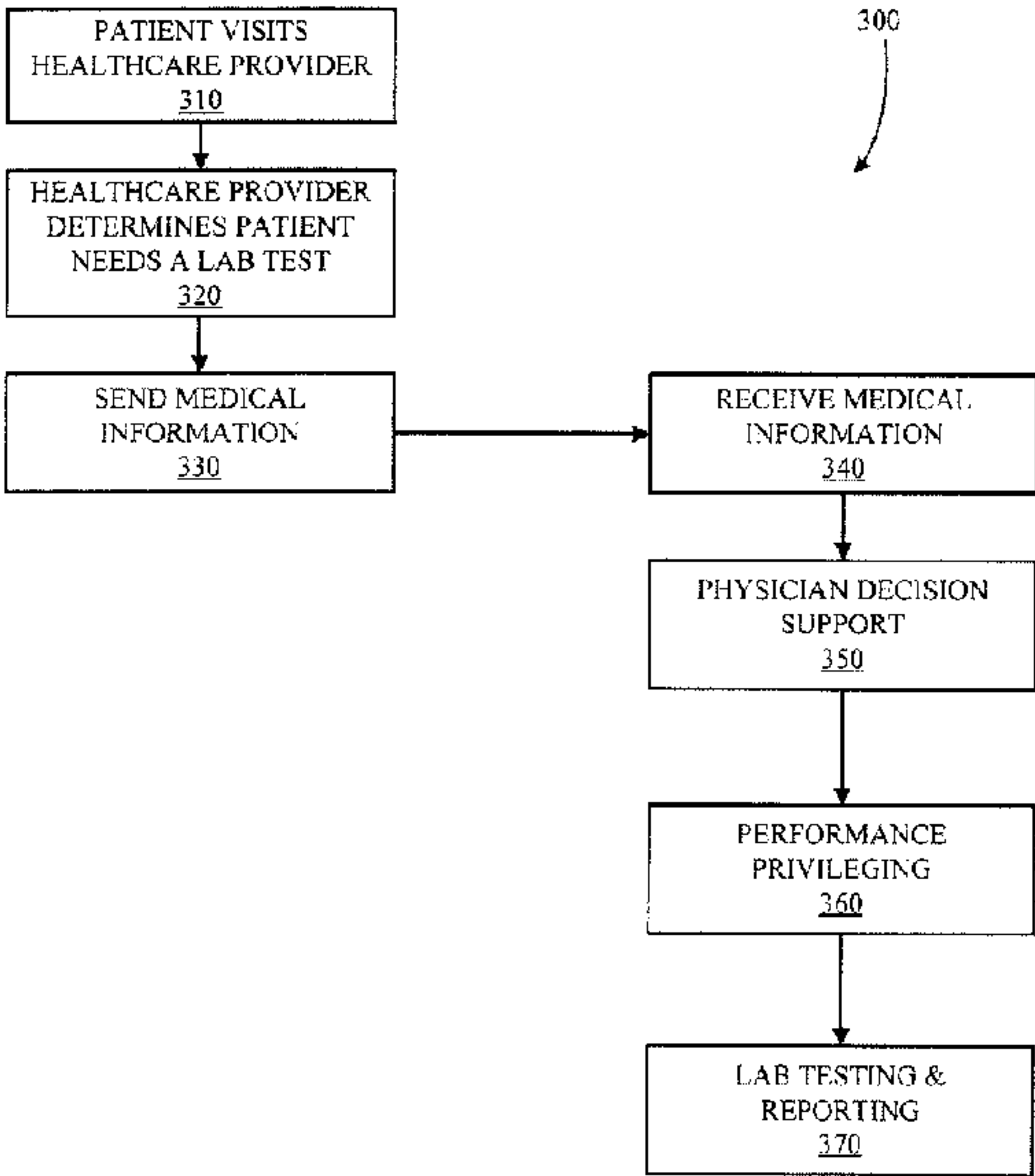




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(54) Titre : SYSTEMES, PROCEDES ET SUPPORTS POUR DES SERVICES DE TEST EN LABORATOIRE
(54) Title: SYSTEMS, METHODS, AND MEDIA FOR LABORATORY TESTING SERVICES



(57) **Abrégé/Abstract:**
Systems, methods, and media for laboratory testing services are disclosed. Medical information can be received from an electronic device. One or more laboratory tests can be recommended based at least in part on the received medical information. For example, if one or more symptoms are received, then one or more laboratory tests may be suggested based at least in part on the received symptoms. As another example, if an order for one or more laboratory tests are received, then one or more additional and/or alternative laboratory tests may be suggested. Suggested laboratory tests can be based on medical symptoms, medical conditions, medical codes, medical history, medications, laboratories, healthcare providers, insurance companies, financial factors, locations, turnaround time, other factors, or a combination thereof. One or more of the suggested laboratory tests can be ordered.

Abstract

Systems, methods, and media for laboratory testing services are disclosed. Medical information can be received from an electronic device. One or more laboratory tests can be recommended based at least in part on the received medical information. For example, if one or more symptoms are received, then one or more laboratory tests may be suggested based at least in part on the received symptoms. As another example, if an order for one or more laboratory tests are received, then one or more additional and/or alternative laboratory tests may be suggested. Suggested laboratory tests can be based on medical symptoms, medical conditions, medical codes, medical history, medications, laboratories, healthcare providers, insurance companies, financial factors, locations, turnaround time, other factors, or a combination thereof. One or more of the suggested laboratory tests can be ordered.

SYSTEMS, METHODS, AND MEDIA FOR LABORATORY TESTING SERVICES

5

FIELD OF THE INVENTION

10 This disclosure relates generally to health care management and more particularly relates to the ordering, viewing, sharing, managing, analysis, delivery, and fulfillment of laboratory tests.

BACKGROUND

 As the number of laboratory tests, health plans, and medical codes have increased, the
15 complexity of managing the ordering, delivery, and fulfillment of laboratory tests has also increased. Systems and methods that reduce the complexity of ordering, delivery, and fulfillment laboratory tests are needed. Systems and methods that increase the efficiency of the delivery of health care services to a patient, by providing health care providers with better and more efficient means for obtaining, viewing, sharing, and/or analyzing clinical laboratory
20 test results would be advantageous. Furthermore, systems and methods that increase the efficiency of the delivery of health care services to a patient, by providing health care providers with better and more efficient means for obtaining, viewing, sharing, and/or analyzing clinical laboratory test results on mobile devices, such as mobile computing devices, including, for example, mobile phones, mobile tablets, and the like, would be advantageous.

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SUMMARY

 Embodiments of the present invention provide systems, methods, and media for laboratory testing services. For example, one disclosed method comprises receiving medical information from an electronic device, the medical information comprising a plurality of identifiers; determining at least one possible laboratory test based at least in part on the
30 received medical information, wherein determining the at least one possible laboratory test comprises using at least one of the plurality of identifiers to query a data store comprising a plurality of laboratory tests, each of the plurality of laboratory tests being associated with one

or more identifiers; and sending the determined at least one possible laboratory test to the electronic device.

In a broad aspect, the present invention provides a method, comprising: receiving, by a server and from an electronic device of a health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider; verifying, by the server and in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care provider by authenticating a username and password or a digital certificate associated with the health care provider, wherein verifying the authenticity of the health care provider comprises: accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and in response to verifying the authenticity of the health care provider and after receiving the order request for the first laboratory test and prior to completing the order corresponding to the order request for the first laboratory test: dynamically determining, by the server, a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying a data store in communication with the server for medical information corresponding to the patient stored in the data store; wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and historical medical information corresponding to the patient; wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient; sending, by the server, the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for the patient should be ordered; and receiving, by the server, a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and completing the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

In another broad aspect, the present invention provides a system, comprising: an electronic device of a health care provider; a server of a laboratory management provider; and a data store of the laboratory management provider in communication with the server, wherein the server is configured to: receive, by the server and from the electronic device of the health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider; verify, by the server and in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care

provider by authenticating a username and password or a digital certificate associated with the health care provider, wherein verifying the authenticity of the health care provider comprises: accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and in response to verifying the authenticity of the health care provider and after receiving the order request for the first laboratory test and prior to completing an order corresponding to the order request for the first laboratory test: dynamically determine, by the server, a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying the data store in communication with the server for medical information corresponding to the patient stored in the data store; wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and historical medical information corresponding to the patient; wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient; send the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for the patient should be ordered; and receive a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and complete the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

In another broad aspect, the present invention provides a non-transitory computer-readable medium comprising machine executable code stored on said medium and configured to be executed by a processor, the machine readable code configured to: receive, from an electronic device of a health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider; verify, in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care provider by authenticating a username and password or a digital certificate associated with the health care provider, wherein verifying the authenticity of the health care provider comprises: accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and after receiving the order request for the first laboratory test and prior to completing an order corresponding to the order request for the first laboratory test: dynamically determine a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying a data store for medical information corresponding to the patient

stored in the data store; wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and historical medical information corresponding to the patient; wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient; send the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for the patient should be ordered; and receive a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and complete the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

These illustrative embodiments are mentioned not to limit or define the invention, but rather to provide examples to aid understanding thereof. Illustrative embodiments are discussed in the Detailed Description, which provides further description of the invention. Advantages offered by various embodiments of this invention may be further understood by examining this specification.

BRIEF DESCRIPTION OF THE FIGURES

These and other features, aspects, and advantages of the present disclosure are better understood when the following Detailed Description is read with reference to the accompanying drawings, where:

Figure 1 is a system diagram depicting exemplary computing devices in an exemplary computing environment according to an embodiment;

Figure 2 is a flow chart illustrating an example of a system 200 comprising various data stores that can store information according to an embodiment;

Figure 3 is a flow chart illustrating an example of the operation of and systems a laboratory benefit management system according to an embodiment;

Figure 4 is a flow chart illustrating a method for a decision support component of a laboratory benefit management system according to an embodiment;

Figure 5 is a flow chart illustrating a method for a performance privileging component of a lab management system according to an embodiment; and

Figure 6 is a flow chart illustrating a method for a lab testing component of a lab management system according to an embodiment.

DETAILED DESCRIPTION

Example embodiments are described herein in the context of systems and methods for the ordering, management, delivery, and/or fulfillment of clinical laboratory diagnostic tests. Those of

ordinary skill in the art will realize that the following description is illustrative only and is not intended to be in any way limiting. Other embodiments will readily suggest themselves to such skilled persons having the benefit of this disclosure. Reference will now be made in detail to implementations of example embodiments as illustrated in the accompanying drawings. The same
5 reference indicators will be used throughout the drawings and the following description to refer to the same or like items.

In the interest of clarity, not all of the routine features of the implementations described herein are shown and described. It will, of course, be appreciated that in the development of any such actual implementation, numerous implementation-specific decisions must be made in order to achieve the developer's specific goals, such as compliance with application- and business-related constraints, and that these specific goals will vary from one implementation to another and from one developer to another.

Illustrative Operation

In one embodiment, a healthcare provider uses an electronic device to access a website for managing the ordering, delivery, and/or fulfillment of laboratory tests. The healthcare provider can use the electronic device to determine one or more possible laboratory tests through the website. For example, the healthcare provider can use the electronic device to select or send medical information – such as one or more medical classification codes, symptoms, diseases, historical medical information for a patient, etc. – to a server. In response to receiving the medical information, the server can determine one or more possible laboratory tests. For example, the server may use the received medical information to query a data store comprising a plurality of laboratory tests to determine one or more possible laboratory tests. The determined one or more possible laboratory tests can be based at least in part on the received medical information. At least one of the determined possible laboratory tests can be sent to the electronic device by the server.

In some embodiments, a healthcare provider can use the electronic device to order one or more laboratory tests through the website. For example, the server may send five possible laboratory tests to the electronic device in response to receiving a list of symptoms from the electronic device. In this embodiment, a healthcare provider can select one or more of the possible laboratory tests and submit an order for the selected tests through the website. In one embodiment, the server receives an order for one or more laboratory tests from the electronic device and provides one or more additional and/or alternative laboratory tests. For example, a server may query a data store to determine an alternative laboratory test to recommend for an order for a particular laboratory test. An alternative laboratory test may be based on factors such as evidence based guidelines, patient eligibility, historical medical information, and/or other factors. As another example, an additional laboratory test may be recommended if factors indicate that an additional laboratory test may need to be ordered. Thus, in one embodiment, evidence based guidelines may suggest that an additional

laboratory tests should be ordered when a particular laboratory test is ordered. Numerous other embodiments are disclosed herein and variations are within the scope of this disclosure.

This illustrative example is given to introduce the reader to the general subject matter discussed herein. The invention is not limited to this example. The following sections
5 describe various additional non-limiting embodiments and examples of devices, systems, and methods for lab testing management.

Illustrative System

Figure 1 is a system 100 diagram depicting exemplary computing devices in an exemplary computing environment according to an embodiment. The system 100 shown in
10 Figure 1 includes a network 105 in communication with various devices associated with doctor offices 110, hospitals 120, patients 140, customer representatives 150, health plan providers 160, internal labs 170, and external labs 180. The various devices that network 105 is in communication with include, but are not limited to, a desktop computer (i.e. 155), a tablet computer (i.e. 130), or a mobile phone (i.e. 145). The network 105 in Figure 1 is also
15 in communication with a server 190 and the server 190 is in communication with a data store 195. The network 105 may be in communication with other networks such as, for example, network 125 which associated with the hospital 120. In embodiments, the various devices can send and receive messages with other devices associated with network 105. Thus, a desktop computer 115 in the doctor's office 110 is to communicate with server 190 through
20 the network 105. As another example, a desktop computer 175 associated with an internal lab 170 may be able to receive information from data store 195 or store information to data store 195, or both, through the network 105 and the server 190.

In embodiments, various devices including, but not limited to, desktop computer 115, tablet computer 130, and mobile phone 145, may be any device capable of communicating
25 with a network, such as network 105, and capable of sending and receiving information to and from another device. For example, in Figure 1, one device may be a tablet computer 130. The tablet computer 130 includes a touch-sensitive display and be able to communicate with network 105 through network 125 by using a wireless network interface card. Another device shown in Figure 1 is a desktop computer 115. The desktop computer 115 has a
30 display and is connected to network 105 through a wired network connection. The desktop computer 115 may be in communication with any number of input devices such as a keyboard or a mouse. In various embodiments, tablets, desktop computers, or other suitable

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computing devices may be associated with one or more healthcare providers, patients, customer representatives, health plan providers, internal labs, external labs, or other users.

In embodiments, network 105 shown in Figure 1 facilitates communications between the various devices (i.e. 145, 155, 175, 185, etc.) and server 190. The network 105 may be
5 any suitable number or type of networks or links, including, but not limited to, a dial-in network, a local area network (LAN), wide area network (WAN), public switched telephone network (PSTN), the Internet, an intranet or any combination of wired and/or wireless communication links. In one embodiment, the network 105 may be a single network. In other embodiments, the network 105 may comprise two or more networks. For example, the
10 various devices may be connected to a first network, such as network 125, and the server 190 may be connected to a second network, such as network 105, and the first and the second network may be connected. Numerous other network configurations would be obvious to a person of ordinary skill in the art.

In embodiments, network 125 shown in Figure 1 facilitates communications between
15 the various devices (i.e. 130, 135, 145 etc.) and server 190. The network 125 may also be any suitable number or type of networks or links, including, but not limited to, a dial-in network, a local area network (LAN), wide area network (WAN), public switched telephone network (PSTN), the Internet, an intranet or any combination of wired and/or wireless communication links. In one embodiment, the network 105 may be a single network. In
20 other embodiments, the network 105 may comprise two or more networks. For example, various devices may be connected to a first network, such as network 125, and the server 190 may be connected to a second network, such as network 105, and the first and the second network may be connected.

In Figure 1, network 125 is associated with hospital 120. In embodiments, any
25 number of entities may be associated with one or more networks. For example, a network associated with customer representative 150 may be in communication with network 105. Likewise, a network associated with an external lab 180 may be associated with network 105. Numerous other networks associated with entities – such as a doctor's office 110, a health plan provider 160, patient 140, or internal lab 170 – and connected with network 105 may be
30 present in various embodiments. Other network configurations would be obvious to a person of ordinary skill in the art.

In some embodiments, communication between devices, networks, or entities, or some combination thereof, may be facilitated by the Internet. For example, network 105 may

be in communication with network 125 through the Internet. In some embodiments, such communication may be secure. For example, a hypertext transfer protocol secure (HTTPS) may be used to provide encrypted communication between various devices, networks, or entities, or some combination thereof. In another embodiment, a virtual private connection
5 (VPN) may be used to provide communication. For example, a gateway associated with network 125 can be in communication with a gateway associated with network 105 through a VPN connection. In one embodiment, a VPN connection may contain a single tunnel connection. To at least provide redundancy, however, a VPN connection may comprise two or more tunnel connections. Thus, if one tunnel connection in the VPN connection fails,
10 communication may still be successful through the other tunnel connection.

The server 190 shown in Figure 1 may be any device capable of communicating with a network, such as network 105, and capable of sending and receiving information to and from another device. For example, in the embodiment shown in Figure 1, the server 190 may receive a request from various devices such as tablet computer 130, desktop computer 155, or
15 other devices. In this embodiment, the server 190 may respond to the request by sending information back to the requesting device through the network 105. Thus, if server 190 receives a request from desktop computer 115 associated with doctor office 110 through network 105, then the server 190 may process the request including performing any necessary communication with any other device and respond to the request by sending a response back
20 to the desktop computer 115 through the network 105. In an embodiment, the server 190 can communicate with a gateway associated with the server and network 105. The server 190 may be in communication with one or more data stores, such as data store 195.

In embodiments, server 190 may be in communication with one or more additional devices, such as additional servers. In some embodiments, server 190 may communicate
25 with one or more additional devices to process a request received from another device. For example, the server 190 in Figure 1 may be in communication with a plurality of additional servers, at least one of which may be used to process at least a portion of a request received from another device, such as tablet computer 130, or desktop computer 175. In other embodiments, the server 190 may send a request to one or more devices and process any
30 response received from the device or devices. For example, server 190 may send a request to desktop computer 135 associated with hospital 120. In this embodiment, the server 190 may receive a response from the desktop computer 135 and process the response. For example, the server 190 may store information related to the response in data store 195.

The system 100 shown in Figure 1 includes a data store 195. The data store 195 can include numerous separate data stores, data tables, databases, or other data storage mechanisms and media for storing data relating to particular aspects of one or more of the embodiments disclosed herein. The architecture depicted in Figure 1 is merely illustrative, and embodiments may be implemented using various different architectures.

Figure 2 is a flow chart illustrating an example of a system 200 comprising various data stores 205, 280-290 that can store information according to an embodiment. In the system 200 shown in Figure 2, a lab management data store 205, a healthcare provider data store 280, a health plan provider data store 285, and a lab data store 290 are in communication with each other through network 275. Information stored in a data store may be accessed by one or more other data stores. For example, information stored in the health plan provider data store 285 may be accessed by the lab management data store 205. In embodiments, information stored in the lab management data store 205 may be accessed by the health plan provider data store 285. Information may be sent to or saved by, or both, one or more data stores from another data store. For example, information regarding a lab testing order may be sent by the healthcare provider data store 280 through network 275 the lab management data store 205. In this embodiment, the lab management data store 205 may store lab testing order data to the orders database 245. In another embodiment, information regarding the results of a lab test may be sent from lab management data store 205 to healthcare provider data store 280. In various embodiments, information stored in data stores 205, 280, 285, and 290 may contain information stored in data store 195 shown in Figure 1 according to various embodiments.

In embodiments, network 275 shown in Figure 2 facilitates communications between the various data stores 205, 280, 285, and 290. The network 105 may be any suitable number or type of networks or links, including, but not limited to, a dial-in network, a local area network (LAN), wide area network (WAN), public switched telephone network (PSTN), the Internet, an intranet or any combination of wired and/or wireless communication links. In one embodiment, the network 105 may be a single network. In other embodiments, the network 105 may comprise two or more networks. For example, the various devices may be connected to a first network, such as network 125, and the server 190 may be connected to a second network, such as network 105, and the first and the second network may be connected. Numerous other network configurations would be obvious to a person of ordinary skill in the art.

In the embodiment shown in Figure 2, the lab management data store 205 comprises information related to various aspects of a lab management system. The lab management data store 205 in Figure 2 comprises information related to healthcare providers 210. For example, information related to health care providers 210 can include names, addresses, 5 phone numbers, personnel, usernames, passwords, other security information, access levels, and other information associated with one or more providers. The lab management data store 205 in Figure 2 contains information related to patients 215. Information related to patients 215 may include patient names, addresses, telephone numbers, providers to which the patients are associated, medical history, medications, relatives, health care provider plans, 10 account balances, access information, or other information related to one or more patients.

In Figure 2, the lab management data store 205 includes information related to health plan providers 220. For example, information related to health plan providers can include insurance companies, various insurance plans, payment information for lab tests, information related to one or more patients, deductible information, testing authorization data, or other 15 information associated with one or more health plan providers. The lab management data store 205 in Figure 2 comprises information related to medical codes 230. Such information may include medical classifications for diseases, signs, symptoms, potential causes of injury, potential causes of one or more diseases, testing procedures, laboratory tests, other coding information, or a combination thereof. For example, in one embodiment, information related 20 to medical codes 230 can include data from the International Statistical Classification of Diseases and Related Health Problems (ICD) such as the ICD-9 medical classification list or the ICD-10 medical classification list. In another embodiment, information related to medical codes 230 may include data such as the American Medical Association's (AMA) CPT data code files that provide at least a list of CPT procedural codes.

25 The lab management data store 205 in Figure 2 contains information related to medical guidelines 240. Information related to medical guidelines 240 can include evidence based guidelines for one or more diseases, illnesses, medical tests, etc. In one embodiment, information related to medical guidelines 240 includes information that may be used to offer suggestions regarding tests or procedures that are typically followed for a particular illness, 30 system or set of symptoms, or other evidence-based information. In one embodiment, a set of questions related to one or more illnesses or one or more symptoms may be stored in data base 240. The lab management data store 205 in Figure 2 includes information related to orders 245. For example, information related to orders 245 can include information related to

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health care providers that have placed an order, information related to patients for which an order has been placed, information related to the tests that have been performed, billing information, payment information, accounts receivable information, order status, one or more laboratories associated with orders, test results, or a combination thereof.

5 The lab management data store 205 in Figure 2 comprises information related to laboratories 250. For example, a laboratories database 250 may contain information such as location, costs for various tests, turnaround time, type of tests performed, current capacity levels, historical information related to tests that have been performed by one or more laboratories, current information regarding one or more orders such as order statuses,
10 addresses, personnel, contacts, profit margins such as profit margins for one or more tests, usernames, passwords, other identification, or other laboratory information. In embodiments, the laboratories database 250 may contain information to distinguish internal laboratories from external laboratories. Internal laboratories can include laboratories owned by or affiliated with one or more organizations operating a laboratory management system. For
15 example, if an organization is operating the laboratory management system described herein and the organization owns a laboratory, in one embodiment, the laboratory can be considered an internal laboratory. Examples of external laboratories can include laboratories not owned or operated by an organization operating the laboratory management system. For example, in
20 one embodiment, an organization may own several laboratories, but none of the internal laboratories perform a particular test that has been ordered. In this embodiment, the laboratories database 250 may contain information for an external laboratory that has the capability to perform the test. Numerous other embodiments or additional information that may be stored in the laboratories database 250 will be obvious to one of skill in the art.

 The lab management data store 205 in Figure 2 contains information related to lab test
25 results 260. Information related to lab test results 260 can include information such as the actual results of the test, suggested follow-up tests, historical information based on past test results, diagnostic information, information related to medical guidelines or thresholds for one or more tests, and other information related to test results. The lab management data store 205 in Figure 2 includes information related to claims 270. For example, information
30 related to claims can include the payment status for claims, whether the claim has been submitted to a health plan provider, eligibility verification information, benefits determination information, whether a claim requires editing, whether the claim needs or has been adjusted, or other information related to one or more claims.

In various embodiments, information stored in data stores 205, 280, 285, and 290 may contain information stored in data store 195 shown in Figure 1 according to various embodiments. It should be understood that there can be many other aspects that may need to be stored in data stores 205, 280, 285, or 290, or some combination thereof. In various
5 embodiments, information shown in data store 205 may be stored in any number of data stores including, but not limited to, data store 280, 285, or 290. In some embodiments, data store 205 may access or store information, or both, in one or more data stores, such as data store 280, 285, or 290. For example, in one embodiment, data store 290 may contain lab test results 260. In this embodiment, data store 205 may be able to access information or store
10 information related to lab test results 260 by accessing data store 290 through network 275. One or more data stores may be associated with any number of entities. For example, data store 280 may be associated with a healthcare provider such as a hospital or a doctor's office. In one embodiment, data store 280 may be associated with a hospital and one or more satellite branches such as other facilities located in surrounding communities. In other
15 embodiments, data store 280 may be associated with multiple hospitals or other facilities owned, affiliated with, or related to one another. Data store 285 may be associated with a health plan provider such as an insurance company. Data store 290 may be associated with one or more labs such as an internal lab or an external lab. It should be understood that information may be stored in any appropriate mechanisms or in additional mechanisms in one
20 or more of data stores 205, 280, 285, or 290.

Referring back to Figure 1, data store 195 is operable, through logic associated therewith, to receive instructions from various devices – such as server 190, other data stores, networks 105 or 125, other devices (i.e. 130, 145, 175, etc.), or a combination thereof – and obtain, update, or otherwise process data in response thereto. As one example, a doctor's
25 office 110 may submit an order for a lab test for a patient using desktop computer 115 to the server 190 through network 105. In this case, the server 190 may process the order at least by querying the data store 195 to verify the identity of the doctor's office and, if the doctor's office is authorized, process the order. It should be understood that there can be many other aspects that may need to be stored in the data store 195, such as page image information or
30 access rights information, which can be stored in any appropriate mechanisms or in additional mechanisms in the data store 195.

In Figure 1, numerous entities, such as hospital 120 and internal lab 170, are shown. In various embodiments, any number of entities may be associated with network 105 or can

send information to server 190 or receive information from server 190, or some combination thereof. In the embodiment shown in Figure 1, healthcare providers, including hospital 120 and doctor office 110, as well as patient 140 are in communication with network 105. A healthcare provider can be any personnel or facility that provides health care services to one or more patients. A patient can be anyone who receives treatment from a healthcare provider. In Figure 1, a customer representative 150 is in communication with network 105. In embodiments, a customer representative 150 may be one or more companies or individuals that provide support to patients 140 or entities (i.e. hospital 120, internal lab 170, health plan provider 160, etc.), or both. For example, a patient 140 may call a customer representative 150 to verify the status or results of a lab test that was ordered for the patient. Numerous entities may be in communication with network 105, additional networks, other entities, or additional devices according to various embodiments of the present invention.

The environment in an embodiment is a distributed computing environment utilizing several computer systems and components that are interconnected via communication links, using one or more computer networks or direct connections. However, it will be appreciated by those of ordinary skill in the art that such a system could operate equally well in a system having fewer or a greater number of components than are illustrated in Figure 1. Thus, the depiction of the system 100 in Figure 1 should be taken as being illustrative in nature, and not limiting to the scope of the disclosure.

Illustrative Operation and Method

Figure 3 is a flow chart illustrating an example of the operation of a laboratory benefit management system according to an embodiment. The method shown in Figure 3 will be described with respect to the environment shown in Figure 1.

The method 300 shown in Figure 3 begins when a patient visits a healthcare provider 310. For example, referring to Figure 1, the patient 140 may visit a physician at a doctor's office 110. Once the patient visits the healthcare provider 110, the method proceeds to block 320. In block 320, the healthcare provider determines that a patient needs a lab test. For example, referring to Figure 1, the physician at the doctor's office 110 may determine that the patient 140 needs a lipoprotein analysis. As another example, the physician at the doctor's office 110 may determine one or more symptoms for the patient 140 and may determine that one or more lab tests may be needed. In this embodiment, the doctor may use the laboratory benefit management system to help determine which lab tests should be ordered for the patient. Thus, as discussed in more detail below, medical information for one or more

patients may be submitted by a healthcare provider and used to recommend one or more laboratory tests to order.

Once the healthcare provider determines that the patient may need a lab test 320, medical information may be sent 330. Medical information may be sent by any number of persons. For example, referring to Figure 1, personnel in the doctor's office 110 may cause medical information to be sent. In embodiments, a physician, a nurse, an administrative assistant, other office personnel, or other persons associated with a healthcare provider may send medical information through one or more electronic devices, such as devices 130, 135, 115 shown in Figure 1 or another suitable electronic device. For example, a nurse may cause medical information, such as one or more current symptoms for a patient, to be sent via an electronic device and the electronic device may receive one or more recommendations for lab tests based at least in part on the received medical information. In another embodiment, a physician may use an electronic device to send medical information, such as an order for one or more laboratory tests, and receive one or more recommendations for additional and/or replacement lab tests based at least in part on the received medical information.

Medical information may be sent in any number of ways. In one embodiment, personnel associated with a healthcare provider may use one or more devices to electronically send information to an organization. For example, referring to Figure 1, a nurse associated with doctor's office 110 may use desktop computer 115 to send an email to a lab management organization associated with server 190 and the email may contain medical information. In another embodiment, a person submitting a lab test request may visit a website designed to receive medical information. For example, referring again to Figure 1, a doctor may visit a website associated with a lab management organization using desktop computer 115 by sending a request to server 190 through network 105. In response to the request, the server 190 may send a response to the desktop computer 115 through network 105. The website may contain one or more security measures, such as requiring a username and password or a digital certificate, to verify the authenticity of the doctor submitting the lab request. For example, the server 190 may access data store 195 to determine whether information received from the desktop computer 115 associated with the doctor's office 110 successfully authenticates a user of the desktop computer 115. In this embodiment, once the authenticity of the doctor has been verified, the website may contain one or more forms that the doctor can fill out to submit medical information for one or more patients. In another embodiment, medical information may be received by server 190 from various devices

through an application programming interface (API) call. In various embodiments, one or more applications, such as a desktop application or a Windows®-based application, associated with the healthcare provider may be executed that facilitates submitting one or more lab test requests to a lab management organization. For example, tablet computer 130
5 associated with hospital 120 may contain an application that can be executed by a user to submit a medical information to a lab management organization. The application may be able to communicate with other devices, such as server 190, through network 105 and network 125.

When a device, such as tablet computer 130 or desktop computer 115, sends medical
10 information 330, another device may receive the sent medical information 340. For example, if an administrator at hospital 120 uses tablet computer 130 to send medical information 330 request a lab test for a patient, then server 190 may receive the lab test request 340 through network 105 and network 125. In embodiments, the device receiving the medical information may process the request. For example, if server 190 receives medical
15 information from desktop computer 115, then server 190 may process the received medical information. In embodiments, a device sending medical information and a device receiving medical information may send and receive information back and forth to provide a healthcare provider with a list of one or more additional laboratory tests and/or alternative laboratory tests that can be ordered. For example, if a lab test request is in some way
20 incomplete then the device receiving the lab test request may send information to the requesting device asking for additional information and the requesting device may send the additional information to the device that received the lab test request. Information may be sent back and forth between a healthcare provider's computer and a computer associated with the laboratory management system. For example, as a healthcare provider selects symptoms
25 of a patient, this information may be sent to the computer associated with the laboratory management system. In this embodiment, a server associated with the laboratory management system that may determine frequently ordered tests based at least in part on the selected symptoms of the patient and return this information to the healthcare provider's computer to be displayed to the healthcare provider.

30 In an embodiment, medical information 340 may be received that contains one or more tests for one or more patients to be ordered. In another embodiment, medical information 340 may contain present or historical, or both, information related to one or more patients and this information may be used by a decision support 350 component to determine

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one or more recommended tests. Medical information can include current and/or past medical statistics, current and/or past biographical information, current and/or past laboratory orders, current and/or past laboratory results, current and/or past symptoms, current and/or past diagnoses, current and/or past treatments, current and/or past prescriptions, current and/or past indications, current and/or past healthcare providers, current and/or past insurance providers, medical codes such as ICD-9 codes, other medical information, or a combination thereof. Numerous other embodiments or implementations, or both, will be obvious to one of skill in the art or are disclosed herein.

Once medical information has been received 340, the medical information may be processed through a decision support 350 component. Physician decision support may provide an option to order one or more laboratory tests. For example, if the medical information sent in a request includes information for identifying an illness, then the decision support component may present frequently ordered laboratory tests for that illness that can be ordered. If the medical information includes an order for one or more laboratory tests, then the decision support component may provide an option to order one or more additional laboratory tests. The one or more additional laboratory tests can be recommended for ordering based on the received medical information for a patient, past medical information for a patient, medical information for a population of patients, evidenced-based medical guidelines, information corresponding to one or more laboratories, information corresponding to one or more healthcare providers, information corresponding to one or more insurance providers, information corresponding to one or more laboratory system management providers, other medical information, or a combination thereof. In one embodiment, if the medical information comprises an order for one or more laboratory tests, the decision support component recommends one or more alternative laboratory tests. This recommendation can be based on the received medical factors and/or other factors discussed above with respect to recommending an additional laboratory test.

Decision support 350 information may be accessed, collected, and/or verified in response to receiving medical information. For example, medical information contained in a request may be verified against one or more medical classification lists such as ICD-9, ICD-10, or CPT data. In one embodiment, evidence based guidelines may be used to determine one or more laboratory tests – including additional and/or alternative laboratory tests if the received medical information includes an order for one or more laboratory tests – for one or more patients associated with the received medical information. For example, information

related to a patient's medical history may be contained in the request or otherwise accessed and used to determine whether one or more additional or alternative tests for the patient can be recommended based at least in part on one or more evidence based guidelines. Similarly, information related to a patient's symptoms may be contained in the request or otherwise
5 accessed and used to determine whether one or more laboratory tests for the patient or patients can be recommended based at least in part on one or more evidence based guidelines. In some embodiments, a patient's medical history, past symptoms, present symptoms, or a combination thereof, may be used to determine one or more laboratory tests. For example, a request may contain a patient's current symptoms which are used to determine one or more
10 suggested lab tests for the patient. In one embodiment, a request contains symptoms as well as a lab test for a patient and the symptoms are used, at least in part, to determine one or more additional or alternative tests for the patient. Other information, such as a patient's medical history, may be used in connection with a patient's symptoms to determine one or more recommended tests for the patient.

15 The decision support component 350 may also determine patient healthcare eligibility and benefits for the one or more lab tests to be performed. Patient eligibility and benefits may be determined in any number of ways. In one embodiment, patient eligibility and benefits are verified using information contained in one or more data stores. In another embodiment, server 190 may query one or more external data stores, such as health plan
20 provider data store 285 shown in Figure 2, to make a determination as to whether a patient 140 is eligible and what benefits patient 145 should receive. In embodiments, various records may be kept regarding one or more orders or lab tests. For example, records may be kept regarding responsible payor or payors, an amount owed, addresses, one or more statuses of an order, etc. Variations are within the scope of this disclosure and will be apparent to one of
25 skill in the art.

Any lab test or tests that are ordered may be processed through a performance privileging module 360. In some embodiments, the performance privileging module can determine one or more laboratories to perform at least a portion of a test for an order. Such a determination may be based on any number of factors. For example, a determination may be
30 based on a timeframe for completing at least a portion of the order. In this embodiment, a laboratory that has the capacity to provide lab results for the portion of the order may be selected. A determination may be based at least in part on the profitability for at least a portion of an order. For example, if an order specifies a particular lab test and ten

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laboratories are available to complete the lab test, then the lab with the overall lowest cost for performing the lab test may be chosen. A determination can be based on other factors such as location of the laboratory, whether the laboratory is an in-network or out-of-network laboratory, whether the laboratory is owned or operated by the lab management organization, or other factors. Numerous various are disclosed herein and others will be apparent to one of skill in the art.

One or more of the lab tests may be processed through a lab testing module 370. A lab testing module 370 may track the status of a lab test. For example, if an external laboratory is selected to perform a lab test, then the lab testing module may track the status of the lab test. The status of the lab test may include information such as whether a sample related to the test has been collected, the historical location of the sample, a current location of the sample, whether the lab test has been started, an expected completion date for the lab test, whether the results of a lab test are available, whether the results of a lab test have been received, or other status information. In embodiments, status information may be exchanged between various devices. For example, referring to Figure 1, an internal lab 170 may send status information to server 190 through network 105 which is stored in data store 195. In one embodiment, status information may be sent from server 190 to an external lab 180 through network 105.

Various entities may be able to access at least some information regarding a lab test. For example, a physician or other personnel in doctor's office 110 may be able to view the status of one or more lab tests. A physician may be able to view the results of one or more lab tests. In one embodiment, a healthcare provider can customize the presentation of results of one or more lab tests. For example, one healthcare provider may customize test results so that only raw data related to the lab test is sent in the test results. Another healthcare provider may customize test results so that raw data as well as graphical indications, such as a bar chart or a pie chart, is shown in a test results report. In another embodiment, the healthcare provider can customize the test results report to include historical medical information related to one or more patients. In yet another embodiment, the healthcare provider can customize test results reports to include one or more recommendations based at least in part on the test results. In some embodiments, one or more persons associated with a healthcare provider can customize test results reports. For example, a healthcare provider may have a customized test results report template and a doctor employed by the healthcare provider may have another customized test results report template. Thus, various entities or people associated with

various entities, or both, may be able to customize test reports. In some embodiments, a patient may be able to customize test results reports. Variations are within the scope of this disclosure and will be apparent to one of skill in the art.

5 This illustrative example is given to introduce the reader to the general subject matter discussed herein. The invention is not limited to this example. The following sections describe various additional non-limiting embodiments and examples of devices, systems, and methods for lab testing management.

Decision support Component

10 **Figure 4** is a flow chart illustrating a method 400 for a decision support component of a laboratory benefit management system according to an embodiment. For example, one or more steps described with respect to method 400 may be performed in the decision support component 350 shown in Figure 3. The description of method 400 will be made with respect to Figure 1, which illustrates an example environment 100 for implementing aspects in accordance with various embodiments.

15 The method 400 begins in block 410 with a test verification for at least a portion of a request. A test verification may be based on one or more medical classification lists. For example, a lab test requested for a patient may be verified against an ICD-9 or ICD-10 medical classification list. In an embodiment, the request contains a code that represents a lab test to be performed for a patient. The code specified in the request may be compared
20 with codes provided in ICD-10 to determine whether the code is a valid code. In one embodiment, if the code specified in the request is also listed in the ICD-10 list, then a determination may be made that the code is valid. Otherwise, in this embodiment, the code specified in the request may be determined to be invalid. A request may contain a name of a lab test to be performed. In this embodiment, a code – such as an ICD-9, ICD-10, or CPT
25 code – may be assigned for the lab test based at least in part on the name of the lab test. For example, if the name of the lab test provided in the request matches a name of a lab test listed in an ICD-10 classification list, then the ICD-10 number associated with that lab test may be assigned.

30 In one embodiment, a classification code for a lab test may be assigned that closely matches the name of a lab test provided in a request. In some embodiments, if a code cannot be ascertained for one or more lab tests specified in a request, then information is sent to the requestor asking for more information. For example, if a request is received by server 190 from tablet computer 130 for a lab test and server 190 cannot determine a classification code

for the lab test, then server 190 may send a response to the tablet computer 130 requesting additional information for the lab test. As an example, the server 190 may request that a classification code for the lab test be provided. As another example, the server 190 may request that a revised name for the lab test be submitted. In one embodiment, the server 190 may provide the tablet computer 130 with a list of potential lab names and the user of the tablet computer 130 can select the appropriate lab name. Once additional information has been input into the tablet computer 130, then an updated response may be sent from the tablet computer 130 to server 190 through network 105.

In performing a test verification for at least a portion of a request, information may be requested from one or more data stores in one or more locations. In one embodiment, server 190 accesses information stored in data store 195 in performing a test verification for at least a portion of an order. For example, data store 195 may contain a list of ICD-10 codes. In this embodiment, a lab test specified in a request received by server 190 may be compared to the list of ICD-10 codes in data store 195 to verify that the lab test specified in the request is valid. In another embodiment, server 190 accesses information stored in one or more external data stores to perform a test verification for at least a portion of an order. For example, referring to Figure 2, a data store related to a health plan provider 285 may contain a classification list of various lab tests. In this embodiment, server 190 may access information stored in data store 285 to perform a test verification.

Referring back to Figure 4, once at least a portion of a request has been verified 410, the method 400 proceeds to block 420. In block 420, a determination is made as to whether one or more additional or alternative tests, or both, are available. If one or more additional or alternative tests, or both, are available 420, then the method 400 proceeds to block 430. Otherwise, the method 400 proceeds to block 460.

A determination as to whether one or more lab tests are available 420 may be made in any number of ways. In one embodiment, a determination as to whether one or more lab tests are available may be based on evidence based guidelines. Evidence based guidelines may be derived from any number of medical sources including, but not limited to, journals, articles, case studies, publications, various data stores containing medical information, or other medical literature. In some embodiments, evidence based guidelines can be based on clinical trials, risk-benefit analyses, medical literature, meta-analysis, or a combination thereof. Evidence based guidelines may be based on one or more symptoms, illnesses, policies, or a combination thereof. In one embodiment, evidence based guidelines may be tailored to one

or more patients based at least in part on a patient's current symptoms or medical history, or both.

5 In one embodiment, a data store 195 containing evidence based guidelines is accessed to determine whether one or more tests are recommended. For example, a request received by server 190 may contain an illness or a disease for a patient, such as high cholesterol. In this embodiment, server 190 accesses data store 195 to determine if there are any tests that are recommended based on the illness or disease provided in the request for the patient and the evidence based guidelines stored in data store 195. In one embodiment, historical medical information for the patient is also used to determine which tests, if any, are recommended. As another example, a request received by server 190 may contain a lab test for a patient. In this embodiment, server 190 may access evidence based guidelines stored in data store 190 to determine whether one or more additional or alternative tests associated with the requested lab test is recommended based at least in part on the evidence based guidelines.

15 In embodiments, a determination as to whether one or more lab tests are available 420 is based on symptoms for a patient. For example, a request received by server 190 may contain a list of symptoms for a patient. In this embodiment, server 190 accesses data store 195 to determine if there are any tests that are recommended based on the symptoms provided in the request and various medical information stored in data store 195. In one embodiment, historical medical information for the patient is also used to determine which tests, if any, are recommended. For example, if a patient has a history of having a bladder infection and symptoms for the patient provided in the request indicates that a bladder infection, among other potential illnesses, may be the problem, then one or more lab tests related to a bladder infection may be determined based on the patient's medical history and symptoms. In one embodiment, a request received by server 190 may contain a lab test for a patient as well as symptoms for the patient. In this embodiment, server 190 may access medical information stored in data store 190 to determine whether one or more additional tests are available based at least in part on the requested lab test as well as the patient's symptoms.

30 In various embodiments, evidenced based guidelines, symptoms, historical medical information, illnesses or diseases, any requested lab tests, or a combination thereof, may be used to determine one or more tests for a request. One or more data stores may be queried in making such a determination. In one embodiment, information is contained in a single data

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store. For example, in Figure 1, data store 195 may contain historical medical information for a patient and evidence based guidelines that are used, along with information received in the request, to determine whether one or more tests are recommended. In another embodiment, information is contained in two or more data stores. For example, referring to

5 Figure 2, data store 205 may contain medical codes, data store 280 may contain evidence based guidelines for the healthcare provider, and data store 285 may contain historical information for patients. In this embodiment, server 190 may receive a request for a lab test and a list of symptoms for a patient. In determining whether one or more tests are recommended, server 190 may access data store 205 for one or more medical codes related to

10 the requested lab test, data store 280 for evidence based guidelines based on the list of symptoms for the patient provided in the request or the requested lab test, or both, and data store 285 for historical information related to the patient.

Referring back to Figure 4, if one or more additional or alternative tests, or both, are available 420, then the method proceeds to block 430. In block 430, one or more additional

15 or alternative tests, or both, are recommended. For example, if a determination is made that two additional lab tests are recommended, then information related to the two lab tests may be sent to a requestor. In embodiments, information related to a lab test can comprise information including, but not limited to, one or more classification codes for the lab test, a name for the lab test, one or more reasons as to why the lab test is recommended, medical

20 information related to the recommended lab test and a patient for which the lab test is recommended, statistics related to the lab test, information regarding evidence based guidelines that were used to make the recommendation, one or more medical references regarding the recommendation, other medical information, or a combination thereof. In embodiments, information provided with a recommendation may be customized. For

25 example, a healthcare provider may specify that a list of recommended tests should be provided. A physician in doctor's office 110, however, may specify that a list of recommended lab tests as well as the criteria used to determine the recommended lab tests should be provided. In another embodiment, a physician can specify that a recommended lab test as well as any relevant medical articles should be provided. Thus, in various

30 embodiments, customized recommendations may be provided to users based on customization settings of the user or an organization associated with the user. For example, a hospital 120 may determine a level of customization for recommended tests. In one

embodiment, a user of the lab management system, such as a physician, can determine a level of customization for recommended tests.

One or more tests may be recommended in any number of ways. In one embodiment, a web page containing the recommended tests may be provided to a user of the lab management system. For example, if a physician is using desktop computer 115 and one or more recommended tests are available, then the server 190 may send information related to the available tests to desktop computer 115 through network 105. In another embodiment, tablet computer 130 is executing software, such as a touchscreen-enabled application, that provides a list of one or more available tests to a user of the tablet computer 130. In one embodiment, tablet computer 130 may contain sufficient information on the device to make a determination as to whether additional tests are available and to recommend any additional tests to a user. Such information may be stored on memory in the tablet computer, on a disk drive in the tablet computer, or one or more external storage devices. In another embodiment, tablet computer 130 may send and receive information from other devices, such as server 190, to recommend any additional or alternative tests, or both that are available.

Referring back to Figure 4, once one or more additional or alternative tests, or both, are recommended 430, the method 400 proceeds to block 440. In block 440, a determination is made as to whether one or more additional or alternative tests, or both, have been ordered. If one or more additional or alternative tests, or both, have been ordered the method 400 proceeds to block 460.

A determination as to whether one or more additional or alternative tests, or both, have been ordered may be made in any number of ways. In one embodiment, a device may receive a response that indicates whether one or more tests have been ordered. For example, server 190 may receive a response that indicates whether one or more tests have been ordered. A response may be received by one or more electronic devices. In one embodiment, a response is received over hypertext transfer protocol (HTTP). A response may be received via a secure connection. For example, a response may be received over hypertext transfer protocol secure (HTTPS). In one embodiment, a response is received over a virtual private network (VPN) connection. A response may be received through one or more application programming interfaces (APIs). In an embodiment, a response is received from a website associated with a lab management organization, a healthcare provider, or a third-party. A response may be received in any number of languages or in any number of formats including, but not limited to, ActionScript®, AJAX, ASP, C, C++, HTML, JAVA

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JavaScript, JSON, JSP, MXML, PHP, XML, or XSLT. In embodiments, a response may be received from one or more data stores. For example, a response may be received from a data store associated with a healthcare provider. A response may be in an archive or compressed format, or both, such as JAR, ZIP, RAR, ISO, or TAR. A combination of protocols, languages, formats, and/or devices may be used to send or receive a response according to various embodiments.

Referring back to Figure 4, the method 400 next proceeds to block 460. In block 460, patient eligibility for the one or more lab tests is verified. Patient eligibility may be determined in any number of ways. In one embodiment, patient eligibility is verified using information contained in one or more data stores. In another embodiment, server 190 may query one or more external data stores, such as health plan provider data store 285 shown in Figure 2, to make a determination as to whether a patient 145 is eligible.

Numerous factors may be used to determine whether a patient is eligible for one or more lab tests. In one embodiment, health plan membership data may be used to determine whether a patient is eligible for the one or more lab tests. For example, server 190 may query data store 195 to determine whether a patient associated with the one or more lab tests is currently an active member in a health plan for a health plan provider. If a determination is made that the patient is an active member in the health plan, then the patient may be determined to be eligible for the one or more lab tests. If a determination is made that the patient is not currently an active member in the health plan, then the patient may be determined to be ineligible for the one or more lab tests. As another example, a determination may be made as to whether a patient for which a particular lab test is ordered has waited a required period of time since receiving the particular lab test or a related lab test, or both. If a determination is made that the patient has not waited the required period of time, then an alternative lab test for which the period of time is not required may be recommended. In one embodiment, the decision support component asks a healthcare provider ordering a laboratory test for a patient a series of questions to determine whether the patient is currently eligible to receive the laboratory test under the patient's health plan provider. Numerous other examples are disclosed herein and variations are within the scope of this disclosure.

Referring back to Figure 4, once patient eligibility for the one or more lab tests has been verified 460, the method 400 proceeds to block 470. In block 470, patient benefits related to the one or more lab tests are determined. In one embodiment, a maximum payment for the one or more lab tests is determined. A maximum payment may be based on any

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number of factors. A maximum payment may be based on the type of lab test that will be performed. A maximum payment can be based on a volume or number of lab tests performed within a timeframe. In one embodiment, a maximum payment may be based on a turnaround time. For example, a lab test that needs completion within two days may have a higher maximum payment than the same lab test that needs completion within one week. In 5
embodiments, a maximum payment may be based on a health plan provider associated with a patient for whom a lab test will be performed. For example, a health plan provider may allow a maximum payment for a particular lab test. In this embodiment, the maximum payment to an internal or external lab may be based at least in part on the maximum payment allowed by 10
the health plan provider.

In determining patient benefits 470 for the one or more lab tests, information stored in one or more data stores may be accessed. For example, referring to Figure 1, server 190 may access information stored in data store 195. In some embodiments, information from one or more external sources may be used to determine patient benefits for the one or more lab tests. 15
For example, server 190 may send a request to desktop computer 165 associated with health plan provider 160. In this embodiment, the request may be for a maximum reimbursement amount for a lab test associated with a patient having a particular plan. In response to the request, server 190 may receive a response from desktop computer 165. In another embodiment, numerous data stores may be queried to determine benefits. For example, 20
referring to Figure 2, information stored in lab management data store 205, health plan provider data store 285, and lab data store 290 may each be queried to determine patient benefits for one or more lab tests. For example, lab data store 290 may be queried to determine a testing identification number for a lab test associated with an order. In this embodiment, information stored in database 245 may be queried to determine a patient 25
associated with the testing identification number. In addition, patient database 215 may be queried to determine a health plan provider and policy number associated with the patient. Furthermore, health plan data store 285 may be accessed to determine a maximum reimbursement price for the lab test.

Referring back to Figure 4, once patient benefits for the one or more lab tests has been 30
determined 470, the method 400 proceeds to block 480. In block 480 an order is approved. An order may be approved in many ways. In one embodiment, order approval is an automated process. Order approval may include processing payment for one or more lab tests. For example, if credit card information is provided to pay for a lab test associated with

a request, then the credit card may be charged. Order approval can also include verifying any additional tests that were ordered.

In one embodiment, order approval includes providing a notification to one or more users of the lab management system. For example, if a nurse originally submits an order for a physician, then the nurse or the physician, or both, may receive a notification that the order has been approved. In embodiments where a request contains tests for multiple patients associated with multiple physicians, then each physician may receive a notification associated with his or her patients. For example, a request may contain a lab test request for patient A associated with physician A, a lab test request for patient B associated with physician A, and a lab test request for patient C associated with physician B. In this embodiment, physician A may receive one notification for the lab test request associated with patient A and another notification for the lab test request associated with patient B. Alternatively, physician A may receive a single, combined notification for the lab test requests associated with patient A and patient B. In addition, physician B may receive a notification for the lab test request associated with patient C.

In embodiments, one or more patients may receive a notification related to an order. For example, patient A may receive a notification that a lab test has been ordered and approved. A patient may receive information indicating additional steps that the patient needs to complete in order for the order to be finished. In one embodiment, the notification may provide information needed to obtain a sample from the patient. For example, a patient may need to have blood drawn in order to complete a lab test. In this embodiment, the notification to the patient may provide a date, time, and location for the patient to have the blood drawn. A notification may contain additional instructions for a patient. For example, a patient may need to fast for twelve hours before an appointment. In this embodiment, the notification may state that the patient should not eat within twelve hours of the appointment. Numerous other embodiments will be obvious to one of skill in the art.

As will be appreciated from the discussion herein, embodiments of the present invention may be advantageously used in a health care environment to connect health care providers, payers and diagnostic test providers to deliver high quality, cost effective care to an individual seeking health care services.

As discussed herein a feature of the present invention comprises decision support. Embodiments of systems, components and methods of the present invention may provide decision support to assist a user in decision making. Decision support may comprise

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receiving input and providing a suggested course of action based on the input and data. Input may comprise patient data. Patient data may comprise: identification data, electronic medical record (EMR) data, physical specifications (height, weight, age), medical history, insurance coverage information, family history and the like. Data may comprise data relating to: a patient, a laboratory, clinical outcomes in similar cases, clinical research, specific tests and the like.

In an embodiment, decision support may comprise a guideline, including but not limited to a guideline relating to: diagnostic test selection, interpretation of test results, follow on testing, additional tests, laboratory selection, identification of appropriate patients for testing, explanation of test results, insurance coverage and insurance coding. A guideline may comprise background data. A guideline may also be sometimes referred to herein as a policy. An embodiment of the present invention may comprise a guideline or policy, or a plurality of guidelines or policies.

As will be understood by those of skill in the art, background data is often temporal and may be updated to reflect changes in a patient, laboratory, clinical outcomes, clinical research, specific tests and/or other datum. A guideline or policy in an embodiment of the present invention may also be temporal and subject to updating and/or changes in view of altered background data.

By way of a non-limiting example, a policy may relate to a diagnostic test, including a diagnostic test for a particular condition or disease. Examples of diagnostic tests include, but are not limited to: urinary tract infections; human immunodeficiency virus (HIV) testing, prognosis, monitoring and/or diagnosis; blood counts; partial thromboplastin time; prothrombin time; serum iron studies; collagen crosslinks; blood glucose testing; glycated hemoglobin/glycated protein; thyroid testing; lipid testing; digoxin therapeutic drug assay; alpha fetoprotein; carcinoembryonic antigen (CEA); human chorionic gonadotropin (HCG); tumor antigen by immunoassay (including, but not limited to, CA 125; CA 15-3/CA 27.29; CA 19-9; prostate specific antigen; gamma glutamyl transferase (GGT); hepatitis panel/acute hepatitis panel; fecal occult blood test; as well as all of the tests found at <https://www.labcorp.com/wps/portal/provider/testmenu> and/or the tests offered by other clinical diagnostic laboratories now or in the future.

Policies may also relate to conditions or diseases. Examples of conditions and/or diseases include, but are not limited to, allergies (food, insect, mold, dust, animal, chemicals and the like); diarrhea; celiac disease; lyme disease; diabetes; arthritis; thalassemia; viral

infections; bacterial infections; cold; flu; upper respiratory tract infections; urinary tract infections; gastroenterological conditions; urological conditions; cardiovascular conditions; cancers, including but not limited to: lung, ovarian, prostate, skin, lymphatic, colon, liver, brain, leukemia and other metastatic and non-metastatic cancers, as well as all of the cancers
 5 listed by the National Cancer Institute, see, e.g. <http://www.cancer.gov/cancertopics/types/alphalist>; as well as all of the conditions found at <https://www.labcorp.com/wps/portal/provider/testmenu> and/or referenced by other clinical diagnostic laboratories now or in the future.

Policies may also relate to particular health care specialties including, but not limited
 10 to, allergy; immunology; cardiology; dermatology; endocrinology; gastroenterology; infectious disease; internal medicine; nephrology; neurology; obstetrics; gynecology; pathology; pediatrics; primary care; psychiatry; rheumatology; urology; routine testing; as well as other existing and/or to be developed specialties.

As described herein decision support may comprise a policy relating to a diagnostic
 15 test; condition, disease and/or specialty. In an embodiment a policy comprises data relating to one or more of a diagnostic test; a condition; a disease; and/or specialty. By way of a non-limiting example, decision support may comprise associating a patient datum or patient data with data relating to one or more of a diagnostic test; a condition; a disease; and/or specialty.

Performance Privileging Component

Figure 5 is a flow chart illustrating a method 500 for a performance privileging
 20 component of a lab management system according to an embodiment. For example, one or more steps described with respect to method 500 may be performed in the performance privileging component 360 shown in Figure 3. The description of method 500 will be made with respect to Figure 1, which illustrates an example environment 100 for implementing
 25 aspects in accordance with various embodiments.

The method 500 begins when one or more labs are determined for one or more orders
 510. One or more labs may be determined in any number of ways. In one embodiment, one or more labs are determined based on the test or tests requested in the order. For example, an order may request a first test and a second test for a patient. In this embodiment, a first lab
 30 may perform the first test, a second lab may perform the second test, and a third lab may perform both the first and the second test. In this embodiment, a determination may be made that the third lab should complete the first and second lab tests for this order because the third lab can perform both tests. In another embodiment, a determination may be made that the

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first lab should complete the first lab test and that the third lab should complete the second lab test because of one or more other factors disclosed herein. Furthermore, the second lab may not be chosen to complete the first lab test because the second lab does not perform the type of test requested in the first lab test.

5 In one embodiment, one or more labs are determined based on availability. For example, two labs may perform a lab test ordered for a patient. In this embodiment, however, the request may specify that results are needed within one week. One of the labs may have the capacity to complete the lab test within the one week timeframe and the other lab may not have the capacity to complete the lab test within the one week timeframe. In this
10 embodiment, the lab that has the capacity to complete the lab test within the requested timeframe may be chosen to perform the lab test. One or more labs may be determined based on the location of the lab. For example, one lab testing facility may be closer to the healthcare provider that submitted the order than another lab testing facility. In this embodiment, the closer lab testing facility may be selected. Multiple labs may be selected for
15 a single lab test. For example, one lab facility – such as a physician office lab – that is in close proximity to a patient may be chosen to collect a sample from the patient for the lab test while another lab facility is selected to analyze the sample. In one embodiment, one or more labs are determined based on whether the labs are in network or out of network. For example, if two labs are available to perform a lab test for an order and one lab is an in-
20 network lab and the other lab is an out-of-network lab, then the in-network lab may be chosen over the out-of-network lab.

 In embodiments, one or more labs are determined based on the cost for a lab test. For example, two labs may be available to perform a lab test related to an order. In this example, the first lab may charge \$50 to perform the lab test and the second lab may charge \$75 to
25 perform the lab test. In this embodiment, the first lab may be chosen because it would be more profitable for the lab management organization to pay \$50 to perform the test than \$75. In embodiments, one or more labs are determined based on the profitability for a lab test. For example, two labs may be available to perform a lab test related to an order. In this example, the first lab may charge a price such that the profitability to the lab management organization
30 would be 35% if the first lab was chosen to perform the lab test. The second lab may charge a price such that the profitability to the lab management organization would be 40% if the second lab was chosen to perform the lab test. In this embodiment, the second lab may be

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chosen to perform the second lab test based on the higher profitability for the lab management organization.

In one embodiment, one or more labs may be determined based on an overall profitability. A lab management organization may receive a discount if a number of lab tests are ordered within a period of time. For example, the lab management organization may receive a discount if twenty lab tests are ordered within a month from a particular testing facility. In this embodiment, nineteen lab tests may have been ordered so far in a particular month and an order for two additional lab tests may be received by the lab management organization. One of the lab tests may be chosen to be performed by the testing facility so that the discount is received for the month. In embodiments, the testing facility is chosen even though the profitability for the one test is lower than the profitability at another testing facility because the overall profitability is higher for all the orders because of the discount for reaching twenty tests in a month.

In embodiments, one or more lab may be based on a combination of factors. For example, one or more testing facilities may be determined based on services offered, availability, location, cost, profitability, whether the lab is an in-network or out-of-network lab, or a combination thereof. In embodiments, one or more lab testing facilities may be determined based at least in part on statistical information related to one or more testing facilities. For example, one or more labs may be determined based on the accuracy, reliability, or other statistics associated with a lab.

Referring back to Figure 5, once one or more labs have been determined for an order 510, the method 500 proceeds to block 520. In block 520, at least a portion of the order is sent to one or more of the determined labs. Sending at least a portion of an order to one or more labs may comprise sending a notification to a lab. A notification may be sent in any form including, but not limited to, a text message, an email, a fax, an automated phone call, or other electronic notifications. In one embodiment, a lab testing facility may be able to access one or more web pages associated with the lab management organization that provides notification of orders. Information regarding orders may be stored in a data store, such as data store 195 shown in Figure 1. For example, data store 195 may contain a list of completed orders as well as a list of pending orders that need to be completed.

Lab Testing Component

Figure 6 is a flow chart illustrating a method 600 for a lab testing component of a lab management system according to an embodiment. For example, one or more steps described

with respect to method 600 may be performed in the lab testing component 380 shown in Figure 3. The description of method 600 will be made with respect to Figure 1, which illustrates an example environment 100 for implementing aspects in accordance with various embodiments.

5 The method 600 begins in block 610 when a sample is received by a lab. In one embodiment, a lab may receive a sample through a carrier such as FedEx™ or UPS™. The sample may contain information associating the sample with a patient, one or more orders, one or more lab tests, or a combination thereof. For example, a sample may contain a barcode that is used to determine a lab test that the sample is associated with. In one embodiment, a sample
10 may contain information so that the location of the sample can be tracked. For example, by scanning a barcode associated with the sample, the present or historical location, or both, of the sample may be accessed. Information related to a sample may be stored in one more data stores. In one embodiment, a sample is associated with a barcode. In this embodiment, the barcode is stored in data store 195. Other information such as one or more tests that the sample
15 will be used for, a patient's name, testing facility, one or more locations, or other information related to the sample may be stored in data store 195. Various devices may be able to access information associated with a sample based on information supplied with the sample. For example, an internal lab 170 may be able to track the current location of a sample by entering tracking information associated with the sample into a website shown on desktop computer
20 175. In this embodiment, desktop computer 175 may send a request to server 190 through network 105. In response to receiving the request, server 190 may query data store 195 for information associated with the sample. For example, data store 195 may contain a present location for the sample, the name of a patient associated with the sample, and one or more tests that will be conducted using the sample. In embodiments, some or all of this information may
25 be sent to the requesting device. Thus, server 190 may send a response to desktop computer 175 through network 105. In other embodiments, an application being executed on desktop computer 175 may be used to access information related to one or more samples.

Referring back to Figure 6, once a sample have been received by the lab 610, the method 600 proceeds to block 620. In block 620, one or more tests are performed. Information
30 relating to the status of one or more tests may be updated to reflect a current status of the test. For example, when a sample is initially received, a status of "Received By Lab" may be assigned to the sample. In this embodiment, when the lab test is started, the

status of the test associated with the sample may be updated to reflect that the lab test has started. For example, the status of the lab test may be “Started” or “In Progress” or “Begun”. In some embodiments an expected completion date may be created or updated. For example, an expected completion date may have previously been determined. In this embodiment, the
5 expected completion date may be updated based at least in part on the actual starting date of the test. Information regarding the status of one or more tests or other information associated with performing one or more tests may be stored in one or more data stores. Referring to Figure 1, such information may be stored in data store 195. In some embodiments, information may be stored in a data store external to the lab management organization such
10 as lab data store 290 shown in Figure 2. Various devices may query one or more data stores containing information related to the status of one or more tests.

Referring back to Figure 6, once one or more tests have been performed 620, the method 600 proceeds to block 630. In block 630, the results for one or more tests are saved. Test results may be saved in any number of ways. In one embodiment, test results are saved
15 electronically to one or more data stores. For example, test result information may be saved to data store 195 shown in Figure 1. Test result information may be saved to an external data store such as data store 290 shown in Figure 2. Test result information may be saved in any format including, but not limited to, numerical data, plain text, HTML, XML, DOC, DOCX, PDF, XLS, etc. In one embodiment, test result information may be stored in a proprietary
20 format. Other information such as historical medical information, various statistics, established medical guidelines, potential courses of action, potential diagnoses, customization settings, notification settings, authentication information, demographic information, medical literature, or other information useful in generating a test results report may be stored in one or more data store.

In embodiments, one or more notifications may be provided that indicate that test result information is available. For example, a notification may be sent to a healthcare provider or a physician, or both, and the notification may indicate that one or more test results for a patient associated with the healthcare provider or physician are available. A notification may be provided to a patient associated with the lab test. In one embodiment, a test results
25 report may automatically be sent to a healthcare provider, physician, patient, or a combination thereof when test results are saved. As discussed herein, test results reports may be customized. Thus, customized test results reports may be sent to various parties. A notification or test results, or both, may be sent in numerous ways. For example, a
30

notification or test results may be sent via email, SMS, or an automated telephone call. A notification may be provided in response to a received request. For example, server 190 may receive a request for one or more outstanding notifications. In this embodiment, server 190 may query data store 195 to determine whether there are any outstanding notifications. If one
 5 or more notifications are outstanding, then sever 190 may send at least a portion of the notifications to a device that requested the notifications. A notification may be provided to a website or an application being executed on a user device. Variations are within the scope of this disclosure.

Referring back to Figure 6, once one or more test results have been saved 630, the
 10 method 600 proceeds to block 640. In block 640, one or more test results reports are generated. Test results reports may be generated in any number of ways. In one embodiment, the results of one or more tests is provided in response to a request from a device in communication with the lab management organization. For example, tablet computer 130 may send a request to server 190 through network 105 and network 125 that
 15 indicates that a user of the tablet computer 130 wants to view the results of one or more tests. In this embodiment, server 190 receives the request. Server 190 may query data store 195 for the requested test results or other medical information needed to customize the test results report. In one embodiment, data store 195 contains a document – such as an HTML file, a DOC file, a DOCX file, or a PDF file – that the server 190 can send to the tablet computer
 20 130. In other embodiments, data store 195 contains test results data or other medical information, such as information used to customize a test results request. In this embodiment, server 190 queries data store 195 and uses at least some of the information received from data store 195 to generate a customized test results report. The server 190 can send the customized test results report to the table computer 130. A test results report may be
 25 sent in any number of formats including, but not limited to, numerical data, plain text, HTML, XML, DOC, DOCX, PDF, XLS, etc. In one embodiment, test results information may be stored in a proprietary format. In another embodiment, information related to one or more test results is sent to one or more applications being executed on a user device. For example, server 190 may send one or more test results reports to an application on desktop
 30 computer 115.

Test results reports may be provided at various times to one or more users of the lab management system once test results have been saved. Tests results may automatically be sent to one or more users. For example, a doctor associated with hospital 120 may receive

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test results for one or more lab tests as soon as the results become available. Another physician associated with doctor's office 110 may receive test results on a periodic basis such as once per hour, once per day, every Monday, every four hours, or some other periodic timeframe. Various entities and users may be able to customize the delivery of tests results reports so that they receive reports at times specified by the entity or user.

A test results report can contain information for the current lab test as well as information for various demographics. For example, a test results report may compare the current test results with test results for an overall population. A test results report may compare the current test results with test results from other patients having one or more similar circumstances including, but not limited to, the same age range, the same gender, the same weight, the same height, one or more common symptoms, one or more common illnesses, one or more common other lab tests, other medical information, or a combination there. Thus, a test results report may compare a patient's current lab tests results with various statistical information associated with other lab tests.

In embodiments, a test results report may contain one or more additional recommended tests. For example, based at least in part on the results of the current lab test, a determination may be made that one or more additional lab tests should be performed. A determination that one or more additional tests are recommended can be based on various sources of medical information. In one embodiment, a determination is made based at least in part on the results of other lab tests, such as the results of the same type of lab tests that were conducted on other samples or other related lab tests. In another embodiment, a determination is made based at least in part on medical history for the patient. One or more tests may be recommended based on evidence based guidelines. In some embodiments, one or more additional tests may be recommended based on other medical literature.

In embodiments, a test results report can contain potential diagnostic information. For example, a potential diagnosis may be determined based at least in part on the results of the current lab test. A potential diagnosis may be determined based on various sources of medical information. In one embodiment, a determination is made based at least in part on the results of other lab tests, such as the results of the same type of lab tests that were conducted on other samples or other related lab tests. In another embodiment, a determination is made based at least in part on the medical history for of patient, such as previous test results for the patient. One or diagnoses may be based on evidence based

guidelines. In some embodiments, one or more diagnoses may be based on medical literature.

In embodiments, a test results report may contain one or more potential courses of action. For example, a potential course of action may be determined based at least in part on the results of the current lab test. A potential course of action may be determined based on various sources of medical information. In one embodiment, a potential course of action may be determined based at least in part on the results of other lab tests, such as the results of the same type of lab tests that were conducted on other samples or other related lab tests. In another embodiment, a potential course of action may be determined based at least in part on the medical history of the patient, such as previous test results for the patient. One or more potential courses of action may be based on evidence based guidelines. In some embodiments, one or more potential courses of action may be based on medical literature.

One or more entities or users may be able to customize the information contained in one or more test results report. For example, a physician may be able to customize test results reports so that only raw test results data is provided in a test results report. In another embodiment, a user can customize test results reports to include historical medical information related to a patient for which a lab test was performed. For example, a tests results report may contain results of the current lab test as well as the results of previous lab tests for the patient. In one embodiment, current test results or historical tests results, or both, may be provided in a graphical format. For example, one or more bar charts or line charts may be included in a tests results report that graphically demonstrate information related to the lab test. In some embodiments, one or more test results reports may be customized to include demographic information, additional recommended tests, potential diagnostic information, potential courses of action, other medical information, or a combination.

In embodiments, one or more entities or users may be able to control the level of customization. For example, referring to Figure 1, hospital 120 may determine that physicians associated with the hospital can choose whether or not a test results report includes additional recommended tests or potential diagnostic information, but that physicians cannot receive test results reports that contain potential courses of action. In this embodiment, one physician associated with the hospital 120 can choose to receive a test results report that includes both additional recommended tests and potential diagnostic information. Another physician associated with hospital 120 may choose to receive test result reports that include additional recommended tests. In this embodiment, however,

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neither physician associated with hospital 120 can receive a test results report that includes potential courses of action because hospital 120 has disabled this option. In other embodiments, hospital 120 may let each physician associated with hospital 120 customize a test results report in any available manner. Thus, in embodiments, a level of allowable customization is based on a hierarchy of entities or users, or both.

In an embodiment, a patient for which a lab test was conducted can receive the results of the lab test. In one embodiment, the patient can customize the test results report as disclosed herein. In other embodiments, a healthcare provider may determine the information that a patient receives in a test result report. The patient may receive the same test results report as a physician associated with the patient. Alternatively, a physician may receive one test results report for a lab test and the patient for which the lab test was performed may receive a different test results report. For example, the physician's test results report may contain one or more potential diagnoses as well as one or more recommended courses of action and the patient's test results report may contain the results of the lab test as well as the test results of other lab tests that were previously performed for the patient.

General

Numerous specific details are set forth herein to provide a thorough understanding of the claimed subject matter. However, those skilled in the art will understand that the claimed subject matter may be practiced without these specific details. In other instances, methods, apparatuses or systems that would be known by one of ordinary skill have not been described in detail so as not to obscure claimed subject matter.

Some portions are presented in terms of algorithms or symbolic representations of operations on data bits or binary digital signals stored within a computing system memory, such as a computer memory. These algorithmic descriptions or representations are examples of techniques used by those of ordinary skill in the data processing arts to convey the substance of their work to others skilled in the art. An algorithm is a self-consistent sequence of operations or similar processing leading to a desired result. In this context, operations or processing involves physical manipulation of physical quantities. Typically, although not necessarily, such quantities may take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared or otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to such signals as bits, data, values, elements, symbols, characters, terms, numbers, numerals or the like. It should be understood, however, that all of these and similar terms are to be associated with

appropriate physical quantities and are merely convenient labels. Unless specifically stated otherwise, it is appreciated that throughout this specification discussions utilizing terms such as “processing,” “computing,” “calculating,” “determining,” and “identifying” or the like refer to actions or processes of a computing device, such as one or more computers or a similar electronic
 5 computing device or devices, that manipulate or transform data represented as physical electronic or magnetic quantities within memories, registers, or other information storage devices, transmission devices, or display devices of the computing platform.

The system or systems discussed herein are not limited to any particular hardware architecture or configuration. A computing device can include any suitable arrangement of
 10 components that provide a result conditioned on one or more inputs. Such computing devices may include, but are not limited to, desktop computers, mobile phones, personal digital assistants (PDAs), tablet computers, laptops, smartphones, Wi-Fi™ enabled computing devices, 3G or 4G enabled computing devices, or other suitable computing devices. Suitable computing devices include multipurpose microprocessor-based computer systems accessing stored software that
 15 programs or configures the computing system from a general purpose computing apparatus to a specialized computing apparatus implementing one or more embodiments of the present subject matter. Any suitable programming, scripting, or other type of language or combinations of languages may be used to implement the teachings contained herein in software to be used in programming or configuring a computing device.

20 Embodiments of the methods disclosed herein may be performed in the operation of such computing devices. The order of the blocks presented in the examples above can be varied—for example, blocks can be re-ordered, combined, and/or broken into sub-blocks. Certain blocks or processes can be performed in parallel. Thus, while the steps of methods disclosed herein have been shown and described in a particular order, other embodiments may comprise the same, additional,
 25 or fewer steps. Some embodiments may perform the steps in a different order or in parallel.

The use of “adapted to” or “configured to” herein is meant as open and inclusive language that does not foreclose devices adapted to or configured to perform additional tasks or steps. Additionally, the use of “based on” is meant to be open and inclusive, in that a process, step, calculation, or other action “based on” one or more recited conditions or values may, in practice, be
 30 based on additional conditions or values beyond those recited. Headings, lists, and numbering included herein are for ease of explanation only and are not meant to be limiting.

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While the present subject matter has been described in detail with respect to specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing may readily produce alterations to, variations of, and equivalents to such embodiments. Accordingly, it should be understood that the present disclosure has been presented for purposes of example rather than limitation, and does not preclude inclusion of such modifications, variations and/or additions to the present subject matter as would be readily apparent to one of ordinary skill in the art.

CLAIMS

That which is claimed is:

1. A method, comprising:

- 5 receiving, by a server and from an electronic device of a health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider;
- verifying, by the server and in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care provider by authenticating a username and password or a digital certificate
- 10 associated with the health care provider, wherein verifying the authenticity of the health care provider comprises:
- accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and
- 15 in response to verifying the authenticity of the health care provider and after receiving the order request for the first laboratory test and prior to completing the order corresponding to the order request for the first laboratory test:
- dynamically determining, by the server, a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying a data store
- 20 in communication with the server for medical information corresponding to the patient stored in the data store;
- wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and
- 25 historical medical information corresponding to the patient;
- wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient;
- sending, by the server, the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for
- 30 the patient should be ordered; and
- receiving, by the server, a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and

completing the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

2. The method of claim 1, wherein the order further comprises the first laboratory test.

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3. The method of claim 2, wherein the order request further comprises a first laboratory facility to perform the first laboratory test, and wherein the method further comprises:

after receiving the order request and prior to completing the order corresponding to the order request for the first laboratory test:

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dynamically determining, by the server, an alternate laboratory facility to perform the first laboratory test and the recommended laboratory test, wherein the alternate laboratory facility is determined based at least in part on the first laboratory test, the recommended laboratory test, and the health plan for the patient; and

wherein the order comprises the alternative laboratory facility to perform both
15 the first laboratory test and the recommended laboratory test.

4. The method of claim 1, wherein the medical classification code comprises at least one of an International Statistical Classification of Diseases and Related Health Problems (ICD) code or an American Medical Association (AMA) CPT code.

20

5. The method of claim 1, wherein the recommended laboratory test comprises the alternate laboratory test to the first laboratory test, and wherein the order does not comprise the first laboratory test.

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6. The method of claim 5, wherein the alternate laboratory test is determined based at least in part on a potential illness corresponding to a current symptom of the patient, and wherein the alternate laboratory test is configured to diagnose the potential illness.

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7. The method of claim 6, wherein the alternate laboratory test is further determined based at least in part on an evidence-based guideline.

8. The method of claim 5, wherein the alternate laboratory test is determined based at least in part on a determination that the alternate laboratory test is a prerequisite to the first laboratory test and that the patient has not received the first laboratory test.

9. The method of claim 5, wherein the alternate laboratory test is determined based at least in part on a first determination that a predetermined time period required before the patient is eligible for the first laboratory test has not passed and a second determination that the patient is eligible for the alternate laboratory test.
- 5
10. The method of claim 7, wherein the evidence based guideline is based on a medical journal article, a medical case study, or a clinical trial.
11. The method of claim 5, wherein the alternate laboratory test is determined based at least in part
- 10 on a maximum reimbursement amount corresponding to the alternate laboratory test.
12. The method of claim 5, further comprising: dynamically determining a laboratory facility to perform the alternate laboratory test.
- 15
13. The method of claim 12, wherein the order request comprises a first laboratory facility to perform the first laboratory test, and wherein the determined laboratory facility is a same laboratory as the first laboratory facility.
14. The method of claim 12, wherein the laboratory facility is determined based at least in part on
- 20 a maximum reimbursement amount for the alternate laboratory test when performed at the laboratory facility.
15. The method of claim 12, wherein the medical information comprises the health plan for the patient and wherein the laboratory facility is determined based at least in part on the health plan
- 25 for the patient, on an expertise of the laboratory facility in performing the alternate laboratory test, a cost of performing the alternate laboratory test at the laboratory facility, and a capacity of the laboratory facility to perform the alternate laboratory test within a predetermined turnaround time.
16. The method of claim 1, further comprising:
- 30 prior to receiving a test result for the recommended laboratory test, generating a status of the recommended laboratory test;
- after receiving the test result for the recommended laboratory test, dynamically generating test result report comprising the test result; and

electronically sending the test result report to at least one of the patient or the health care provider.

17. The method of claim 16, wherein the test result report is customized based at least in part on a predefined preference of the healthcare provider.

18. A system, comprising:

an electronic device of a health care provider;

a server of a laboratory management provider; and

10 a data store of the laboratory management provider in communication with the server, wherein the server is configured to:

receive, by the server and from the electronic device of the health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider;

15 verify, by the server and in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care provider by authenticating a username and password or a digital certificate associated with the health care provider, wherein verifying the authenticity of the health care provider comprises:

20 accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and

in response to verifying the authenticity of the health care provider and after receiving the order request for the first laboratory test and prior to completing an order corresponding to the order request for the first laboratory test:

25 dynamically determine, by the server, a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying the data store in communication with the server for medical information corresponding to the patient stored in the data store;

30 wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and historical medical information corresponding to the patient;

wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient;

send the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for the patient should be ordered; and

receive a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and
complete the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

19. A non-transitory computer-readable medium comprising machine executable code stored on said medium and configured to be executed by a processor, the machine readable code configured to:

receive, from an electronic device of a health care provider, an order request for a first laboratory test for a patient corresponding to the health care provider;

verify, in response to receiving the order request and prior to completing an order corresponding to the order request for the first laboratory test, an authenticity of the health care provider by authenticating a username and password or a digital certificate associated with the health care provider, wherein verifying the authenticity of the health care provider comprises:

accessing, by the server, an authenticity data store to determine whether the username and password or the digital certificate received from the electronic device of the health care provider authenticates the health care provider; and

after receiving the order request for the first laboratory test and prior to completing an order corresponding to the order request for the first laboratory test:

dynamically determine a recommended laboratory test for the patient based at least in part on the first laboratory test for the patient and by querying a data store for medical information corresponding to the patient stored in the data store;

wherein the medical information stored in the data store used in dynamically determining the recommended laboratory test for the patient comprises a medical classification code corresponding to the patient, a health plan corresponding to the patient, and historical medical information corresponding to the patient;

wherein the recommended laboratory test comprises at least one of an additional laboratory test for the patient or an alternate laboratory test for the patient;

send the recommended laboratory test for the patient to the electronic device of the health care provider asking whether the recommended laboratory test for the patient should be ordered; and

receive a response from the electronic device of the health care provider to order the recommended laboratory test for the patient; and

complete the order from the health care provider, wherein the order comprises the recommended laboratory test for the patient.

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20. The method of claim 16, wherein test result report is customized based at least in part on a predefined preference of the patient.

21. The method of claim 16, wherein the test result is sent to the health care provider based on a predetermined delivery preference of the health care provider.

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22. The method of claim 16, further comprising:

determining a recommendation for the patient to have a follow-up laboratory test, wherein the recommendation is determined based at least in part on the test result, wherein the test result report comprises the recommendation.

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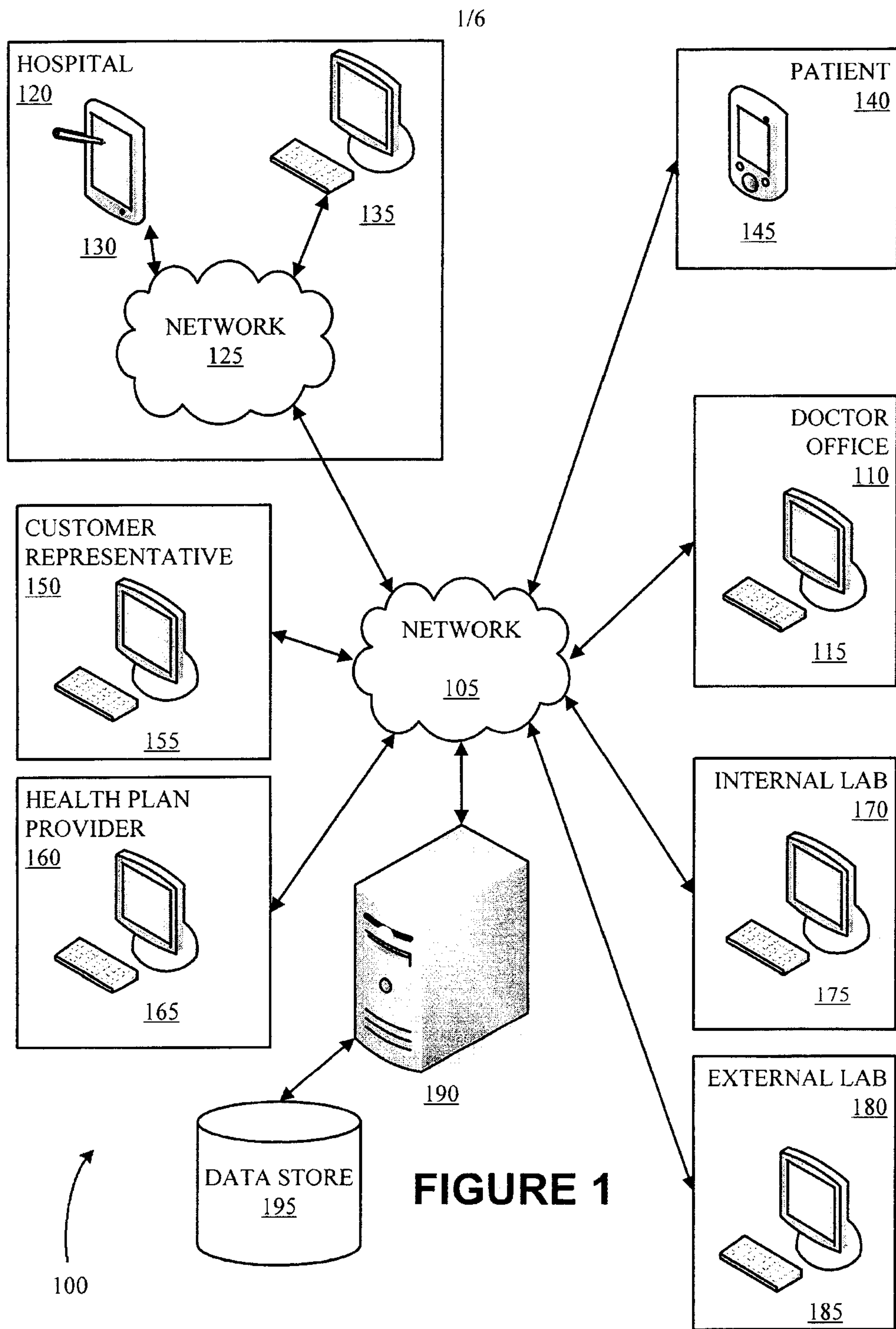
23. The method of claim 22, wherein the recommendation is further determined based at least in part on a historical medical information for the patient and an evidence-based guideline corresponding to the test result and the follow-up laboratory test.

20

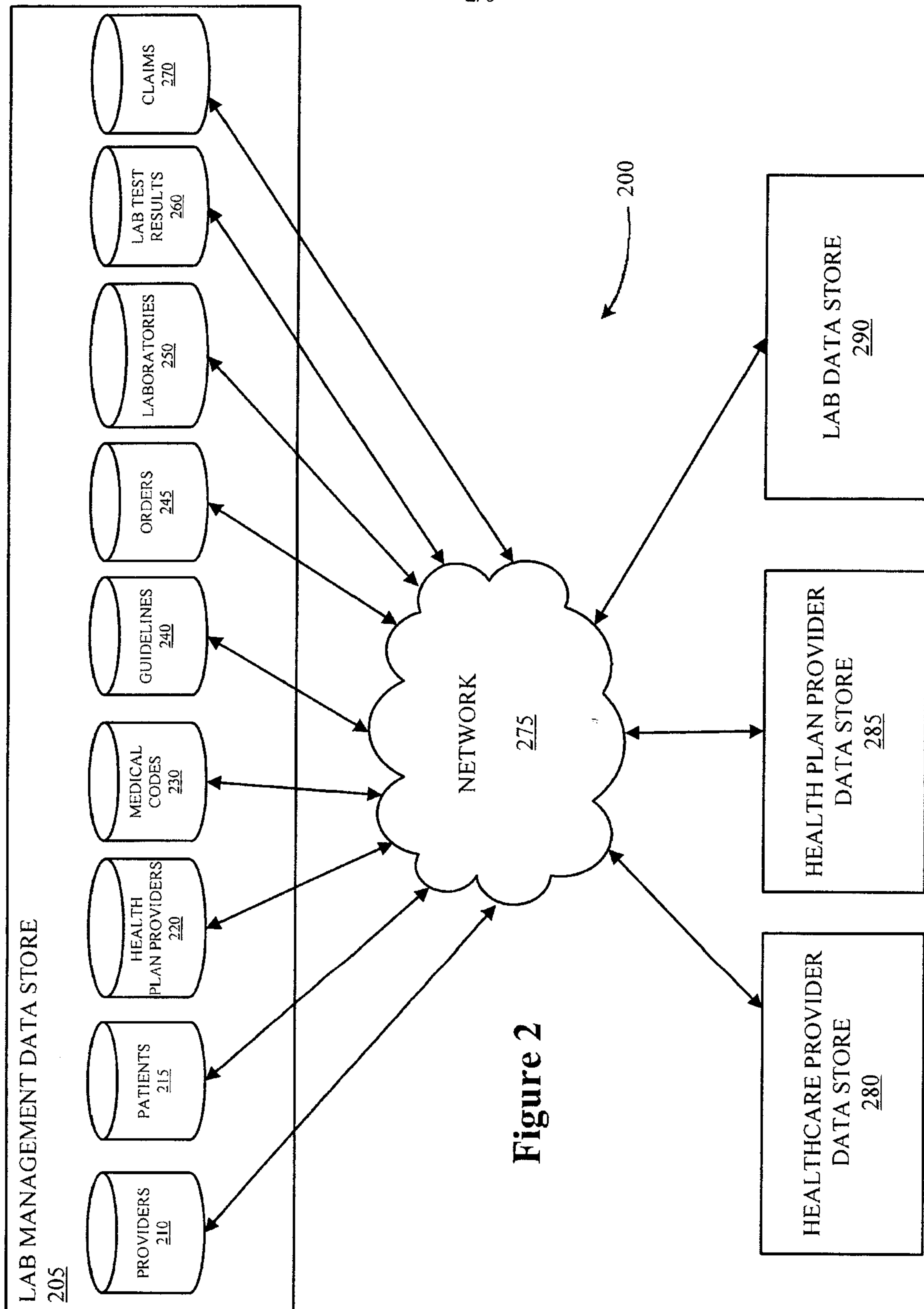
24. The method of claim 16, wherein the test result report comprises a chart corresponding to test results of a population of patients that previously received the recommended laboratory test.

25. The method of claim 16, wherein the test result report comprises a chart of a historical medical indicator of the patient, the historical medical indicator corresponding to the recommended laboratory test.

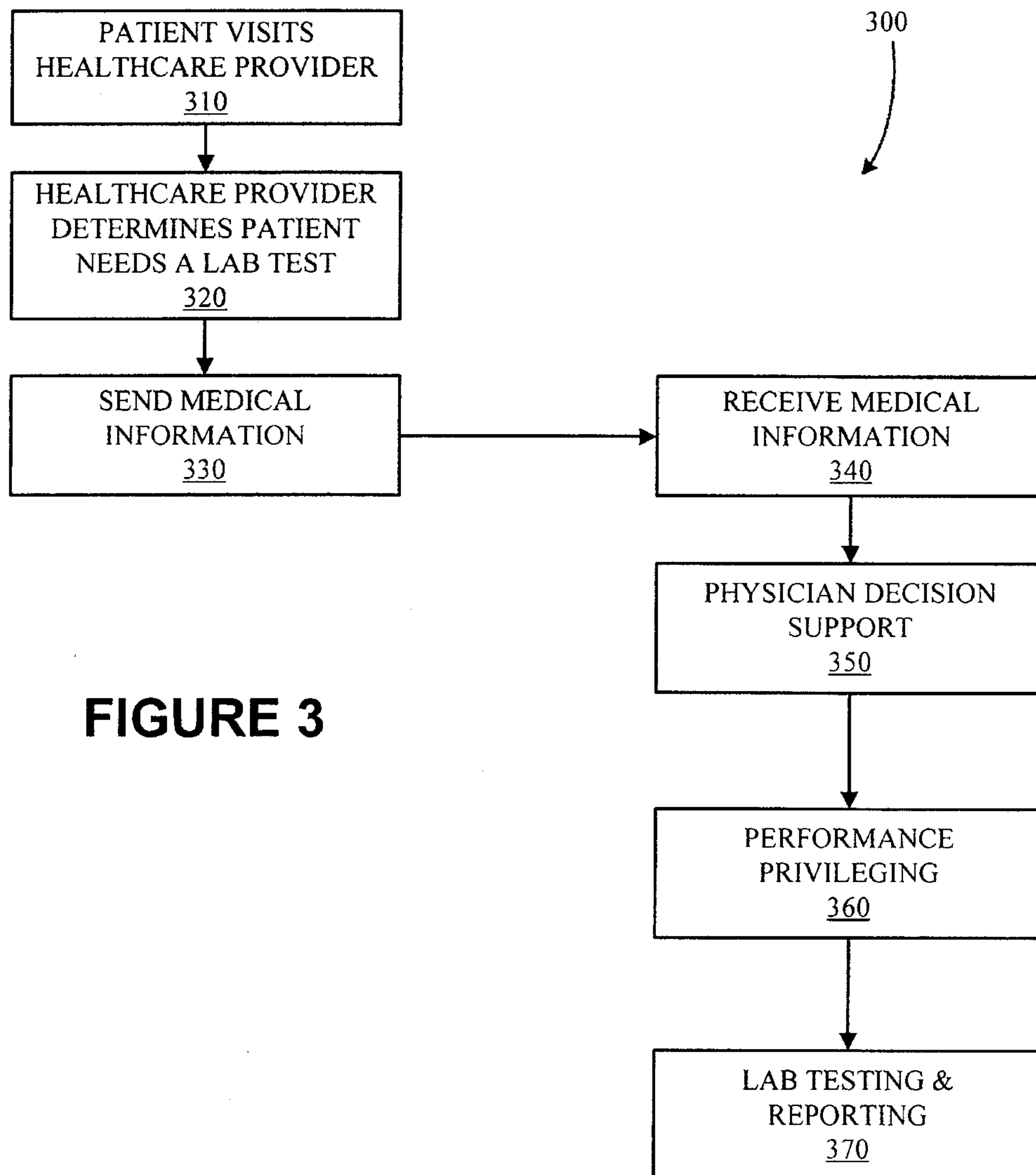
25

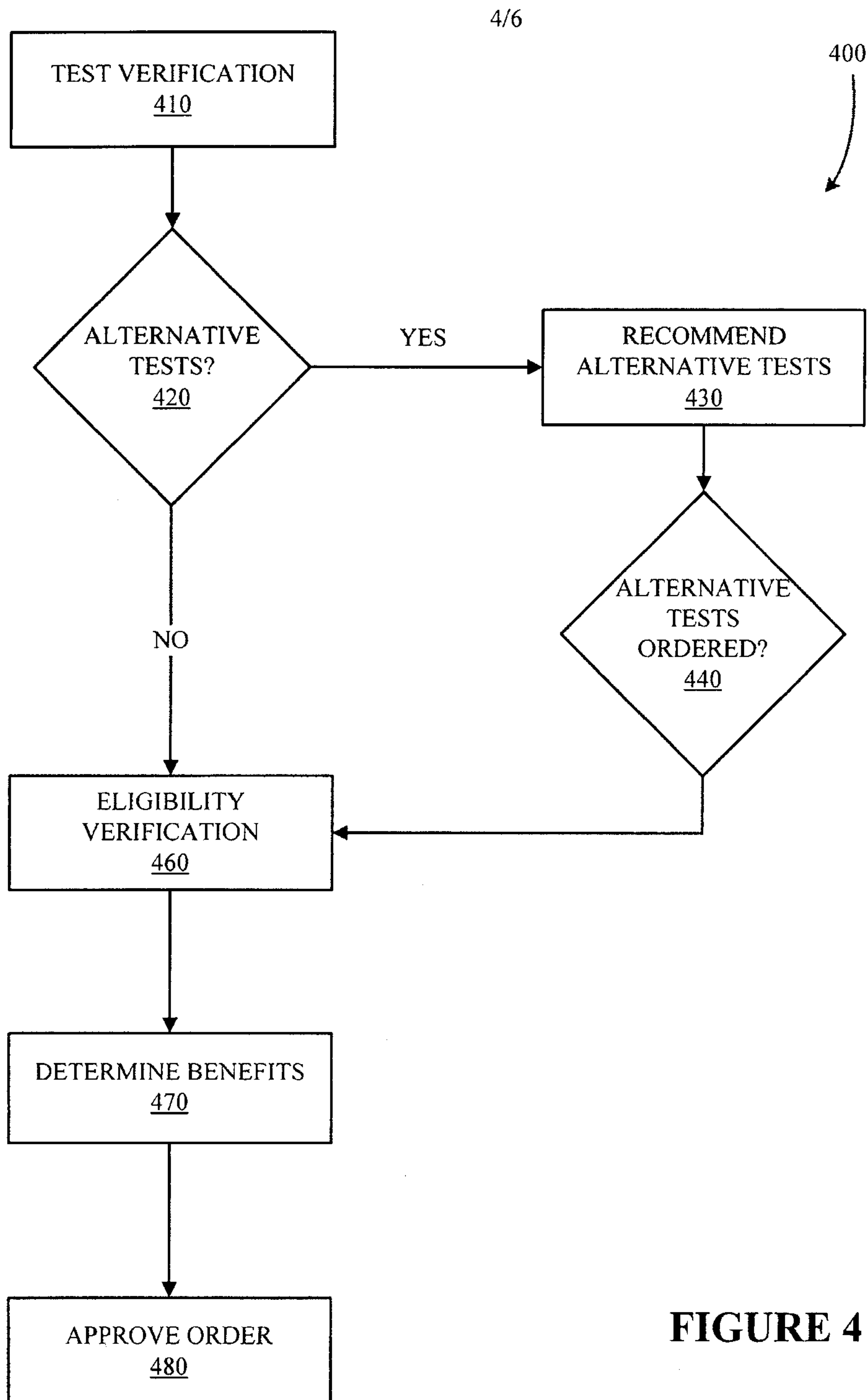


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**Figure 2**

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**FIGURE 3**

**FIGURE 4**

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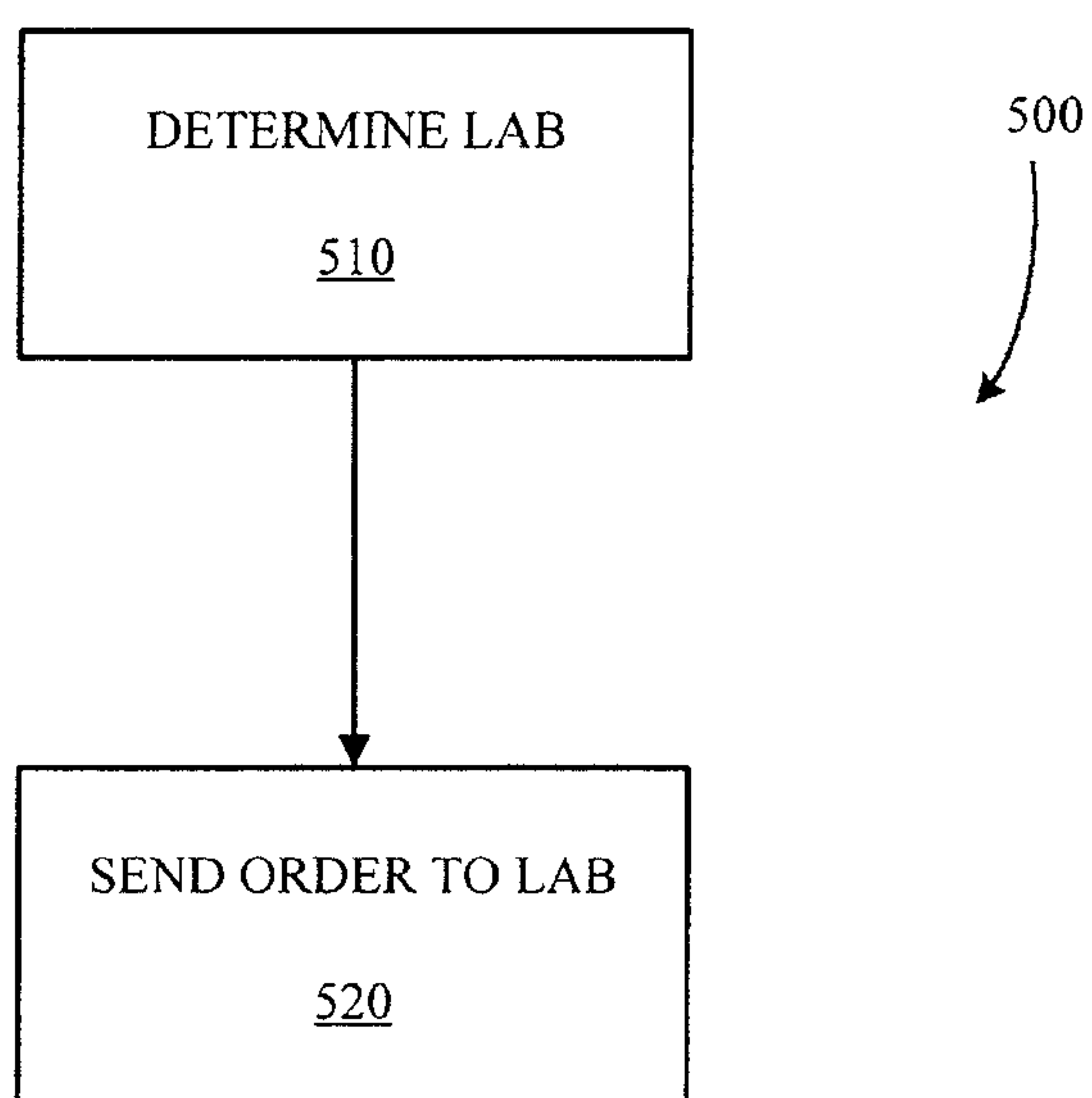
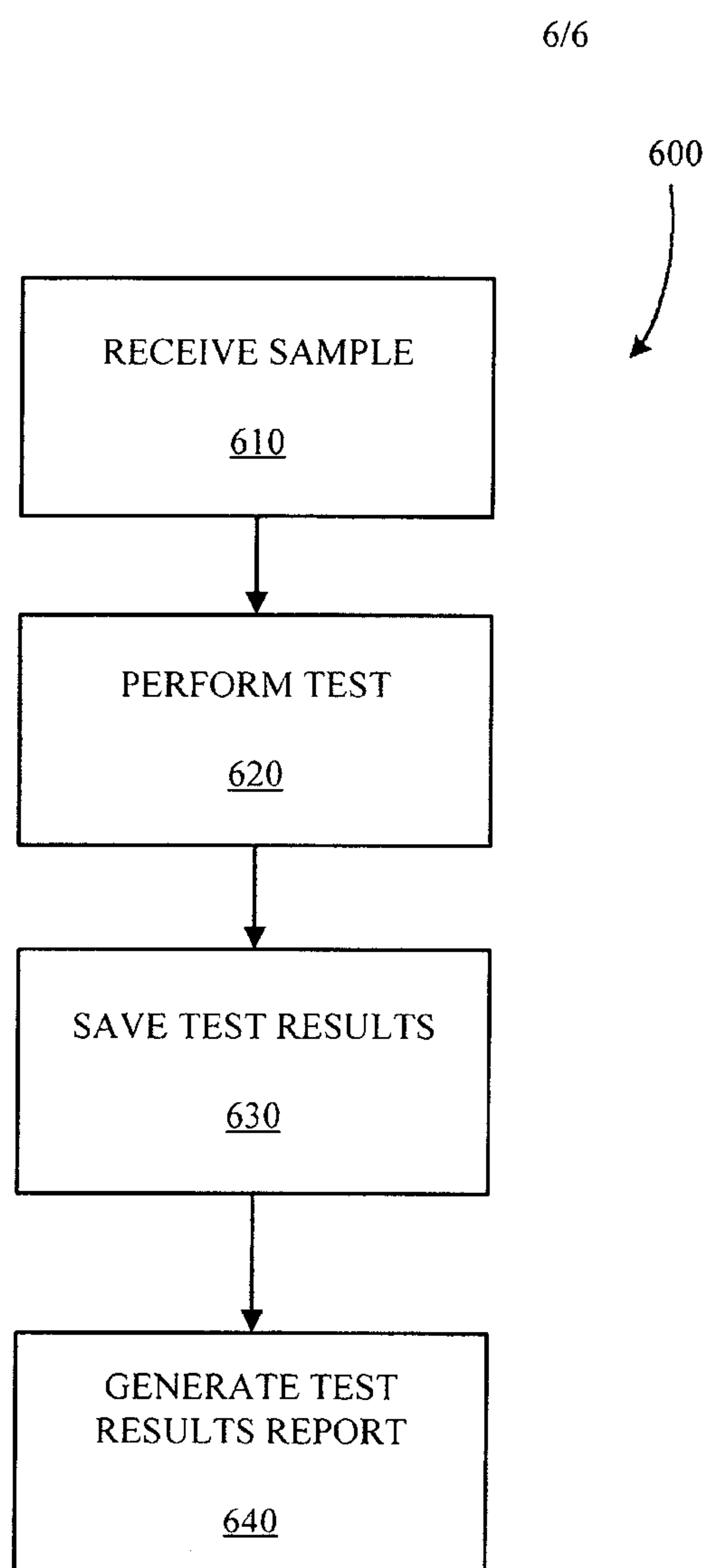


FIGURE 5

**FIGURE 6**

