

What is Claimed:

1. A sensing system for sensing a potential complication at a site of a venous catheter inserted within a vein of a patient, the system comprising:

5 (i) a sensor module configured for attachment at the site of the venous catheter, the sensor module including:

(a) a pressure sensor configured to generate pressure data representing measured pressure at the site of the venous catheter;

(b) a temperature sensor configured to generate temperature data representing measured temperature at the site of the venous catheter;

10 (c) a bio impedance sensor comprising two pairs of bio impedance electrodes that are together configured to generate bio impedance data comprising bio-electrical signals representing bioelectrical activity at the site of the venous catheter;

(d) a transmitter coupled to the sensors and the bio impedance electrodes, the transmitter configured to receive an interrogation signal and produce a response signal in response to the interrogation signal, the response signal including the generated pressure, temperature and bio impedance data; and

(e) a biocompatible substrate configured to support the pressure sensor, the temperature sensor, the bio impedance sensor and the transmitter; and

20 (ii) a computing device including a non-transitory computer readable medium having stored thereon a program, wherein execution of the program of the non-transitory computer readable medium configures the computing device to:

(a) emit, with an antenna system of the computing device, the interrogation signal;

(b) receive, with the antenna system of the computing device, the response signal that includes the generated pressure, temperature and bio impedance data; and

25 (c) transmit the generated pressure, temperature and bio impedance data to a user device for comparing the generated pressure, temperature and bio impedance data to threshold values indicative of intravenous complications.

2. The system of claim 1, wherein the computing device comprises:

a microcontroller,

30 a temperature sensor,

a near field communication (NFC) reader coupled to the microcontroller for receiving the pressure, temperature and bio impedance data and modulating the pressure, temperature and bio impedance data onto a response signal, and

wherein the antenna system of the computing device is a wireless transmitter
5 coupled to the microcontroller for transmitting the response signal to the user device.

3. The system according to any one of claims 1 or 2, wherein the pressure sensor, the temperature sensor, and the bio impedance sensor are positioned on the same layer of the biocompatible substrate.

4. The system according to any one of claims 1 to 3, wherein the antenna system is a
10 wireless transmitter that is configured to emit signals via Bluetooth or Wi-Fi.

5. A method for sensing a potential complication at a site of a venous catheter inserted within a vein of a patient, the method comprising the steps of:

positioning an intravenous complication sensing module over the site of the venous catheter, the intravenous complication sensing module configured to sense pressure,
15 temperature and bio impedance values at the site of the venous catheter;

emitting, with an antenna system of a computing device, an interrogation signal;

receiving, with the antenna system of the computing device, a response signal that includes the sensed pressure, temperature and bio impedance values;

transmitting the sensed pressure, temperature and bio impedance values to a user
20 device;

comparing, at the user device, the sensed pressure, temperature and bio impedance values to threshold pressure, temperature and bio impedance values indicative of intravenous complications; and

alerting the user of the user device of the potential intravenous complication, with an
25 output interface of the user device, when one or more of the sensed pressure, temperature and bio impedance values exceeds one or more of the threshold values.

6. The method of claim 5, wherein the positioning step comprises:

positioning the intravenous complication sensing module along the vein where a
30 capillary of the catheter was inserted; and

adhering the positioned intravenous complication sensing module to skin of the patient.

7. A sensing module configured for attachment at a site of a venous catheter inserted within a vein of a patient, the module comprising:

a pressure sensor configured to generate pressure data representing measured pressure at the site of the venous catheter;

5 a temperature sensor configured to generate temperature data representing measured temperature at the site of the venous catheter;

a bio impedance sensor comprising two pairs of bio impedance electrodes that are together configured to generate bio impedance data comprising bio-electrical signals representing bioelectrical activity at the site of the venous catheter;

10 a transmitter coupled to the pressure sensor, the bio impedance sensor and the temperature sensor, the transmitter configured to receive an interrogation signal and produce a response signal in response to the interrogation signal, the response signal including the generated pressure, bio impedance and temperature data; and

15 a biocompatible substrate configured to support the pressure sensor, the temperature sensor, the bio impedance sensor and the transmitter.

8. The sensing module of claim 7, wherein the biocompatible substrate includes an adhesive configured to adhere the sensing module to the site of the venous catheter.

9. The sensing module according to any one of claims 7 or 8, wherein the pressure sensor, the temperature sensor, and the bio impedance sensor are positioned on a same layer of the biocompatible substrate.

20 10. A sensing system for sensing a potential complication at a site of a venous catheter inserted within a vein of a patient, the system comprising:

(a) a first temperature sensor configured to generate temperature data representing measured temperature at the site of the venous catheter;

25 (b) a second temperature sensor positioned at a pre-determined distance from the first temperature sensor and configured to measure a reference temperature at a second site on the patient; and

(c) a computing device including a non-transitory computer readable medium having stored thereon a program, wherein execution of the program of the non-transitory computer readable medium configures the computing device to compare the measured temperature with the reference temperature to determine the potential complication at the site of the venous catheter.

11. The sensing system of claim 10, wherein the first and second temperature sensor are either coupled to one transmitter or are coupled to separate transmitters, wherein the or each transmitter is configured to receive an interrogation signal and produce a response signal in response to the interrogation signal, the response signal including
5 generated temperature data from one or both of the temperature sensors, and wherein a sensing module comprises one transmitter and at least one of the temperature sensors.
12. The sensing system according to any one of claims 10 or 11, wherein the sensing module comprises a first transmitter of the separate transmitters and the first temperature sensor, and a second sensing module comprises a second transmitter of the
10 separate transmitters and the second temperature sensor.
13. The sensing system according to any one of claims 10 to 12, wherein the sensing module comprises said one transmitter and the first and second temperature sensors.
14. The sensing system according to any one of claims 10 to 13, wherein the
15 computing device is detached from the sensing module, and the computing device is configured to:
- (a) emit, with an antenna system of the computing device, the interrogation signal; and
 - (b) receive, with the antenna system of the computing device, the response signal
20 that includes the generated temperature data from at least one of the temperature sensors.
15. The sensing system according to any one of claims 10 to 14, wherein the sensing module is associated with a first patient, and the sensing system comprises a second sensing module associated with a second patient, wherein the computing device is configured to receive signals from the first and second sensing modules.
- 25 16. The sensing system according to any one of claim 10 to 15, wherein the computing device is configured to transmit, with an antenna system of the computing device, the response signal that includes the generated temperature data from each temperature sensor to a documentation system or an electronic health system.
17. The sensing system according to any one of claims 10 to 16, wherein the pre-
30 determined distance is at least 3 cm.