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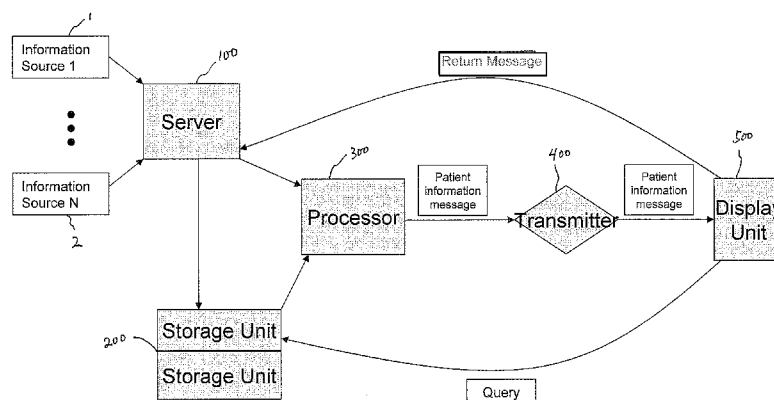
(54) **Title:** PATIENT INTERACTIVE INFORMATION INTERFACE

Fig. 1

(57) **Abstract:** The present invention is a system for dynamically informing a patient about the patient's healthcare progress or status. The system includes a machine-readable storage unit that stores patient information; a server that receives patient information; a processor that processes the patient information to dynamically generate a patient information message; a transmitter for disseminating the generated patient information; and a display unit to receive and display the patient information message. In another aspect, the present invention is a computer-implemented method for dynamically informing a patient about the patient's healthcare progress. The method includes steps of providing stored patient information about the patient; receiving patient information about the patient at a server; processing the received patient information using a processor to dynamically generate a patient information message; transmitting the generated patient information message to a display unit associated with the patient; and displaying the patient information message on the display unit.

## PATIENT INTERACTIVE INFORMATION INTERFACE

### **BACKGROUND OF THE INVENTION**

#### **[0001] 1. Field of the Invention**

**[0002]** The present invention relates generally to healthcare management software. More specifically, the present invention is directed to a dynamic system and method for providing patients with real time information on their healthcare.

#### **[0003] 2. Description of the Related Technology**

**[0004]** Effective communication between patients and healthcare providers is essential to the smooth functioning of complex clinical environments. Communication failures in the health system have been reported to be a large contributor to adverse clinical outcomes, such as improper diagnosis and delayed or improper medical treatment. With the recent increases in healthcare costs, physicians are pressured to see more patients and spend less time on each one. The patients often feel that healthcare providers have communicated insufficient information to them.

**[0005]** Communication in the emergency departments (EDs) may present even bigger challenges. EDs are for dealing with emergency situations, and are characterized by high pressure, constant interruptions and a high intensity atmosphere in which it can be extremely stressful to work. At anytime of the day at an ED, a physician may order a test, receive a test result, or prescribe medication for a patient. The pressure to complete tasks quickly often leaves the physician little time to inform or explain to the patient the medical conditions, risk factors, or interpretation or reason for a test to the patient. In addition, interruptions for higher priority patients may inevitably delay communication. As a result, the patient may feel frustrated because of a lack of information on their medical condition, or a lack of understanding of test results.

[0006] Research has indicated that one of the primary causes, if not the major cause, of patient dissatisfaction in our nation's EDs is the level of communication that often exists between healthcare providers and patients. In addition, provision of adequate information to patients will keep the patients up-to-date on their care and encourage communication between the healthcare provider and patients. This has been shown to significantly increase patients' perception of the quality of care and overall satisfaction with the healthcare services. A method and system that would provide ample individualized information to the patients in a timely fashion would thus greatly reduce their frustration.

[0007] Technology in the healthcare setting has made remarkable advances in the last decade. For one thing, the nationwide implementation and use of the electronic medical record is beginning. This allows for centralized storage of the huge amount of information and data collected on every patient who enters the system. Despite the advances made in the electronic capture of medical information, direct communication of this information to the patient continues to be a problem, even though many healthcare providers access and use specific pieces of data for other purposes. The electronic medical records are a valuable source for keeping the patient informed about their healthcare progress and status.

[0008] In view of the communication difficulties in healthcare settings, several systems and methods have been developed that tap into the information in electronic medical records to enhance communication with patients. U.S. Patent application publication no. 2007/0038471 discloses software that receives data on test results, and after retrieving additional data about the patient from electronic medical record database, autopopulates a medplate (letter template). Some text is also included in the medplate that help the patient to interpret the test data. The populated medplate is then reviewed by a physician and transmitted to the patient. The final medplate may include background information on how to interpret a test result. The patient is not provided with any device for receiving the message, nor is the patient able to interact with the system except by replying the letter.

**[0009]** U.S. Patent application publication no. 2010/0223073 discloses a system that may receive patient related information from multiple sources, such as a physician, a nurse, a lab service, a pharmacy, etc. These parties can enter information about the patient into the system. The information is then broadcast to any component that subscribes to information about that particular patient. Subscribers may include the primary physician, the nurse on duty, or a lab technician. The patient may also be one of the subscribers and receive information. The patient may be able to interact with the system by sending a response, which will be broadcast to all the subscribers. Messages tend to be short, such as “Chest X-ray on Mr. Smith is completed,” “Blood glucose 187 mg/dl.” No context appears to be provided for helping interpret the message.

**[00010]** U.S. Patent no. 7,490,048 discloses a computer-implemented method for processing a request to alter/modify a patient’s healthcare record, automatically generating a message regarding the alteration/modification, and transmitting the message regarding the alteration to the patient. The message contains the actual change to the patient’s healthcare record. In case of physician ordering a test for a patient, the order is entered into the healthcare record, which modifies the healthcare record. A message is automatically generated and sent to the patient. U.S. Patent application publication no. 2008/0077431 discloses a system that helps to ensure that a patient is following a physician’s advice on procedures and medications. The system has a server hosting an electronic medical record database. A physician can set up alerts to a patient as to when a procedure needs to be performed, or for a time to take medication, etc. The patient is provided with a communication device, such as a PDA, to receive the alerts. The patient receives the alerts at the predetermined time. After receiving the message, the patient can use the provided communication device to inform the physician that the procedure has been performed, or medication has been taken.

**[00011]** These systems and methods are still not sufficient for providing real time communications to patients about their healthcare progress and status. In addition, there is a

need to present context or background information to the patient to help them interpret the communications.

### **SUMMARY OF THE INVENTION**

[00012] In a first embodiment, the present invention is a system for dynamically informing a patient about the patient's healthcare progress or status. The system includes a machine-readable storage unit that stores patient information; a server that receives patient information about the patient from one or more information sources; a processor that processes the patient information received by the server to dynamically generate a patient information message based on the received patient information; a transmitter for disseminating the generated patient information to a display unit; and a display unit associated with the patient which receives and displays the dynamically generated patient information message.

[00013] In another aspect, the present invention is a computer-implemented method for dynamically informing a patient about the patient's healthcare progress. The method includes steps of providing stored patient information about the patient on a machine-readable storage unit; receiving patient information from one or more information sources at a server; processing the received patient information using a processor to dynamically generate a patient information message; transmitting the generated patient information message to a display unit associated with the patient; and displaying the patient information message for the patient on the display unit.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[00014] Fig. 1 is a schematic diagram illustrating a system configured in accordance with one aspect of the present invention.

[00015] Fig. 2 is a flow chart that illustrates a method of providing dynamic patient information messages to a patient.

**[00016]** Fig. 3 shows an example of an emergency department (ED) patient flow process indicating the types of activities that can be used to generate patient information messages.

**[00017]** Fig. 4 is a flow chart showing an example of the various steps which may be carried out by a patient electronic interaction module and patient information messages a patient may receive as his healthcare progresses in a typical ED.

**[00018]** Fig. 5 is a schematic diagram showing an example of the steps that may be carried out as part of an ED clinical evaluation of a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

**[00019]** Fig. 6 is a schematic diagram showing an example of the steps that may be carried out as part of an ED radiology evaluation of a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

**[00020]** Fig. 7 is a schematic diagram showing an example of the steps that may be carried out as part of an ED laboratory evaluation of a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

**[00021]** Fig. 8 is a schematic diagram showing an example of the steps that may be carried out as part of an ED radiology/laboratory result analysis of a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

**[00022]** Fig. 9 is a schematic diagram showing an example of the steps that may be carried out as part of an ED treatment of a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

**[00023]** Fig. 10 is a schematic diagram showing an example of the steps that may be carried out as part of a hospital admission process for a patient who will be admitted to the hospital from the ED and the messages and trigger events for generating such messages and the patient interactions with the system.

[00024] Fig. 11 is a schematic diagram showing an example of the steps that may be carried out as part of an ED discharge process for a patient and the messages and trigger events for generating such messages and the patient interactions with the system.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[00025] For illustrative purposes, the principles of the present invention are described by referencing various exemplary embodiments. Although certain embodiments of the invention are specifically described herein, one of ordinary skill in the art will readily recognize that the same principles are equally applicable to, and can be employed in other systems and methods. Before explaining the disclosed embodiments of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of any particular embodiment shown. Additionally, the terminology used herein is for the purpose of description and not of limitation. Furthermore, although certain methods are described with reference to steps that are presented herein in a certain order, in many instances, these steps may be performed in any order as may be appreciated by one skilled in the art; the novel method is therefore not limited to the particular arrangement of steps disclosed herein.

[00026] It must be noted that as used herein and in the appended claims, the singular forms “a”, “an”, and “the” include plural references unless the context clearly dictates otherwise. Thus, for example, reference to “a server” may include a plurality of servers and equivalents thereof known to those skilled in the art, and so forth. As well, the terms “a” (or “an”), “one or more” and “at least one” can be used interchangeably herein. It is also to be noted that the terms “comprising”, “including”, “composed of” and “having” can be used interchangeably.

[00027] As utilized herein, terms “component,” “system,” and the like are intended to refer to a computer-related entity, either hardware, software (e.g., in execution), and/or firmware. For example, a component can be a process running on a processor, a processor, an object, an executable, a program, and/or a computer. By way of illustration, both an application running on a server and the server can be a component. One or more components can reside within a

process and a component can be localized on one computer and/or distributed between two or more computers.

**[00028]** Furthermore, the claimed subject matter may be implemented as a method, apparatus, or article of manufacture using standard programming and/or engineering techniques to produce software, firmware, hardware, or any combination thereof to control a computer to implement the disclosed subject matter. The term “article of manufacture” as used herein is intended to encompass a computer program accessible from any machine-readable device, carrier, or media. For example, machine-readable media can include but are not limited to magnetic storage devices (e.g., hard disk, floppy disk, magnetic strips, etc.), optical disks (e.g., compact disk (CD), digital versatile disk (DVD), etc.), smart cards, and flash memory devices (e.g., card, stick, key drive, etc.).

**[00029]** A machine-readable media shall be understood to mean any article of manufacture that contains data that can be read by a computer. Such machine-readable media includes but is not limited to magnetic media, such as a floppy disk, a flexible disk, a hard disk, reel-to-reel tape, cartridge tape, cassette tape or cards; optical media such as CD-ROM, DVD-ROM and writeable compact disc; magneto-optical media in disc, tape or card form; paper media, such as punched cards and paper tape. The machine-readable media are intended to comprise, without being limited to, these and any other suitable types of memory. In addition, it is to be appreciated that the machine-readable media can be a server, a database, a hard drive, and the like.

**[00030]** In the system of the present invention it is also possible that information will be provided from a remote location via a carrier wave (e.g. wirelessly) which can be read by the system of the invention and thus embodiments of this type are also included herein.

**[00031]** Input devices are any devices that capable of taking information into a server or a computer, include, but are not limited to, a pointing device such as a mouse, trackball, stylus, touch pad, keypad, keyboard, microphone, e.g. by voice command and/or speech recognition, joystick, game pad, satellite dish, scanner, monitor such as a touch screen monitor, tuner card,

digital camera, digital video camera, web camera, data acquisition devices, particularly those associated with medical equipment or medical analysis devices and the like.

**[00032]** The present invention is a dynamic system that enables real time communication of information from healthcare providers to patients in a healthcare setting, especially an ED. The system is not limited to use in an ED, however, and may also be applied to any type of healthcare setting, including, for example, any outpatient department or any inpatient environment of a healthcare setting. The system is schematically represented in Figure 1. The system includes a server 100 that is operably linked to one of more information sources 1 and 2, where patient information is entered or gathered and then transferred to server 100. Server 100 is, in turn, connected to a storage unit 200, where machine-readable media stores patient information. The system also includes a processor 300, which may receive patient information from either the server 100, or the storage unit 200, or both. The processor 300 generates a patient information message based on the received patient information. The patient information message is then sent to a transmitter 400, which disseminates the patient information message to a display unit 500. The display unit 500 is readily accessible by the patient to receive the generated patient information message. The dynamic system can generate patient information messages based on the patient information entered at the information sources 1 and 2 in real time.

**[00033]** The information sources 1 and 2 are devices where patient information can be entered into the system. The information sources 1 and 2 may be remotely connected with server 100 through a wired or wireless connection. The information sources 1 and 2 are preferably placed at locations where patient information is usually generated, such as laboratories, a physician's desk, nurse station, or X-ray room, etc.

**[00034]** The patient information may include any information a healthcare provider may collect or generate regarding a patient who uses the healthcare facility. Some examples are a clinical evaluation, a laboratory evaluation, a radiologic evaluation, ultrasound tests, electrocardiograms, stress tests, a treatment, a test request, a treatment result, a diagnosis, a

discharge decision, an admission decision, a patient decision, a location of the patient, and combinations thereof. The information sources 1 and 2 can be a computer, a terminal, a hand-held device including PDAs (personal digital assistants), tablet computer, smart phones, laptops, handheld communication devices, handheld computing devices, and/or any other suitable device(s) and the like, or any other devices known to those skilled in the art which can be used to provide input signals to the server 100. Information sources 1 and 2 may also be data acquisition devices associated with medical testing or analysis equipment.

**[00035]** The information sources 1 and 2 may be equipped with input devices. Patient information can be manually entered into the system through the information sources 1 and 2 by persons such as lab technicians, physicians, physical therapists, radiologists, or pharmacists. In the case where the input device captures voice signals, voice recognition software may be installed in the information sources 1 and 2.

**[00036]** Patient information can also be automatically entered into the system through the information sources 1 and 2, which may be capable of reading patient information from another device/instrument automatically. The automatic data entry mode can include a standardized data format. Further, the automatic data entry mode can be used in connection with a lab computer, a portable monitor, radiology data, a portable lab computer, an electronic medical record, admission information, and so forth. The patient information can also be entered the system through a combination of the manual and automatic processes.

**[00037]** Information can also be obtained by the server 100 or processor 300 from other information sources such as a patient's permanent medical record, records kept on machine readable media by the patient or at a remote location, from the internet, from other sources at remote locations that can be accessed via the internet or other means, such as libraries, collections of periodicals, reference materials, etc.

**[00038]** In an exemplary embodiment, a medical instrument, such as an electrocardiograph, can be used as an information source 1 and 2. The data generated by the medical instrument may be directly sent to the server 100.

**[00039]** The server 100 receives the patient information that is entered through information sources 1 and 2. The server 100 can be any of a number of servers known to those skilled in the art that are intended to be operably connected to a network so as to operably link to a plurality of information sources 1 and 2 that can be used to send patient information to the server.

**[00040]** As illustration, the server typically includes a central processing unit including one or more microprocessors such as those manufactured by Intel or AMD, random access memory (RAM), mechanisms and structures for performing I/O operations, a storage medium such as a magnetic hard disk drive(s), solid state drives and flash drives, and an operating system for execution on the central processing unit. The hard disk drive of the server may be used for storing data, client applications and the like utilized by client applications. The hard disk drive(s) of the server also are typically provided for purposes of booting and storing the operating system, other applications or systems that are to be executed on the server, paging and swapping between the hard disk and the RAM. It is envisioned that the server can be or otherwise utilize multiple servers in cooperation to facilitate greater performance and stability of the subject invention by distributing memory and processing in a conventional manner.

**[00041]** The server 100 may be capable of determining whether the patient information received from information sources 1 and 2 needs to be saved at the storage unit 200 as part of permanent medical record for the patient. The patient information may or may not need to be made part of permanent record for the patient. For example, a nurse may send the patient a general greeting message, or introduction to the physicians and nurses on duty at the time of care, through an information source 1 and 2 at the nurse station. This type of generic information is not patient specific and may not need to be included as part of permanent medical record for the patient.

**[00042]** When the server 100 determines, through a set of stipulated rules, that the patient information received from the information sources 1 and 2 needs to be made part of permanent medical record for the patient, the server 100 may then store the patient information in the

permanent medical record kept on the storage unit 200. Before the server 100 sends the patient information to storage unit 200, it may reformat, condense, or otherwise preprocess the patient information for more efficient storage or to adapt the patient information to the format of the permanent medical record. On the other hand, if the server 100 determines that the patient information need not be made part of the permanent medical record for the patient, the server 100 may directly send the patient information to the processor 300, without passing the patient information to the storage unit 200. Processor 300 or another processor may be employed for the purpose of determining whether patient information is to be added to the permanent medical record.

**[00043]** The storage unit 200 can be any type of machine-readable media where the patient information may be stored. The storage unit 200 can optionally be multiple storage units working in cooperation to store the patient information. The patient information saved on storage unit 200 may include one or more of a clinical evaluation, a laboratory evaluation, a radiologic evaluation, a treatment, a test request, a treatment result, a diagnosis, a discharge decision, an admission decision, a patient decision, a location of the patient, and combinations thereof. The storage unit 200 may also store non-patient information. The non-patient information may include, for example, background information about different illnesses, background information about the medical tests, caregiver information, treatment information, intake information, admission information, discharge information, medication information, information for interpretation of test results, instructions for the patient, hospital procedures and combinations thereof.

**[00044]** In an exemplary embodiment, the storage unit 200 may include multiple storage units, with at least one storage unit that stores patient information and at least one storage unit that stores non-patient information.

**[00045]** In another exemplary embodiment, one or both of the server 100 and storage unit 200 are part of a hospital record management system which stores and updates patient information about patients treated in the hospital.

**[00046]** The processor 300 is capable of processing the patient information to dynamically generate a patient information message for the patient. The processor 300 may receive the patient information from either the server 100, or storage unit 200, or both. In one embodiment, the server 100 may directly send the patient information to the processor 300. In another embodiment, the processor 300 may receive the patient information exclusively from the storage unit 200 and all the patient information received by the server 100 has to go through the storage unit 200. In either case, the historical patient information and non-patient information are typically retrieved from the storage unit 200 by the processor 300.

**[00047]** The processor 300 may preferably filter the patient information received. Not all received patient information warrants an immediate communication to the patient, examples being updates on patient's home address and phone numbers. The processor 300 should first be notified by server 100 that patient information about a particular patient has been received or updated. The processor 300 then determines the nature of the patient information entered through the information sources 1 and 2. If the patient information requires a patient communication, judged by a set of stipulated rules, the processor 300 would then carry out the next task of generating a patient information message. Alternatively, if no communication is required by the patient information, the processor 300 will not generate a patient information message.

**[00048]** Once the processor 300 determines that a communication to the patient is required, the processor 300 may optionally initiate a query to the storage unit 200 to retrieve historical patient information, non-patient information, or both. The processor 300 then generates a patient information message based on the newly received patient information, optionally in combination with historical patient information, and/or non-patient information.

**[00049]** Patient information messages will typically require some level of processing by processor 300 in embodiments where the system of the present invention is employed as an add-on or component of an existing hospital recordkeeping system. Thus, in such embodiments, the existing recordkeeping system can be employed for collecting and storing

information from the admission department, discharge department, medical staff, laboratories, pharmacy and any other sources of information that may be encountered in a hospital setting.

**[00050]** When a new item of information is received by the hospital recordkeeping system regarding the progress of a patient's ED care, for example, the recordkeeping system can be programmed to notify processor 300 that information has been received, provide a copy of the information to processor 300 and identify to processor 300 the patient to which the information pertains.

**[00051]** Thus, when processor 300 receives information from, for example, a server 100 of a hospital recordkeeping system, processor 300 may first carry out a step of deciding whether a patient information message is required for the received information. If not, processor 300 can simply disregard the received information and take no further action. If, however, a patient information message is required or desirable, then processor 300 will take the received information and generate a suitable patient information message.

**[00052]** The patient information message may include identity of the patient, the patient information newly entered at one of the information sources 1 and 2, historical patient information, and any non-patient information that may be necessary for the patient to understand the patient information message.

**[00053]** In yet another exemplary embodiment, patient information messages can be color coded for displaying at the display unit 500, according to the nature of the message. Thus patient information message about general information may be coded in green, such as nurse's greeting, introduction to the care giving team. The patient information message about ordering of a test or exam may be coded in amber. The patient information message about test results, diagnosis etc., may be coded in red.

**[00054]** Generation of the patient information message by processor 300 may involve a variety of activities. In one embodiment, receipt of certain types of information may cause processor 300 to select a standard patient information message for that type of information for

transmission to the patient. Alternatively, processor 300 may have to obtain additional information and combine it with the new information received or a processed version thereof. Various forms of processing of a number of different types of information to generate patient information messages are described below in reference to Figures 5-11. Processor 300 may also omit certain types of information, such as a particularly egregious test result or diagnosis, preferring direct presentation of such information to the patient by the caregiver. Processor 300 may also alter the presentation of the received information for the patient information message, for example, to present the information in a more user-friendly form, larger type, etc.

**[00055]** The generated patient information message is automatically sent to a transmitter 400. The transmitter 400 disseminates the generated patient information message to the right recipient. The transmitter 400 sends the patient information message according the routing information embedded in the patient information message to a display unit 500 associated with the right patient. The routing information may be added to the patient information message by different components of the system in present invention. For example, the routing information may be added to the patient information message by the server 100 or the processor 300.

**[00056]** The patient information message may be optionally encrypted by a security component, which can be installed on one or both of processor 300 and transmitter 400. Further, different levels of encryption can be utilized by the security component as a function of the nature of the patient information message (e.g., stronger encryption can be applied to a message that includes a patient's diagnosis as compared to a message that indicates a patient has arrived at a healthcare professional's office,...). When the patient information message is encrypted, the display unit 500 may include corresponding encrypting software, which decrypts the patient information message before it is displayed on the display unit 500.

**[00057]** In another exemplary embodiment, the server 100, processor 300, and transmitter 400 can optionally be a single computer. Alternative, any two of the server 100, processor 300, and transmitter 400 can be a single computer. In yet another embodiment, each of the server 100, processor 300, and transmitter 400 can be a separate computer. In a further

embodiment, the storage unit 200 may be part of the memory, such as hard drives, solid state drives and flash drives, of one of the server 100, processor 300, or transmitter 400.

**[00058]** The display unit 500 receives the patient information message from the transmitter 400. The display unit 500 can be one of the many devices that the person skilled in the art known to be capable of displaying text and/or graphic information. Some examples of such devices include TV monitors, PDAs, computers, laptops, and even mobile phones. The display unit 500 can be connected to the system through wired or wireless connections.

**[00059]** The display unit 500 that is associated with the patient receives the transmitted patient information message. In one embodiment, each patient that is admitted to the healthcare facility such as an ED is assigned a display unit 500, which is registered in the system as the destination to receive all the communications about that patient. Typically, this display unit 500 is located in the room in the ED to which the patient is assigned upon intake. Two exemplary means can be used to register the display unit 500. One way is that an administrator can register the display unit 500 in the system to receive patient information messages for a patient. Alternatively, display unit 500 may include a function that allows a patient to register the display unit 500 in the system directly using the display unit 500.

**[00060]** Display units 500 are preferably set up at locations within the healthcare facility that are easily accessible by the patient, such as an urgent care facility, ED, patient room in hospital, or a waiting room. However, if the display unit 500 is a portable device, such as tablet computer or PDA, such location preferences are unnecessary. It is important that the display unit 500 is operated in a manner which ensures patient confidentiality. Thus, typically a means will be provided to ensure that the patient is present at the location of the display unit 500 when a message is displayed. The patient should also be given the option to turn off the display unit 500 in certain situations, such as when others are present with whom the patient may not wish to share the information contained in the messages. Alternatively, the system can be designed to require the patient to make an affirmative request or open an information

message and an authentication means may be provided to authenticate the identity of the patient to assure patient confidentiality.

**[00061]** The display unit 500 can be automatically turned on when it receives a patient information message, or be programmed to stay in standby mode and only turned on when the patient manually turns it on. The patient information message is displayed on the display unit 500. The routing information, other than the patient's identity, is preferably not displayed.

**[00062]** In one embodiment, the display unit 500 may optionally be connected to the internet. The patient may use the display unit 500 to browse the web in order to find out more information about the subject of the messages from, for example, a web-based dictionary or other suitable source. In one embodiment, browsing is limited to particular sources of information to ensure that the patient obtains information about the subject of a message from a reliable source. The patient's access to the web can alternatively be limited in any other suitable manner, e.g. to only the hospital site or approved sites, to block certain sites, etc.

**[00063]** The display unit 500 may be capable of interacting with either the server 100 or the storage unit 200, through an included input device. In one embodiment, the display unit 500 is a touch screen monitor where the patient can touch the screen to request further information from the storage unit 200, or send back a message to the server 100.

**[00064]** The display unit 500 may be capable of sending a reply message to the server 100. The reply message may be simply a confirmation of receipt and proper display of the patient information message, which can optionally be logged by the server 100. The reply message to server 100 can also be feedback from the patient or another person located at display unit 500 about the patient information, which the server 100 may optionally store or forward to a suitable recipient such as the attending physician, nurse on call, etc. Display unit 500 may include a means to allow a patient to selectively route a reply message to one or more destinations connected to server 100. The server 100 may also optionally forward the feedback to the person who entered the original patient information using the information sources 1 and 2. The reply message may optionally also be selected from a list of pre-

composed messages to facilitate patient interaction with display unit 500 or provide a patient with a limited number of options in order to influence the type of information to be returned by the patient. For example, upon receipt of a medication, the patient can be prompted for feedback on adverse reactions and provided a list of suitable choices to describe such reactions.

**[00065]** The display unit 500 may be also capable of making a query to the storage unit 200 for retrieving more information from the storage unit 200. The queried information may be more patient information about the test that is the subject of the current communication, or prior tests the patient had. The queried information may also be non-patient information that can be used to interpret the test results, or more detailed information about the ordered test, just naming a few examples. The query may be standard queries that can be selected by means such as touch-buttons, check boxes, or the like. Alternatively, the query may be composed by the patient or physician using an input device of the display unit 500. The information retrieved by the query from storage unit 200 may then be displayed on the display unit 500.

**[00066]** The dynamic system of present invention may have a texting mode, which allows a healthcare provider such as a physician to directly text a patient. The healthcare provider can use an information source 1 and 2, preferably a mobile phone, to send a text message to a patient. The text message will be flagged accordingly, which permits the text message passing through server 100, processor 300, and transmitter 400. The text message may instantaneously appear on the display unit 500 that is associated with the patient without any substantial alterations or processing by processor 300.

**[00067]** In another aspect, the present invention is a method that provides patients with dynamic patient information about their healthcare in healthcare facilities, such as EDs. The method, as represented in Figure 2, includes steps of providing stored patient information about the patient on a machine-readable storage unit 200; receiving patient information about the patient from one or more information sources 1 and 2 at a server 100; processing the received patient information using a processor 300 to dynamically generate a patient

information message responsive to the received patient information using the stored patient information; transmitting the generated patient information message by a transmitter 400 to a display unit 500 that is associated with the patient; and displaying the patient information message for the patient on the display unit 500.

**[00068]** The step of receiving the patient information 102 is accomplished by the server 100. The patient information is originated from one or more information sources 1 and 2. The server 100 may receive the patient information through a direct wire connection between the server 100 and information sources 1 and 2, or the patient information may travel through an internal computer network (intranet) from the information sources 1 and 2 to the server 100, or the patient information may be received through wireless connection between the information sources 1 and 2, and the server 100.

**[00069]** As discussed above, the server 100 used to receive the patient information can be any type of servers known to those skilled in the art that are intended to be operably connected to a network so as to operably link to a plurality of terminals that can be used to send patient information to the server 100. It is to be understood that multiple servers may be used to accomplish the function of receiving the patient information in order to gain higher efficiency.

**[00070]** The method may include an optional step of capturing patient information by the information sources 1 and 2. The information sources 1 and 2 may be equipped with at least one input device. Through the input device, the information sources 1 and 2 may capture the patient information entered at the input device. Alternatively, the information sources 1 and 2 may also capture the patient information through a direct connection to another device such as a medical instrument. This automatic data capturing mode can be used in connection with a lab computer, a portable monitor, radiology data, a portable lab computer, an electronic medical record, admission information, and so forth.

**[00071]** The information sources 1 and 2 used for this step can be a computer, a terminal, a hand-held device including PDAs (personal digital assistants), tablet computer, smart phones, laptops, handheld communication devices, handheld computing devices, and/or any other

suitable device(s) and the like, or any other devices known to those skilled in the art which can be used to provide input signals to the server 100.

**[00072]** The method also includes the step 103 of processing the received patient information using a processor 300 to dynamically generate a patient information message responsive to the received patient information. The processing of the received patient information may include some or all of the following: determining whether the patient information needs to be saved at the storage unit 200 as part of patient's permanent medical record; determining whether a communication is required based on the received patient information; determining whether and what additional patient information and/or non-patient information needs to be retrieved from the storage unit 200; retrieving the additional patient information and/or non-patient information from the storage unit 200; and generating the patient information message.

**[00073]** The processor 300 may determine whether the patient information needs to be saved at the storage unit 200 as part of a patient's permanent medical record. The processor 300 makes this determination according to a set of stipulated rules. The processor 300 also may determine whether a communication to the patient is required based on the received patient information. The processor 300 may further determine whether and what additional patient information and/or non-patient information needs to be retrieved from the storage unit 200, if a communication to the patient is required. After the determination that additional information is needed for the communication to the patient, the processor 300 then retrieves the needed historical patient information or/and non-patient information from the storage unit 200.

**[00074]** The processor 300 then uses the received patient information, retrieved historical patient information, and/or retrieved non-patient information to generate the patient information message. The patient information message is preferably short and concise. The processor 300 should summarize the received patient information, and supplement it with historical patient information or/and any non-patient information as required or useful for the patient to understand the patient information message. The processor 300 may optionally

include routing information in the patient information message that helps to direct the message to the right recipient/patient.

**[00075]** The method also includes a step 101, providing stored patient information about the patient. From the storage unit 200, the stored patient information is provided to the processor 300 for generating the patient information message. The patient information provided from the storage unit 200 can be the patient's medical records, or non-patient, background information about a test or a medical procedure, or both. In one embodiment, the patient information newly entered through the information sources 1 and 2 may also be provided to the processor 300 by the storage unit 200.

**[00076]** Another step of the method 104 is transmitting the generated patient information message by a transmitter 400 to the display unit 500 associated with the right patient. The transmitter 400 transmits the patient information message according to the routing information embedded in the patient information message or associated with a patient information message to a display unit 500 associated with the right patient.

**[00077]** The method further includes step 105 displaying the patient information message for the patient. The display unit 500 may display the patient information message on the display unit 500. Figure 3 depicts an exemplary ED patient flow process for which the system, method and software of the present invention may be employed. Figure 3 shows the relationship between various steps in the progress of the patient's ED care and indicates the steps which could trigger processor 300 to generate an patient information message.

**[00078]** Figure 4 depicts a patient electronic interaction module which can be employed to generate patient information messages at the various steps in the progress of the patient's ED care depicted in Figure 3, as well as examples of the types of messages and information which may be included in exemplary patient information messages at certain steps in the progress of the patient's ED care.

**[00079]** Figure 4 also shows some examples of types of information that may be obtained by processor 300 for generation of patient information messages. For example, once the patient

is placed in a treatment room and the ED caregivers for that patient are assigned, processor 300 may obtain pictures, names and background information such as the title or specialty of the caregivers from a machine-readable media or other suitable source and initiate the steps required to present this information on the display device 500 in the patient's room. In another example shown in Figure 4, the patient's medical history obtained from the patient can be displayed for the patient for review and verification.

**[00080]** In another example in Figure 4, certain tests are ordered. Processor 300 is notified that tests have been ordered, and is informed of the type of test and the patient for which the test was ordered. Processor 300 then takes this information and generates a lay explanation of the test that has been ordered and may obtain and present additional information such as the purpose of such a test or an explanation of how the steps to be taken to conduct such a test.

**[00081]** Also shown in Figure 4 is a situation where test results are received and passed to processor 300. Processor 300 may then present the results of the tests in an understandable form to a lay person along with additional information for interpretation of the results of the test. For example, in the case of a blood test, processor 300 may provide information about the normal range of a certain parameter for a healthy individual and, if the test result is outside the normal range, information as to what such a test result may indicate.

**[00082]** Figure 5 is schematic representation of an example of the initiation of a clinical evaluation of a patient in the ED showing various actions of the clinical staff, the emergency room tracking system (EMTRAC), the displays on the patient Edialog monitor and the patient interaction with the system. Thus, at this stage of the process, the processor 300 is informed as to which room the patient has been assigned for routing patient information messages. The system can be used to greet the patient, allow the patient to review and correct the personal medical history that is available at that hospital, allow the patient to signal that he or she is ready for evaluation, allow the patient to browse information about the hospital, by, for example, interaction with a customer site, and allow the patient to browse the internet for other information.

**[00083]** The Edialog monitor refers to a monitor, such as a display unit 500, which enabled for display of patient information messages and which is identified to the processor 300 such that each Edialog monitor can be associated with a particular patient for routing of messages and preserving patient confidentiality. The Edialog monitor can also be enabled for the patient to send messages back through the system to other users of the system or to the system storage in order to provide feedback, update records, communicate with caregivers, etc.

**[00084]** Figure 6 is an example of a radiology evaluation of a patient in the ED showing various actions of the clinical staff, EMTRAC, the displays on the patient Edialog monitor and the patient interaction with the system. Thus, at this stage of the process, an imaging order is placed. This triggers processor 300 to generate a patient information message to be displayed for the patient informing the patient that an imaging order has been placed and optionally providing additional information about the order, the timing, the steps required to carry out the order and the type of test that has been ordered. The patient may review this information on display unit 500 and may brows the knowledge base for further information. Also, since imaging typically requires removal of the patient from the room, the system may be updated to indicate that the patient is out of the room, in which case processor 300 will no longer route messages for the patient to that room, instead awaiting input of a new routing destination for messages for that patient. Upon return of the patient, the system can be updated to indicate to the processor 300 that the patient has returned to the room and thus messages about the patient can again be routed to the room.

**[00085]** Figure 7 is an example of a laboratory evaluation of a patient in the ED showing various actions of the clinical staff, the EMTRAC, the displays on the patient Edialog monitor and the patient interaction with the system. Thus, at this stage of the process, laboratory order is placed. This triggers processor 300 to generate a patient information message to be displayed for the patient informing the patient that a laboratory order has been placed and optionally providing additional information about the order, the timing, the steps required to carry out the order and the type of test that has been ordered. The patient may review this

information on display unit 500 and may browse the knowledge base for further information. Once the lab sample has been taken, a patient information message can be generated indicating that the lab sample has been dispatched to the laboratory for evaluation.

**[00086]** Figure 8 is an example of a radiology/laboratory analysis of test results of a patient in the ED showing various actions of the clinical staff, EMTRAC, the displays on the patient Edialog monitor and the patient interaction with the system. Thus, at this stage of the process, a radiology/laboratory analysis is entered into the system. This triggers processor 300 to generate a patient information message to be displayed for the patient informing the patient that the results have been received and optionally, providing the results and perhaps information as to the meaning of the results. The patient may review this information on display unit 500 and may brows the knowledge base for further information.

**[00087]** Figure 9 is an example of treatment of a patient in the ED showing various actions of the clinical staff, the EMTRAC, the displays on the patient Edialog monitor and the patient interaction with the system. Thus, at this stage of the process, a treatment order is placed, e.g. a medication order. This triggers processor 300 to generate a patient information message to be displayed for the patient informing the patient that a medication order has been placed and optionally providing additional information about the order, the timing, the steps required to carry out the order and the type of medication that has been ordered, e.g. dosage, side effects, purpose of treatment. The patient may review this information on display unit 500 and may brows the knowledge base for further information. Also, at this stage the clinical staff may reach a diagnosis which can also trigger processor 300 to generate a patient information message providing the diagnosis, as well as any other desirable additional information such as methods of treatment, long-term effects, instructions for the patient as to beneficial actions that can be taken, e.g. rest, or any other relevant information.

**[00088]** Figure 10 is an example of a hospital admission process which may be carried out if a decision is taken to admit the patient from the ED into the hospital. Figure 10 shows various actions of the clinical staff, the EMTRAC, the displays on the patient Edialog monitor and the

patient interaction with the system. Thus, the patient's admission data can be displayed for the patient for review, correction and/or comment. The admitting doctor may be displayed as well as the admitting department, room number, telephone number, attending physician and/or nurses and other potentially relevant information to the hospital admission.

**[00089]** Figure 11 is an example of a discharge process which may be carried out if a decision is taken to discharge the patient from the ED into the hospital. Figure 10 shows various actions of the clinical staff, the EMTRAC, the displays on the patient Edialog monitor and the patient interaction with the system. Thus, the patient's discharge data can be displayed for the patient for review, correction and/or comment. The discharging doctor may be displayed as well as a course of treatment, drug prescriptions and information, pharmacy information and hours, scheduled clinical appointments for follow-up and other potentially relevant information to the ED discharge.

**[00090]** For simplicity of explanation, the methodologies are depicted and described as a series of acts. It is to be understood and appreciated that the subject innovation is not limited by the acts illustrated and/or by the order of acts, for example acts can occur in various orders and/or concurrently, and with other acts not presented and described herein. Furthermore, not all illustrated acts may be required to implement the methodologies in accordance with the claimed subject matter. In addition, those skilled in the art will understand and appreciate that the methodologies could alternatively be represented as a series of interrelated states via a state diagram or events.

**[00091]** The invention also encompasses software stored on a machine readable medium or run on a processor for carrying out the method of the invention described above. A skilled person familiar with said method would be capable of providing a suitable software implementation thereof.

**[00092]** Moreover, those skilled in the art will appreciate that the inventive methods may be practiced with other computer system configurations, including single-processor or multiprocessor computer systems, minicomputers, mainframe computers, as well as personal

computers, hand-held computing devices, microprocessor-based and/or programmable consumer electronics, and the like, each of which may operatively communicate with one or more associated devices. The illustrated aspects of the claimed subject matter may also be practiced in distributed computing environments where certain tasks are performed by remote processing devices that are linked through a communications network. However, some, if not all, aspects of the subject innovation may be practiced on stand-alone computers. In a distributed computing environment, program modules may be located in local and/or remote memory storage devices. Furthermore, one of ordinary skill in the art may recognize that many further combinations and permutations of the subject innovation are possible. Accordingly, the claimed subject matter is intended to embrace all such alterations, modifications, and variations that fall within the scope of the appended claims.

**[00093]** In particular and in regard to the various functions performed by the above described components, devices, circuits, systems and the like, the terms (including a reference to a "means") used to describe such components are intended to correspond, unless otherwise indicated, to any component which performs the specified function of the described component (e.g., a functional equivalent), even though not structurally equivalent to the disclosed structure, which performs the function in the herein illustrated exemplary aspects of the claimed subject matter. In this regard, it will also be recognized that the innovation includes a system as well as a machine-readable medium having computer-executable instructions for performing the acts and/or events of the various methods of the claimed subject matter.

**[00094]** The invention will be further illustrated by the following non-limiting examples. These examples, and more, are represented in Figure 4.

**Example 1**

[00095] Represented as 203 in Figure 4. A patient X is located in a particular room of an ED provided with a flat screen monitor, the display unit 500 that has been registered to receive communications for patient X. The doctor just ordered a complete blood count (CBC) for patient X. Using an information source 1 and 2, the doctor entered the test order into the system. The patient information is passed to the server 100, which determines that the patient information needs to be saved as part of X's permanent medical record. The server sends the patient information to both the storage unit 200 for saving as part of the permanent medical record, and the processor 300 for further processing. The processor 300, after receiving the patient information from the server 200, determines that a communication to the patient is required. Processor 300 also determines that some non-patient, background information on the blood tests is required from the storage unit 200 to provide information to the patient as to why such blood cell counts are typically performed. The processor 300 then retrieves the background information on the blood test from storage unit 200.

[00096] The processor 300 then uses the information that the blood test has been ordered and the background information on the blood test to dynamically generate a patient information message. The message may read, for example, "The following blood test has been ordered for you: complete blood cell counts for checking possible bacterial infection." The processor 300 also adds routing information to the patient information message. The routing information identifies patient X as the recipient and/or the display unit 500 associated with patient X.

[00097] The patient information message is immediately transferred to the transmitter 400. The transmitter 400 then disseminates the patient information message to patient X according to the routing information. The patient information message is received by the flat screen monitor 500 in patient X's room and displayed on the flat screen monitor.

[00098] The entire process starting from the entering of the order of blood tests to the displaying of the patient information message is dynamic and takes a very short time, perhaps only a fraction of a second.

### **Example 2**

[00099] Represented as 204 in Figure 4. A patient Y is staying in a particular room of an ED provided with the display unit 500 that has been registered to receive communications for patient Y. The blood test for Y was just completed. Using an information source 1 and 2, a lab technician entered the test results into the system. In general this would be done automatically after the physician ordered the test. The patient information (test results) is passed to the server 100, which determines that the patient information needs to be saved as part of Y's permanent medical record. The server sends the patient information to both the storage unit 200 for saving as part of the permanent medical record, and the processor 300 for further processing. The processor 300, after receiving the patient information from the server 200, determines that a communication to the patient is required and that some non-patient, background information from the storage unit 200 on the blood tests is required to help the patient interpret the blood test results. The processor 300 then retrieves the background information on the blood tests, such as the normal range of white cell counts.

[000100] The processor 300 then uses the information on the blood test results and the background information on the blood test to dynamically generate a patient information message. The message may read, for example, "Your blood test results are: white blood cell count  $1.4 \times 10^{10}/L$ . The normal range for white blood cells is between  $4 \times 10^9$  and  $1.1 \times 10^{10}/L$ . White blood cell counts above normal may indicate acute bacterial infection." The processor 300 also adds routing information to the patient information message. The routing information identifies patient Y as the recipient and/or the display unit 500 associated with patient Y.

[000101] The patient information message is immediately transferred to the transmitter 400. The transmitter 400 transmits the patient information message to patient Y according to the

routing information. The patient information message is received by the flat screen monitor 500 in patient Y's room and displayed on the flat screen monitor.

[000102] The entire process starting from the entering of the blood test results to the displaying of the patient information message is dynamic and may take only a fraction of a second.

[000103] A physician arrives at the room of patient Y. By touching the screen of the flat screen monitor, the physician retrieves the test results and/or more information on blood tests from the storage unit 200. The physician can then discuss with patient Y in detail the blood test results and their significance using display unit 500.

### **Example 3**

[000104] Represented as 205 in Figure 4. A patient Z is waiting in a bed in an ED. His bed is next to a flat screen monitor, the display unit 500 that has been registered to receive communications for patient Z. The X-ray results are just back for patient Z. From the computer (the information source 1 and 2) associated with the X-ray equipment, the X-ray results are automatically transferred to the server 100, which determines that the X-ray results need to be saved as part of Z's permanent medical record. The server sends the X-ray results to both the storage unit 200 for saving as part of the permanent medical record, and the processor 300 for further processing. The processor 300, after receiving the X-ray results from the server 200, determines that a patient communication is required and processes the X-ray results. The processor 300 also retrieves the background information on the X-ray examination which can be used to generate an understandable interpretation of the X-ray results for the patient. Alternatively, a radiologist can input the X-ray results into the system with, for example, a code or series of codes indicating the interpretation of the X-ray results for the processor 300.

[000105] An understandable interpretation of the X-ray results is then generated by the processor 300. The interpretation, together with routing information, becomes the patient

information message. The routing information added by the processor 300 to the patient information message identifies Z as the right recipient and the display unit 500 at the side of Z's bed. The actual X-ray image could also be displayed.

**[000106]** The patient information message is immediately transferred to the transmitter 400. The transmitter 400 transmits the patient information message to the patient according to the routing information. The patient information message is received by the flat screen monitor next to Z's bed. Less than a second after the X-ray results are received by the server 100, the message is displayed on the flat screen monitor:

**[000107]** "Your X-ray results are back: interpretation..."

**[000108]** A radiologist walks to Z's bed. By touching the screen of the flat screen monitor, the radiologist retrieves the actual X-ray image from the storage unit 200. The X-ray image is then displayed on the flat screen monitor. The radiologist may then discuss the image with Z.

#### **Example 4**

**[000109]** Represented as 206 in Figure 4. A patient X is staying in a patient room of an ED provided with a flat screen monitor, the display unit 500 that has been registered to receive communications for patient X. A physician just reaches a diagnosis (bacterial infection) at the conclusion of the ED care. Using an information source 1 and 2, the physician enters the diagnosis into the system.

**[000110]** The diagnosis is passed to the server 100, which determines that the diagnosis needs to be saved as part of X's permanent medical record. The server sends the diagnosis to both the storage unit 200 for saving as part of the permanent medical record, and the processor 300 for further processing. The processor 300, after receiving the diagnosis from the server 200, determines that some non-patient, background information on the diagnosis is required from the storage unit 200. The processor 300 then retrieves the background information on diagnosis, such as the risks associated with the disease, the treatment options, or likely outcomes of the treatment options.

[000111] The processor 300 then uses the diagnosis and the background information to dynamically generate a patient information message. The processor 300 also adds routing information to the patient information message. The routing information identifies X as the recipient and/or the display unit 500 associated with X.

[000112] The patient information message is immediately transferred to the transmitter 400. The transmitter 400 transmits the patient information message to X according to the routing information. The patient information message is received by the flat screen monitor 500 in patient X's room. The message is then displayed on the flat screen monitor

[000113] The entire process starting from the entering of the diagnosis to the displaying of the patient information message is dynamic and takes a very short time.

[000114] The foregoing examples have been presented for the purpose of illustration and description and are not to be construed as limiting the scope of the invention in any way. The scope of the invention is to be determined from the claims appended hereto.

**WHAT IS CLAIMED IS:**

1. A system for dynamically informing a patient of information about the patient's healthcare progress comprising:
  - at least one machine-readable storage unit that stores patient information for the patient;
  - a server that receives patient information about the patient from one or more information sources;
  - a processor that processes the patient information received by said server to dynamically generate a patient information message responsive to said received patient information using said stored patient information, said patient information message including an update on a status of the patient's healthcare, which update is derived from said patient information received by said server and routing information for routing said patient information message to a display unit associated with the patient;
  - a transmitter for transmitting the generated patient information message from said processor; and
  - a display unit associated with the patient which receives the dynamically generated patient information message from said transmitter and displays said dynamically generated patient information message for the patient.
2. A system as claimed in claim 1, wherein said display unit is located in a patient room.
3. A system as claimed in claim 2, wherein said server and machine-readable storage unit are part of a hospital record management system which stores and updates patient information about patients treated in the hospital.
4. A system as claimed in claim 1, wherein the processor first determines whether the patient information received by the server requires generation of a patient information message

and then generates the patient information based upon this determination.

5. A system as claimed in claim 1, wherein at least one machine-readable storage unit stores non-patient information and said processor uses at least some of said non-patient information to generate said patient information message, whereby said patient information messages includes at least some of said non-patient information.

6. A system as claimed in claim 5, wherein said non-patient information is selected from the group consisting of caregiver information, treatment information, intake information, admission information, discharge information, medication information, information for interpretation of test results, instructions for the patient and combinations thereof.

7. A system as claimed in claim 5, wherein the display unit comprises a query device which allows the query of information from said at least one machine-readable storage unit using said display device.

8. A system as claimed in claim 1, wherein the display unit comprises a communication device which allows the patient to send a message to the server.

9. A system as claimed in claim 1, wherein the patient information received by the server is selected from the group consisting of a clinical evaluation, a laboratory evaluation, a radiologic evaluation, a treatment, a test request, a treatment result, a diagnosis, a discharge decision, an admission decision, a patient decision, a location of the patient, and combinations thereof.

10. A computer-implemented method for dynamically information a patient of information about the patient's healthcare progress comprising the steps of:  
providing stored patient information about the patient on a machine-readable storage

unit;

receiving patient information about the patient from one or more information sources at a server;

processing the received patient information using a processor to dynamically generate a patient information message responsive to said received patient information using said stored patient information, said patient information message including an update on a status of the patient's healthcare, which update is derived from the received patient information and routing information for routing said patient information message to a display unit associated with the patient;

transmitting the generated patient information message to the display unit associated with the patient; and

displaying the patient information message for the patient on the display unit.

11. A method as claimed in claim 1, further comprising a step of providing stored non-patient information obtained from said machine-readable storage unit or other information source.

12. A method as claimed in claim 11, wherein said step of processing the received patient information using a processor includes determining whether a patient information message is required based on said patient information received by said server.

13. A method as claimed in claim 11, wherein said step of processing the received patient information using a processor includes determining whether and what additional patient information and/or non-patient information is to be retrieved for generation of the patient information message.

14. A method as claimed in claim 13, further comprising a step of retrieving said additional patient information or said non-patient information from said storage unit and said

retrieved additional information is processed in said processing step to generate the patient information message.

15. A method as claimed in claim 11, further including the step of informing the processor of the presence or absence of a patient at a location of the display unit and said processing step includes the step of determining that a patient information message should not be sent when said patient is absent from the location of the display unit.

16. A method as claimed in claim 11, wherein said processing step alters the presentation of information received from one or more information sources for generation of said patient information message.

17. A method as claimed in claim 11, wherein said processing step omits information received from one or more information sources for generation of said patient information message.

18. A method as claimed in claim 11, wherein said processing step associates additional information with the information received from the one or more information sources to provide context or explanation of the information received from the one or more information sources.

19. Software stored on a machine readable data carrier for carrying out the method of claim 11.

20. Software stored on a machine readable data carrier for carrying out the method of claim 18.

Fig. 1

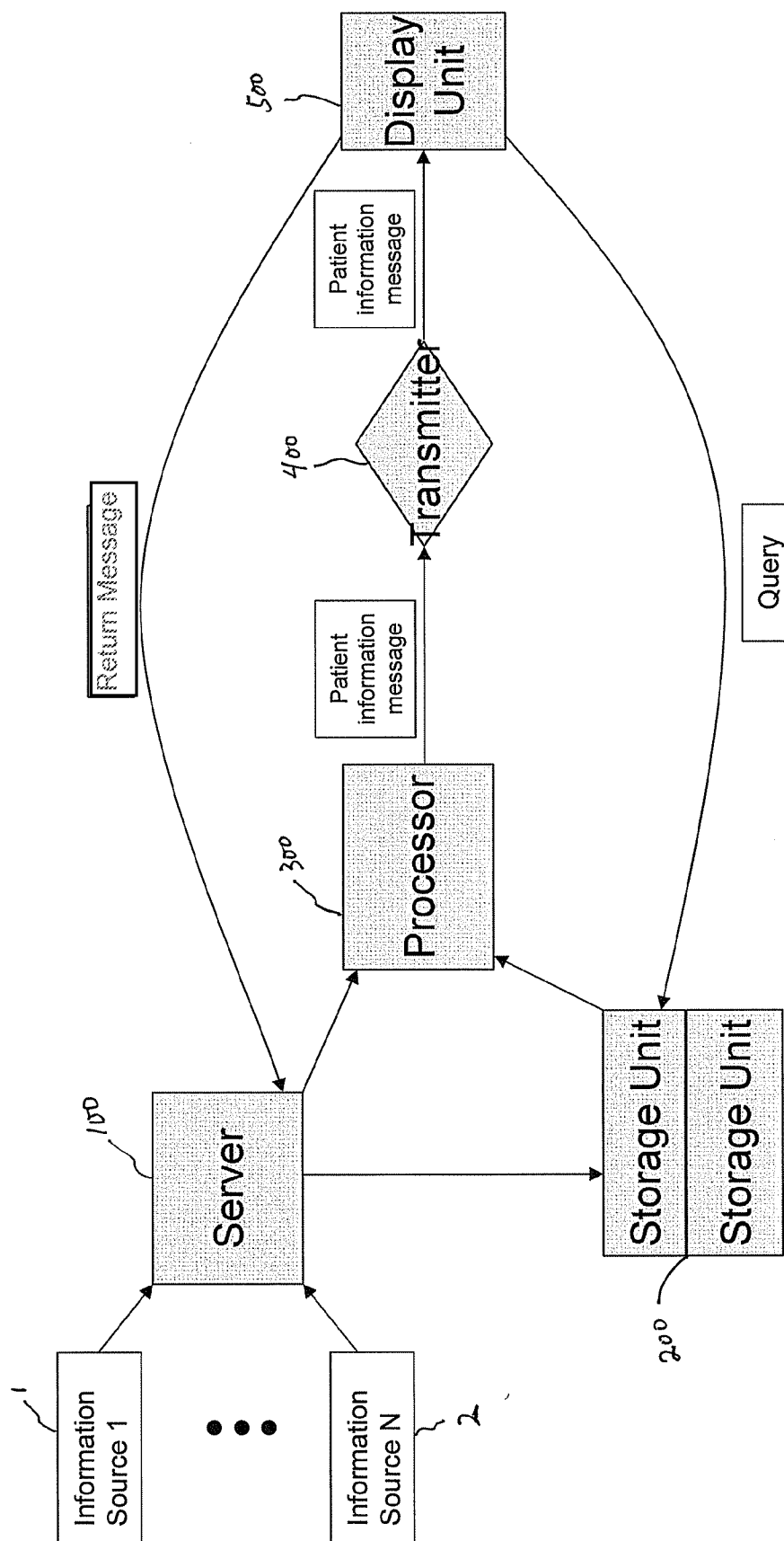


Fig. 2

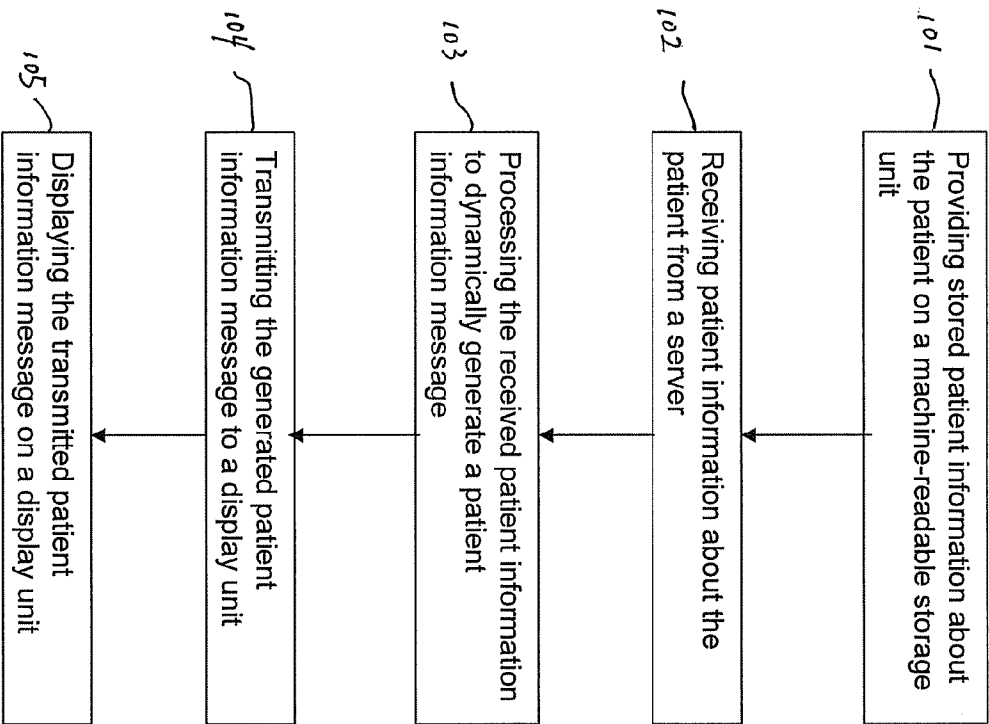


Figure 3

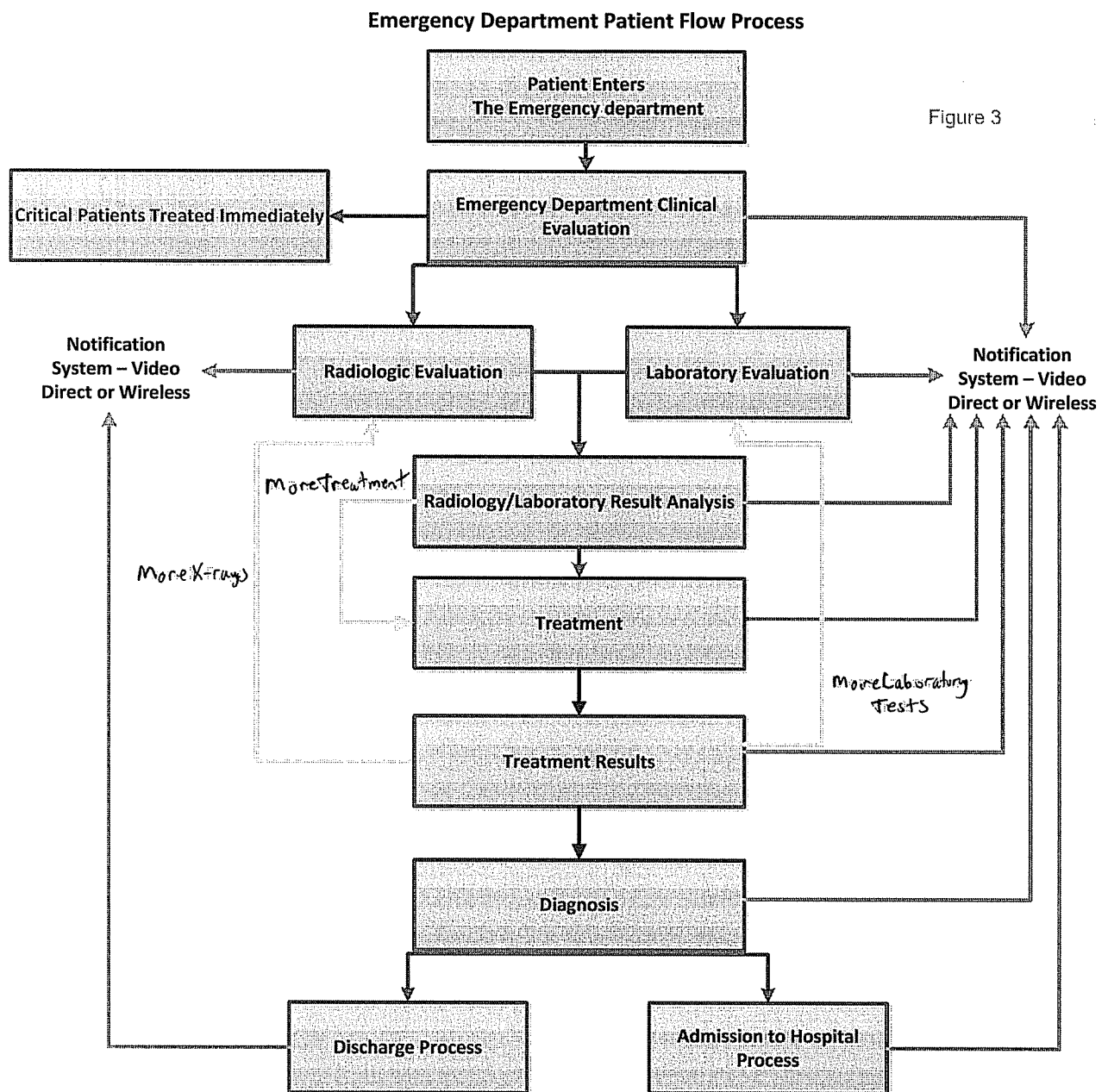
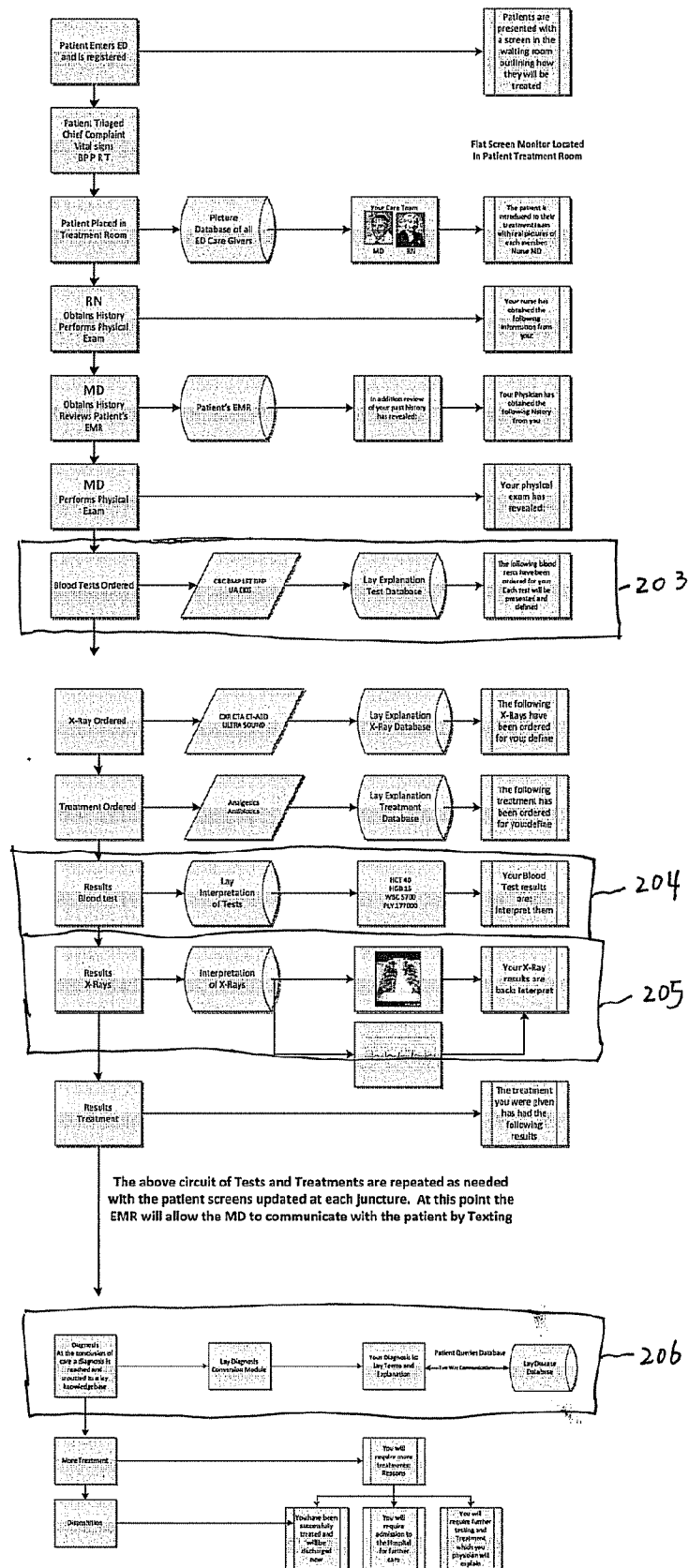


Figure 4





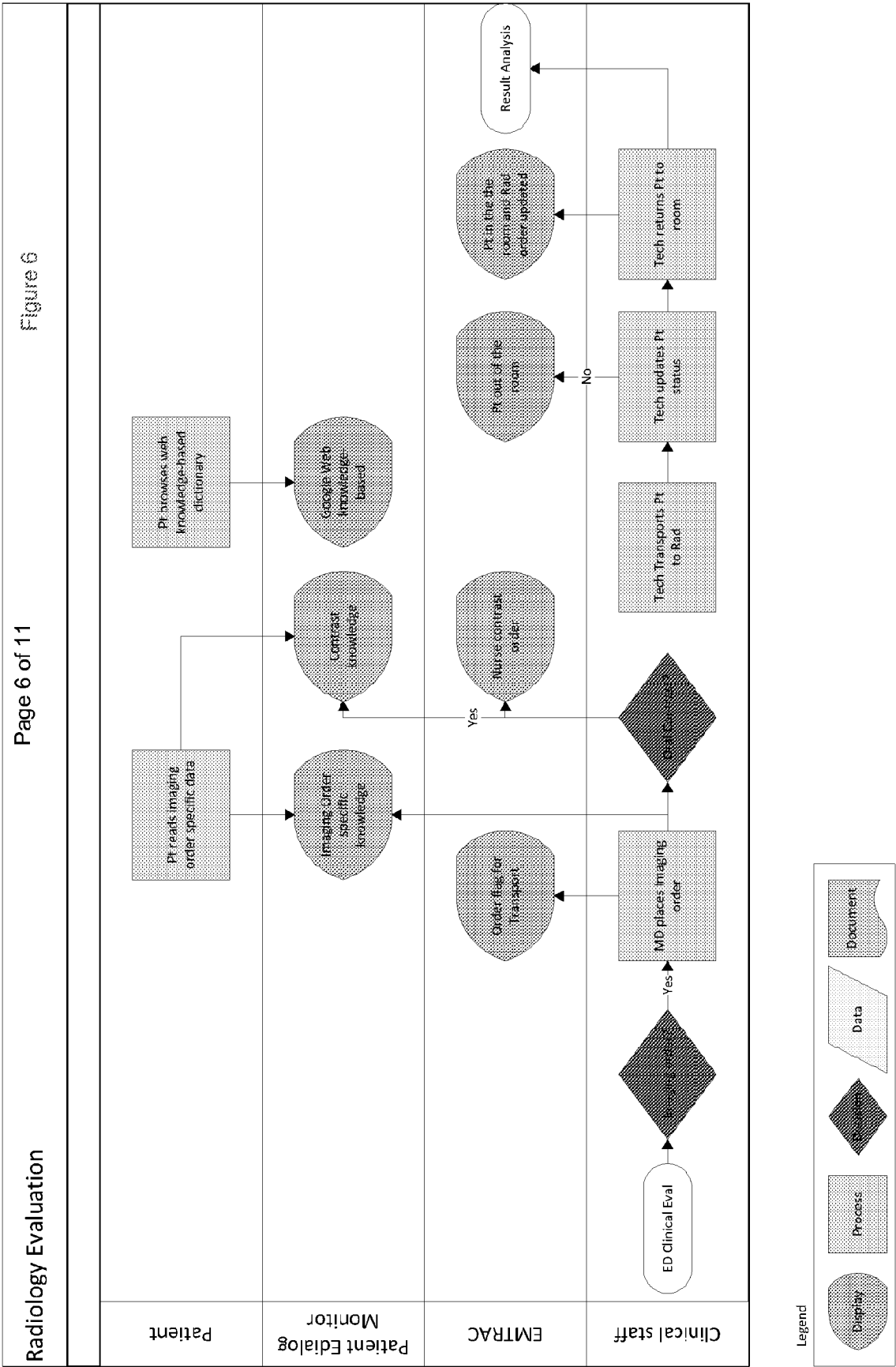
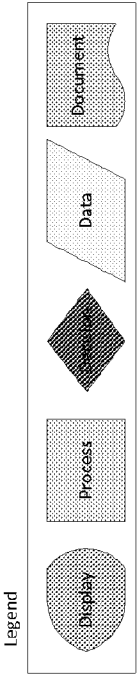
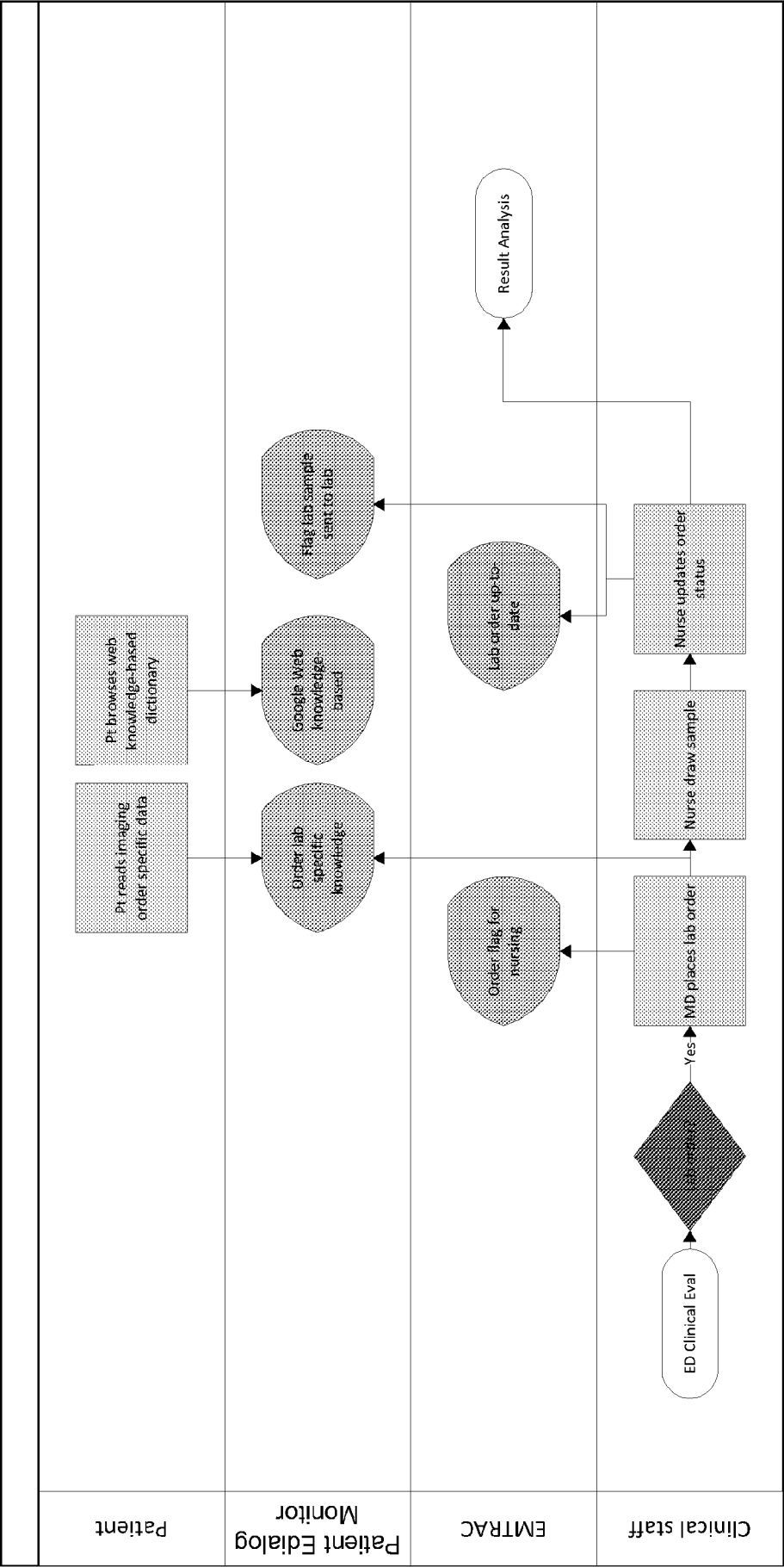


Figure 7

Laboratory Evaluation



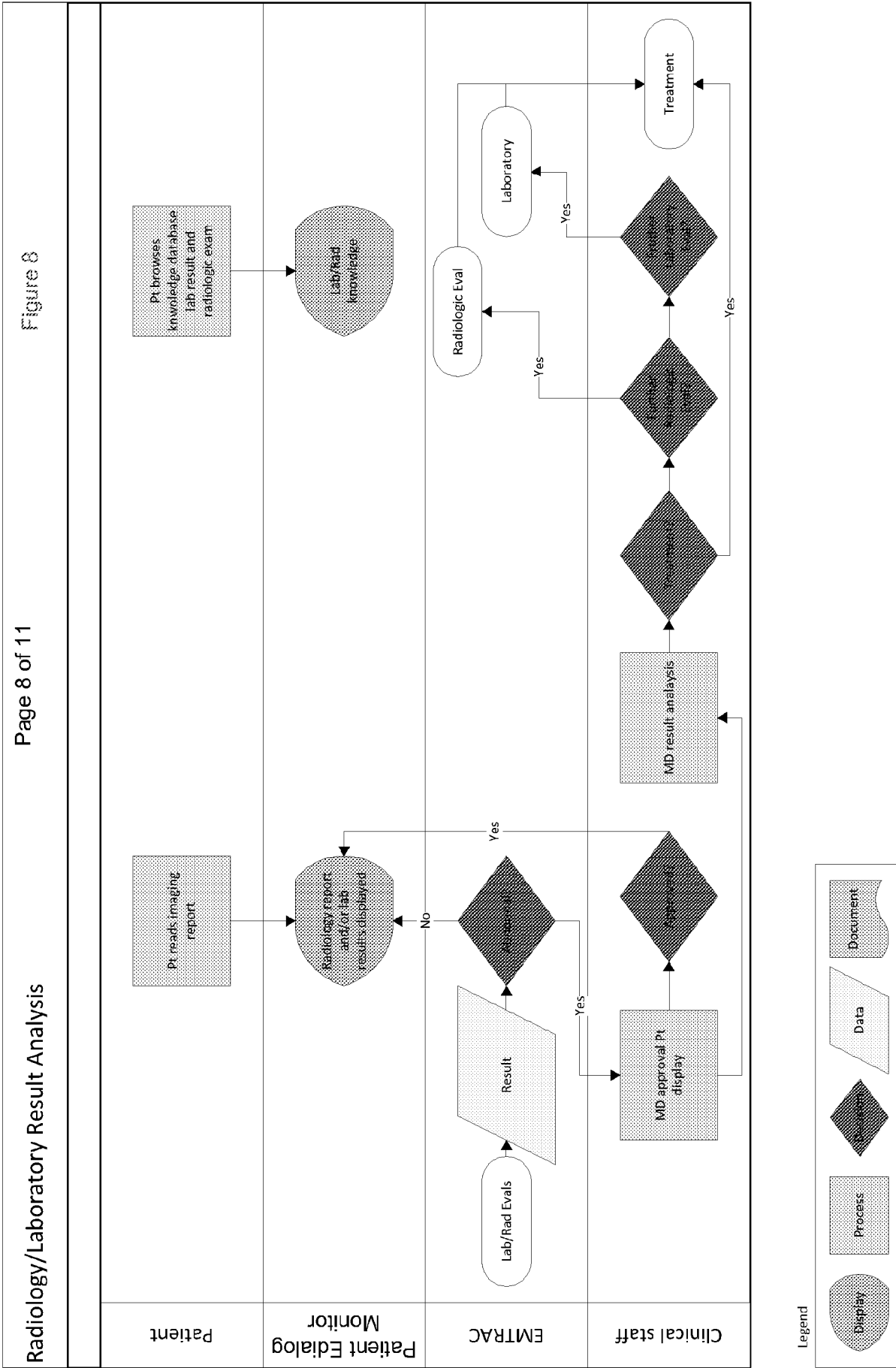
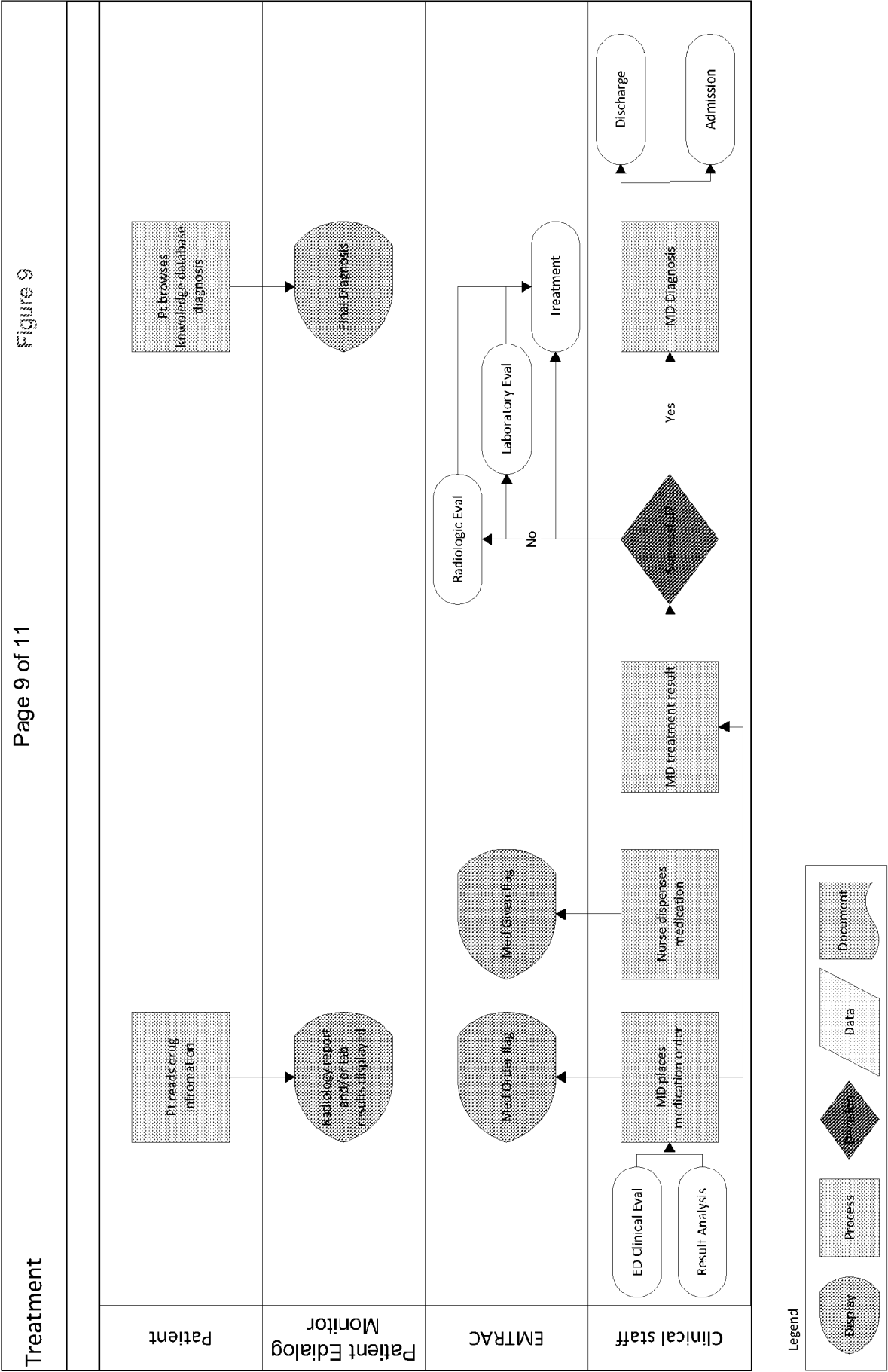
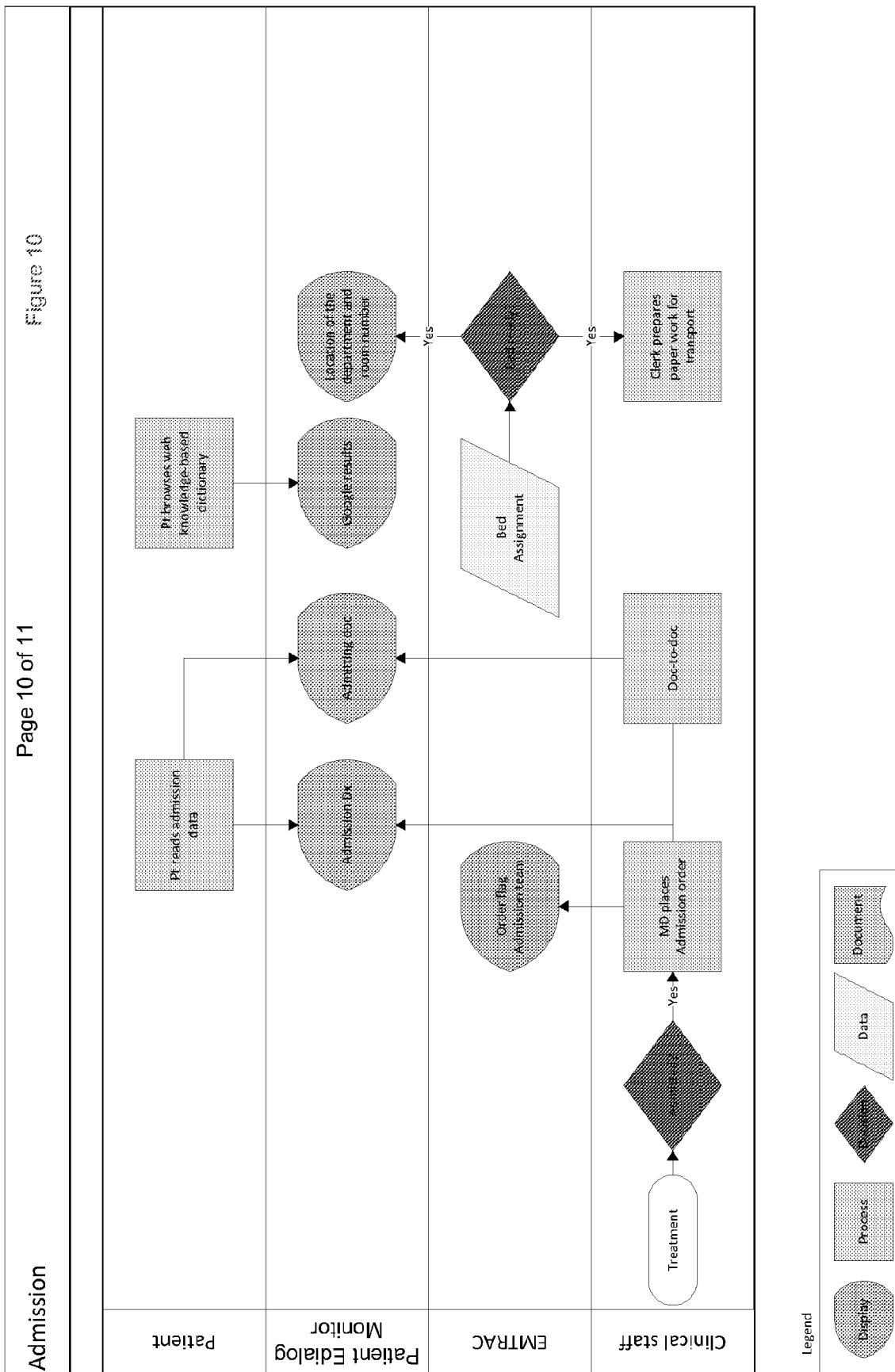
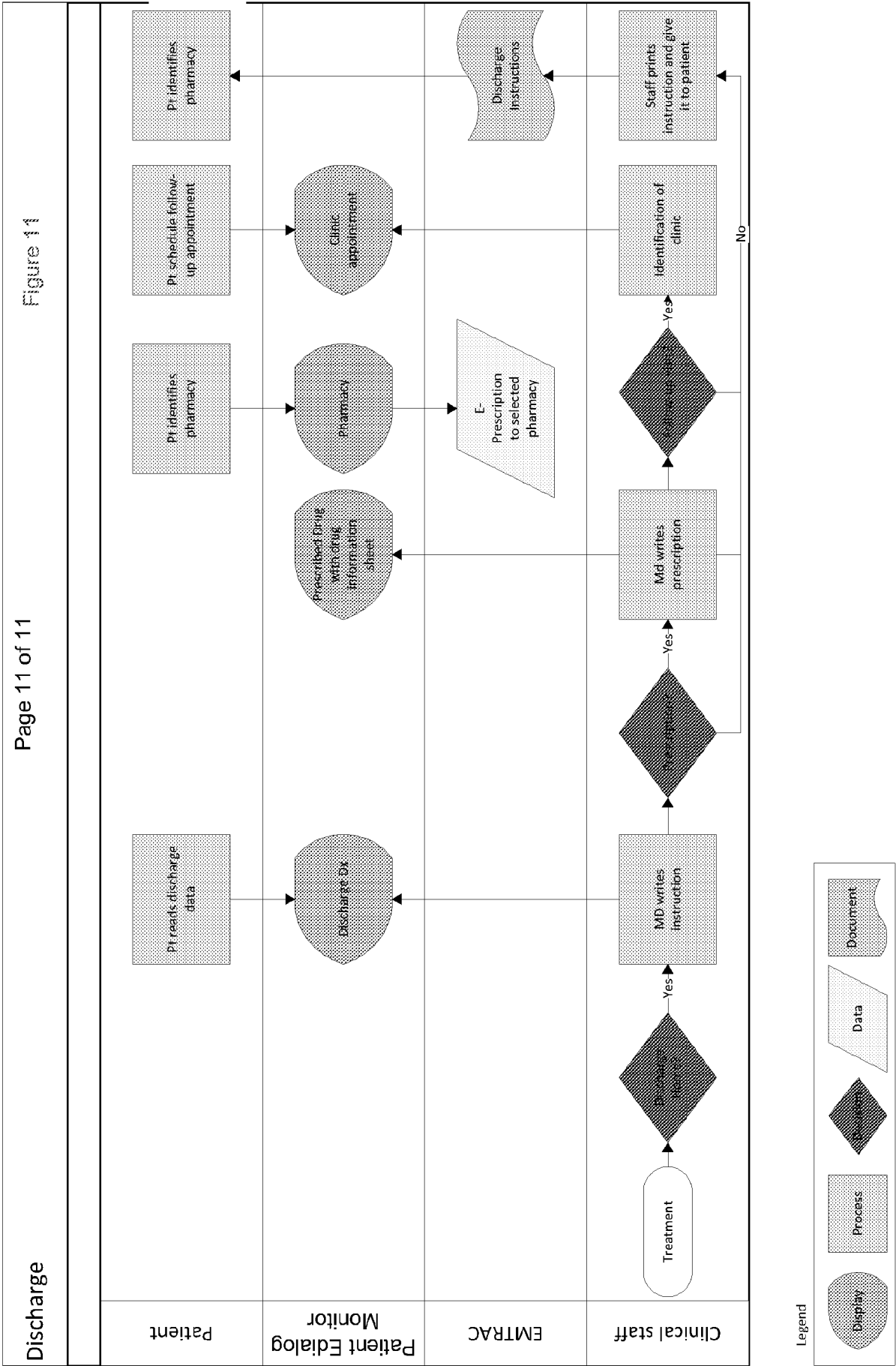


Figure 9







## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2012/028415

## A. CLASSIFICATION OF SUBJECT MATTER

*G06Q 50/22 (2012.01)*

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)

A61B 5/00, 5/04, G06F 3/00-3/14, 9/00-9/54, 13/00-13/42, 15/00-15/82, 17/00, 19/00, G06N 3/00, 5/00, 7/00, G06Q 50/22, G09B 5/00, G09C 1/00, G09G 3/00-3/36, 5/00-5/42, 7/00, 7/52, G11C 7/00, H01J 31/00

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

ESP@CENET, K-PION, PAJ, RUPTO, USPO

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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                        | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | US 6032119 A (HEALTH HERO NETWORK, INC.) 29.02.2000, col. 2, lines 5-12, 27-31, 63-67, col. 3, lines 1-2, 61-67, col. 4, lines 1-19, 25-30, 53-64, col. 5, lines 64-67, col. 6, line 1-6, col. 7, lines 3-6, 19-39, fig.1 | 1, 4-20               |
| Y         |                                                                                                                                                                                                                           | 2-3                   |
| Y         | RU 2336808 C2 (INTILLEKCHUAL PROPRTI BENK KORP. et al.) 27.10.2008, p. 16, lines 29-37, p. 13, lines 43-47                                                                                                                | 2-3                   |
| A         | RU 2171492 C1 (HAZANOV MIKHAIL EVGENIEVICH) 27.07.2001, abstract, p. 7, lines 30-53, claims                                                                                                                               | 1-40                  |
| A         | RU 82536 U1 (MONICH VIKTOR ANATOLIEVICH et al.) 10.05.2009, abstract                                                                                                                                                      | 1-40                  |

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

## \* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier document but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&amp;” document member of the same patent family

Date of the actual completion of the international search

28 May 2012 (28.05.2012)

Date of mailing of the international search report

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