



(51) International Patent Classification:

G06F 17/30 (2006.01) G06Q 50/00 (2012.01)
G06F 21/00 (2013.01) H04K 3/00 (2006.01)
G06Q 10/00 (2012.01)

(21) International Application Number:

PCT/US2016/024796

(22) International Filing Date:

29 March 2016 (29.03.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/140,396 30 March 2015 (30.03.2015) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: CUSTOMER-OR PATIENT-BASED SELECTIVE DATA ENCRYPTION IN MEDICAL DEVICE MANAGEMENT

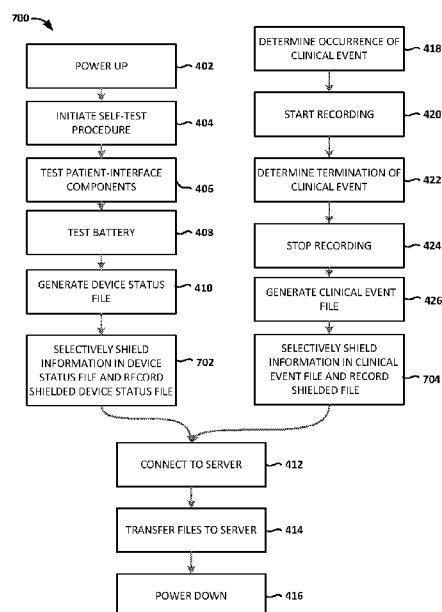


FIG. 7

(57) Abstract: A system for remotely managing a medical device includes a selective shielding component, configured to (a) shield with an electronic key any portion of device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information and/or (b) shield with an electronic key any portion of device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, and record the selectively shielded device information; a first communication component configured to facilitate transmitting the selectively shielded device information through a network; and a server device communicatively coupled to the network and configured to use the selectively shielded device information to generate reports about the device information, and the clinical event information, but wherein the server device lacks access to the electronic key.

CUSTOMER- OR PATIENT-BASED SELECTIVE DATA ENCRYPTION IN MEDICAL DEVICE MANAGEMENT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 62/140,396, filed on March 30, 2015, the contents of which are incorporated herein by reference in their entirety for all purposes. This application also incorporates by reference in their entireties for all purposes the following two other applications: U.S. Provisional Patent Application Serial No. 62/140,400, filed on March 30, 2015, and also U.S. Patent Application Serial No. 15/084,249, filed on March 29, 2016.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate generally to monitoring and managing medical devices.

BACKGROUND

[0003] Medical devices configured for infrequent use in medical situations (for example, emergent situations) often are disposed at non-medical facilities, are powered by batteries, and may sometimes rely on patient-interface components such as electrodes that have a limited useful life. Conventional devices such as, for example, automated external defibrillators (AEDs) may employ automated self-tests to ensure that the device will work when it is needed. However, these devices typically store the results of the self-tests in a local memory and, therefore, self-test failures often go unrecognized. For example, defibrillator failure may be detected when a caregiver attempts to use it to save a life. Additionally, caregivers benefit from the sharing of clinical event information when care of a patient is being transitioned.

[0004] Medical devices that record and transmit data often transmit the recorded data in a manner that allows the direct recipient to view all of the recorded data, even if the recipient only needs or wants to have access to only a subset of the recorded data.

SUMMARY

[0005] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising one or both of device readiness information and device performance information, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including one or both of (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a first communication component configured to facilitate transmitting the selectively shielded device information through a network; a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or both of the device readiness information and the device performance information, but wherein the server device lacks access to the electronic key.

[0006] The system of paragraph [0005], wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

[0007] The system of any of paragraphs [0005] to [0006], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0008] The system of any of paragraphs [0005] to [0007], the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0009] The system of any of paragraphs [0005] to [0008], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0010] The system of any of paragraphs [0005] to [0009], wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.

[0011] The system of any of paragraphs [0005] to [0010], wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.

[0012] The system of any of paragraphs [0005] to [0011], wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.

[0013] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including one or both of (a) the any portion of the device information that identifies the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a first communication component configured to facilitate transmitting the selectively shielded device information through a network; a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about the clinical event information, but wherein the server device lacks access to the electronic key.

[0014] The system of any of paragraphs [0005] to [0013], wherein the server device is a first server device, the system further including a second server device

communicatively coupled to the network, the second server device having access to the electronic key.

[0015] The system of any of paragraphs [0005] to [0014], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0016] The system of any of paragraphs [0005] to [0015], the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0017] The system of any of paragraphs [0005] to [0016], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0018] The system of any of paragraphs [0005] to [0017], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[0019] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information; the selective shielding component configured to create selectively shielded device information by (a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or (b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the

electronic key and (b) the association, and record the selectively shielded device information, a first communication component configured to facilitate transmitting the selectively shielded device information through a network; a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information, but wherein the server device lacks access to the electronic key.

[0020] The system of any of paragraphs [0005] to [0019], wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

[0021] The system of any of paragraphs [0005] to [0020], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0022] The system of any of paragraphs [0005] to [0021], the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0023] The system of any of paragraphs [0005] to [0022], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[0024] The system of any of paragraphs [0005] to [0023], wherein the selective shielding component is further configured to (a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and (b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

[0025] The system of any of paragraphs [0005] to [0024], wherein the selective shielding component is further configured to (a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and (b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information; wherein the server device lacks access to the second electronic key.

[0026] The system of any of paragraphs [0005] to [0025], wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the first and second electronic keys.

[0027] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising one or both of device readiness information and device performance information, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or both of the device readiness information and the device performance information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

[0028] The system of any of paragraphs [0005] to [0027], wherein the server device is a first server device communicatively coupled to a network, the system

further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

[0029] The system of any of paragraphs [0005] to [0028], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0030] The system of any of paragraphs [0005] to [0029], wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0031] The system of any of paragraphs [0005] to [0030], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0032] The system of any of paragraphs [0005] to [0031], wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.

[0033] The system of any of paragraphs [0005] to [0032], wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.

[0034] The system of any of paragraphs [0005] to [0033], wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.

[0035] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device

information, a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about the clinical event information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

[0036] The system of any of paragraphs [0005] to [0035], wherein the server device is a first server device coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

[0037] The system of any of paragraphs [0005] to [0036], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0038] The system of any of paragraphs [0005] to [0037], wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0039] The system of any of paragraphs [0005] to [0038], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0040] The system of any of paragraphs [0005] to [0039], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[0041] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information, the selective shielding component configured to create selectively shielded device information by (a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association

between such any portion and a rest of the device information, or (b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

[0042] The system of any of paragraphs [0005] to [0041], wherein the server device is a first server device communicatively coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

[0043] The system of any of paragraphs [0005] to [0042], wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

[0044] The system of any of paragraphs [0005] to [0043], wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

[0045] The system of any of paragraphs [0005] to [0044], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[0046] The system of any of paragraphs [0005] to [0045], wherein the selective shielding component is further configured to (a) shield with the electronic key any portion of the device information that identifies the medical device

individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and (b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

[0047] The system of any of paragraphs [0005] to [0046], wherein the selective shielding component is further configured to (a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and (b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information; wherein the server device lacks access to the second electronic key.

[0048] The system of any of paragraphs [0005] to [0047], wherein the server device is a first server device communicatively coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the first and second electronic keys.

[0049] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a medical device configured to gather device information, the device information comprising one or both of device readiness information and device performance information, the medical device configured for infrequent use in medical situations; a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively

shielded device information may be used to generate reports about one or both of the device readiness information and the device performance information without access to the electronic key.

[0050] The system of any of paragraphs [0005] to [0049], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0051] The system of any of paragraphs [0005] to [0050], wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.

[0052] The system of any of paragraphs [0005] to [0051], wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.

[0053] The system of any of paragraphs [0005] to [0052], wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.

[0054] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a medical device configured to gather device information, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the medical device configured for infrequent use in medical situations; a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively shielded device information may be used to generate reports about the clinical event information without access to the electronic key.

[0055] The system of any of paragraphs [0005] to [0054], wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

[0056] The system of any of paragraphs [0005] to [0055], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[0057] A system for remotely managing a medical device according to an embodiment of the present disclosure includes a medical device configured to gather device information, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information, the medical device configured for infrequent use in medical situations; a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by (a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or (b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information, a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively shielded device information may be used to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information without access to the electronic key.

[0058] The system of any of paragraphs [0005] to [0057], wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the

patient, a driver's license of the patient, and biometric data associated with the patient.

[0059] The system of any of paragraphs [0005] to [0058], wherein the selective shielding component is further configured to (a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and (b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

[0060] The system of any of paragraphs [0005] to [0059], wherein the selective shielding component is further configured to (a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and (b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information. In certain embodiments described herein, the selectively shielded device information may optionally include one or both of the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and the association.

[0061] The system of any of paragraphs [0005] to [0060], wherein the medical device is a portable medical device.

[0062] The system of any of paragraphs [0005] to [0061], wherein the medical device is a wearable medical device.

[0063] While multiple embodiments are disclosed, still other embodiments of the invention will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative embodiments. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0064] FIG. 1 depicts an illustrative operating environment in accordance with embodiments of the present disclosure.

[0065] FIG. 2 depicts an illustrative computing device in accordance with embodiments of the present disclosure.

[0066] FIG. 3 depicts another illustrative operating environment in accordance with embodiments of the present disclosure.

[0067] FIG. 4 is a flow diagram depicting an illustrative method of medical device management in accordance with embodiments of the disclosure.

[0068] FIG. 5 depicts an illustrative operation of an operating environment in accordance with embodiments of the present disclosure.

[0069] FIG. 6 depicts the illustrative operating environment of FIG. 3 including additional elements in accordance with embodiments of the disclosure.

[0070] FIG. 7 illustrates a flow diagram depicting an illustrative method of medical device management in accordance with embodiments of the disclosure.

[0071] While the present invention is amenable to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and are described in detail below. The present invention, however, is not limited to the particular embodiments described. On the contrary, the present invention is intended to cover all modifications, equivalents, and alternatives falling within the ambit of the present invention as defined by the appended claims.

[0072] Although the term “block” may be used herein to connote different elements illustratively employed, the term should not be interpreted as implying any requirement of, or particular order among or between, various steps disclosed herein unless and except when explicitly referring to the order of individual steps.

DETAILED DESCRIPTION

[0073] Various types of facilities (for example, hospitals, schools, office buildings, airplanes, busses, etc.) may be equipped with one or more medical devices configured for infrequent use in medical situations. As used herein, the phrases “medical situations” and “medical events” are used in their broadest sense to refer to may include any situation or event in which medical attention is called for, in which a patient experiences a medical problem, or in which a patient has

treatment or care, and includes, for example, emergent situations. For example, and without limitation, a medical event may begin when a patient experiences medical symptoms and a call is made to emergency services (e.g. emergency medical services), and the medical event may end when the patient has been evaluated, treated, transported, and/or released. A medical event or situation may include various events within the medical event, including for example emergency transport. Medical devices configured for infrequent use in medical situations include medical devices that are generally not used in a continuous manner, but are used less frequently. As the phrase is used herein, "infrequent use" may include intermittent use with some period of time between uses, several uses, one use, no uses, and/or the like. For example, automated external defibrillators (AEDs) are designed to be used in medical situations involving a victim of cardiac arrest, which is not an event that occurs frequently, if at all, in some locations. Thus, an AED may remain unused for several years before being used only once, if at all. In other situations, such a medical device may only be used occasionally.

[0074] Because these types of medical devices may not need to be used frequently, they often are placed in service and not maintained for long periods of time. When the medical devices are needed, however, users rely on them to function properly. Medical devices such as AEDs benefit from regular maintenance and/or monitoring for optimal functionality and performance. Embodiments of the invention facilitate remote monitoring of the condition of such medical devices. Additionally, following an event where a medical device is used, the responders or other clinicians often desire to view clinical event information generated during the use. Embodiments of the invention facilitate capturing and managing this type of information, as well.

[0075] According to embodiments, a medical device (for example, an AED) is configured to transmit self-test information, clinical event information, and/or the like to a server that is associated with a medical device management service, which may be, for example, web-based. The management service may be configured allow users to view, manipulate, convert, aggregate, analyze, and/or otherwise manage information received from medical devices, information about medical devices, software updates for medical devices, configuration updates for medical devices, clinical event information, and/or the like. In embodiments, the management service is configured to be incorporated into a user's daily activities and to conveniently

facilitate adjusting medical device configuration, updating medical device software, updating and/or maintaining site compliance, viewing device-readiness and/or device performance, viewing clinical event information, viewing device locations in a geographical area, and/or the like.

[0076] FIG. 1 depicts an illustrative operating environment 100 (and, in some embodiments, aspects of the present invention) in accordance with embodiments of the present invention, as illustrated by way of example. As shown in FIG. 1, the illustrative operating environment 100 may include a number of medical devices 102, 104, and 106 that communicate with one or more management servers 108 via one or more networks 110. The network 110 may be, or include, any number of different types of communication networks such as, for example, a short messaging service (SMS), a local area network (LAN), a wireless LAN (WLAN), a wide area network (WAN), the Internet, a peer-to-peer (P2P) network, a direct wired connection between two or more devices (for example, an RS-232 connection), a direct wireless connection between two or more devices (for example, a Bluetooth® connection), and/or the like. In embodiments, the network 110 may be a combination of networks.

[0077] The medical devices 102, 104, and/or 106 may be configured for infrequent use in emergent or medical situations. For example, the medical devices 102, 104, and 106 may include, for example, an automated external defibrillator (AED), a portable infuser, and/or the like. The medical devices 102, 104, and/or 106 may be, for example, defibrillators (for example, ZOLL® X-Series®, E-Series®, or R-Series® devices), automatic external defibrillators (AEDs) (for example, ZOLL® AED Pro® devices, ZOLL® AED Plus® devices), wearable cardioverter defibrillators (for example, ZOLL® LifeVest® devices), portable electronic infusion pumps (for example, ZOLL® Power Infuser® devices), device systems (for example, ZOLL® Propaq® systems), compression assistance devices or technologies (for example, ZOLL® Real CPR Help®, ZOLL® AutoPulse®, or ZOLL® PocketCPR®), ventilation assistance devices (for example, IMPACT® Instrumentation ventilators) and/or the like. The medical devices 102, 104, and/or 106 may be configured to provide therapy (for example, defibrillation shocks, infused medicines, and/or the like), and/or to monitor, detect, and/or derive or calculate various physiological parameters such as, for example, heart rate, blood pressure, temperature, respiration rate, blood oxygen level, end-tidal carbon dioxide level, pulmonary function, blood glucose level,

weight, and/or the like. In embodiments, the medical devices 102, 104, and/or 106 may determine and/or present waveforms such as, for example, electrocardiographs (ECGs).

[0078] In embodiments, the medical devices 102, 104, and/or 106 are disposed at the same location or different locations. For example, an organization may install one or more medical devices 102, 104, and/or 106 at various facilities, in various geographic locations, and/or the like. In embodiments, the medical devices 102, 104, and/or 106 may be managed by a single entity or different entities. As shown, different medical devices 102, 104, and 106 may be configured to communicate with other devices using different types of networks, combinations of networks, and/or the like. For example, medical devices 102 and 104 may be configured to communicate via a wireless local access network (WLAN) 112, while medical device 106 may be configured to communicate via a cellular network 114. In embodiments, the medical devices 102, 104, and/or 106 may include technology that enables communication through different types of networks, thereby enabling a medical device 102, 104, and/or 106 to transition from one type of network to another.

[0079] According to embodiments, the medical devices 102, 104, and/or 106 are configured to provide information, such as, device-readiness information, device performance information, clinical event information, and/or the like, to the management server 108. Device-readiness information or data may include any information associated with the condition of one or more components of the medical device that may have bearing on the ability of the medical device to perform a function for which it was designed. For example, device-readiness information may include information associated with a condition, status, and/or remaining life of a battery or batteries, an electrode, a sensor, a communication component, and/or the like. Device performance information or data may include any information associated with a performance of a component and/or function of the medical device. For example, device performance information may include information about functions a medical device performed during a medical and/or emergent situation such as, for example, a manner in which a defibrillation shock was applied during a cardiac arrest situation, an energy level of an applied shock during the situation, a number of times a shock was applied during the situation, and/or the like. Clinical event information or data may include any information, recorded during a clinical

event, associated with a patient. For example, clinical event information may include physiological parameters, patient demographic information, patient ECG data, device prompting records, device actions and operations, CPR performance data, faults, errors, and/or voice recording, and/or the like.

[0080] The medical devices 102, 104, and/or 106 are communicably coupled to the management server 108, and, in some embodiments, are configured to communicate directly with the management server 108, while, in other embodiments, the medical devices 102, 104, and/or 106 are configured to communicate with a collection server 116, which is configured to communicate with the management server 108. In embodiments, to improve efficiencies all of the medical devices 102, 104, and/or 106 may be configured to provide information to the management server 108 by transmitting the information to a single uniform resource locator (URL). Although the management server 108 and the collection server 116 are each referred to herein in the singular, the management server 108 and the collection server 116 may be implemented in multiple server instances (for example, as a server cluster), distributed across multiple computing devices, instantiated within multiple virtual machines, and/or the like.

[0081] As shown in FIG. 1, user devices 118 and 120 may be communicably coupled to the management server 108 and may be configured to access services provided by the management server 108. For example, the management server 108 may facilitate providing information received from the medical devices 102, 104, and/or 108 to the user devices 118 and/or 120. Additionally, users may utilize the management server 108, via the user devices 118 and/or 120, to configure the medical devices 102, 104, and/or 108, to provide software updates to them, and/or the like.

[0082] As used herein, the phrase “communicably coupled” is used in its broadest sense to refer to any coupling whereby information may be passed. Thus, for example, communicably coupled includes electrically coupled by, for example, a wire; optically coupled by, for example, an optical cable; and/or wirelessly coupled by, for example, a radio frequency or other transmission media. “Communicably coupled” also includes, for example, indirect coupling, such as through a network or a series of devices and/or communication protocols, or direct coupling.

[0083] The illustrative operating environment 100 shown in FIG. 1 is not intended to suggest any limitation as to the scope of use or functionality of

embodiments of the present disclosure. Neither should the illustrative operating environment 100 be interpreted as having any dependency or requirement related to any single component or combination of components illustrated therein. Additionally, any one or more of the components depicted in FIG. 1 or described herein may be, in embodiments, integrated with various ones of the other components depicted therein (and/or components not illustrated), all of which are considered to be within the ambit of the present invention. For example, the collection server 116 may be integrated with the management server 108, and the network 110 may be included, or be included within, the WLAN 112, and/or the cellular network 114.

[0084] According to embodiments, various components of the operating environment 100, illustrated in FIG. 1, can be implemented on one or more computing devices. For example, one or more of the medical devices 102, 104, 106; the management server 108, the collection server 116, and the user devices 118 and 120 may include, be communicatively coupled to, and/or be included within, one or more computing devices. A computing device may include any type of computing device suitable for implementing embodiments of the invention. Examples of computing devices include specialized computing devices or general-purpose computing devices such “workstations,” “servers,” “laptops,” “desktops,” “tablet computers,” “hand-held devices,” components of medical devices, and/or the like, all of which are contemplated within the scope of FIG. 1 and reference to various components of the operating environment 100.

[0085] As shown in FIG. 2, a computing device 200 includes a bus 202 that, directly and/or indirectly, couples one or more of the following devices: a processor 204, a memory 206, an input/output (I/O) port 208, an I/O component 210, and a power supply 212. Any number of additional components, different components, and/or combinations of components may also be included in the computing device 200. The bus 202 may represent one or more busses (such as, for example, an address bus, data bus, and/or combination thereof). Similarly, in embodiments, a computing device 200 may include a number of processors 204, a number of memory components 206, a number of I/O ports 208, a number of I/O components 210, and/or a number of power supplies 212. Additionally, any number of these components, and/or combinations thereof, may be distributed and/or duplicated across a number of computing devices 200.

[0086] Although the various components of FIG. 2 are shown as distinct components for the sake of clarity, in reality, delineating various components of a computing device 200 may not be as clear. For example, I/O components 210 may include devices contained within the computing device 200 and/or devices that are separate from the computing device 200. As another example, processors 204 may have memory. As such, the diagram of FIG. 2 is merely illustrative of an example of a computing device 200 that may be used in connection with one or more embodiments, but any number of other configurations for a computing device 200 that can execute computer-executable instructions to accomplish various aspects of embodiments described herein are also considered to be within the ambit of the invention.

[0087] According to various embodiments, the processor 204 (or processors) reads data from various entities such as the memory 206, I/O components 210, and/or the like. For example, in embodiments, the processor 204 may execute computer-executable instructions 214 that are stored in the memory 206. Additionally, in embodiments, the processor 204 may receive computer-executable instructions, signals, and/or other types of information from one or more I/O components 210. As the processor 204 reads and manipulates information, it may also cause information to be stored in the memory 206.

[0088] In embodiments, the memory 206 includes computer-readable media in the form of volatile and/or nonvolatile memory and may be removable, nonremovable, or a combination thereof. Media examples include Random Access Memory (RAM); Read Only Memory (ROM); Electronically Erasable Programmable Read Only Memory (EEPROM); flash memory; optical or holographic media; magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices; data transmissions; or any other medium that can be used to encode information and can be accessed by a computing device such as, for example, quantum state memory, and/or the like.

[0089] In embodiments, the memory 206 stores computer-executable instructions for causing the processor 204 to implement aspects of embodiments of system components discussed herein and/or to perform aspects of embodiments of methods and/or procedures discussed herein. Computer-executable instructions may include, for example, computer code, machine-useable instructions, and the like such as, for example, program components capable of being executed by one or

more processors associated with a computing device. Examples of such program components are depicted in FIG. 3, and may include the system manager 328, the communication component 330, the device dashboard 332 (and components thereof), the database 336, and/or the like. Some or all of the functionality contemplated herein may also, or alternatively, be implemented in hardware and/or firmware.

[0090] In embodiments described herein, upon being executed by one or more processors, computer-executable instructions may cause the one or more processors to initiate one or more components, e.g. a communication component. The components may be, or include, program components, electrical circuits, logic modules, mechanical assemblies, and/or any number of different types of combinations of hardware, firmware, and software. As the term is used herein, “initiate” may include instantiate, create, activate, utilize, and/or the like. That is, for example, the components initiated by a processor may be software components created, instantiated, or otherwise invoked by the processor. As another example, the components may include hardware (for example, electronic circuits) activated by the processor. As such, a “component” which may also be referred to as a “module” may be initiated and/or implemented in, or as a combination of two or more of, hardware, software, and firmware, and may be initiated and/or instantiated and/or located in one device or place, or alternatively distributed across multiple devices and/or places and/or in the network 110 or the cloud.

[0091] In embodiments, the I/O port 208 may allow the computing device 200 to be logically coupled to other devices including external devices and/or I/O components 210, some of which may be built in. Examples of I/O components 210 include a microphone, joystick, game pad, satellite dish, scanner, printer, wireless device, keyboard, pen, voice-input device, touch-input device, touch-screen device, interactive display device, a mouse, and the like. In embodiments, the I/O component 210 may include, for example, a presentation component (for example, a display, a printing device, a touch-screen I/O display, etc.), a communication component (for example, a transceiver, an antenna, etc.), and/or the like.

[0092] The illustrative computing device 200 shown in FIG. 2 is not intended to suggest any limitation as to the scope of use or functionality of embodiments of the present disclosure. Neither should the illustrative computing device 200 be interpreted as having any dependency or requirement related to any single

component or combination of components illustrated therein. Additionally, any one or more of the components depicted in FIG. 2 may be, in embodiments, integrated with various ones of the other components depicted therein (and/or components not illustrated), all of which are considered to be within the ambit of the present invention.

[0093] FIG. 3 depicts an illustrative operating environment 300 in accordance with embodiments of the invention. The illustrative operating environment 300 includes a management server 302 that is configured to communicate with a medical device 304 via a network 306. Any number of additional medical devices 308 may be configured to communicate with the management server 302, as well. The communication between the management server 302 and the medical device 304 and/or 308 may be unidirectional or bidirectional. According to embodiments, a user may utilize a user device 310 to communicate with the management server 302. The management server 302 may be (or be similar to), for example, the management server 108 depicted in FIG. 1; the medical device 304 and/or 308 may be (or be similar to), for example, the medical devices 102, 104 and/or 106 depicted in FIG. 1; the network 306 may be (or be similar to) any one or more of the networks 110, 112, and 114 depicted in FIG. 1; and the user device 310 may be (or be similar to) the user devices 118 and/or 120 depicted in FIG. 1.

[0094] The medical device 304 may be powered by one or more batteries 312 and may include a patient-interface component 314 configured to provide treatment to, and/or obtain physiological parameter measurements from, a patient; and a communication component 316 configured to facilitate transmitting information through the network 306 to the management server 302. In embodiments, the patient-interface component 314 may be, or include, one or more defibrillation electrodes (pads), one or more infusion needles, and/or the like. The medical device 304 also may include a processor 318 and a memory 320.

[0095] The medical device 304 may receive signals from one or more patient-interface components 314 (for example, sensors or electrodes) coupled to a patient and use the processor 318 to analyze the signals to monitor, detect, and/or derive or calculate various physiological parameters. For example, the processor 318 may monitor, detect, and/or derive or calculate heart rate, blood pressure, temperature, respiration rate, blood oxygen level, end-tidal carbon dioxide level, pulmonary function, blood glucose level, weight, and/or the like. Any one or more of these

physiological parameters, other measured parameters, other derived parameters, and/or the like may be stored in the memory 320. In some embodiments, the medical device 304 includes a display 322 for presenting data associated with one or more of the above physiological parameters, other clinical event information, configuration options, and/or the like. Clinical event information (for example, physiological parameters, device usage metrics, and/or the like, recorded during use of the medical device 304 during a clinical event), self-test information, configuration information, and/or the like may be stored in the memory 320.

[0096] The communication component 316 may include I/O ports (for example, logical ports, virtual ports, physical ports, etc.), one or more antenna, one or more transceivers, one or more receivers, and/or the like. In embodiments, for example, the communication component 316 may include I/O ports such as, for example, an RS-232 port for use with a modem based dialup connection, a copper or fiber 10/100/1000 Ethernet port, a Bluetooth® or WiFi interface, an infrared port, a universal serial bus (USB) port, and/or the like. In embodiments, the communication component 316 may be configured to facilitate near-field communications, cellular communications, and/or the like.

[0097] In embodiments, the medical device 304 may be configured to transmit information to the management server 302, receive communications from the management server 302, and/or facilitate management of patient data, device status and history, device error logs, and/or the like. The medical device 304 may be configured to receive software updates and configuration information via the communication component 316. In embodiments, the medical device 304 may be configured to transmit self-test information, clinical event information, alarm information, to the management server 302 automatically (for example, according to a programmed schedule, in response to an event, and/or the like) and/or manually (for example, in response to a user input).

[0098] As shown in FIG. 3, the management server 302 may be implemented on a computing device that includes a processor 324 and a memory 326. In embodiments, the management server 302 may refer to hardware, software, firmware, or a combination of these, and may be, or include, a computing device, a number of computing devices, a virtual machine, a number of virtual machines, a service, and/or the like. For example, the management server 302 may be a stand-alone server device or server bank. In embodiments, the management server 302

may be software configured to be executed by a computing device such as, for example, the user device 310. Various program components such as, for example, a system manager 328, a communication component 330, and/or device dashboard service 332 may be stored in the memory 326. In embodiments, the processor 324 executes the system manager 328, the communication component 330, and/or the device dashboard service 332.

[0099] The system manager 328 may facilitate management of various aspects of the medical devices 304 and/or 306, the device dashboard service 330, and/or the like. For example, the system manager 328 may be configured to coordinate communications between the management server 302 and the medical devices 304 and/or 306; facilitate login and authentication procedures; create, delete, manipulate, and manage user accounts and account information 334 stored in a database 336; interact with, query, and/or index the database 336; facilitate integration with other systems (for example, electronic medical record (EMR) systems, administration systems, and/or insurance/billing systems); facilitate operations and procedures for maintaining compliance with relevant laws and regulations; facilitate configuration and/or customization of various aspects of embodiments of the management server 302; and/or the like. The database 336 may be, or include, one or more tables, one or more relational databases, one or more multi-dimensional data cubes, one or more non-relational databases, and/or the like. Further, though illustrated as a single component, the database 336 may, in fact, be a plurality of databases 336 such as, for instance, a database cluster, which may be implemented on a single computing device or distributed among a number of computing devices, memory components, and/or the like.

[00100] The communication component 330 may include similar aspects as the communication component 316 of the medical device 304, and may be configured to communicate with the communication component 316 of the medical device 304. This communication between communication component 330 and communication component 316 may be direct device-to-device communication, and/or indirect communication via network 306 and/or via one or more other devices 308, 310, 336. In embodiments, the operating environment 300 may include a collection server (such as, for example, the collection server 112 depicted in FIG. 1), in which case the communication component 330 may be configured to communicate with a communication component of the collection server, which may be configured to

communicate with the communication component 316 of the medical device 304. In embodiments, the communication component 330 may also be configured to facilitate communications between the management server 302 and the medical device 308, the user device 310, other devices, other systems, and/or the like.

[00101] In embodiments, the communication component 330 may be configured to receive device-readiness information 338, device performance information, and/or clinical event information 340 from the medical devices 304 and/or 308, e.g. wirelessly. The received information 338 and/or 340 may be stored in the database 336, as shown. According to embodiments, the communication component may also be configured to receive information (for example, device-readiness information, device performance information, and/or clinical event information) from a USB flash drive, a CD-ROM disc, and/or any number of other storage and/or transmission media.

[00102] Although communication components 316 and 330 (and 512 and 618) are shown as boxes associated with devices in FIGS. 3, 5, and 6, as described above such “components” or “modules” may be initiated and/or implemented in, or as a combination of two or more of, hardware, software, and firmware, and may be initiated and/or instantiated and/or located in one device or place, or alternatively distributed across multiple devices and/or places. For example, any one of communication components 316, 330, 512, and/or 618 may be hardware, software, firmware, or some combination thereof, and may be initiated in or on the same device that is collecting information or data being communication, distributed across multiple devices, and/or on a device different from the device that is collecting the information or data being communicated.

[00103] According to embodiments, the device dashboard service 332 may be an application configured to assist users with the management of their medical devices. The device dashboard service 332 may serve as a central location for a user to manage their medical devices. Access to the device dashboard service 332 may be web based with the option for customers to add the application to their computer system/network. The device dashboard service 332 may be configured to be compatible with any number of different medical devices and may be configured to allow the user to input additional information about their medical devices, competitor devices, and/or the like. In this manner, the device dashboard service 332 may, in embodiments, facilitate organizing and simplifying medical device

management, remotely monitoring medical devices; remotely managing AED software; remotely configuring medical devices; viewing clinical event information; viewing device-readiness (self-test) information; and/or the like.

[00104] According to embodiments, the device dashboard service 332 may be configured to facilitate management of the medical devices 304 and 306, information received from the medical devices 304 and 306, and/or the like. As shown in FIG. 3, the device dashboard service 332 includes a graphical user interface (GUI) component 342 that is configured to facilitate display of a GUI 344 on the user device 310 (which may include a display (not shown)). Although the GUI 344 is illustrated as being rendered using a browser 346 running on the user device 310, in embodiments, the GUI 344 may be provided using a client application, a browser plug-in, an application plug-in, application programming interface (API), and/or the like. The GUI 344 may facilitate presenting any number of different types of information to a user, including, for example, device-readiness information; device performance information; clinical event information; configuration information; information associated with software status and/or updates; location information corresponding to medical devices; user information; account information; and the like.

[00105] In embodiments, for example, the medical device 304 may be an AED and the GUI 344 may be configured to display the following device information, generated from a self-test report: result of the most recent self-test; device serial number; electrode status/expiration; battery status/expiration; device software revisions; device user ID (if programmed); and/or device self-test interval. A failed self-test may result in the aggregation and display of information such as, for example, integration device "failed" self-test; reason for failed self-test, if applicable; and/or the like.

[00106] According to embodiments, the device dashboard service 332 may be configured to cause the GUI component 342 to provide reports that may be displayed using the GUI 344, printed, forwarded, and/or the like. For example, on a periodic basis, the device dashboard service 332 may notify a user of a passed self-test via email, the GUI 344, and/or the like. In another example, a daily, weekly, and/or monthly report may be provided. Additionally, in embodiments, reports, alerts, and/or other types of data may be provided to a user via email, short message service (SMS) messaging, and/or the like.

[00107] According to embodiments, the management server 108, 302 may be configured to receive, manage, and present device-readiness information or data. The device dashboard service 332 may be configured to provide the user with up-to-date information on the readiness of the medical device 304. This information may include: device-readiness (for example, an indication as to whether the medical device 304 passed the latest self-test), electrode expiration/readiness, and battery information (for example, whether the battery contains enough power for a minimum of 1 rescue). According to embodiments, the management server 108, 302 may be configured to receive, manage, and present device performance information or data.

[00108] According to embodiments, the management server 108, 302 also may be configured to receive, manage, and present clinical event information or data. The device dashboard service 332 may be configured to provide the user with complete event information once downloaded from the medical device 304. This data may be downloaded in a HIPPA compliant manner. When downloaded the user may be able to view device actions and prompts, along with basic device information in a main screen. From this main screen the user may be able to navigate to additional tabs such as, for example, ECG and CPR analysis. Upon download of clinical event information, the device dashboard service 332 may be configured to provide display of prompts and/or basic information in languages, in which the medical device recorded the data. According to embodiments, the clinical event information may include event logs and device prompt logs, ECG and waveforms; CPR analysis; CPR quality prompts and screens.

[00109] The device dashboard service 332 further includes a configuration component 348 configured to provide configuration information to the medical device 304 and/or 308. In embodiments, a medical device 304 may be configurable based on a number of different options that may be selected by a user. The user may be able to configure the medical device 304 by providing user input directly to the medical device 304, by providing configuration information to the medical device 304 via the configuration component 348, and/or the like. In embodiments, for example, the configuration component 348 may receive user input via the GUI 344 to configure various configuration options. The configuration information (including the configured options) may be provided to the medical device 304 using the configuration component 348. In embodiments, for example, configuration information may be provided, in a configuration file, to the medical device 304, which

may be configured to read and parse the configuration file, extract the configuration information, and configure itself based on the configuration information. The device dashboard service 332 may enable a user to provide the same configuration information to all medical devices (of a similar type) that the user is managing, unique configuration information to each medical device, and/or various combinations of the above. According to embodiments, the configuration component 348 may provide configuration information that is transmitted over the network 306 to the medical device 304, downloaded to a storage medium (for example, a USB flash drive), and/or the like.

[00110] Any number of different options, features, settings, and/or the like, may be configured using configuration information. The types of configuration options features, and/or settings that are available to be configured by a user may be based on a roll assigned to the user, regulatory compliance limitations, safety considerations, and/or the like. In embodiments, for example, the medical device 304 may be an AED, and the configuration options and parameters depicted in Table 1, below, may be available to a user of a first type (for example, a non-administrator), while the configuration options and parameters depicted in Table 2, below, may be available to a user of a second type.

Table 1: User Configurable Options		
#	Configurable Option	Possible Values
T1	<i>Lay Rescuer Prompts</i> When this option is checked (On), the unit issues the following voice and text prompts after completion of the power-on self-test and entry into clinical mode: <i>STAY CALM</i> <i>CHECK RESPONSIVENESS</i> <i>CALL FOR HELP</i> Lay Rescuer prompts will only be issued prior to pad placement. If pads are pre-attached the lay rescuer prompts will NOT be issued.	• On • Off
T2	<i>CPR Countdown Timer</i> The AED Plus 2 will display a visual indication for remaining time in CPR/compression cycle	• On • Off
T3	<i>Language</i> User configurable for up to three (3) languages - Languages must be individually loaded - Dependent on ordered languages	• Language 1 • Language 2 • Language 3

T4	<i>Transfer</i> User can: - Transfer via a USB flash drive or through a WiFi connection.	• Transfer via WiFi or USB: - Clinical event file - Device History - Configuration
T5	<i>Set Time & Date</i> Allows user to manually set the time on the AED Plus 2 (Ability to set DST)	00:00 Month/Day/Year DST
T6	<i>CPR Depth Measure of Units</i>	• Inches (IN) • Centimeters (CM)
T7	<i>Lay Breathing Prompt</i> Allows you to configure the “Lay Breathing” prompt of “Open Airway, Check Breathing”, based on the guidelines you want to follow. When disabled (Off), these prompts are not issued.	• On • Off

TABLE 1

Table 2: Administrator Configurable Options		
#	Configurable Option	Possible Values
1	<i>Self Test Interval</i> Sets the period of time between automated self-tests in standby state.	• 1 day • 7 days
2	<i>Auto Self-Test Report</i> Following the pre-configured self-test the AED Plus 2 will attempt to link with ZOLL Online/En-Pro through a WiFi connection.	• On • Off
3	<i>CPR Recording</i> When this option is checked (On) and pads with a CPR sensor are attached, the unit performs CPR monitoring, prompts the rescuer, and records chest compressions in the event data file. (Real CPR Help®). When this option is Off , the unit does the same – BUT does NOT record chest compressions.	• On • Off
4	<i>Breathe During CPR Prompt</i> The AED Plus 2 will prompt “Give Two Breaths” every 30 recognized compressions	• On • Off
5	<i>Adult First Shock Energy</i> Sets the energy level in joules for the first shock for an adult patient.	• 120 J • 150 J • 200 J
6	<i>Adult Second Shock Energy</i> Note: This value cannot be less than the value selected for the first adult shock.	• 120 J • 150 J • 200 J
7	<i>Adult Third Shock Energy</i> Note: This value cannot be less than the value selected for the second adult shock.	• 120 J • 150 J • 200 J

8	<i>Pediatric First Shock Energy</i> Sets the energy level in joules for the first shock for a pediatric patient.	• 50 J • 70 J • 85 J
9	<i>Pediatric Second Shock Energy</i> Note: This value cannot be less than the value selected for the first pediatric shock.	• 50 J • 70 J • 85 J
10	<i>Pediatric Third Shock Energy</i> Note: This value cannot be less than the value selected for the second pediatric shock.	• 50 J • 70 J • 85 J
11	<i>No Shock CPR Period</i> Sets the duration of the CPR period following a No Shock Advised result for the analysis.	• 30 seconds • 60 seconds • 90 seconds • 120 seconds • 150 seconds • 180 seconds
12	<i>Post Shock CPR Period</i> Sets the duration of the CPR period following the delivery of a shock.	• 30 seconds • 60 seconds • 90 seconds • 120 seconds • 150 seconds • 180 seconds
13	<i>Start with CPR Period</i> Configures the AED Plus 2 to start with CPR once electrodes are attached to the patient.	• Off • 30 seconds • 60 seconds • 90 seconds • 120 seconds • 150 seconds • 180 seconds
14	<i>Continue CPR Prompt</i> “Continue CPR” will be repeated once every N* seconds (see parameter 15) if CPR compressions stop during the CPR interval. When this option is set to Off , the “Continue CPR” prompt will not be issued during the CPR period.	• On • Off
15	<i>CPR Prompt Interval</i> This option determines the interval for the following prompts: - Real CPR Help® - START CPR - CONTINUE CPR	• 10 seconds • 15 seconds
16	<i>Set Supervisor Passcode</i> Allows user to change the passcode used to enter Supervisor mode	• 1 2 3 4 5 6 • - - - - -
17	<i>Device Identifier</i> (defaults to SN of device)	• Allows input of 11 digit alpha-numeric device ID.

18	<i>User Transfer via USB or WiFi</i> User can transfer the: - Configuration file (device and WiFi settings) - Device History Report - Clinical Event Data	• Transfer via WiFi or USB: - Configuration file - Device History Report - Clinical Event Data
19	<i>Install (USB)</i> User can install: - Configuration file - Software upgrade - Language file	• Install via USB flash drive: - Configuration file - Software upgrade - Language file
20	<i>Number of Clinical Cases</i> User can configure number of clinical cases the AED Plus 2 will store for both audio and non-audio devices	• 1 • 2
21	<i>Voice Recording</i> Note: Option will only be available when a customer orders an “AED Plus 2 Pro” device. Default will be “OFF” on enabled devices.	• On • Off
22	<i>Device Display</i> Allows user to select information displayed on the LCD during clinical use.	• Lay Rescuer • ECG and CPR Dashboard • ECG • CPR Dashboard
	Lay Rescuer	Default AED Plus 2 display with animations.
	ECG and CPR Dashboard	The AED Plus 2 will display the patient’s ECG rhythm and all text prompts. During the CPR cycle the CPR Dashboard will also be active.
	ECG	The AED Plus 2 will display the patient’s ECG rhythm and text prompts.
	CPR Dashboard	Text prompts will be displayed. During the CPR Cycle the CPR Dashboard will also be active.

TABLE 2

[00111] As shown in FIG. 3, the device dashboard service 332 may also include an update component 350 configured to provide software updates to the medical device 304. According to embodiments, the update component 352 may provide software updates that are transmitted over the network 306 to the medical device 304, downloaded to a storage medium (for example, a USB flash drive), and/or the like. Additionally, the update component 352 may be configured to enable scheduled software updates, periodic software updates, and/or the like.

[00112] In embodiments, the device dashboard service 332 may include a customer registration wizard 350 configured to assist a user in registering to use one or more services provided by the management server 302. The customer registration wizard 350 may be configured to walk a user through a registration process, gather various types information from the user, and send the information to various appropriate services, databases, entities, and/or the like. For example, the registration wizard 350 may solicit, and/or facilitate the creation of, login credentials corresponding to a particular user device, user, organization, medical device, group of medical devices, user account, and/or the like. These login credentials may be provided to a first service and/or entity. The registration wizard 350 may be configured to solicit, and/or facilitate the creation of, account set-up information, which may be provided to a second service and/or entity. Additionally, for example, the registration wizard 350 may be configured to solicit device warranty registration information, which may be provided to a third service and/or entity. Any number of different types of information may be requested from a user and/or generated during a registration procedure and the registration wizard 350 may facilitate providing any number of different types of information to any number of different service and/or entities.

[00113] During a registration process, a user may configure any number of various aspects, features, options, and/or the like, associated with the device dashboard service 332. In embodiments, for example, a user may be able to specify a notification frequency, which may be a frequency with which the medical device 304 is configured to communicate information to the management server 302. The device dashboard service 332 may, in embodiments, facilitate tiered device management, grouping medical devices based on geography, selection of the language to be used, providing portals for distribution partners, and/or the like.

[00114] According to embodiments, the device dashboard service 332 may facilitate user role-based permissions. That is, in embodiments, each user associated with a particular account, group of medical devices, and/or the like, may be assigned a particular role that defines the level of access the user has to various types of information, functionality, and/or the like. The device dashboard service 332 may also identify responsibilities of each user and implement mechanisms for tracking their relative performance, regulatory compliance, internal policy compliance, and/or the like. In embodiments, the device dashboard service 332 may

be configured to manage a number of different user types associated with each type of medical device.

[00115] As an example, the device dashboard service 332 may be configured to recognize various types of users associated with AEDs. That is, for example, the device dashboard service 332 may recognize five main user roles associated with AED devices themselves: AED Maintainer; AED Program Manager; AED Rescuer; Medical Director; and Medical Doctor. Although these user roles associated with AEDs are described herein for the purposes of clarity and illuminating possible implementation concepts, embodiments of the invention facilitate supporting any number of different user roles associated with any number of different types of medical devices.

[00116] According to embodiments, an AED Maintainer may be tasked with maintaining a fleet of AEDs (for example, 1-100+ AEDs). The AED Maintainer may be responsible for ensuring that all AEDs are in working order, are up to date, have current electrodes and batteries, and/or the like. An AED Program Manager may, for example, be tasked with managing a number of locations at which an AED Maintainer is present. The AED Program Manager may have responsibility over an entire AED Program (corporate/school district/military base, and the like), ensuring that all locations are meeting internal and external requirements. In embodiments, the AED Program Manager may be provided the ability to view information associated with all AEDs for which he or she is responsible through a hierarchical system. The AED Rescuer may operate the AED during a clinical patient event.

[00117] In embodiments, the Medical Director may provide medical direction over a number of AEDs. The Medical Director's responsibilities may include, for example, ensuring that all of the AEDs under the Medical Director's care are properly maintained; ensuring that all AED sites have up-to date CPR/AED Certified responders; providing post-event support and/or clinical event data review. Thus, for example, the Medical Director may be provided the ability to quickly view locations that they are in charge of managing to confirm compliance with various aspects of AED management, such as, for example, to confirm device-readiness and the preparedness of a location to respond to a medically emergent situation. Additionally, in embodiments, the Medical Doctor may be provided with the ability to view clinical event information closely following the clinical use of an AED.

[00118] Similarly, the device dashboard service 332 may be configured to recognize a number of dashboard user roles. For example, in embodiments, dashboard users may have responsibility over the management and maintenance of an AED or multiple AEDs. Additionally these users may have responsibility for the download and/or review of clinical event information. In embodiments, these users may be assigned one or more of four user roles: administrator, site-user, medical director/doctor, and EMS Agencies.

[00119] For example, an administrator may be responsible for the management of multiple AEDs spread over multiple locations. The locations may vary (for example, by state, country, town, or the like) with each site having a specific responsible user. The administrator may be responsible for the management of all sites, groups of sites, and/or the like. Illustrative activities related to an administrator's responsibility may include ensuring compliance with "Good Samaritan" laws, ensuring AED program compliance, ensuring device-readiness, providing CPR/AED training, and facilitating device configuration. In embodiments, the administrator's primary task may not involve AED device management, as the management of an AED program may be an assigned task.

[00120] In embodiments, a site-user may be responsible for all AEDs associated with an individual location. The site user may report to an administrator as their site could be one of multiple locations associated with one customer. Illustrative activities related to a site-user's responsibility may include ensuring device-readiness, device performance, training of an emergency response team, and/or the like. A medical director/doctor may have responsibility over multiple AEDs at multiple locations, and may be a prescribing physician. The medical director/doctor may be responsible over AEDs deployed in multiple locations. They may be responsible for ensuring that all sites maintain their AEDs properly and are compliant with training certifications. Additionally, the medical director/doctor also may provide post-event support and may review clinical event information. Illustrative activities related to a medical director/doctor's responsibilities may include tracking individual site compliance, providing post-event support, review of clinical event information, and/or the like. Additionally, in embodiments, EMS Agencies may also be an "administrator" if the EMS service offers a Public Access Defibrillation (PAD) program. Additionally, the device dashboard service 332 may be configured

to integrate into EMS response software, for example, to alert dispatchers of the locations of AEDs in close proximity to a cardiac arrest emergency.

[00121] According to embodiments, the management server 302, the medical device 304, the user device 310, and/or another system component such as, for example, an administration system (for example, the administration system 542 depicted in FIG. 5), may be configured to process information received from the medical device 304 and, in embodiments, utilize the information and/or processed information to facilitate additional services. For example, in embodiments, any one or more of device-readiness information, device performance information, and clinical event information may be processed to generate statistical reports across geographic areas, customers, devices within a fleet, device types, devices of certain ages, versions, and/or configurations, environmental conditions (for example, elevation, average temperature, temperature ranges, average humidity, humidity ranges, average barometric pressure, barometric pressure ranges, sun-exposure levels and/or durations, atmospheric contaminant types and/or levels, and/or the like), use conditions (for example, frequency of use, nature of use, durations of use, and/or the like), user demographics (for example, user roles, user types, user ages, user experience levels, and/or the like), outcomes (for example, measures of intervention success, prognosis, diagnosis, and/or the like), and/or the like. Reports may be generated periodically, manually, automatically, and/or the like, and may be provided to any number of devices, users, groups of users, regulation authorities, clinicians, and/or the like.

[00122] In embodiments, the management server 302, the medical device 304, the user device 310, and/or another system component such as, for example, an administration system (for example, the administration system 542 depicted in FIG. 5), may be configured to facilitate any number of other functionalities, services, and/or features associated with managing a fleet of medical devices. For example, a user may be able to remotely access audio/video equipment associated with the medical device 304, facilitate medical billing and/or other financial transactions, respond to requests for medical information, obscure personally identifiable information, and/or the like.

[00123] The illustrative operating environment 300 shown in FIG. 3 is not intended to suggest any limitation as to the scope of use or functionality of embodiments of the present disclosure. Neither should the illustrative operating

environment 300 be interpreted as having any dependency or requirement related to any single component or combination of components illustrated therein. Additionally, any one or more of the components depicted in FIG. 3 may be, in embodiments, integrated with various ones of the other components depicted therein (and/or components not illustrated), all of which are considered to be within the ambit of the present invention. For example, a web server (which may include one or more components, features or aspects of the management server 302) may be integrated with the medical device 304, may be accessible by the browser 346, and may be used to manage one or more other medical devices 308. Embodiments of situations in which a medical device 304 includes a web server, in this manner, are disclosed, for example, in U.S. Publication No. 2014/0266794, "PATIENT MONITOR SCREEN AGGREGATION," filed by Brown *et al.* on March 14, 2014, the entirety of which is hereby incorporated by reference herein, for all purposes.

[00124] As described above, embodiments of the invention provide a management server configured to facilitate remote management of a number of medical devices and/or information received therefrom. FIG. 4 is a flow diagram depicting an illustrative method 400 of facilitating medical device management in accordance with embodiments of the invention. As shown in FIG. 4, embodiments of the method 400 may be performed by a medical device (for example, the medical devices 102, 104, and/or 106 depicted in FIG. 1; and/or the medical devices 304 and 308 depicted in FIG. 3) and may include powering up (block 402) and initiating a self-test procedure (block 404). In embodiments, the medical device may be configured to initiate the self-test procedure periodically, according to a programmed schedule; upon installation of a battery or batteries; upon being powered up (i.e., turned on); upon receiving a user input; and/or the like.

[00125] In embodiments, the self-test procedure may be configured to test any number of different functions, features, and/or the like. As shown in FIG. 4, the illustrative method 400 includes testing patient-interface components (block 406) and testing the battery (or batteries) (block 408). Using the device-readiness information resulting from the self-test procedure, a device status file is generated and saved in a local memory component (block 410). According to embodiments, the self-test procedure may include any number of different protocols and procedures for verifying the ability of patient-interface components, batteries,

communication components, and/or the like, to operate safely and effectively when needed.

[00126] According to embodiments, patient-interface components may include any type of component configured to facilitate an interaction with a patient such as, for example, therapy-delivery components, sensing components, communication components, and/or the like. For example, in the case of a medical device that is, or includes, an AED, the self-test procedure may include verifying that the defibrillation electrodes are properly connected to the device; verifying that the ECG signal acquisition and processing electronics are functional; verifying that the defibrillator electronics are functional and can charge and discharge at a predetermined level; verifying proper function of the microprocessor electronics and the integrity of the software; verifying that the CPR monitoring and compression depth detection are functional; verifying that voice prompts and/or visual indicators are functional; verifying that adequate battery capacity remains; verifying that the defibrillation electrodes have adequate usable life remaining; and/or the like.

[00127] As shown in FIG. 4, the method may further include connecting to a server (block 412), and transferring files to the server (block 414). The server may be, or be similar to, for example, the management server 108 and/or the collection server 116 depicted in FIG. 1, and/or the management server 302 depicted in FIG. 3. Optionally, the medical device may be configured to power down (block 416) after transferring the files to the server. Embodiments of the illustrative method 400 may also include determining the occurrence of a clinical event (block 418) and, in response to determining the occurrence of the clinical event, start recording (block 420). The occurrence or commencement of a clinical event may be determined, in some embodiments, by the placement of the medical device into a therapy or clinical mode. In embodiments, the medical device may be configured to record any number of different types of clinical event information such as, for example, heart rate, blood pressure, temperature, respiration rate, blood oxygen level, end-tidal carbon dioxide level, pulmonary function, blood glucose level, weight, electrocardiographs, and/or the like. The medical device determines when the clinical event has terminated (block 422), stops recording (block 424), and generates and saves a clinical event file (block 426). The clinical event file, containing clinical event information, may be transferred to the server (block 414) along with the device status file, in a separate communication, and/or the like.

[00128] FIG. 5 is a schematic block diagram depicting an illustrative operation of an operating environment 500 in accordance with embodiments of the invention. As shown in FIG. 5, the operating environment 500 includes a medical device 502 (for example, an AED) that is communicably coupled to a collection server 504. The medical device 502 may be (or be similar to), for example, the medical devices 102, 104, and/or 106 depicted in FIG. 1, and/or the medical devices 304 and/or 308 depicted in FIG. 3; and the collection server may be (or be similar to), for example, the collection server 116 depicted in FIG. 1. In embodiments, the medical device 502 may be configured to perform periodic self-tests to evaluate the condition of one or more batteries, one or more patient interface components (for example, electrodes), and/or the like. The results of the self-tests may be stored, as device-readiness information, in a local memory on the medical device 502. The device-readiness information may include, for example, the date and time of the self-test, the type of self-test performed, and/or the results of the self-test.

[00129] The medical device 502 is configured to communicate the device-readiness information 506, as well as clinical event information 508, to the collection server 504, which may be, for example, a software-as-a-service (SaaS) implementation hosted on the cloud, independent of the geographical site of the medical device 502. The medical device 502 may also communicate, to the collection server 504, performance data, maintenance logs, a device identifier (ID), a device serial number, and/or the like. In embodiments, the medical device 502 may include a global positioning system (GPS), or other location-identifying technology, and may communicate location information to the collection server 504. In other embodiments, the medical device 502 does not include a GPS or other location-identifying technology, in which case no location information is communicated to the collection server 504. In embodiments, a device ID may be configured to include, within its text, information about the location of the medical device 502. In embodiments, the various types of information may be sent from the medical device 502 to the collection server as a Device History File (DHF) 510. The DHF 510 may be, for example, a file configured using a proprietary file format and communicated over standard HTTP/SSL. According to embodiments, the DHF 510 may be configured using any number of different formats and may be communicated using any number of different communication protocols.

[00130] According to embodiments, the medical device 502 may initialize communication with the collection server 504 in any number of various ways. For example, the medical device 502 may initiate communication manually (for example, in response to user input to the medical device 502), automatically (for example, according to a predetermined schedule, in response to an event, etc.), and/or the like. In an automatic configuration, the medical device 502 may be configured to attempt to initiate a session with the collection server 504 periodically, upon receiving the DHF 510, and/or according to any other configured schedule. In embodiments, if the medical device 502 fails to establish communication with the collection server 504, it may be configured to re-attempt communication initiation a certain number of times before powering down and waiting to attempt to initiate communication again according to the schedule.

[00131] As shown, the collection server 504 includes a communication component 512 that is configured to receive the DHF 510 from the medical device 502, a parsing component 514 that is configured to parse the DHF 510, and an indexing component 516 that is configured to save the parsed information 518 in a database 520. The database 520 may include a relational database, a tabular database, a multidimensional data cube, and/or the like. Additionally, the database 520 may represent one or more databases distributed across one or more memory components, computers, and/or the like. According to embodiments, the collection server 504 may be configured to interrogate the medical device 502 and/or may maintain a registry of medical devices with which it communicates; while, in other embodiments, the collection server 504 does not interrogate medical devices and/or does not maintain a registry of medical devices with which it communicates. Information associated with a particular medical device 502 may be indexed according to the device ID and/or serial number corresponding to that medical device 502. In embodiments, the collection server 504 may continue to build the database 520 without purging information contained therein, while in other embodiments, the collection server 504 may continuously or periodically purge information from the database 520 to make room for new information.

[00132] As shown in FIG. 5, the operating environment 500 also includes a management server 522, which may be configured to facilitate user access, via a user device 524, to information obtained from the medical device 502. The management server 522 may be (or be similar to) the management server 108

and/or the collection server 116 depicted in FIG. 1, and/or the management server 302 depicted in FIG. 3. In embodiments, the management server 522 facilitates remote maintenance, monitoring, and/or management of various medical devices 502. In the illustrated embodiments, the management server 522 does not communicate directly with the medical device 502, but receives information from the medical device 502 only through the collection server 504. In other embodiments, the management server 522 may be configured to communicate directly with the medical device 502.

[00133] The management server 522 may be configured to obtain information from the medical device 502, via the collection server 504, in any number of different ways. For example, the management server 522 may include a query component 526 configured to obtain indexed information 528 via a specific query (for example, a device-specific query). The query component 526 may be configured to query the database 520 in response to user input (received, for example, via the user device 524), automatically, according to a configured option, and/or the like. In embodiments, the collection server 504 may be configured to send indexed information 528 from the database 520 to the management server 522 according to a configured option such as, for example, anytime information is received by the collection server 504, periodically, anytime information associated with a failed self-test is received, and/or the like. To facilitate reliability, the management server 522 and/or the collection server 504 may be configured to provide an alert to the user device 524 in the event that information that is expected to be received about a particular medical device 502 is not received. This alert may be provided in the form of email, pop-up screens, and/or the like.

[00134] The management server 522 may include a device dashboard 530 that is configured to provide a graphical user interface (GUI) 532 with which a user can interact via the user device 524. The device dashboard 530 may be configured to interact with a database 534 to store, retrieve, and/or manipulate account information 536 associated with a particular user, user device, fleet of medical devices, and/or the like. In operation, for example, the user logs into the service provided by the device dashboard 530 using a username and password and is provided with information associated with medical devices 502 registered to that user. The device dashboard 530 may be configured to allow a customer to register medical devices, view a dashboard feature that presents overall compliance (for example,

maintenance status of all registered medical devices), log maintenance checks, and view and edit information about medical devices and the sites in which they are located. In embodiments, the management server 522 provides a role-based system for device management corresponding to various sites at which the medical devices are located.

[00135] As is further shown in FIG. 5, the illustrative operating environment 500 includes an integration component 538 that is configured to facilitate interaction between the database 520 and one or more systems or devices. For example, as shown, the integration component 538 may be configured to provide indexed information (for example, clinical event information) 528 to an electronic medical record (EMR) system 540, an administration system 542, and/or the like. The EMR system 540 may be any EMR system, combination of EMR systems and/or the like. In embodiments, the administration system 542 may be a system configured to administer one or more aspects of embodiments of the illustrative operating environment 500. For example, the administration system 542 may be associated with an entity that manages, hosts, and/or otherwise provides the management server 522, the collection server 504, the medical device 502, and/or the like. Embodiments of the administration system 542 may facilitate quality control, software updates, configuration updates, legal compliance, and/or the like.

[00136] The illustrative operating environment 500 shown in FIG. 5 is not intended to suggest any limitation as to the scope of use or functionality of embodiments of the present invention. Neither should the illustrative operating environment 500 be interpreted as having any dependency or requirement related to any single component or combination of components illustrated therein. Additionally, any one or more of the components depicted in FIG. 5 may be, in embodiments, integrated with various ones of the other components depicted therein (and/or components not illustrated), all of which are considered to be within the ambit of the present invention.

[00137] A medical device 304, such as an AED, is mounted on the wall at a location, for example an office building. The AED includes one or more batteries 312 and one or more patient interface components 314, for example electrodes. The AED runs a self-test to assess its device readiness, for example by determining whether the battery 312 is operational and/or is carrying a sufficient charge to operate in an emergency medical event. The AED self-test may also determine

whether the electrodes 314 are functioning and/or whether they need to be replaced, for example if continuity has been disrupted or if the AED notes the passage of a certain period of time since the installation of the electrodes 314 indicating their expiration or near expiration. Various other or additional device readiness information may be observed by the AED and/or stored in a memory, for example memory 320. The AED 304 may be communicably coupled to the network 306 by a WiFi connection. After the self-test, and/or according to a schedule, the AED 304 sends or transfers device readiness information to the server 302 via the network 306. In some cases, sending or transfer of device readiness information occurs automatically, and/or with or without a request or query made by or originating with the server 302. In other cases, the user of the AED makes a selection on the AED 304 to push the device readiness information to the server 302. If a fault or device readiness error or condition is present in the message from the AED 304 to the server 302, the server 302 may automatically notify a user, for example by initiating a visual and/or audio message on the user device 310, according to embodiments of the present disclosure. In this example embodiment, these steps may be carried out according to the left side of the flow diagram of FIG. 4. It should be noted that blocks 402, 404, 406, 408, and 410 of the left side may occur independently of blocks 418, 420, 422, 424, and 426 of the right side and that some devices may include the functionality of the left side of this diagram, some of the right side of this diagram, and some of both sides of this diagram.

[00138] A medical device 304, such as an AED, is mounted on the wall at a location, for example an office building. The AED runs a self-test to assess its device performance, for example by determining whether the software of the AED is running correctly and without faults and/or whether the AED itself is in working condition or functioning internally. Various other or additional device performance information may be observed by the AED and/or stored in a memory, for example memory 320. The AED 304 may be communicably coupled to the network 306 by a WiFi connection. After the self-test, and/or according to a schedule, the AED 304 sends or transfers device performance information to the server 302 via the network 306. In some cases, sending or transfer of device performance information occurs automatically, and/or with or without a request or query made by or originating with the server 302. In other cases, the user of the AED makes a selection on the AED 304 to push the device performance information to the server 302. If a fault or

device performance error or condition is present in the message from the AED 304 to the server 302, the server 302 may automatically notify a user, for example by initiating a visual and/or audio message on the user device 310, according to embodiments of the present disclosure. In this example embodiment, these steps may be carried out according to the left side of the flow diagram of FIG. 4, where device performance is assessed or observed instead of or in addition to the various device readiness information discussed above, according to embodiments of the present disclosure.

[00139] A medical device 304, such as an AED, is mounted on the wall at a location, for example an office building. During a medical event, such as a medical emergency, the AED is de-mounted and used on a patient during the medical emergency. De-mounting and/or using the AED on a patient may involve activating or selecting a “therapy mode” on the AED, which may be distinguished from a standby mode or other mode in which the AED operates for the long periods of time when it is mounted on the wall (or other location). During the medical emergency, the AED gathers and stores clinical event information. The AED 304 may be communicably coupled to the network 306 by a WiFi connection. After the clinical event, the AED is configured to send or transfer the clinical event information to the server 302 via the network 306. In some cases, this sending or transfer of clinical event information occurs automatically, and/or with or without a request or query made by or originating with the server 302. In other cases, the user of the AED makes a selection on the AED 304 to push the clinical event information to the server 302.

[00140] In this example embodiment, these steps may be carried out according to the right side of the flow diagram of FIG. 4, according to embodiments of the present disclosure.

[00141] A medical device 304, such as an AED, is mounted on the wall at a location, for example an office building. The AED may be one of a number of device types, and/or may be running one of a number of different software versions. Either in response to an AED administrative user request and/or automatically, the AED 304 sends a message to the server 302 indicating the AED device type and/or serial number and/or current software version, and the configuration component 348 and/or update component 352 of the server 302 sends a software or configuration update to the AED 304 corresponding to the device and/or needed software version.

According to such configurations of communication component 316 of the AED 304, there is no need for multiple back-and-forth messages in order to initiate a device or component update, according to embodiments of the present disclosure. In certain embodiments, the server 302 may automatically send software or configuration updates to the AED 304.

[00142] According to some embodiments, a user logs into a user device 310 and requests software or configuration updates for all devices 304, 308 managed by the user or customer. According to other embodiments, the devices 304, 308 automatically update their software or configurations via their respective WiFi connections.

[00143] Embodiments of the present disclosure include systems and methods having one or more features of any or all combinations of the features described above, as well as the other examples and embodiments discussed herein. For example, an AED 304 may be configured to transmit, either via a user push and/or an automatic push, to the server 302 one or more of clinical event information, device readiness information, and device performance information. This may be done simultaneously, according to some embodiments. According to some embodiments, software or configuration upgrades are requested manually or otherwise by a user, either via the AED 304 and/or the server 302; according to other embodiments, software upgrades are requested automatically. In certain embodiments, the medical device or server may transmit, push or pull, automatically or manually, one or more of clinical event information, device readiness information, device performance information, configuration updates and/or software updates. Communication between the device and server may be unidirectional or bidirectional.

[00144] FIG. 6 illustrates the system 300 of FIG. 3, including additional elements. For example, the medical device 304 may further include a shielding component 618, which may access one or more keys 620. The user device 310 may further access one or more keys 622, and the server 302 may likewise access one or more keys 624. As used herein, the word “key” is used in its broadest sense to refer to any element required to access information, and may include, without limitation, an electronic token, an object, code, a username and/or password, signature, biometric data, or other data.

[00145] The shielding component 618 is configured to selectively shield certain portions of the data gathered by device 304, according to embodiments of the present invention. As used herein, the word “shield” and its variations are used in their broadest sense to refer to any information content access control technology, including without limitation encryption. Various encryption and content access control technologies are well understood by those of ordinary skill in the art; as such, the various ways in which information may be shielded will be apparent to one of ordinary skill in the art, based on the present disclosure.

[00146] Typically, a data file generated and recorded by a medical device is either unshielded, or all elements of the data file are shielded in the same way, at the same level of access. Shielding medical device information, particularly during transmission (e.g. over the Internet) helps ensure secrecy and privacy, which can be important particularly with respect to protected health information, the security of which may be regulated by various governments. However, shielding all elements of a medical device data file in the same way does not provide selective control over different elements within the medical device data file after the medical device data file is accessed by the recipient. In some cases, the recipient may not need, or may not want, access to all of the elements within the medical device data file. For example, a recipient who is concerned primarily with device maintenance and device performance data may not wish to possess, even temporarily, access to patient clinical information that may be specially protected or regulated by law. However, in such cases, it may be beneficial for the initial recipient to be able to further disseminate the medical device file or portions thereof to other recipients who need or want to be able to access not only the specially protected or regulated data, but also the device maintenance and performance data, as well as the relationship or association between the different types of data (such as the time when the data was collected and the device from which it was collected). Embodiments of the present invention permit this capability via the selective shielding of certain data by the shielding component 618 of the medical device 304.

[00147] Selective shielding of certain data by medical device 304 may also provide other benefits. For example, if the recipient of a medical device data file is interested primarily in gather statistical data or generating reports regarding medical device maintenance and/or performance data, but does not wish to access or possess information about the readiness of any particular identifiable device, then

the device identity and/or its specific geographic location may be shielded by device 304. In such cases, the initial recipient of such a data file may glean the desired device performance and/or maintenance information, but the initial recipient is unable to ascertain which specific devices are not ready or are not well maintained. However, the medical device data file may include an association between the selectively shielded portions and the portions that are unshielded to or by the initial recipient, such that when the initial recipient further disseminates the medical device data file to another recipient, the subsequent recipient may possess the key or other ability to view not only the general device maintenance or performance information, but also ascertain the specific devices associated with any particular device information. In this manner, the device manufacturer could collect device maintenance and performance data across all or a subset of its devices, but would not be able to determine which specific devices are not ready or maintained. However, passing the same information on to the customer, for example the customer of a subscription-based device maintenance system, allows the customer to access all of the device data file for the devices associated with the customer, thus allowing the customer to ascertain which specific devices need attention.

[00148] The flow diagram 700 FIG. 7 is similar to that 400 of FIG. 4, except for blocks 702 and 704. After the device status file is generated (block 410), the shielding component 618 selectively shields information in the device status file (block 702) before connecting to the server 302 (block 412). Also, after the device status file is generated (block 426), the shielding component 618 selectively shields information in the clinical event file (block 704) before connecting to the server 302 (block 412).

[00149] According to some embodiments, the entire device status file is shielded or encrypted to prevent unauthorized access, but the selective shielding of blocks 702 and/or 704 occurs as a further shielding of a subset of that data. As such, selective shielding refers not only to shielding of some portions of the device file and lack of shielding of others, but refers also to the further shielding of a subset of the device file as to a particular recipient or key holder, even though the portions of the device file that are unshielded as to that particular recipient or key holder are actually shielded or encrypted as to third parties.

[00150] The system 300 of FIG. 6 may be used for remotely managing a medical device 304. The medical device 304 of the system 300 may include a

selective shielding component 618, which may be active on the medical device 304. The medical device 304 may be configured for infrequent use in medical situations, for example it may be an AED. The medical device 304 may be configured to gather device information from itself, and the device information may include device readiness information, device performance information, and/or clinical event information gathered by the medical device from a patient during a medical event. The selective shielding component 618 may be configured to create selectively shielded device information by shielding with an electronic key 620 any portion of the device information that identifies the medical device 304 individually while maintaining unshielded with the electronic key 620 an association between such any portion and a rest of the device information, and record the selectively shielded device information, for example in memory 320. The selective shielding component 618 may alternatively and/or additionally be configured to shield with an electronic key 620 any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key 620 an association between such any portion and a rest of the device information, the selectively shielded device information may include the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and/or the association, and record the selectively shielded device information, for example in memory 320.

[00151] The medical device 304 may include a first communication component 316 configured to facilitate transmitting the selectively shielded device information through network 306. The system 300 further includes a server device 302 communicatively coupled to the network 306, the server device 302 including a second communication component 330 configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information. According to some embodiments, the server device 302 lacks access to the electronic key 620. In some cases, server device 302 has access to key 624, but key 624 is not and does not correspond to key 620. In other embodiments, server device 302 does have access to key 620, and/or has access to key 620 by having access to key 624 which is the same as or grants access to key 620.

[00152] While FIG. 6 illustrates one server device 302, additional server devices that are the same as or similar to server 302 may be communicatively coupled to the network 306. For example, user device 310 may be a server device or another device capable of receiving the selectively shielded device information. In some cases, the user device 310 has access to the key 620 which server device 302 does not have access to. In some instances, the key 622 to which user device 310 has access is the same as, or otherwise permits access to, the key 620 which was used to shield the device data. The user device 310 may belong to a customer of a subscription service administered by an administrator running server 302, and the shielded information may be shielded from the server 302 but not from user device 310, according to some embodiments.

[00153] The shielding component 618 may employ any shielding technology, including multiple levels of shielding technology. Such shielding technology may include, without limitation, encryption, hashing, public key encryption, and/or private key encryption. According to some embodiments, the selective shielding component generates the electronic key 620 using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

[00154] As described above, the selective shielding component may operate to selectively shield portions of the device record which are not intended or not needed to be accessed by all recipients. While the same key 620 may be used to shield portions of device readiness, device performance, and clinical event information, different keys 620 may be used to shield different parts of such device information, in order to facilitate different users or recipients being able to access different portions of the information and/or the associations among the different portions. For example, a first key 624 may be used to shield clinical event information and a second key 622 may be used to shield device performance information, thereby permitting the server 302 which has access to the first key 624 to view and analyze the clinical event information but not the device performance information (without access to key 622), and permitting the user device 310 which has access to the second key 622 to view and analyze the device performance information but not the clinical event information (without access to key 624), according to some embodiments. In other cases, both server 302 and user device 310 have access to

both the first key and the second key. In addition, more than two keys may be used to shield device information.

[00155] Although FIG. 6 illustrates the selective shielding component 618 and key 620 as being associated with medical device 304, some or all of the shielding component 618 may be implemented or instantiated on device 304, server 302, another device, and/or distributed across multiple devices; in addition, shielding component 618 may be implemented or instantiated in one or a combination of hardware, firmware, and software. In some embodiments, the selective shielding component 618 is on server 302; in other embodiments, none of the selective shielding component 618 is on server 302; in yet other embodiments, at least a portion of selective shielding component 618 is on one or a combination of the server 302, the device 304, and/or some other device or memory. For example, in one embodiment information or a portion thereof is shielded or encrypted by shielding component 618 on medical device 304 before the information leaves the medical device 304; however, the shielding component 618 may utilize an algorithm or a portion of an algorithm from another device or from another server in order to implement the shielding. For example, the shielding component 618 may be configured to use the key 620 to encrypt information according to one of a plurality of encryption algorithms, and the shielding component 618 may be configured to receive a selection of one of the plurality of encryption algorithms from another device or the cloud. In other words, in some embodiments not all of the shielding component is on the medical device 304.

[00156] While embodiments of the present disclosure are described with respect to management of medical devices, one of ordinary skill in the art will appreciate, based on the present disclosure, that such systems, methods, and combinations of systems and methods described herein may be used for management of devices, including medical and/or non-medical devices, according to embodiments of the present disclosure.

[00157] Various modifications and additions can be made to the exemplary embodiments discussed without departing from the scope of the present disclosure. For example, while the embodiments described above refer to particular features, the scope of this disclosure also includes embodiments having different combinations of features and embodiments that do not include all of the described features. Accordingly, the scope of the present disclosure is intended to embrace all

such alternatives, modifications, and variations as fall within the scope of the claims, together with all equivalents thereof.

CLAIMS

What is claimed is:

1. A system for remotely managing a medical device, the system comprising:
 - a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information; the selective shielding component configured to create selectively shielded device information by
 - (a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or
 - (b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information,
 - the selectively shielded device information including both
 - (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and
 - (b) the association, and record the selectively shielded device information,
 - a first communication component configured to facilitate transmitting the selectively shielded device information through a network;

a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information, but wherein the server device lacks access to the electronic key.

2. The system of claim 1, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

3. The system of claim 2, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

4. The system of claim 2, the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

5. The system of claim 1, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

6. The system of claim 1, wherein the selective shielding component is further configured to

(a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and

(b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with

the electronic key a second association between such any portion and a rest of the device information.

7. The system of claim 1, wherein the selective shielding component is further configured to

(a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and

(b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information;

wherein the server device lacks access to the second electronic key.

8. The system of claim 1, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the first and second electronic keys.

9. The system of claim 1, wherein the medical device is a portable medical device.

10. The system of claim 1, wherein the medical device is a wearable medical device.

11. A system for remotely managing a medical device, the system comprising:

a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising one or both of device readiness information and device performance information, the selective shielding component

configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a first communication component configured to facilitate transmitting the selectively shielded device information through a network;

a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or both of the device readiness information and the device performance information, but wherein the server device lacks access to the electronic key.

12. The system of claim 11, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

13. The system of claim 12, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

14. The system of claim 12, the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

15. The system of claim 11, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information

with encryption.

16. The system of claim 11, wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.

17. The system of claim 11, wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.

18. The system of claim 11, wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.

19. The system of claim 11, wherein the medical device is a portable medical device.

20. The system of claim 11, wherein the medical device is a wearable medical device.

21. A system for remotely managing a medical device, the system comprising:

a selective shielding component, the selective shielding component active on a medical device, the medical device configured for infrequent use in medical situations, the medical device configured to gather device information from the medical device, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the patient individually and that has been

shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a first communication component configured to facilitate transmitting the selectively shielded device information through a network;

a server device communicatively coupled to the network, the server device comprising a second communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about the clinical event information, but wherein the server device lacks access to the electronic key.

22. The system of claim 21, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

23. The system of claim 22, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

24. The system of claim 22, the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

25. The system of claim 21, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

26. The system of claim 21, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

27. The system of claim 21, wherein the medical device is a portable medical device.

28. The system of claim 21, wherein the medical device is a wearable medical device.

29. A system for remotely managing a medical device, the system comprising:

a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising one or both of device readiness information and device performance information, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or both of the device readiness information and the device performance information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

30. The system of claim 29, wherein the server device is a first server device communicatively coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

31. The system of claim 30, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

32. The system of claim 30, wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.
33. The system of claim 29, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.
34. The system of claim 29, wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.
35. The system of claim 29, wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.
36. The system of claim 29, wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.
37. The system of claim 29, wherein the medical device is a portable medical device.
38. The system of claim 29, wherein the medical device is a wearable medical device.
39. A system for remotely managing a medical device, the system comprising:

a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with

the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about the clinical event information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

40. The system of claim 39, wherein the server device is a first server device coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

41. The system of claim 40, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

42. The system of claim 40, wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

43. The system of claim 39, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

44. The system of claim 39, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the

patient, and biometric data associated with the patient.

45. The system of claim 39, wherein the medical device is a portable medical device.

46. The system of claim 39, wherein the medical device is a wearable medical device.

47. A system for remotely managing a medical device, the system comprising:

a selective shielding component configured to operate on device information gathered by a medical device, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information, the selective shielding component configured to create selectively shielded device information by

(a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or

(b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information,

the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a server device comprising a communication component configured to receive the selectively shielded device information and to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information, wherein at least a portion of the selective shielding component resides with the server device, but wherein the server device lacks access to the electronic key.

48. The system of claim 47, wherein the server device is a first server device communicatively coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

49. The system of claim 48, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

50. The system of claim 48, wherein the communication component is a first communication component, the second server device comprising a second communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

51. The system of claim 47, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

52. The system of claim 47, wherein the selective shielding component is further configured to

(a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and

(b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

53. The system of claim 47, wherein the selective shielding component is further configured to

(a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and

(b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information;

wherein the server device lacks access to the second electronic key.

54. The system of claim 53, wherein the server device is a first server device communicatively coupled to a network, the system further including a second server device communicatively coupled to the network, the second server device having access to the first and second electronic keys.

55. The system of claim 47, wherein the medical device is a portable medical device.

56. The system of claim 47, wherein the medical device is a wearable medical device.

57. A system for remotely managing a medical device, the system comprising:

a medical device configured to gather device information, the device information comprising one or both of device readiness information and device performance information, the medical device configured for infrequent use in medical situations;

a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively shielded device information may be used to generate reports about one or both of the device readiness information and the device performance information without access to the electronic key.

58. The system of claim 57, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

59. The system of claim 57, wherein the medical device comprises a battery, and wherein the device readiness information includes information about a charge level of the battery.

60. The system of claim 57, wherein the medical device comprises electrodes, and wherein the device readiness information includes information about readiness of the electrodes.

61. The system of claim 57, wherein the medical device comprises a defibrillator, and wherein the device performance information includes information about operation of the defibrillator during a clinical event.

62. The system of claim 57, wherein the medical device is a portable medical device.

63. The system of claim 57, wherein the medical device is a wearable medical device.

64. A system for remotely managing a medical device, the system comprising:

a medical device configured to gather device information, the device information comprising clinical event information gathered by the medical device from a patient during a medical event, the medical device configured for infrequent use in medical situations;

a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, the selectively shielded device information including both (a) the any portion of the device information that identifies the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively shielded device information may be used to generate reports about the clinical event information without access to the electronic key.

65. The system of claim 64, wherein the selective shielding component is further configured to shield with the electronic key the any portion of the device information with encryption.

66. The system of claim 64, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

67. The system of claim 64, wherein the medical device is a portable medical device.
68. The system of claim 64, wherein the medical device is a wearable medical device.
69. A system for remotely managing a medical device, the system comprising:
- a medical device configured to gather device information, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information, the medical device configured for infrequent use in medical situations;
 - a selective shielding component, the selective shielding component active on the medical device, the selective shielding component configured to create selectively shielded device information by
 - (a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or
 - (b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information,
 - the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and (b) the association, and record the selectively shielded device information,

a communication component configured to facilitate transmitting the selectively shielded device information through a network, wherein the selectively shielded device information may be used to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information without access to the electronic key.

70. The system of claim 69, wherein the selective shielding component is further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

71. The system of claim 69, wherein the selective shielding component is further configured to

(a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and

(b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

72. The system of claim 69, wherein the selective shielding component is further configured to

(a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and

(b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining

unshielded with the second electronic key a second association between such any portion and a rest of the device information.

73. The system of claim 69, wherein the medical device is a portable medical device.

74. The system of claim 69, wherein the medical device is a wearable medical device.

75. A system for remotely managing a medical device, the system comprising:

a server device communicatively coupled to the network, the server device comprising a communication component configured to receive selectively shielded device information;

the selectively shielded device information having been created by a selective shielding component, the medical device having been configured to gather device information from the medical device, the device information comprising one or more of clinical event information gathered by the medical device from a patient during a medical event, device readiness information, and device performance information; the selective shielding component having been configured to create selectively shielded device information by

(a) shielding with an electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key an association between such any portion and a rest of the device information, or

(b) shielding with an electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the

electronic key an association between such any portion and a rest of the device information,

the selectively shielded device information including both (a) the any portion of the device information that identifies the medical device or the patient individually and that has been shielded with the electronic key and (b) the association, and by recording the selectively shielded device information,

the server device further configured to use the selectively shielded device information to generate reports about one or more of the device readiness information, the device performance information, and the clinical event information, but wherein the server device lacks access to the electronic key.

76. The system of claim 75, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the electronic key.

77. The system of claim 76, wherein the second server device is configured to access the selectively shielded device information from the first server device according to a customer subscription service.

78. The system of claim 76, the second server device comprising a third communication component configured to receive the selectively shielded device information, wherein the selectively shielded device information includes the association.

79. The system of claim 75, the selective shielding component having been further configured to generate the electronic key using one or more of: biographical information of the patient, an identity token of the patient, a driver's license of the patient, and biometric data associated with the patient.

80. The system of claim 75, the selective shielding component having been

further configured to

(a) shield with the electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the electronic key a first association between such any portion and a rest of the device information, and

(b) shield with the electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the electronic key a second association between such any portion and a rest of the device information.

81. The system of claim 75, the selective shielding component having been further configured to

(a) shield with a first electronic key any portion of the device information that identifies the medical device individually while maintaining unshielded with the first electronic key a first association between such any portion and a rest of the device information, and

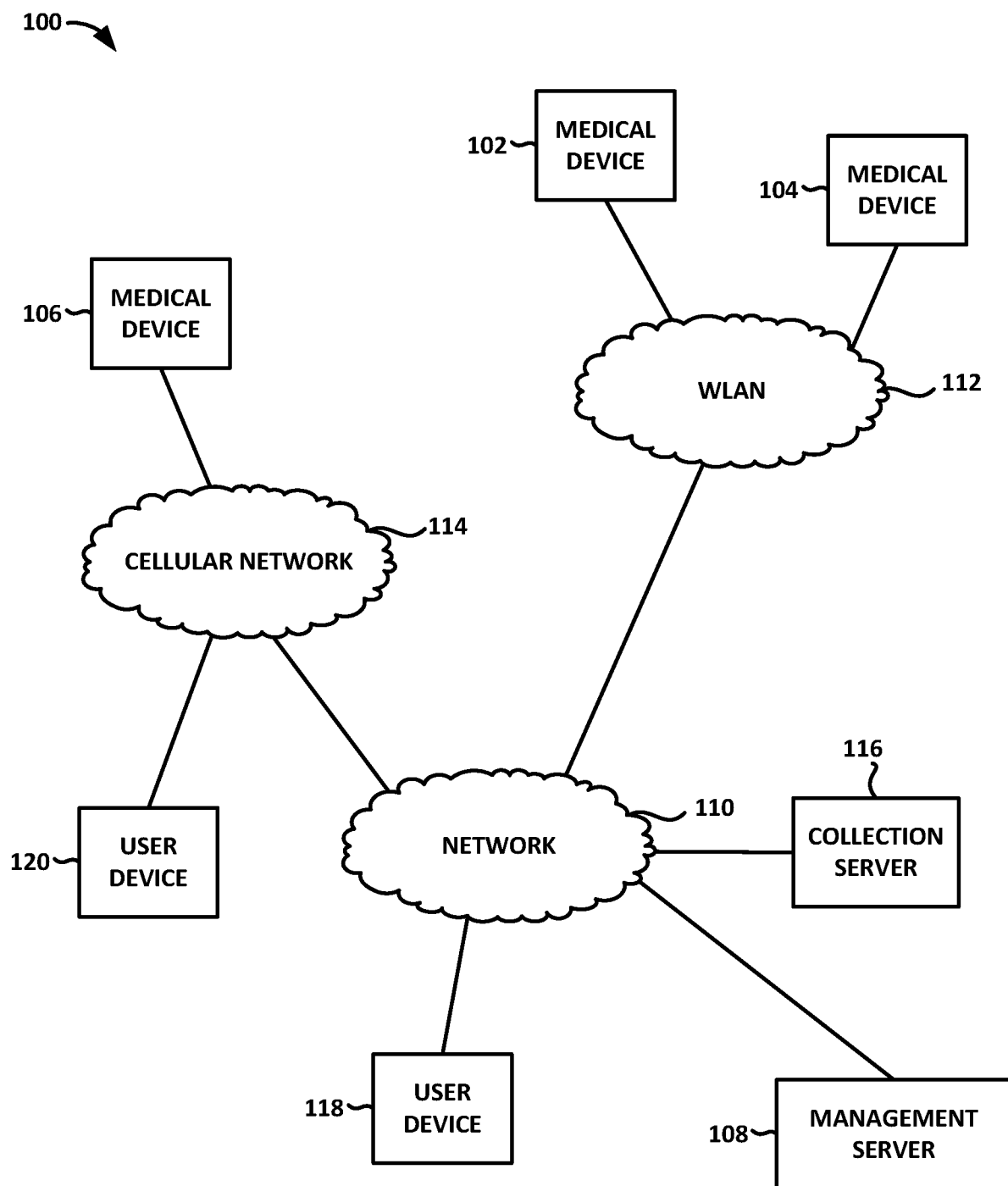
(b) shield with a second electronic key any portion of the device information that identifies the patient individually while maintaining unshielded with the second electronic key a second association between such any portion and a rest of the device information;

wherein the server device lacks access to the second electronic key.

82. The system of claim 75, wherein the server device is a first server device, the system further including a second server device communicatively coupled to the network, the second server device having access to the first and second electronic keys.

83. The system of claim 75, the medical device having been a portable medical device.

84. The system of claim 75, the medical device having been a wearable medical device.

**FIG. 1**

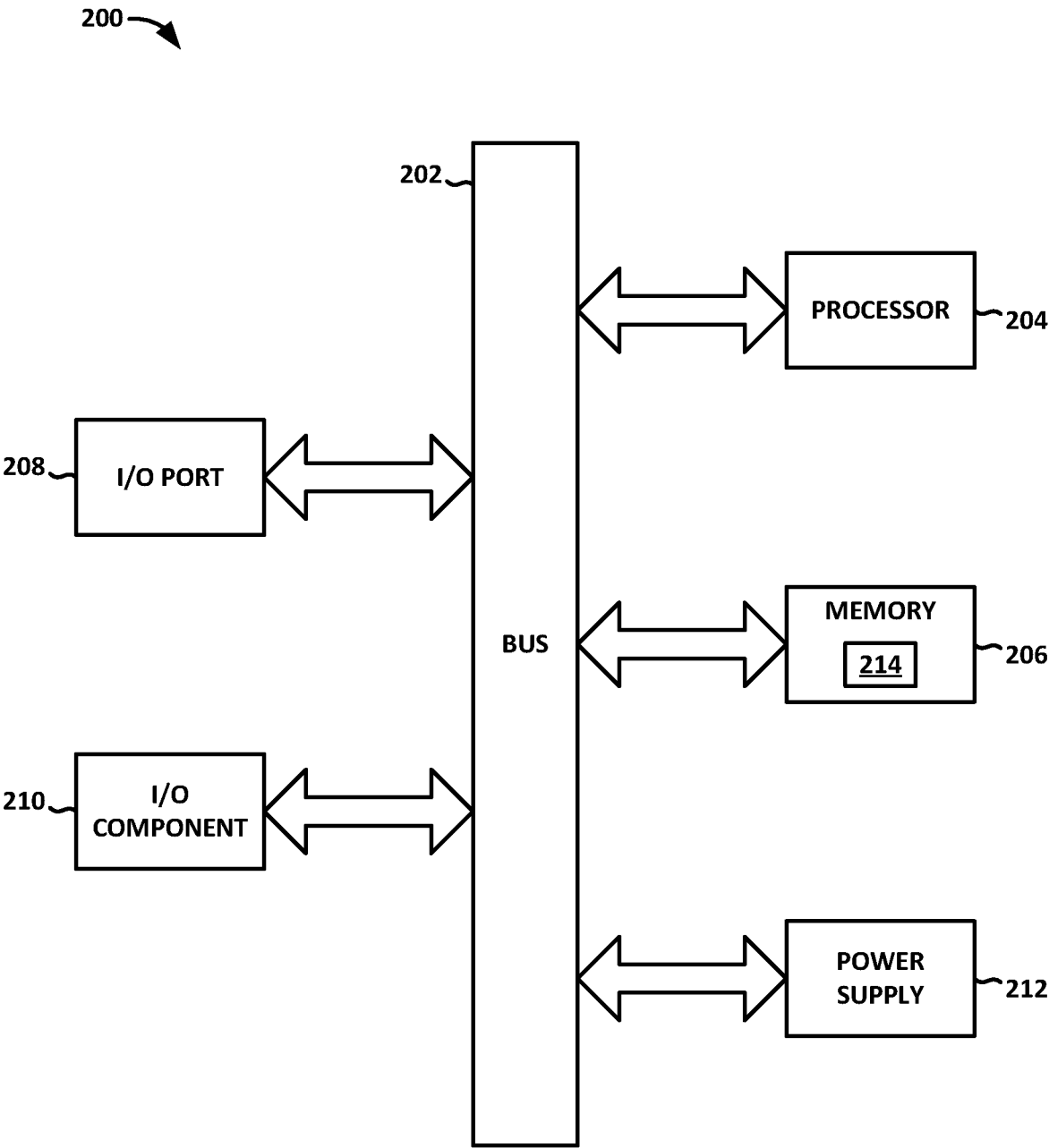


FIG. 2

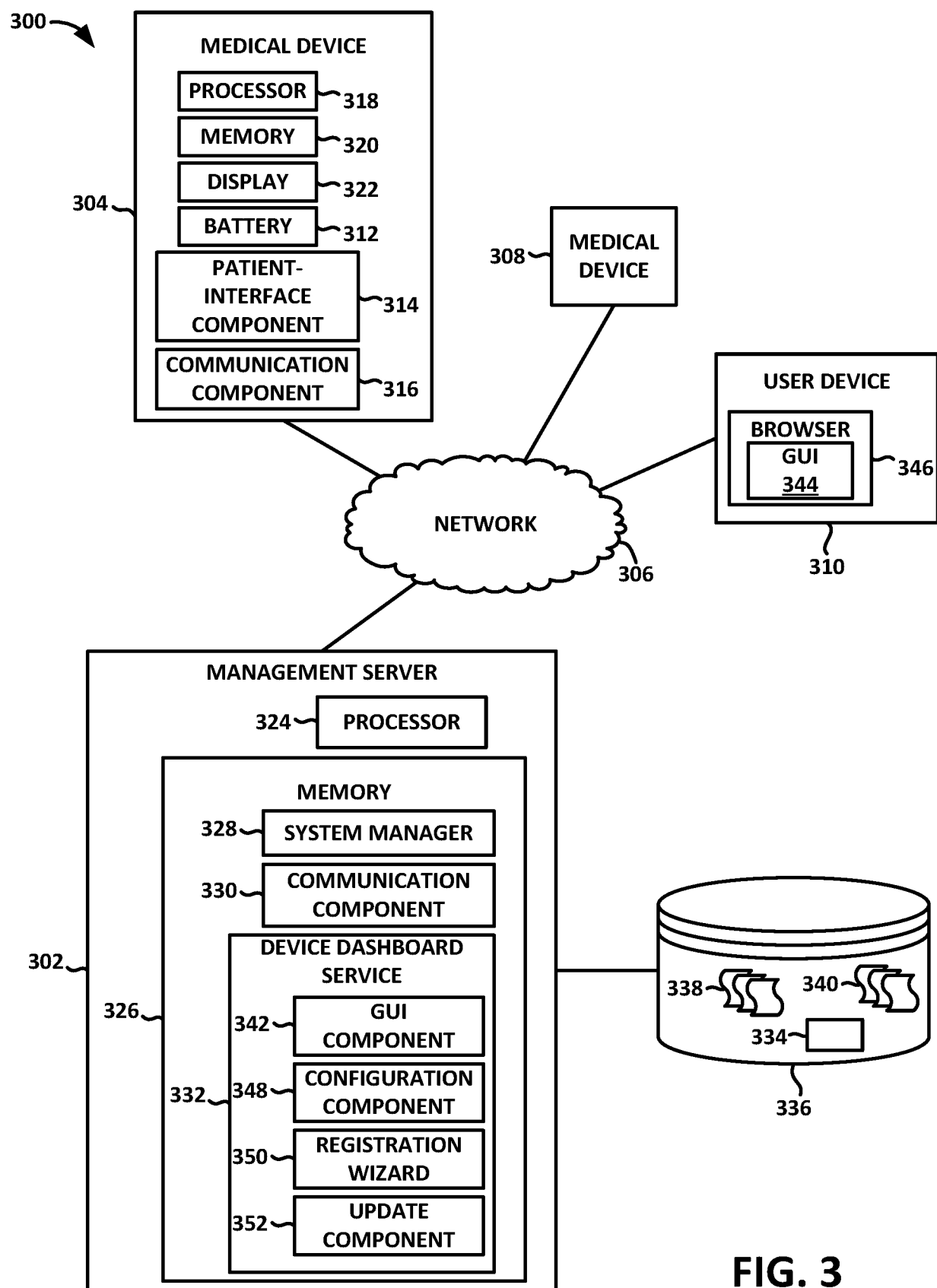
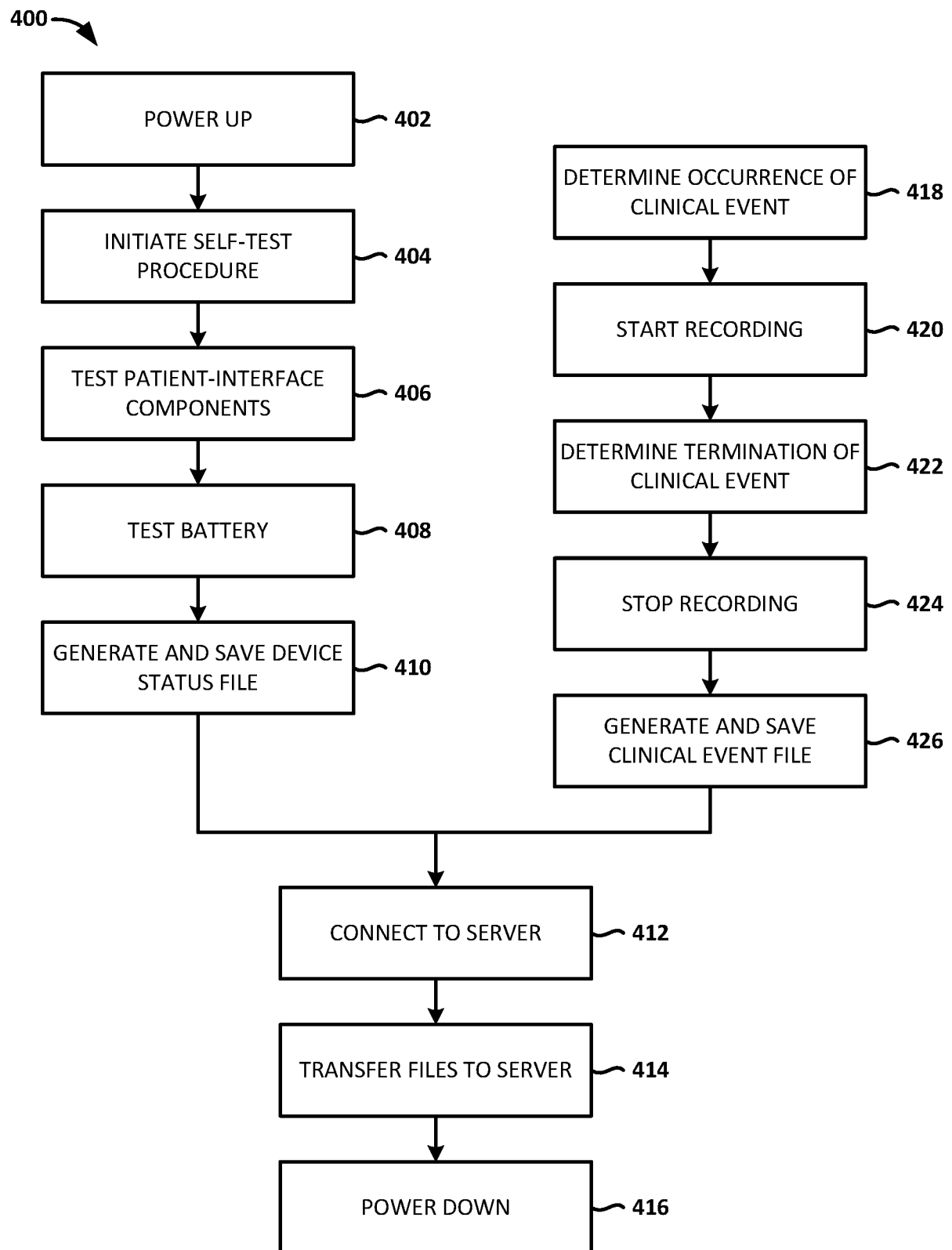
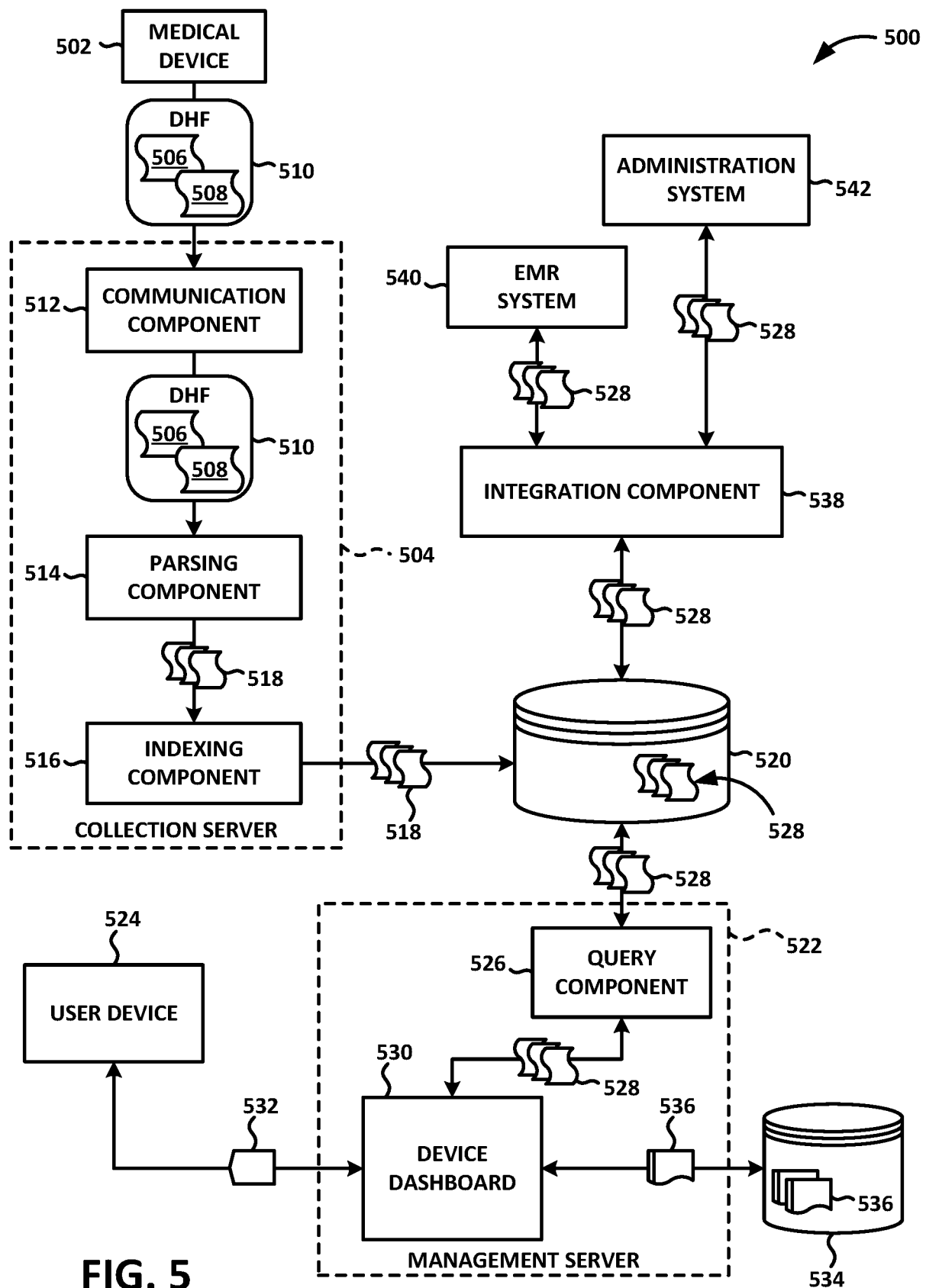


FIG. 3

**FIG. 4**



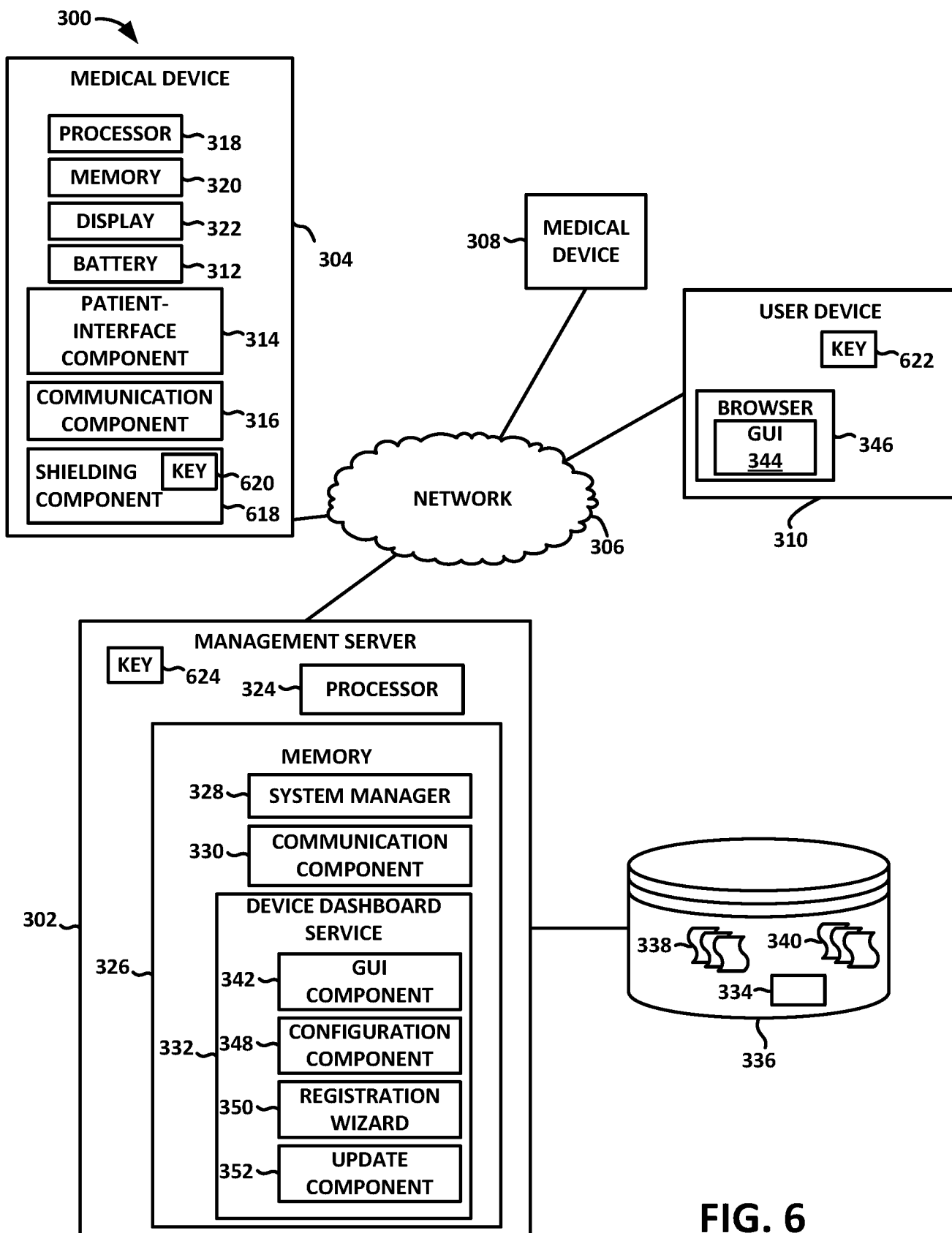
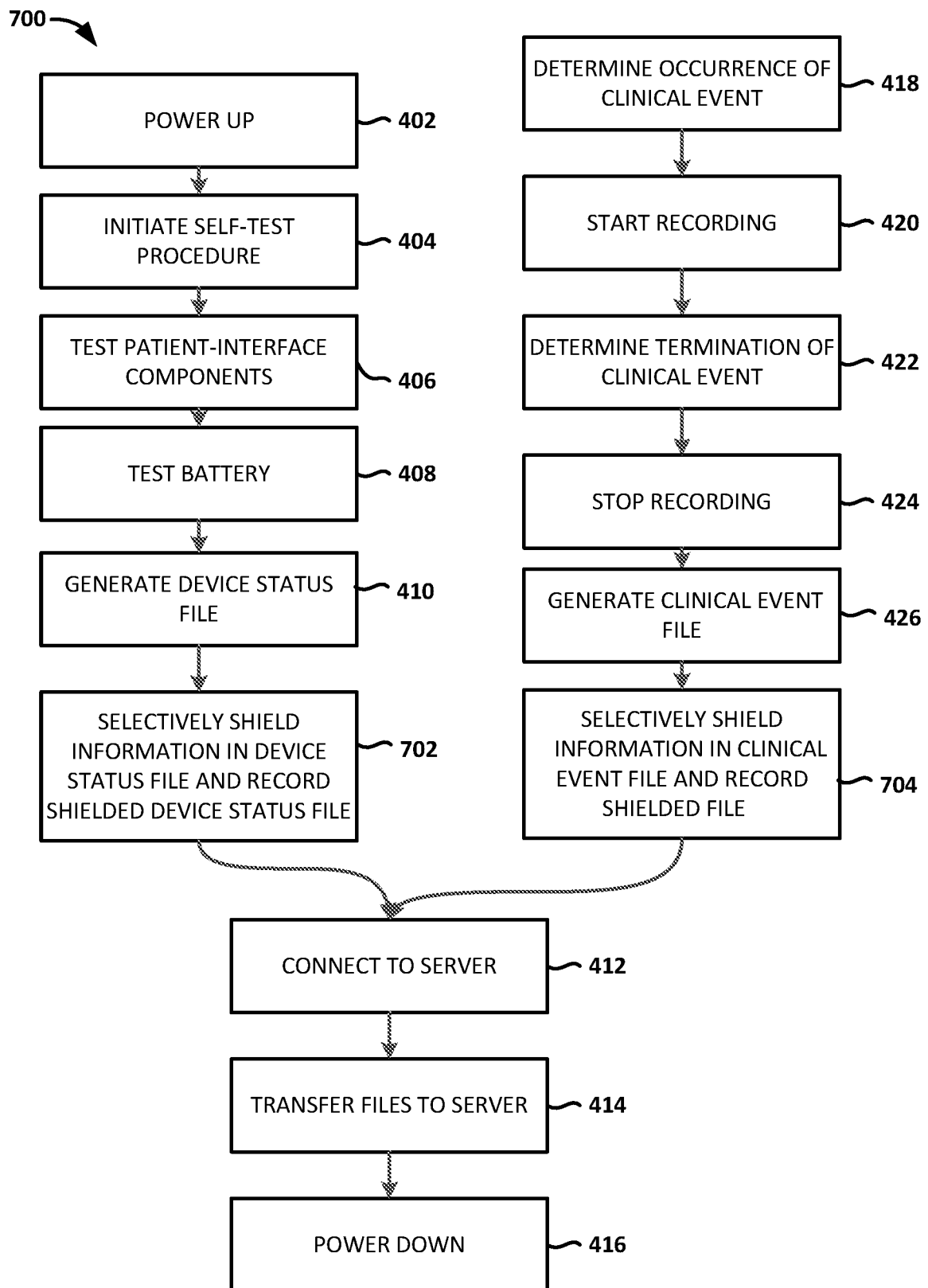


FIG. 6

**FIG. 7**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2016/024796

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G06F 17/30, G06F 21/00, G06Q 10/00, G06Q 50/00, H04K 3/00 (2016.01)

CPC - G06F 19/322, G06Q 50/24, H04K 2203/16, H04K 3/41, H04K 3/45, H04K 3/825 (2016.02)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - G06F 17/30, G06F 21/00, G06Q 10/00, G06Q 50/00, H04K 3/00 (2016.01)

CPC - G06F 19/322, G06Q 50/24, H04K 2203/16, H04K 3/41, H04K 3/45, H04K 3/825, H04K 3/86, H04L 63/0428, H04L 63/06
H04L 63/104 (2016.02)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC - 455/1, 705/3, 707/999.2, 707/E17.009, 713/182, 713/185, 726/27 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar, Google

Search terms used: remotely manage medical device, selective shielding component,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/0231711 A1 (KAIB) 05 September 2013 (05.09.2013), entire document	1-84
Y	US 2013/0097086 A1 (MVISUM, INC.) 18 April 2013 (18.04.2013), entire document	1-84
Y	US 2004/0049233 A1 (EDWARDS) 11 March 2004 (11.03.2004), entire document	16, 34, 59
A	US 2010/0235924 A1 (BULOT et al) 16 September 2010 (16.09.2010), entire document	1-84
A	US 2009/0150451 A1 (GEJDOS et al) 11 June 2009 (11.06.2009), entire document	1-84
A	US 2012/0052794 A1 (MAZAR) 01 March 2012 (01.03.2012), entire document	1-84
A	NEDD. "Self-Diagnostics Digitally Controlled Pacemaker/Defibrillators: A Design Plan for Incorporating Diagnostics and Digital Control in the schema of a Pacemaker/Defibrillator Design." In: NAVAL POSTGRADUATE SCHOOL MONTEREY CA DEPT OF COMPUTER SCIENCE. September 2005 (09.2005) Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA439649>, entire document	1-84



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

27 May 2016

Date of mailing of the international search report

05 JUL 2016

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