Claims

1. A system for determining congestion in a blood vessel comprising:

    a sensor in the vessel, the sensor configured to obtain a first signal indicating a first area measurement, a1, of the vessel prior to patient manoeuvre and a second signal indicating a second area measurement, a2, of the vessel after a patient manoeuvre;

    a processor configured to receive the first and second signal and to determine congestion in the vessel based on a difference between the first signal indicating the first area measurement, a1, obtained prior to patient manoeuvre and the second signal indicating the second area measurement, a2, obtained after the patient manoeuvre.

2. The system of claim 1 wherein the processor is further configured to provide a notification of fluid status.

3. The system of claim 1 wherein the processor is further configured to provide a notification indicating an action for reducing congestion in the blood vessel.

4. The system of claim 3 wherein the action comprises a drug treatment schedule.

5. The system of claim 3 wherein the action comprises a medical treatment schedule.

6. The system of claim 5 wherein the medical treatment schedule comprises at least of a diuretic or vasodilation schedule, a modification to a medical device such as vascular pump, drug pump, dialysis or auto-filtration machine, pacing device or extracorporeal membrane oxygenation (ECMO) machine.

7. A method for determining congestion in a blood vessel comprising:

    obtaining a first signal indicating a first area measurement, a1, from a sensor in a blood vessel prior to a patient performing a patient manoeuvre;

    obtaining a second signal indicating a second area measurement, a2, from the sensor in the blood vessel after the patient performs the patient manoeuvre;

    determining congestion in a blood vessel based on a difference between the first signal indicating the first area measurement, a1, obtained prior to patient manoeuvre

and the second signal indicating the second area measurement, a2, obtained after the patient manoeuvre.

8. The method of claim 7 wherein the patient manoeuvre is a Valsalva manoeuvre.

9. A system for determining cardiac output, O_c, comprising:

a sensor deployed in the inferior vena cava, IVC, the sensor configured to obtain a first area measurement, Area1, of the IVC at a time t1;

the sensor configured to obtain a second area measurement, Area2, of the IVC at a time t2;

a processor configured to determine the cardiac output based on area changes of the IVC derived from the first area measurement, Area1, of the IVC obtained at a time t1 and the second area measurements, Area2, of the IVC obtained at a time t2.

10. The system of claim 9 wherein the processor is further configured to determine a heart rate from analysis of the area changes of the IVC.

11. The system of claim 9 or 10 wherein the processor is further configured to provide a notification of the cardiac output.

12. The system of claim 11 wherein the processor is further configured to provide a notification indicating an action for adjusting the cardiac output.

13. The system of claim 12 wherein the action comprises a drug treatment schedule.

14. The system of claim 12 wherein the action comprises a medical treatment schedule.

15. The system of claim 14 wherein the medical treatment schedule comprises at least of a diuretic or vasodilation schedule, a modification to a medical device such as vascular pump, drug pump, dialysis or auto-filtration machine, pacing device or extracorporeal membrane oxygenation (ECMO) machine.

16. A method for determining cardiac output comprising:

obtaining a first area measurement, m1, from a sensor deployed in the inferior vena cava, IVC, at a time t1;

obtaining a second area measurement, m2, from a sensor deployed in the IVC, at a time t2;

determining the cardiac output based on an area change of the IVC derived from the first area measurement, m1, of the IVC obtained at a time t1 and the second area measurement, m2, of the IVC obtained at a time t2.