pressure rise in the cavity can be separated into pressure due to UF and pressure due to patient movement. It is a further purpose of this invention to show that the sleep quality of the patient can be inferred from these pressure data. For example, if the breathing of the patient becomes compromised or changes dramatically. It is the further purpose of this invention to show that the heart rate of the patient can be extracted from collected pressure data. It is a further purpose of this invention to disclose a Fill Dwell and Drain methodology and apparatus that is used for evidence based determination of Tidal exchange points. It is the further purpose of this invention to disclosed methods and apparatus such that the traditional Batch process (Fill, Dwell and Drain) can be combined with the Tidal modality to produce a hybrid modality system according to the invention.

[0017] According to an aspect of the invention, there is provided a system of measuring a volume of a patient cavity for peritoneal dialysis (PD). The system comprises a cassette having a heated region and a sensor region. The sensor region is configured to measure pressure measurements. The system also comprises a volumetric pump configured to supply a fluid from one or more bags to the cassette or extract the fluid from the cassette. A patient connection is in fluid communication with the cassette by way of a valve manifold. A microprocessor is configured to communicate with the sensor region and control the heated region, the valve manifold, and the volumetric pump. The microprocessor is configured to read and execute instructions from a computer-readable memory. The instructions involve: activating the volumetric pump to deliver discrete increments of the fluid to the cassette; receiving the pressure measurements from the sensor region; filtering rapid fluctuations in the pressure measurements to determine an accumulated pressure in the patient cavity; and correlating the accumulated pressure to the volume of the fluid in the patient cavity. The instructions may also measure the accumulated pressure and determine a volume of the patient cavity that induces physical discomfort. The instructions may also correlate the determination of the volume of the patient cavity to a full cavity condition. The instructions may also isolate pressure changes due to an ultrafiltrate (UF) volume increase from the accumulated pressure.

[0018] In an embodiment, the instructions may determine a Tidal exchange point based on the isolated pressure changes. The accumulated pressure in the

patient cavity may be monitored until it reaches a minimum cycle pressure, then the volumetric pump may be activated to deliver discrete increments of the fluid to the cassette until the patient cavity again reaches the full cavity condition.

[0019] In an embodiment, the instructions may initiate a Drain phase based on the isolated pressure changes. The volumetric pump may reverse to reduce the accumulated pressure in the patient cavity until an empty condition occurs.

[0020] In an embodiment, there is provided instructions to isolate and/or record pressure changes due to a respiratory rate; heart rate; or determine sleep characteristics. There may also be instructions to determine transport kinetics based on at least one characteristic of the UF volume increase.

[0021] Herein disclosed is a computer-implemented method of measuring a volume of a patient cavity for peritoneal dialysis (PD). The steps may comprise activating a volumetric pump to deliver discrete increments of a fluid from at least one bag to a cassette or extracting discrete increments of the fluid from the cassette; the cassette in fluid communication with the patient cavity by way of a valve manifold; measuring pressure measurements from a sensor region of the cassette; filtering rapid fluctuations in the pressure measurements to determine an accumulated pressure in the patient cavity; and correlating the accumulated pressure to the volume of the fluid in the patient cavity. The method may also comprise steps of measuring the accumulated pressure and determining a volume of the patient cavity that induces physical stress that causes discomfort. The determination of physical stress may be correlated to a full cavity condition.

[0022] In an embodiment, the computer-implemented method may comprise at least one of the steps of: isolating pressure changes due to ultrafiltrate (UF) volume increase from the accumulated pressure; determining a Tidal exchange point based on the isolated pressure changes; reversing the volumetric pump to reduce the accumulated pressure in the patient cavity; and monitoring the accumulated pressure in the patient cavity until it reaches a minimum cycle pressure; and activating the

volumetric pump to deliver discrete increments of the fluid to the cassette until the patient cavity again reaches the full cavity condition.

[0023] Herein disclosed is a computer-implemented method that comprises the steps of initiating a Drain phase based on the isolated pressure changes. The Drain phase may comprise reversing the volumetric pump to reduce the accumulated pressure in the patient cavity and reducing the accumulated pressure in the patient cavity until an empty condition occurs.

[0024] In an embodiment, the valve manifold may have a plurality of ports each coupled to a different bag from the at least one bag, each bag having a different solution. The instructions may dynamically adjust a formulation provided to the patient cavity from the different bags.

[0025] In an embodiment, the sensor region may measure optical properties. The microprocessor may execute instructions to: receive at least one optical property to detect air in the sensor region; and stop the volumetric pump in response to the detected air.

[0026] In an embodiment, the sensor region may measure temperature. The microprocessor may execute instructions to: receive the temperature associated with the sensor region and increase or decrease energy to the heated region to maintain a physiological temperature in the sensor region.

[0027] While several objectives have been identified above, the invention is not considered limited to any one or any combination of the objectives in particular. Rather, any system meeting at least one of the aforementioned objectives is considered within the scope of the present invention.

Brief Description of the Drawings

[0028] An embodiment will now be described, by way of example only, with reference to the attached Figures, wherein:

[0029] Figures 1A to 1C shows perspective view with detailed views of a dialysis system;

What is claimed is:

1. A peritoneal dialysis (PD) system comprising:

a cassette comprising a heated region and a sensor region, the sensor region configured to measure pressure measurements;

a volumetric pump configured to supply a fluid from at least one bag to the cassette or extract the fluid from the cassette;

a patient connection in fluid communication with the cassette by way of a valve manifold;

a microprocessor configured to communicate with the sensor region and control the heated region, the valve manifold, and the volumetric pump; the microprocessor configured to read and execute instructions from a computer-readable memory comprising instructions to:

activate the volumetric pump to deliver discrete increments of the fluid to the cassette;

receive the pressure measurements from the sensor region;

filter rapid fluctuations in the pressure measurements to determine an accumulated pressure in the patient cavity; and

correlate the accumulated pressure to a volume of the fluid in the patient cavity.

2. The system according to claim 1, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: correlate the determination of the volume of fluid in the patient cavity to a full cavity condition.

3. The system according to claim 2, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: isolate pressure changes due to ultrafiltrate (UF) volume increase from the accumulated pressure.

4. The system according to claim 3, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: determine a Tidal exchange point based on the isolated pressure changes.

5. The system according to claim 4, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: reverse the volumetric pump to reduce the accumulated pressure in the patient cavity.

6. The system according to claim 5, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: monitor the accumulated pressure in the patient cavity until it reaches a minimum cycle pressure; and at the minimum cycle pressure, activate the volumetric pump to deliver discrete increments of the fluid to the cassette until the patient cavity again reaches the full cavity condition.

7. The system according to claim 3, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: initiate a Drain phase based on the isolated pressure changes.

8. The system according to claim 7, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: reverse the volumetric pump to reduce the accumulated pressure in the patient cavity.

9. The system according to claim 8, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: reduce the accumulated pressure in the patient cavity until an empty condition occurs.

10. The system according to any one of claims 1 to 9, wherein the valve manifold comprises a plurality of ports each coupled to a different bag from the at least one bag, each bag having a different solution; the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: dynamically adjust a formulation provided to the patient cavity from the different bags.

11. The system according to any one of claims 1 to 10, further comprising: the sensor region configured to measure optical properties; and the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: receive at least one optical property to detect air in the sensor region; and stop the volumetric pump in response to the detected air.

12. The system according to any one of claims 1 to 11, further comprising the sensor region configured to measure temperature; and the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: receive the temperature associated with the sensor region and increase or decrease energy to the heated region to maintain a physiological temperature in the sensor region.

13. The system according to claim 2, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: isolate pressure changes due to a respiratory rate.

14. The system according to claim 2, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: isolate pressure changes due to a heart rate.

15. The system according to claim 13, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: record at least one respiratory cycle.

16. The system according to any one of claims 1 to 15, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: determine sleep characteristics.

17. The system according to claim 3, the microprocessor configured to read and execute instructions from the computer-readable memory further comprising instructions to: determine transport kinetics based on at least one characteristic of the UF volume increase.