via a wireless access point 32, the healthcare monitoring apparatuses may be provided with an internal battery 33, a touch-screen LCD 34 or a keypad 35. The healthcare monitoring apparatuses may also be built into a chair or other item of furniture, kiosk, clinical chair or other household object, for ease of use.

It will be appreciated that the present invention provides a powerful, flexible and integrated system for monitoring the health of healthcare users, maintaining medical records and facilitating communication between healthcare users and healthcare providers.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A portable healthcare monitoring device having:

a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver; and

a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the memory device,

the arrangement being such that a recent data set relating to a period of time immediately before the present is stored on the portable memory device, the recent data set being available for retrieval in the event of an emergency.

2. A healthcare monitoring system, comprising:

a portable healthcare monitoring device having:

a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver; and

a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the portable memory device; and

a processing machine having a connection to a network,

the monitor having a docking port allowing the monitor to dock to a cooperating docking port on the memory device receiver or the processing machine to allow the transfer of data from the monitor to the memory device receiver or the processing machine.

3. A healthcare system according to Claim 2, wherein the processing machine is a desktop PC, a laptop PC, a notebook PC, a personal digital assistant or a portable tablet PC.

4. A healthcare monitoring according to Claim 1 or 2, wherein the portable memory device is a smart card.

5. A healthcare system or portable healthcare monitoring device according to any preceding claim, wherein the monitor measures the blood pressure, $SPO_2$, body temperature, blood glucose levels, pulse rate, ECG parameters, haemoglobin concentration, blood glucose levels, cholesterol or urine acid levels of the user

6. A healthcare system or portable healthcare monitoring device according to any preceding claim, wherein data gathered by the monitor is transmitted to the memory device receiver by a wireless link, a dedicated communication line or a common communication line.

7. A healthcare system or portable healthcare monitoring device according to any preceding claim, wherein the receiver writes data to the portable memory device in an encrypted form.

8. A healthcare monitoring system according to any one of Claims 2 to 7, further comprising an authentication device operable to gather input allowing the system to authenticate the identity of the user.

9. A healthcare monitoring system according to Claim 8, wherein the authentication device comprises a keypad allowing a password to be entered.

10. A healthcare monitoring system according to Claim 8, wherein the authentication device comprises a fingerprint reading device.

11. A healthcare monitoring system according to any one of Claims 8 to 10, wherein the authentication of the identity of the user provides a digital signature.

12. A healthcare monitoring system according to any one of Claims 2 to 9, wherein the network is the Internet.

13. A portable healthcare monitoring device comprising:

a memory device receiver for communicating with a portable memory device, the receiver being operable to read data from and write data to a portable memory device inserted into the receiver;

a monitor operable to gather data relating to at least one physiological parameter of a user of the apparatus, data gathered by the monitor being written to the portable memory device;

an authentication device operable to gather input allowing the apparatus to authenticate the identity of the user; and

a video conferencing facility operable to allow video conferencing between the user and a healthcare provider over a network upon authentication of the identity of the user, the portable healthcare monitoring device being operable to transmit data stored on the portable memory device to the healthcare provider over the network.

14. A healthcare collaboration system, comprising:

a first healthcare server, associated with a plurality of healthcare users, healthcare records relating to the healthcare users being stored on the first healthcare server;

a second healthcare server, associated with at least one healthcare provider;

an authentication system associated with the healthcare provider; and

a network connecting the healthcare monitoring systems and authentication systems,

the first server being operable to transmit at least selected portions of the medical records relating to one of the healthcare users to the second healthcare

server for review by the healthcare provider upon authentication of the identity of the healthcare provider by the authentication system.

15. A healthcare collaboration system according to Claim 14, wherein a record of the review of the medical records by the healthcare provider is stored in the medical records relating to the one of the healthcare users.

16. A healthcare collaboration system according to Claim 14 or 15, wherein the medical records relating to the one of the healthcare users that are transmitted to the second healthcare server not stored on the second server once the healthcare provider has reviewed the medical records.

17. A healthcare collaboration system according to any one of Claims 14 to 16, wherein amendments to the medical records relating to the one of the healthcare users may be made by the healthcare provider and transmitted back to the first healthcare server for storage.

18. A healthcare collaboration system according to any one of Claims 14 to 16, wherein the first healthcare server is operable to transmit healthcare records relating to a healthcare user associated with the first healthcare server to the second healthcare server for review by the healthcare user upon authentication of the identity of the healthcare user by the authentication system.

19. A healthcare collaboration system according to any one of Claims 14 to 18, wherein healthcare records are transmitted from the first healthcare server to the second healthcare server in a standard format.

20. A healthcare collaboration system according to any one of Claims 14 to 19, wherein a record of the review of the medical records by the healthcare provider is stored in the medical records relating to the one of the healthcare users.

21. A healthcare collaboration system according to any one of Claims 14 to 20, wherein the network is the Internet.

22. A healthcare collaboration system according to any one of Claims 14 to 21, wherein the identity of the healthcare user or the healthcare provider is authenticated by inputting a password.

23. A healthcare collaboration system according to any one of Claims 14 to 21, wherein the identity of the healthcare user or the healthcare provider is authenticated by analysis of a fingerprint.

24. A healthcare collaboration system according to any one of Claims 14 to 23, further comprising a translation server connected to the network, which translation server is operable to translate messages passing between the healthcare user and the healthcare provider from one language into another.

25. A healthcare collaboration system according to any one of Claims 14 to 24, wherein the first or second healthcare server allows healthcare users to sign up for healthcare packages on-line.

26. A healthcare collaboration system according to any one of Claims 14 to 25, wherein the first or second healthcare server allows healthcare users to view claim processing status.

27. A healthcare collaboration system according to any one of Claims 14 to 26, wherein the first or second healthcare server allows healthcare users to view billing information.

28. A computer program comprising computer program code adapted to:

read data from and write data to a portable memory device; and

gather data relating to at least one physiological parameter of a user and write the data to the memory device, the arrangement being such that a recent data set relating to a period of time immediately before the present is stored on the portable memory device, the recent data set being available for retrieval in the event of an emergency,

when said computer program is run on a computer.

29. A computer program according to Claim 28, further adapted to translate data transmitted over the network from one language into another.

30. A computer program according to Claim 28 or 29, stored on a computer-readable medium.

31. A portable healthcare monitoring device substantially as hereinbefore described, with reference to the accompanying drawings.

32. A healthcare monitoring system substantially as hereinbefore described, with reference to the accompanying drawings.

33. A healthcare collaboration system substantially as hereinbefore described, with reference to the accompanying drawings.

34. A computer program substantially as hereinbefore described, with reference to the accompanying drawings.