

I CLAIM:

1. A system (100) for 12-lead ECG recording and wireless remote monitoring, the system (100) being capable of recording a 12-lead ECG that is equivalent to a standard 12-lead ECG recorded using a conventional 12-lead ECG system, the system (100) comprising:

a wearable ECG acquisition unit (40) being adapted to acquire the 12-lead ECG when worn by a user around torso region thereof, the wearable ECG acquisition unit (40) comprising of:

- a support substrate,
- a first component being an electrode sensor assembly (10) preconfigured and fixedly positioned across the support substrate for being adhered at positions on the torso region of the user to collectively acquire 12-lead ECG signals therefrom when the wearable ECG acquisition unit (40) is worn by the user, the electrode sensor assembly (10) comprising,

a) six precordial electrode sensors (V1- V6) provided for being adhered to chest region of the user for acquiring precordial ECG signals therefrom, the six precordial electrode sensors (V1- V6) preconfigured at fixed predetermined positions across the support substrate for adhering to the chest region of the user at positions such that V1 and V2 gets disposed to lie on fourth intercostal space on opposite side of sternum and equidistant therefrom, V4 gets disposed to lie on fifth intercostal space at mid-clavicular line of the user, V3 gets disposed to lie midway between placement position of V2 and V4 whereas V5 and V6 gets disposed to lie on the fifth intercostal space at anterior-axillary line and mid-axillary line respectively upon wearing of the wearable ECG acquisition unit (40) by the user,

wherein, positions of the V4, V5 and V6 generally define a horizontal plane, and

- b) four limb electrode sensors (RA, LA, RL, LL) provided for being adhered to the chest and abdominal region of the user for acquiring ECG signals therefrom, the four limb electrode sensors (RA, LA, RL, LL) preconfigured at fixed predetermined positions across the support substrate for adhering to the chest and abdominal region of the user at positions such that RA and LA gets disposed to lie exactly in or adjacent to right and left delto-pectoral groove of the user below lateral end of clavicle respectively whereas RL and LL gets disposed to lie at a distance ranging from 1- 3 inches above and left-lateral to umbilicus of the user at 12 o'clock and 3 o'clock position respectively upon wearing of the wearable ECG acquisition unit (40) by the user, and
- a second component being a signal processing unit (20) electrically coupled to the first component for receiving the 12-lead ECG signals therefrom, the signal processing unit (20) being capable of performing processing and digitization of the 12-lead ECG signals to generate the 12-lead ECG therefrom indicative of cardiovascular health of the user, wherein the signal processing unit (20) being adapted with capability of wireless transmission of the 12-lead ECG of the user to facilitate wireless remote monitoring cardiac condition thereof;

a plurality of communication device (80) coupled over a communication network (60) to the second component of the wearable ECG acquisition unit (40) for receiving the 12-lead ECG generated and transmitted wirelessly therefrom, each of the plurality of communication device (80) represents a computing device configured with a web application for enabling real-time interaction

and remote exchange of information therebetween over the communication network (60) thereby facilitating wireless remote monitoring of the cardiovascular health of the user by a healthcare provider, wherein, the user and the healthcare provider interacts using the web application executing on the communication device (80) independently coupled thereto; and

a communication module operatively coupled to the second component and to each of the plurality of communication device (80) for establishing the communication network (60) therebetween and therewithin to enable effective real-time monitoring and management of the cardiovascular health of the user by the healthcare provider,

wherein, adherence of the four limb electrode sensors (RA, LA, RL, LL) at said positions on the chest and the abdominal region of the user imparts portability and wearability whilst facilitating acquisition of the 12-lead ECG across ECG modalities without alteration in placement/adherence positions of the electrode sensor assembly (10) thereby imparting universality with respect thereto and enabling uniform acquisition of the 12-lead ECG across ECG modalities allowing extrapolation of ECG changes thereacross, wherein, the ECG modalities includes recording of resting, ambulatory and stress ECG and continuous monitoring of ECG during ongoing surgical procedures in ICU and telemetry.

2. The system (100) as claimed in claim 1, wherein the wearable ECG acquisition unit (40) is fabricated in at least one form selected from a group consisting of a vest, a jacket, a pad, a garment, a pad or band, a shirt, a strip, a strap, a band, a belt, a plate, a patch, a mask, a harness and combinations thereof.

3. The system (100) as claimed in claim 1, wherein the wearable ECG acquisition unit (40) further comprises of a GPS module to provide location information of the user to the healthcare provider.

4. The system (100) as claimed in claim 1, wherein the communication module comprises of anyone of a wired and a wireless communication network module, and preferably includes a wireless communication network module for establishing a wireless communication network within the system (100).

5. A method (200) for 12-lead ECG recording and wireless remote monitoring, the method (200) being capable of recording a 12-lead ECG that is equivalent to a standard 12-lead ECG recorded using a conventional 12-lead ECG system, the method (200) comprising the steps of:

providing a system for 12-lead ECG recording and wireless remote monitoring, the system (100) comprising:

a wearable ECG acquisition unit (40) comprising of a support substrate, a first component being an electrode sensor assembly (10) including six precordial electrode sensors (V1- V6) and four limb electrode sensors (RA, LA, RL, LL) preconfigured and fixedly positioned across the support substrate for adhering at positions on torso region of user to collectively acquire 12-lead ECG signals therefrom, and a second component being a signal processing unit (20) electrically coupled to the first component for receiving the 12-lead ECG signals to generate the 12-lead ECG therefrom when the wearable ECG acquisition unit (40) is worn by the user, **a plurality of communication device (80)** coupled to the second component over a communication network (60) for receiving the 12-lead ECG transmitted wirelessly therefrom, wherein each of the plurality of communication device (80) represents a computing device configured with a web application to facilitate interaction and real-time exchange of data therebetween, and **a communication module** operatively coupled to the system (100) for establishing the communication network (60) within components/parts of the system (100) thereby

facilitating wireless remote monitoring and management of cardiovascular health of the user by a healthcare provider;

wearing of the wearable ECG acquisition unit (40) by the user around torso region thereof facilitating torsional placement of the electrode sensor assembly (10) such that amongst the six precordial electrode sensors (V1- V6), V1 and V2 gets disposed to lie on opposite side of sternum equidistant therefrom and on fourth intercostal space, V4 gets disposed to lie on fifth intercostal space at mid-clavicular line, V3 gets disposed to lie midway between V2 and V4, V5 and V6 gets disposed to lie on the fifth intercostal space at anterior-axillary line and mid-axillary line respectively, whereas amongst the four limb electrode sensors (RA, LA, RL, LL), RA and LA gets disposed to lie within or adjacent to right and left delto-pectoral groove respectively below lateral end of clavicle, and RL and LL gets disposed to lie at a distance ranging from 1-3 inches above and left lateral to umbilicus of the user at 12 o'clock and 3 o'clock position respectively to acquire ECG signals therefrom;

sensing and acquisition of precordial ECG signals and ECG signals by the six precordial electrode sensors (V1-V6) and the four limb electrode sensors (RA, LA, RL, LL) respectively thereby collectively facilitating acquisition of 12-lead ECG signals from corresponding positions on chest and abdominal region of the user;

transmission of the 12-lead ECG signals by the electrode sensor assembly (10) to the signal processing unit (20) electrically coupled thereto;

processing of the 12-lead ECG signals to generate the 12-lead ECG therefrom by the signal processing unit (20), wherein the 12-lead ECG indicates cardiovascular health of the user;

transmission of generated 12-lead ECG to a user communication device by the signal processing unit (20) coupled thereto over a communication network (60), and preferably a wireless communication network (60);

routing of the 12-lead ECG to a healthcare provider communication device located remote to the user by the web application executing on the user communication device over the communication network (60), wherein the healthcare provider remotely views and analyzes user's data via a healthcare provider interface

of the web application executing on the healthcare provider communication device to provide expert comments to the user; and

receiving remote medical assistance and medication by the user via the web application executing on the user communication device from the healthcare provider communication device coupled thereto over the communication network (60) thereby facilitating effective real-time monitoring and management of the cardiovascular health of the user by the healthcare provider,

wherein, acquisition of the 12-lead ECG across ECG modalities is facilitated without alteration in placement/adherence positions of the electrode sensor assembly (10) thereby imparting universality with respect thereto and enabling uniform acquisition of the 12-lead ECG across the ECG modalities allowing extrapolation of ECG changes thereacross, wherein, the ECG modalities includes recording of resting, ambulatory and stress ECG and continuous monitoring of ECG during ongoing surgical procedures in ICU and telemetry.

6. The method (200) as claimed in claim 5, comprising a step of acquisition of location signals of the user by a GPS module operatively coupled to the wearable ECG acquisition unit (40) to additionally provide location information of the user to the healthcare provider thereby facilitating reception of immediate medical assistance in an unforeseen event.