action with the paitent therapy devices. Safety protocols may be generally defined as short term, emergency intervention protocols, to at least prevent or reverse an ongoing clinical state of degradation, which may be exacerbated by an ongoing therapy. Typically, safety protocols will occur after a predetermined amount of time for a warning has passed. The bedside brain may display vital signs and trends, as selected by a clinician. The bedside brain activates an alarm to alert a clinician if vital signs are outside of bedside brain safe operating ranges.

[0006] Preferably, the bedside brain is configured to execute a therapeutic control rule (e.g., selected by a clinician), read patient monitors, EMR data etc. and control therapeutic devices. The control rule may be specified in a manner that allows a "rule specification" element to fully configure and specify the control algorithm, limits, and verification parameters. The bedside brain is further configured to warn a clinician when vital signs are outside of specified ranges and/or devices need attention. The bedside brain is further configured to maintain full functionality (with exception of access to server data) when disconnected from higher level hospital systems. The bedside brain is further configured to store and retrieve data from internal data stores. The bedsie brain is further configured to support a global multi-lingual human interface.

[0007] In light of the disclosure herein, and without limiting the scope of the invention in any way, in a first aspect of the present disclosure, which may be combined with any other aspect listed herein unless specified otherwise, a system includes a memory, one or more processors, in communication with the memory, a plurality of medical therapy devices, a plurality of patient monitoring devices, and a protocol execution module. The protocol execution module is configured to execute on the one or more processors, to display a plurality of protocols, wherein the plurality of protocols is dictated by an individual medical therapy device, such that each of the plurality of protocols are configured to be ran on the individual medical therapy device, the individual medical therapy device being one of the plurality of medical therapy devices, and receive, from a user, a selected protocol of the plurality of protocols. The selected protocol is associated with an individual medical therapy device, and associated with an individual patient monitoring device, being one of the plurality of patient monitoring devices. The protocol execution module is configured to display the selected protocol such that an entire logical flow of the selected protocol is displayed in a user-readable format including each possible logical

determination and related action to be taken; and receive, from the user, a plurality of common settings for the selected protocol. The individual medical therapy device is configured to receive, from the user, a first confirmation of the selected protocol. The protocol execution module is configured to receive, from the user, a second confirmation of the selected protocol. The protocol execution module is configured to execute the selected protocol with the individual medical therapy device.

[0008] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the plurality of medical therapy devices

includes at least one of an infusion pump, a dialysis or renal failure therapy machine, a respirator, and a defibrillators.

[0009] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the plurality of patient monitoring devices includes at least one of a heart rate sensor, a temperature sensor, a pulse oximetry sensor, a patient weight sensor, a glucose sensor, a respiratory sensor, a blood pressure sensor, a pressure sensor, and a volume-index sensor.

[0010] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the protocol execution module receives the plurality of protocols from an external server.

[0011] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, executing the selected protocol with the individual medical therapy device includes identifying a patient parameter with the individual patient monitoring device, and determining that the patient parameter violates a threshold, wherein the threshold is dictated by the selected protocol.

[0012] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, executing the selected protocol with the individual medical therapy device further includes, responsive to determining that the patient parameter violates the threshold, triggering an alarm.

[0013] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, further comprising, responsive to triggering the alarm, displaying, at the protocol execution module, an action dictated by the selected protocol.

[0014] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, further including starting a countdown timer.

[0015] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the countdown timer expires, such that the protocol execution module instructs the individual medical therapy device to take the action, and wherein the individual medical therapy device takes the action.

[0016] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the individual medical therapy device is an infusion pump, and wherein the action is one of increasing infusion rate of the infusion pump, decreasing infusion rate of the infusion pump, and ceasing infusion.

[0017] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, prior to the countdown timer expiring, the user instructs the protocol execution module to take the action, and the protocol execution module instructs the individual medical therapy device to take the action, such that the individual medical therapy device takes the action.

[0018] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, prior to the countdown timer expiring, the user instructs the protocol execution module to take cancel the action, such that the protocol execution module pauses the countdown timer and removes the action from the individual patient monitoring devices such that the first confirmation no longer exists.

[0019] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, further comprising, prior to the countdown timer expiring, identifying an updated patient parameter with the individual patient monitoring device, determining that the updated patient parameter no longer violates the threshold, and removing the action from the selected protocol, such that the action is no longer displayed at the protocol execution module.

[0020] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, a protocol execution module includes a memory, one or more processors, in communication with the memory, where the protocol execution module is configured to display a plurality of protocols. The protocol execution module is further configured to receive, from a user, a selected protocol, the selected protocol associated with an individual medical therapy device being one of a plurality of medical therapy devices and associated with an individual patient monitoring device being one of a plurality of patient monitoring devices. The protocol execution module is further configured to identify a patient parameter with the individual patient monitoring device, and determine that the patient parameter violates a threshold. The threshold is dictated by the selected protocol. The individual medical therapy device takes an action, dictated by the selected protocol.

[0021] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the individual medical therapy device is an infusion pump.

[0022] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the action is one of increasing infusion rate of the infusion pump, decreasing infusion rate of the infusion pump, and ceasing infusion.

[0023] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, responsive to taking the action, the protocol execution module removes the selected protocol such that the selected protocol is no longer associated with the individual medical therapy device and the individual patient monitoring device.

[0024] In a second aspect of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, a method includes displaying a plurality of protocols, wherein the plurality of protocols is dictated by an individual medical therapy device, such that each of the plurality of protocols are configured to be ran on the individual medical therapy device, the individual medical therapy device being one of the plurality of medical therapy devices, and receiving a selected protocol of the plurality of protocols, the selected protocol associated with an individual medical therapy device and associated with an individual patient monitoring device being one of a plurality of patient monitoring devices. The method includes displaying the selected protocol such that an entire logical flow of the selected protocol is displayed in a user-readable format including each possible logical determination and related action to be taken; and receiving, from the user, a plurality of common settings for the selected protocol. The individual medical therapy device receives, from the user, a first confirmation of the selected protocol. The protocol execution module receives, from the user, a second confirmation of the selected protocol. The protocol execution module executes the selected protocol with the individual medical therapy device.

[0025] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the plurality

of medical therapy devices includes at least one of an infusion pump, a dialysis or renal failure therapy machine, a respirator, and a defibrillators.

[0026] In an example of the present disclosure, which may be combined with any other aspect or example listed herein unless specified otherwise, the plurality of patient monitoring devices includes at least one of a heart rate sensor, a temperature sensor, a pulse oximetry sensor, a patient weight sensor, a glucose sensor, a respiratory sensor, a blood pressure sensor, a pressure sensor, and a volume-index sensor.

[0027] Additional features and advantages of the disclosed devices, systems, and methods are described in, and will be apparent from, the following Detailed Description and the

CLAIMS

The invention is claimed as follows:

**1.** Asystem comprising:

a memory;

one or more processors, in communication with the memory;

a plurality of medical therapy devices;

a plurality of patient monitoring devices; and

a protocol execution module, configured to execute on the one or more processors, to:

display a plurality of protocols, wherein the plurality of protocols is dictated by an individual medical therapy device, such that each of the plurality of protocols are configured to be ran on the individual medical therapy device, the individual medical therapy device being one of the plurality of medical therapy devices;

receive, from a user, a selected protocol of the plurality of protocols, the selected protocol associated with an individual medical therapy device, and associated with an individual patient monitoring device, being one of the plurality of patient monitoring devices;

display the selected protocol such that an entire logical flow of the selected protocol is displayed in a user-readable format including each possible logical determination and related action to be taken; and

receive, from the user, a plurality of common settings for the selected protocol;

wherein the individual medical therapy device is configured to receive, from the user, a first confirmation of the selected protocol,

wherein the protocol execution module is configured to receive, from the user, a second confirmation of the selected protocol,

such that the protocol execution module is configured to execute the selected protocol with the individual medical therapy device.

**2.** The system of claim **1,** wherein the plurality of medical therapy devices includes at least one of an infusion pump, a dialysis or renal failure therapy machine, a respirator, and a defibrillator.

**3.** The system of claim **1,** wherein the plurality of patient monitoring devices includes at least one of a heart rate sensor, a temperature sensor, a pulse oximetry sensor, a patient weight sensor, a glucose sensor, a respiratory sensor, a blood pressure sensor, a pressure sensor, and a volume-index sensor.

**4.** The system of claim **1**, further comprising an external server, wherein the protocol execution module receives the plurality of protocols from the external server.

**5.** The system of claim **1,** wherein executing the selected protocol with the individual medical therapy device includes:

identifying a patient parameter with the individual patient monitoring device; and

determining that the patient parameter violates a threshold, wherein the threshold is dictated by the selected protocol.

**6.** The system of claim 5, wherein executing the selected protocol with the individual medical therapy device further includes, responsive to determining that the patient parameter violates the threshold, triggering an alarm.

**7.** The system of claim 6, wherein, responsive to triggering the alarm, the system is configured for displaying, at the protocol execution module, an action dictated by the selected protocol.

**8.** The system of claim 7, wherein the system is configured for starting a countdown timer.

**9.** The system of claim 8, wherein the system is configured for, when the countdown timer expires, the protocol execution module instructs the individual medical therapy device to take the action, and the individual medical therapy device takes the action.

**10.** The system of claim 9, wherein the individual medical therapy device is an infusion pump, and wherein the action is one of increasing infusion rate of the infusion pump, decreasing infusion rate of the infusion pump, and ceasing infusion.

**11.** The system of claim 8, wherein the system is configured such that, prior to the countdown timer expiring, the protocol execution module can be instructed by the user to take the

action, and the protocol execution module instructs the individual medical therapy device to take the action, such that the individual medical therapy device takes the action.

**12.** The system of claim 8, wherein the system is configured such that, prior to the countdown timer expiring, the protocol execution module can be instructed by the user to cancel the action, such that the protocol execution module pauses the countdown timer and removes the action from the individual patient monitoring devices such that the first confirmation no longer exists.

**13.** The system of claim 8, wherein the system is configured for, prior to the countdown timer expiring: identifying an updated patient parameter with the individual patient monitoring device; determining that the updated patient parameter no longer violates the threshold; and removing the action from the selected protocol, such that the action is no longer
displayed at the protocol execution module.

**14.** A method comprising:

displaying a plurality of protocols, wherein the plurality of protocols is dictated by an individual medical therapy device, such that each of the plurality of protocols are configured to be ran on the individual medical therapy device, the individual medical therapy device being one of the plurality of medical therapy devices;

receiving a selected protocol of the plurality of protocols, the selected protocol associated with an individual medical therapy device, and associated with an individual patient monitoring device, being one of a plurality of patient monitoring devices;

displaying the selected protocol such that an entire logical flow of the selected protocol is displayed in a user-readable format including each possible logical determination and related action to be taken; and

receiving, from the user, a plurality of common settings for the selected protocol;

wherein the individual medical therapy device receives, from the user, a first confirmation of the selected protocol, and

wherein the protocol execution module receives, from the user, a second confirmation of the selected protocol,

such that the protocol execution module executes the selected protocol with the

individual medical therapy device.

**15.** The method of claim 14, wherein the plurality of medical therapy devices includes at least one of an infusion pump, a dialysis or renal failure therapy machine, a respirator, and a defibrillators.

**16.** The method of claim 14, wherein the plurality of patient monitoring devices includes at least one of a heart rate sensor, a temperature sensor, a pulse oximetry sensor, a patient weight sensor, a glucose sensor, a respiratory sensor, a blood pressure sensor, a pressure sensor, and a volume-index sensor.