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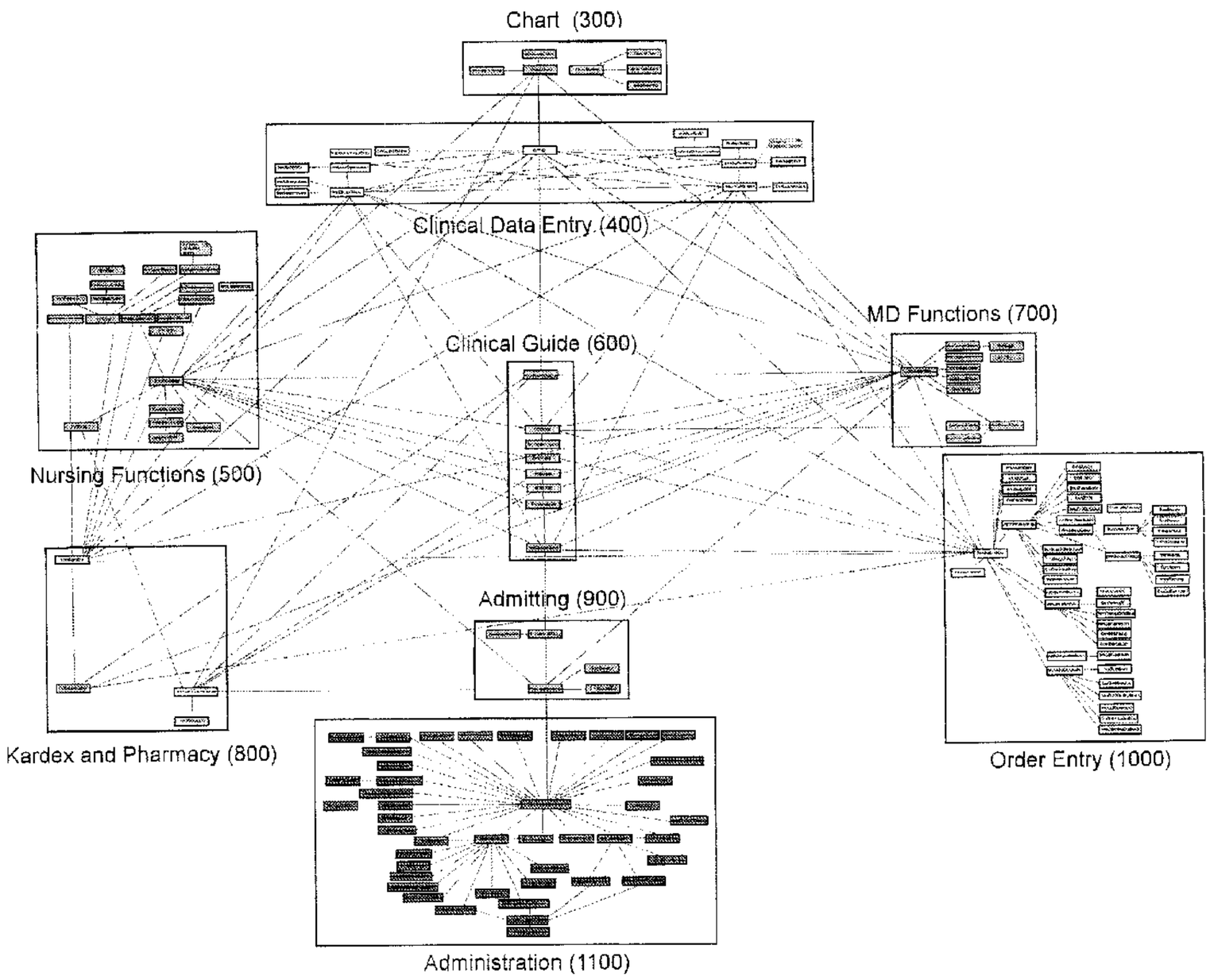


(57) Abrégé/Abstract:
Medical conditions of a plurality of patients in a hospital are monitored, diagnosed, prioritised and treated using a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems. A central data processing and storage system is configured to obtain patient data and analyse the obtained patient data to identify medical conditions of each respective patient. A central data processing system may include: 1) a medicine dosage algorithm using the stored patient data to generate medicine dosage recommendations for a patient; 2) a medicine dosage algorithms.

HOSPITAL INFORMATICS SYSTEM

ABSTRACT

Medical conditions of a plurality of patients in a hospital are monitored, diagnosed, prioritised and treated using a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems. A central data processing and storage system is configured to obtain patient data and analyse the obtained patient data to identify medical conditions of each respective patient. A central data processing system may include: 1) a medicine dosage algorithm using the stored patient data to generate medicine dosage recommendations for a patient; 2) a medicine dosage algorithms.

RESERVATION OF COPYRIGHT

FIELD OF THE INVENTION

This invention relates to information systems within hospital settings.

BACKGROUND OF THE INVENTION

There is a need to efficiently manage patient information in a hospital environment.

In particular, a hospital emergency room facility is somewhat peculiar in that patients are often brought into the facility with serious life threatening injuries or ailments. Many emergency treatment situations are ones for which there is little or no opportunity to obtain routine information about the patient. When a newly arrived patient has a serious and immediately life threatening situation, treatment will often begin prior to the formalities of admission or even complete identification of the patient.

Physicians and nurses working in emergency room environments are often under considerable stress. The tracking of patient information and orders for X-rays, medication, and the like can be crucial at the outset. As in most high stress situations, the provision and display of important information should be both prominent and simple.

Furthermore, in hospital emergency facilities, it is often desirable to switch patients among various rooms as the patient's needs and condition change and as other patients having greater

need of particular facilities arrive. It is important that correct information identifying the patient and his or her condition follow the patient as he or she moves through the hospital. While this is true in virtually all situations in a hospital, it is particularly important in an emergency room facility since the patients are often unconscious or incommunicative as to their identity, and often receive their most vital treatment early in their stay before the staff has become familiar with the identities of different individuals.

In many situations, a number of physicians orders are made with respect to a patient's treatment during the first hour of the patient's stay in the facility. For example, once victims of an automobile wreck are stabilized, a physician will often order X-rays. Furthermore, laboratory work is often required early in the patient's stay.

Various electronic communications systems annunciators and doctors registers have been designed for and used in hospitals. Such communications systems have generally been designed to communicate among various facilities in a hospital, to provide particularized nurse or physician call signals, or to provide silent paging systems and information identifying particular physicians who are in the hospital at any given time.

For example, U.S. Pat. No. 4,967,195 to Shipley shows a multi-drop audio communications system for use in a hospital that also includes conventional nurse call and patient emergency switches. Requests for nursing assistance, including those made for patient shower facilities and other potentially dangerous areas, are communicated over multi-drop buses to the nursing station via a central controller. The conventional dome light outside the patient's room is activated and the nursing station is also alerted to the patient's request for assistance. The system of the Shipley '195 patent also provides prioritizing of verbal communication calls among hospital facilities. There is a basic architectural similarity between the system disclosed in Shipley '195 and the preferred embodiment of the present invention in that a central controller polls a plurality of remote controller devices to which peripheral devices are attached and all communication among different remote controllers are effected via packets passed through the central controller.

The prior art has also provided plural lighted indicators associated on a one-to-one basis with patients in particular rooms that indicate particular patient requests. For example, U.S. Pat. No. 2,910,680 to McLain shows a patient-to-nursing station annunciator system wherein each patient room is provided with a keyboard having a plurality of keys that may be depressed in order to activate particular lights at a nurses station indicating, for example, that the patient requests the nurse's assistance, needs water, or to have other services performed. Setting of the lamps is controlled at the patient's room and is also cleared there. Thus, the system of the McLain '680 patent provides only a silent annunciator providing a visual indication of a patient service request.

An electronic patient tracking system for use in a hospital, particularly a hospital emergency room facility is provided by U.S. Patent 5,760,704. This invention provides a plurality of patient tracking modules, each of which includes a multi-character display for indicating a patient's name and complaint as well as an indicator of attending physician and nurse. Illuminated colour coded switches are used to indicate the placement of orders for work to be done. The system provides automatic timeouts if the order is not completed, as evidenced by subsequent operation of a switch, within a predetermined period of time and changes the lamp status to an alarm condition, such as flashing with a particular cadence. The system allows local entry of data and setting of order indicators as well as the control of these elements from a host computer system of the hospital in which the device is used. It also provides for a complete transfer of identification information and order status among patient modules when a patient is moved between rooms associated with particular modules.

Computerised medical systems for diagnosing and/or treating a patient is provided by U.S. Patent No. 5,988,851, wherein the system has a controller for controlling the system-specific components. The controller works together with an input device and is additionally assigned a data storage unit in which it is possible to store at least one operating menu. The operating menu can be called up by means of the input device and can be displayed on an indicating or display device. The operating menu includes a plurality of operating functions which can be selected,

e.g., by means of a movable marker. When an operating function is selected its associated executable function is executed under control of the system controller. The system is further provided with the functionality of allowing a user to freely select specific operating functions from among the totality of operating functions assigned to the one or more operating menus and store the selected functions in the data storage device grouped as a separate, independent operating menu. This independent operating menu can thereafter be displayed as a separate menu on the indicating or display device and utilised as a more direct means for executing those functions grouped with the independent operating menu.

A computerised medical system to monitor, diagnose, prioritise and treat a plurality of remotely located patients is provided in U.S. Patent No. 6,024,699, wherein the system uses a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems. Patient monitoring systems are capable of receiving and storing patient data and may include a medicine dosage algorithm for using the stored patient data to generate medicine dosage recommendations for a patient. A central data processing system is configured to obtain patient data from each patient monitoring system and analyse the obtained patient data to identify medical conditions of each respective patient. A central data processing system may include medicine dosage algorithms. Identified patient medical conditions for each respective patient are displayed in selectable, prioritised order according to medical severity via one or more remotely located clients in communication with a central data processing system. Modifications to medicine dosages, medicine dosage algorithms, patient fixed or contingent self-monitoring schedules, as well as other treatment information, may be communicated directly to a patient or to a patient monitoring system.

A computerised care management system in which the management of the administration of care for patients is provided in U.S. Patent No. 5,781,442. Hospital information systems are monitored and the information from those systems is used in verifying the administrations of care to patients. The care management system monitors ongoing administrations for progress and automatically updates records and provides alarms when necessary. The care management system is modular in nature but is fully integrated among its modules. Particular lists of data,

such as the termination times of all ongoing infusions, provide hospital staff current information for increased accuracy and efficiency in planning. Features include the automatic provision of infusion parameters to pumps for accurate and efficient configuration of the pump, and providing an alarm when an unscheduled suspension of an infusion exceeds a predetermined length of time.

None of the above mentioned computerised systems, however, provide a single integrated system that can track patient care, prescribe medications, present results of patient tests, assist in scheduling caregiver timing, etc. Thus, a need remains for an improved integrated system that can provide a wide multiplicity of data management pertaining to patient care in a hospital environment.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a hospital informatics system. In accordance with one aspect of the present invention, there is provided a data management system for hospitals that can facilitate the diagnosis, tracking, monitoring, treatment of a plurality of patients using a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems, wherein each patient monitoring system is capable of receiving and storing patient data, the system comprising: a central data processing system, a central data storage unit, a dynamic interactive prescription creation module, a patient tracking module, one or more optical scanners for user identification and a dynamic interactive patient care order module.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 presents an overview of the informatic system.

Figure 2 presents a schematic of the chart module.

Figure 3 presents a schematic of the clinical data entry module.

Figure 4 presents a schematic of the nursing functions module.

Figure 5 presents a schematic of the clinical guide module.

Figure 6 presents a schematic of the MD functions module.

Figure 7 presents a schematic of the kardex and pharmacy module.

Figure 8 presents a schematic of the admitting module.

Figure 9 presents a schematic of the order entry module.

Figure 10 presents a schematic of the administration module.

Figure 11 presents an overview of the system architecture.

Figure 12 presents another overview of the system architecture.

Figure 13 shows an example of a computer screen used for examining the most recent results for one patient, Francois Simplon, selected from the background list of patients. The results screen was brought forward by selecting the Erlenmeyer flask icon.

Figure 14 shows an example of a computer screen used for examining the clinical signs for a patient selected from the list of patients. The results screen was brought forward by selecting the graphics icon.

Figure 15 shows a screen prompting the caregiver to select a dosing frequency. It also reports the most recent blood sugar. This dosage frequency selection screen was brought forward by selecting a dosage of the drug, Acarbose 50 mg, from the menu on the Prescription Order Entry

for Medications screen.

Figure 16 demonstrates a menu driven dosage frequency selection screen for Acetamenophen 650 mg, that was brought forward by selecting Acetamenophen 650 mg from the list of available medications.

Figure 17 presents an exemplary Prescription Order Entry for Medication. In particular, this screen demonstrates the development of a prescription (see box, upper right) that will be sent to the pharmacy. Drug costs are also displayed, tracked and recorded.

Figure 18 shows a screen presenting information pertaining to accepted indications for the drug Amikacin. The selection screen also presents an alternative drug, Gentamicin. Drug prices are presented, wherein the cost for the selected dosage and frequency is presented on a cost/week basis.

Figure 19 demonstrates the aspect of the system wherein one can select a diagnostic/therapeutic order profile from a list.

Figure 20 demonstrates an order set for congestive heart failure, selected from the list in Figure 9. This screen presents an order profile for diagnosis of this condition.

Figure 21 presents a computer screen demonstrating selection from a list of drug classes, such as analgesics, that will enable the care provider to select from the list of analgesics in order to formulate a prescription.

Figure 22 demonstrates a computer screen showing a nursing Kardex. Some key features are the active prescriptions for a specific date, the current IV solutions, and the drug administration record for that day. It also shows which tests are performed on that day.

Figure 23 shows a screen that demonstrates clinical signs presented graphically, along with the

drug administration for a patient.

Figure 24 shows an example of a computer screen indicating nursing activities on October 19, 1999. The screen includes separate windows, which may be organised by room or by nurse, that contain information regarding nursing activities for individual patients. Activities are indicated by icons which represent admission, drugs administered, IV, etc.

Figure 25 depicts a computer screen showing the fluid Ins and Outs for one patient, Samuel Bemelmans. The data for this patient is presented as dated raw data and graphically. The total Ins and Outs are also provided.

Figure 26 shows a computer screen with windows indicating various components of the personal care plan for a single patient, Samuel Bemelmans, including routine care, IV care, catheter care, nursing prescription and special needs. An additional window summarizes the functional assessment of the patient.

Figure 27 shows a computer screen with an interactive formal functional assessment form, for cognitive assessment of a single patient, Samuel Bemelmans. In each section of the assessment form there are questions followed by a choice of response that may be selected by the user, in this case Linda Armstrong, RN, in evaluating the cognitive abilities of the patient.

Figure 28 depicts a computer screen with the hospital chart for a single patient, Samuel Bemelmans. On the right hand side of the screen there is a series of buttons, which can be selected in order to read and/or write in various portions of the hospital chart. In this case, MD Notes ! have been selected by the user, Arthur Gelston, Medical Staff. The notes are shown on the left hand side of the screen and contain the date and time that the entry was made and the name and position of the person who made the entry. By clicking on the backward (B) and forward (F) hands at the bottom of the screen, the user can go through the notes in the hospital chart.

Figure 29 depicts a computer screen with a clinical signs data entry window for a single patient, Samuel Bemelmens. On the right hand side there is a window with areas for entering data related the patient's vital signs. The window on the left contains the clinical signs for the patient with the time they were input into the system. A third window appears in front of the left and right windows. This window is opened if the user wants to enter a message into the system.

Figure 30 shows a computer screen with a window used for writing a note in a patient's file, in this case Samuel Bemelmens'. By using the physical finding button the user is able add more information to the file.

Figure 31 shows a computer screen used for patient tracking in the emergency room of a hospital. Each window represents a single patient and contains information including the patient's name, time of arrival and initial symptoms. Each window contains icons which represent classes of action that may be taken, including prescription, drugs administered, admission, ambulance. The colour of each icon is indicative of action taken.

Figure 32 shows a computer screen as in Figure 21 with a single patient, Katrina Theodopoulas, selected. A new window has opened showing more detailed information relating to the colour coded information in the previous screen. Lines shown on the chart indicate the time and duration of each action taken. Multiple actions are shown for some of the classes.

Figure 33 shows a computer screen in which a triage order entry window has been opened for a single patient, Samuel Wolfe. This window is used to select laboratory tests and image examinations based on a working diagnosis. Once a working diagnosis is selected, in this case "abdominal pain", then an appropriate list of tests and examinations appears on the right hand side of the window.

Figure 34 depicts a computer screen with a Clinical Systems – Ward order administration window.

Figure 35 depicts a computer screen with the Laboratory Test Administration window.

DETAILED DESCRIPTION OF THE INVENTION

The present invention now is described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. Like numbers refer to like elements throughout.

As will be appreciated by one of skill in the art, the present invention may be embodied as a method, data processing system, or computer program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment or an embodiment combining software and hardware aspects. Furthermore, the present invention may take the form of a computer program product on a computer-readable storage medium having computer-readable program code means embodied in the medium. Any suitable computer readable medium may be utilised including hard disks, CD-ROMs, optical storage devices, or magnetic storage devices.

The present invention is described below with reference to flowchart illustrations of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations, and combinations of blocks in the flowchart illustrations, can be implemented by computer program instructions. These computer program instructions may be loaded onto a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions which execute on the computer or other programmable data processing apparatus

create means for implementing the functions specified in the flowchart block or blocks.

These computer program instructions may also be stored in a computer-usable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-usable memory produce an article of manufacture including instruction means which implement the function specified in the flowchart block or blocks. The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the flowchart block or blocks.

Accordingly, blocks of the flowchart illustrations support combinations of means for performing the specified functions, combinations of steps for performing the specified functions and program instruction means for performing the specified functions. It will also be understood that each block of the flowchart illustrations, and combinations of blocks in the flowchart illustrations, can be implemented by special purpose hardware-based computer systems which perform the specified functions or steps, or combinations of special purpose hardware and computer instructions.

Computer program for implementing the present invention may be written in various object-oriented programming languages, such as Delphi and Java.RTM.. However, it is understood that other object oriented programming languages, such as C++ and Smalltalk, as well as conventional programming languages, such as FORTRAN or COBOL, could be utilised without departing from the spirit and intent of the present invention.

System Overview

In one embodiment of the present invention, a system for monitoring, diagnosing and treating

medical patients with various chronic illnesses, according to the present invention, is schematically illustrated in Fig. 1. This system encompasses all of the activities performed within a hospital setting and provides means for the immediate transfer of information requested by hospital personnel. The system comprises a plurality of modules including Chart 300, Clinical Data Entry 400, Nursing Functions 500, Clinical Guide 600, MD Functions 700, Kardex and Pharmacy 800, Admitting 900, Order Entry 1000 and Administration 1100. Each of these modules performs a defined set of tasks, which are designed to encapsulate and assist specific hospital personnel with the performance of their required duties. For example, the MD functions module 700 provides physicians with a means for clinical order entry in conjunction with a plurality of additional assistance including decision support, which may be based on local practise standards in conjunction with current patient information.

The above system is divided into the respective modules and schematic representations of each module are illustrated in Figs. 2 - 10. Straight lines connecting nodes within a module indicate the transfer pathway of information between said nodes. The information transfer pathways between modules are also indicated by straight lines and said pathways are sequentially number to correlate said information transfer pathways between figures.

The interconnectivity of each module of this system provides a means for enabling the efficient and rapid transfer of patient information to hospital personnel requiring said information. Furthermore, any patient information that is entered into this system by physicians, nurses or paramedical personnel is immediately available for consultation by all users of the system. With this immediate access to the most recent patient information, hospital personnel are able to perform their duties and make decisions based on the most current information.

Modular software integrates physician expert order entry with clinical nursing activities as well as with numerical and image results reporting. The system contains decision-support algorithms that can be independently modified by the institution to adapt recommendations to local practice standards. The system accesses laboratory and clinical input in real-time to alert staff at critical junctures in the care cycle.

This system provides an informatics tool that facilitates the physician and the health care team to make informed diagnostic therapeutic decisions. A database of the latest clinical information, combined with the individual patient information, and results of other similar age-matched patient results, provides the healthcare team with dynamic interactive decision-support capabilities. It can also be used for scheduling decisions for a ward, given the types of patient disorders and time required for each. This system is particularly useful for use in a multidisciplinary team approach where all members have concurrent access to the same information.

Referring now to Fig. 11, a system providing the functionality of the above monitoring, diagnosing and treating system, is schematically illustrated. A plurality of portable patient monitors (PPMs) 12 are configured to establish communications directly with a central data processing system referred to as a Physicians Access Center server (hereinafter "PAC server") 14 via communications links 13. A plurality of case manager clients (CMCs) 16 are configured to establish client-server communications with the PAC server 14 via a computer network 17, such as the Internet or an Intranet. It is understood that a CMC or PAC server or other apparatus configured to execute program code embodied within computer usable media, operates as means for performing the various functions and carries out the methods of the various operations of the present invention. It is also understood that the present invention may be used with various client-server communications protocols, and is not limited to specific protocols such as TCP/IP protocol.

Each of these components will be described in detail below.

The system transparently integrates the clinical activities of physicians, nurses and paramedical personnel while the modular construction of the system enables caregivers belonging to any medical speciality to practice their unique style of medicine.

Essential Components Of The System

There are a number of essential components that combine to render this system more useful than other computerized physician supports:

A Dynamic Interactive Database

The database includes the latest clinical guide information that is updateable. This information is drawn up in different situations, such as when prescribing a drug, or analyzing lab results. The data base also comprises patient records which are updated in real-time with laboratory and nursing input so the most current information is always at hand. This information comprises the results of all tests including EEG, EKF, X-rays, CAT scans, MRI scans, etc.

The system uses Tree logic (whereby parts deeper in the tree can take precedence over later) to provide the healthcare team with action directives based on patient information (eg. Age, weight, sex, prognosis) drawing upon past experiences with similar patients.

The system uses a menu driven data entry method where the user doesn't know data type to be entered, but just uses the ENTER key and the down arrow to make selections based on automatic display of possible data allowed, by the system. Method of order generation using branching menus and button selection. Color-coded windows and intuitive navigational cues guide the user through standard procedures such as admitting and discharging patients, prescribing medications and treatment, picking up physician orders or viewing test results.

The Intelligent Use of Color

The use of color to denote the navigation method. Buttons are organized into color groups related to function. For example, in a preferred embodiment mustard-colored buttons are used to navigate to "external" forms, i.e., other clinical screens not related to the currently active function type. Dark blue buttons are used to navigate to "internal" forms, i.e., other clinical

screens related to the currently active function type (seen on the principal order entry forms, for example). Salmon-colored buttons are usually used for Cancel/Continue operations or operations where records are being manipulated. Orange buttons are used to filter records in data lists. Light blue buttons are used to access forms displaying supplementary information concerning the currently active clinical function. Off-white buttons are used to modify demographics records.

The color scheme is also sensitive to whether the user is color-blind. Given the fact that xx% of the population is color-blind, it is important that this is taken into account. Thus, when an individual enters into this system using optical scanners, the colors used in the visual display automatically change to accommodate for their color blindness, if appropriate.

Optical Scanners

In a preferred embodiment, digital optical scanners which scan the fingerprint of the user are used for quick and easy identification processes. The system also sues optical scanners in a validation method for cosigning orders. User identification is provided by digital optical scanners to enable appropriate access to patient records in addition to entries and orders such as prescriptions to be validated.

Dynamic Interactive Prescription Module

The method of prescribing lab work, patient care or prescriptions includes an optical scanner verification system. Translation method for transforming MD prescriptions from the Latin format into hours and/or a schedule. It also includes a U.I. for the kardex. The healthcare team is provided with suggestions and information pertinent to the information that was input, which can be over-ridden. Physician prescriptions are transmitted directly to the Kardex, care plan and hospital pharmacy.

The diagnosis-based order sets can be prescribed with just one keystroke. Prescriptions are

legible and dosages are calculated on the basis of individual patient parameters. The system dynamically reviews all prescriptions and suggests alternative courses of therapy based on local practice standards. Clinical signs, diabetic flow sheets, and input and output data are all immediately available to contribute information to system decision-support algorithms which alert the healthcare team before critical situations develop.

Dynamic Interactive Results Analysis Module

The module provides a decision-support system whereby the healthcare team is provided with a standardized evaluation of the implications of laboratory or other results of patient tests. The system provides context sensitive help for lab results with built-in access to the clinical guide by selecting (e.g., right-clicking) abnormal lab results. The data base allows for setting the normal and alert rangers for lab test results, by age range.

Dynamic Interactive Individual Patient Summary Module

The system will notify the healthcare team with automatically generated message depending on vital signs. The system uses a method of showing input and output data with overlay of clinical data. Use of icons and hyperlinks to bring-results. There are also Icon displays for alerts. For example, selecting a heart icon brings up the history of heart EKG's or selecting a brain icon will bring up the CAT scan or MRI scan results. Clinical signs, diabetic flow sheets, and input and output data contribute information to system decision-support algorithms which alert the healthcare team before critical situations develop.

Dynamic Interactive Scheduling/Prioritization Module

This module can be used to equitably distribute the nursing workload through the up patient information and laboratory implementation of a flexible, system-determined "Acuity Point" score which allows rational personnel scheduling. One screen demonstrates the amount of work involved in caring for patients with specific diagnosis. This module allows individual nursing

units to schedule nursing duties in a flexible manner specific to the medical specialty of each particular ward, as determined by the nursing staff themselves.

Dynamic Multiple Patient Summary

This output screen demonstrates the current treatment history and current situation for a number of patients at once, thereby providing the healthcare team with a comprehensive view of the patient's progress. Each patient record is updated in real-time with laboratory and nursing input so the most current information is always at hand. Color coding indicates which patients have received attention and which are currently waiting for what type of attention. This is particularly useful in an emergency ward. This display contains a patient-tracking feature that allows wards such as the busy emergency room physician to rapidly assess the patient's progress through the various diagnostic and therapeutic stages of an ER visit. Clinical signs, diabetic flow sheets, and input and output data contribute information to system decision-support algorithms which alert the healthcare team before critical situations develop.

System Architecture

The system is a mission-critical application with hardware and software configured for 24 hours × 7 days a week uptime. The three-tiered client server architecture is scaleable and can support any number of concurrent users. The three tiers are referred to as backend, middle tier and client tier (see Figure 1). Depending on the hardware selected for the middle tier and backend servers, several thousand clients can use the system concurrently.

Middle tier servers are not dedicated to specific tasks. This allows the seamless addition of an unlimited number of servers to accommodate expansion of the client base. The configuration of the embodiment depicted in Figure 1 shows a High-Availability backed that resists faults by automatically switching over to a Standby Server in the event of a failure of the primary server.

The system uses fault-tolerant, scaleable hardware. In a preferred embodiment, the system uses

UNIX database servers as backend servers, operating with RAID technology, for example IBM RS6000™ or HP 9000™. Failover controllers provide for operational redundancy. In the middle tier, Windows NT servers can be added incrementally to support additional client workstations. Examples of the high-performance Intel-based Windows NT machines that are used in one embodiment of the present invention are, IBM Netfinity™ and HP D-Class™.

At the client end, touch-capable thin screens enhance the functionality of the unique graphical user interface. Hardware function can be monitored offsite to verify performance. Some workstations at the client tier require high bandwidth (such as for Medical Imaging) and are connected directly to the 100 Mbps backbone.

The system uses flexible, modular software. In a preferred embodiment, system data is stored in Oracle 8i tables running under UNIX while the NT middle tier contains the business logic, as COM objects (see Figure 2). Middle tier objects share a pool of database connections on an as-needed basis to isolate transactions and reduce resource requirements. Client applications are very thin. They mostly contain screen forms and input logic. Each Client Application Using Dynamic Server Allocation (DSA) technology middle tier COM objects are instantiated on demand and allocated to run on the most available middle tier machine. Clients use DCOM and MIDAS to exchange information with objects on the middle tier servers. Middle tier objects share a pool of Oracle database connections on an as-needed basis to isolate transactions and reduce system resources.

The system of the present invention can communicate with legacy systems using HL-7 protocol or customized interfaces, and with PACS and other available image storage devices using DICOM. OEM technology allows for remote site technical support.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A data management system for hospitals that can facilitate the diagnosis, tracking, monitoring and treatment of a plurality of patients using a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems, wherein each patient monitoring system is capable of receiving and storing patient data, the system comprising:

(i) a central data processing system;

(ii) a central data storage unit;

(iii) a dynamic interactive prescription creation module;

(iv) a patient tracking module;

(v) one or more optical scanners for user identification; and

(vi) a dynamic interactive patient care order module.

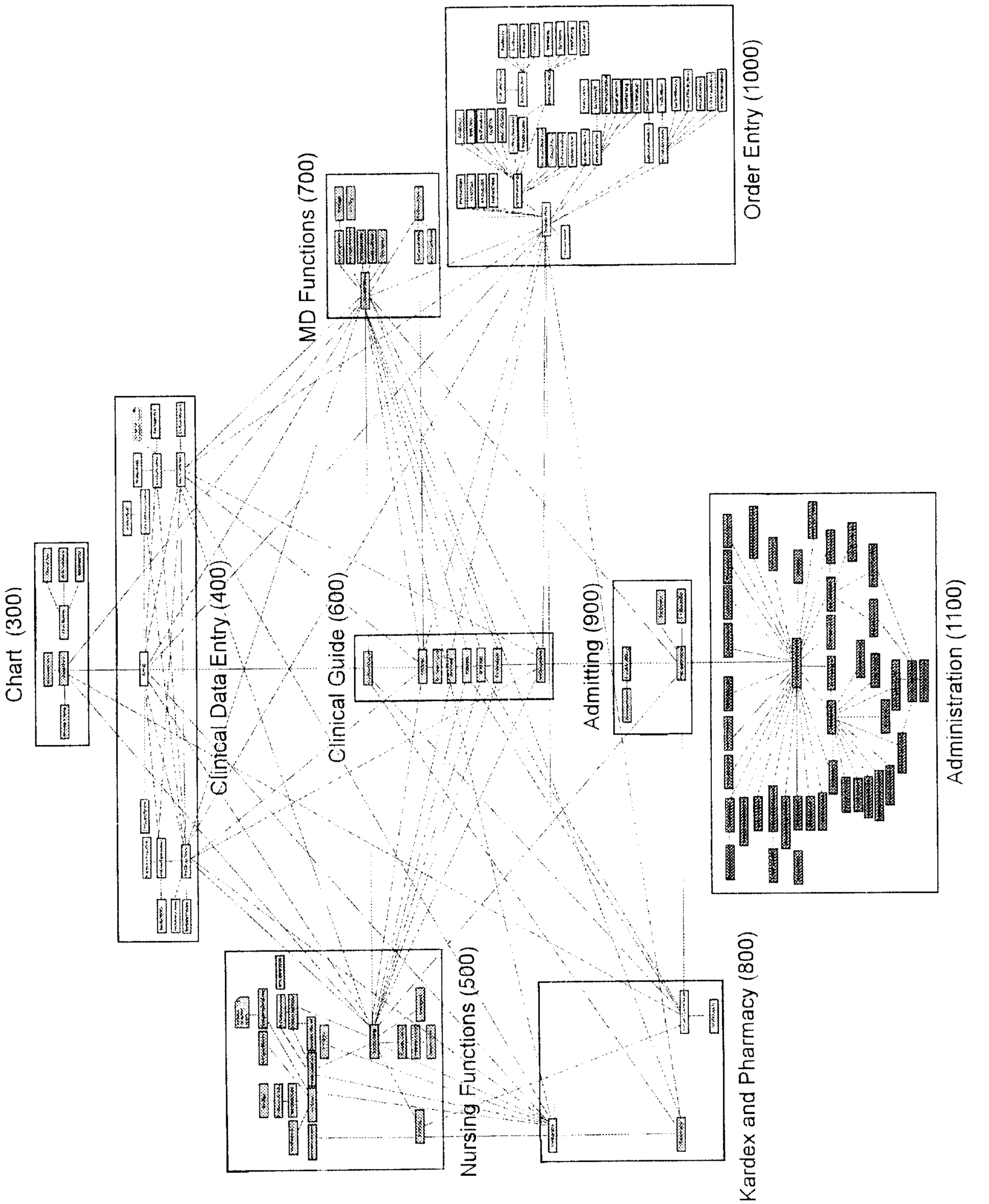

Order Entry (1000)
MD Functions (700)
Chart (300)
Clinical Data Entry (400)
Clinical Guide (600)
Admitting (900)
Administration (1100)
Nursing Functions (500)
Kardex and Pharmacy (800)

Figure 1

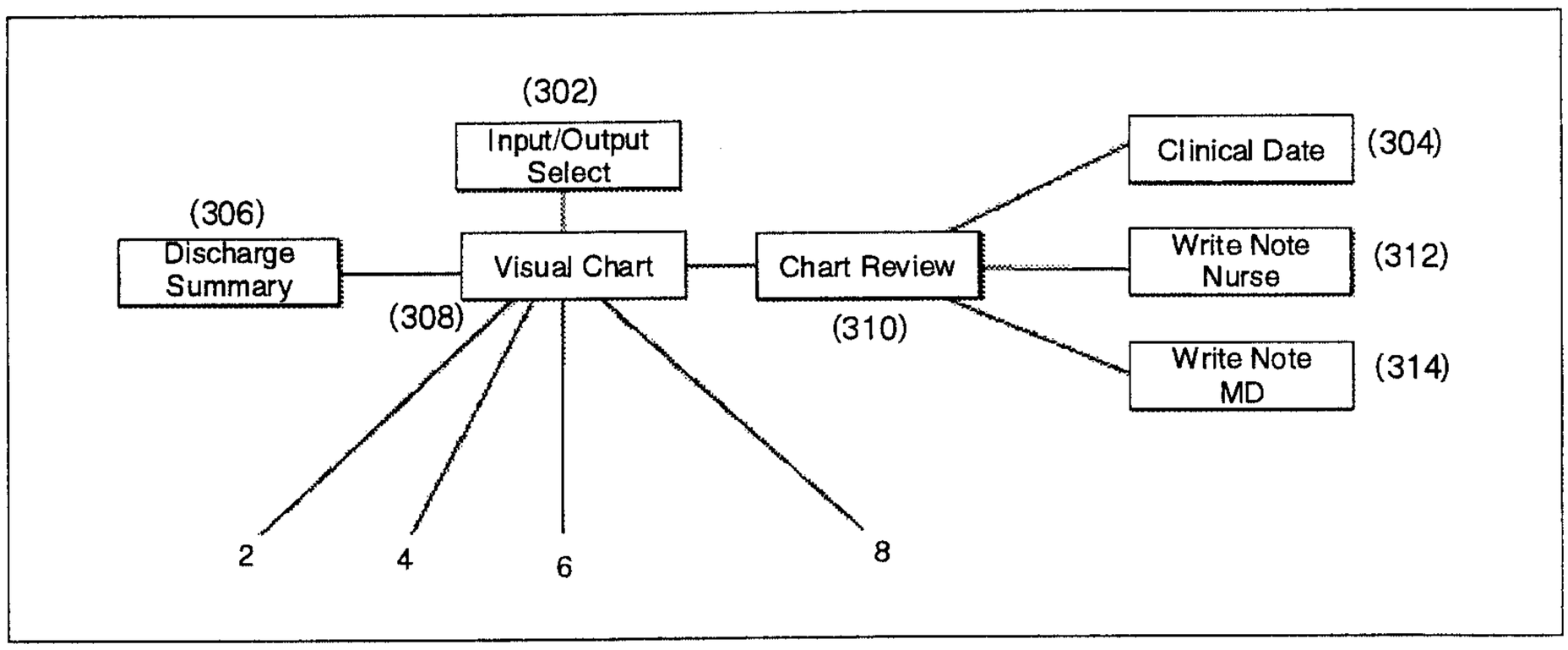

(302)
Input/Output Select
(306)
Discharge Summary
Visual Chart
(308)
Chart Review
(310)
Clinical Date
(304)
Write Note Nurse
(312)
Write Note MD
(314)
2
4
6
8
Chart (300)

Figure 2

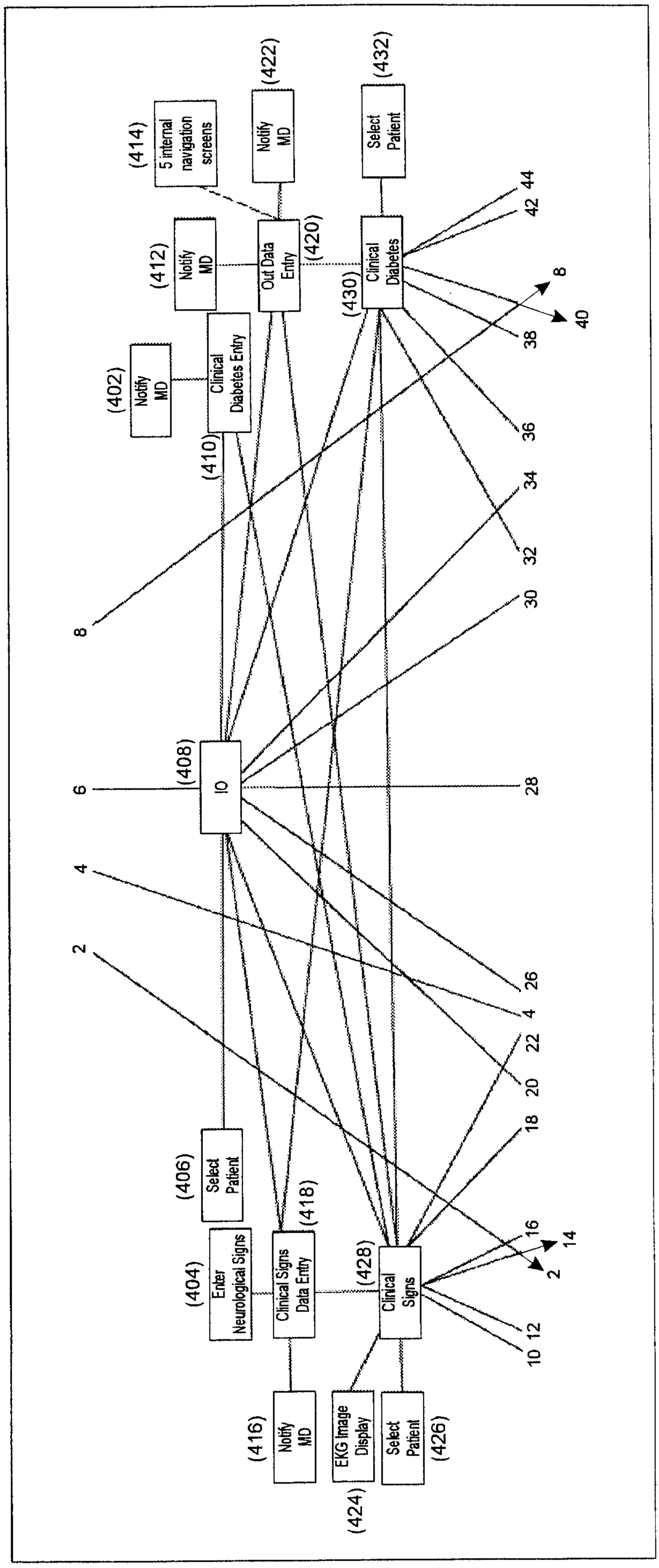

Clinical Data Entry (400)
(402) Notify MD
Clinical Diabetes Entry
(410)
(412) Notify MD
(414) 5 internal navigation screens
Out Data Entry
(420)
(422) Notify MD
(430) Clinical Diabetes
(432) Select Patient
(404) Enter Neurological Signs
Clinical Signs Data Entry
(418)
(406) Select Patient
(408)
(428) Clinical Signs
(416) Notify MD
EKG Image Display
(424)
Select Patient
(426)
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44

Figure 3

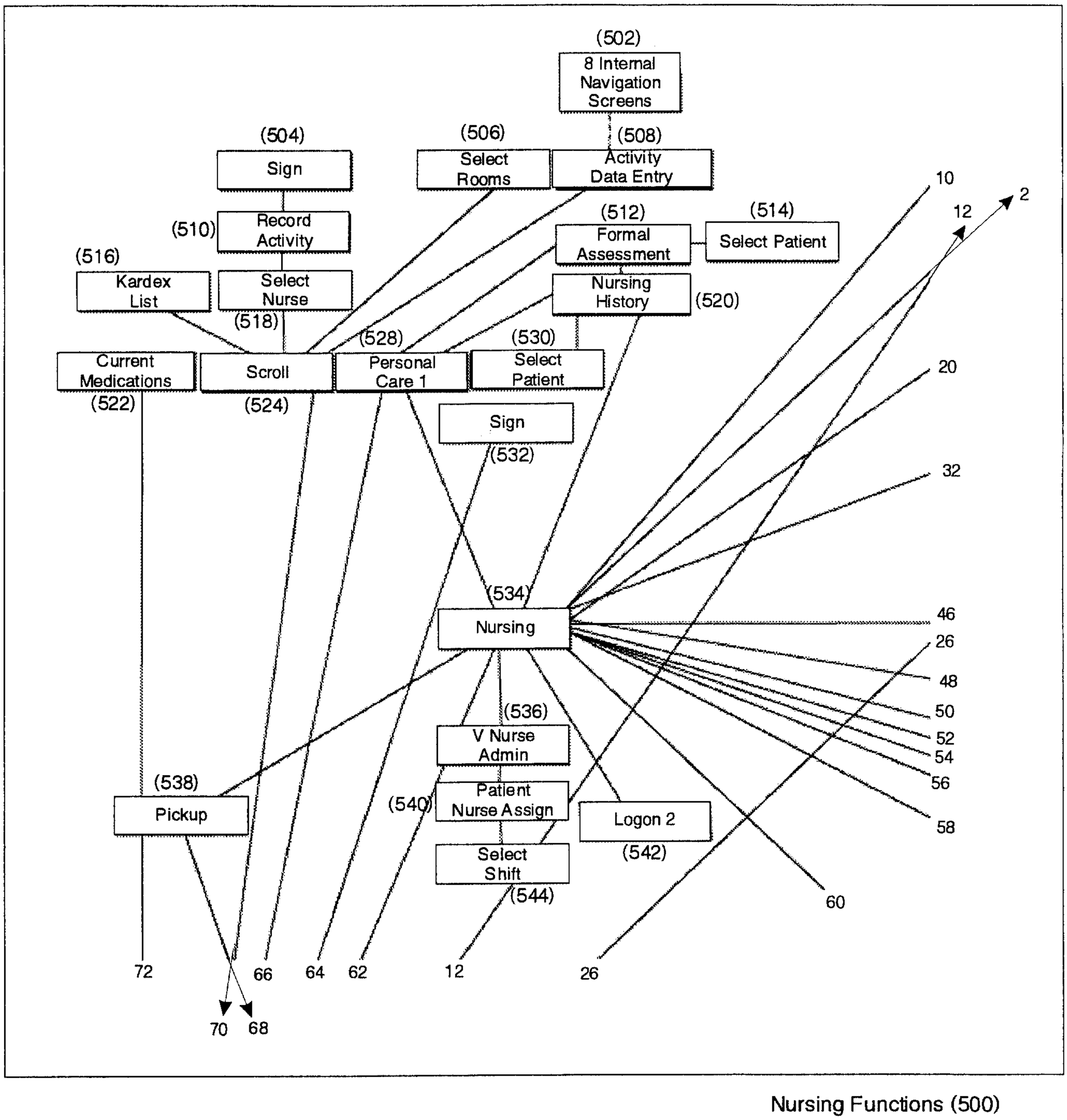
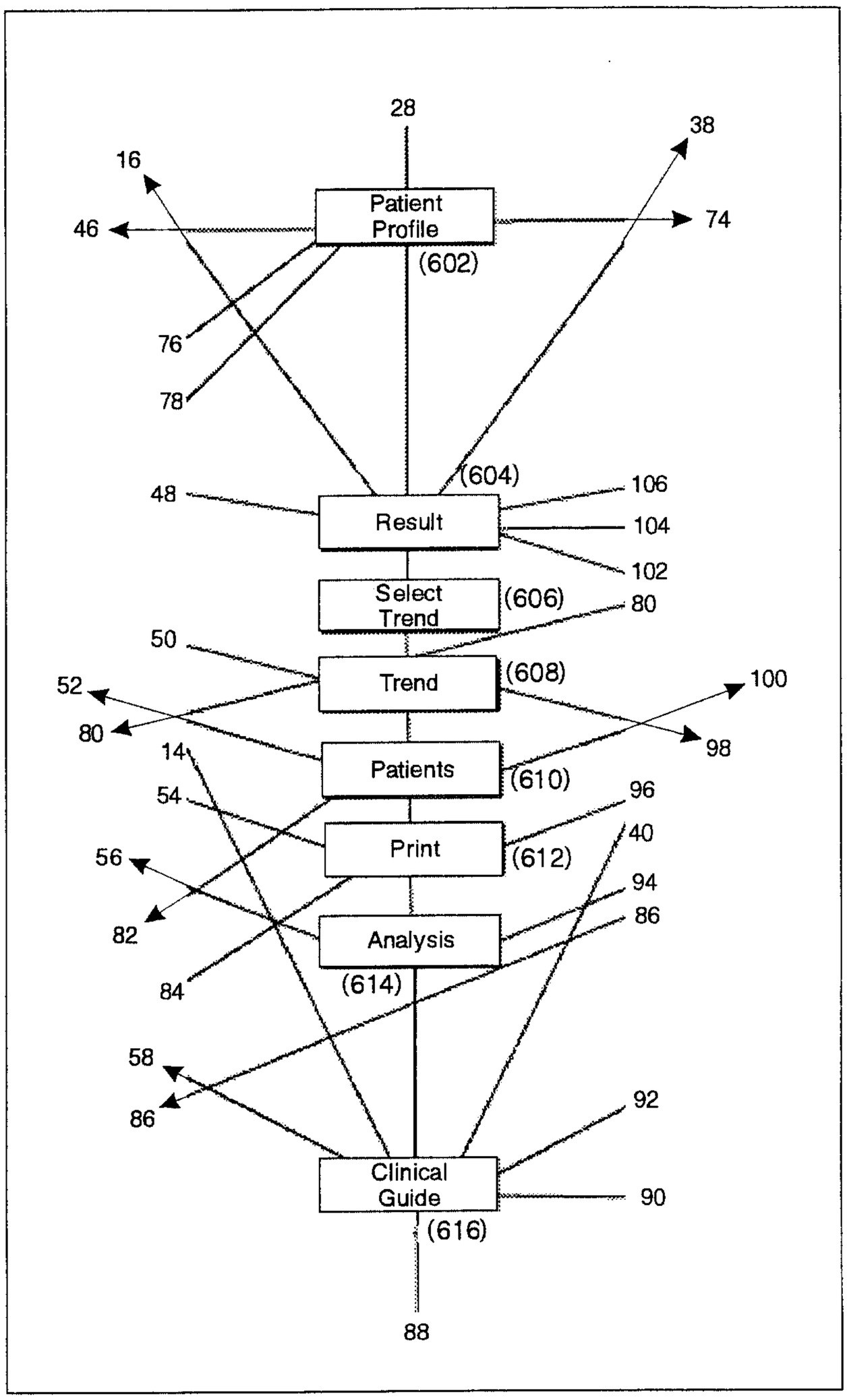
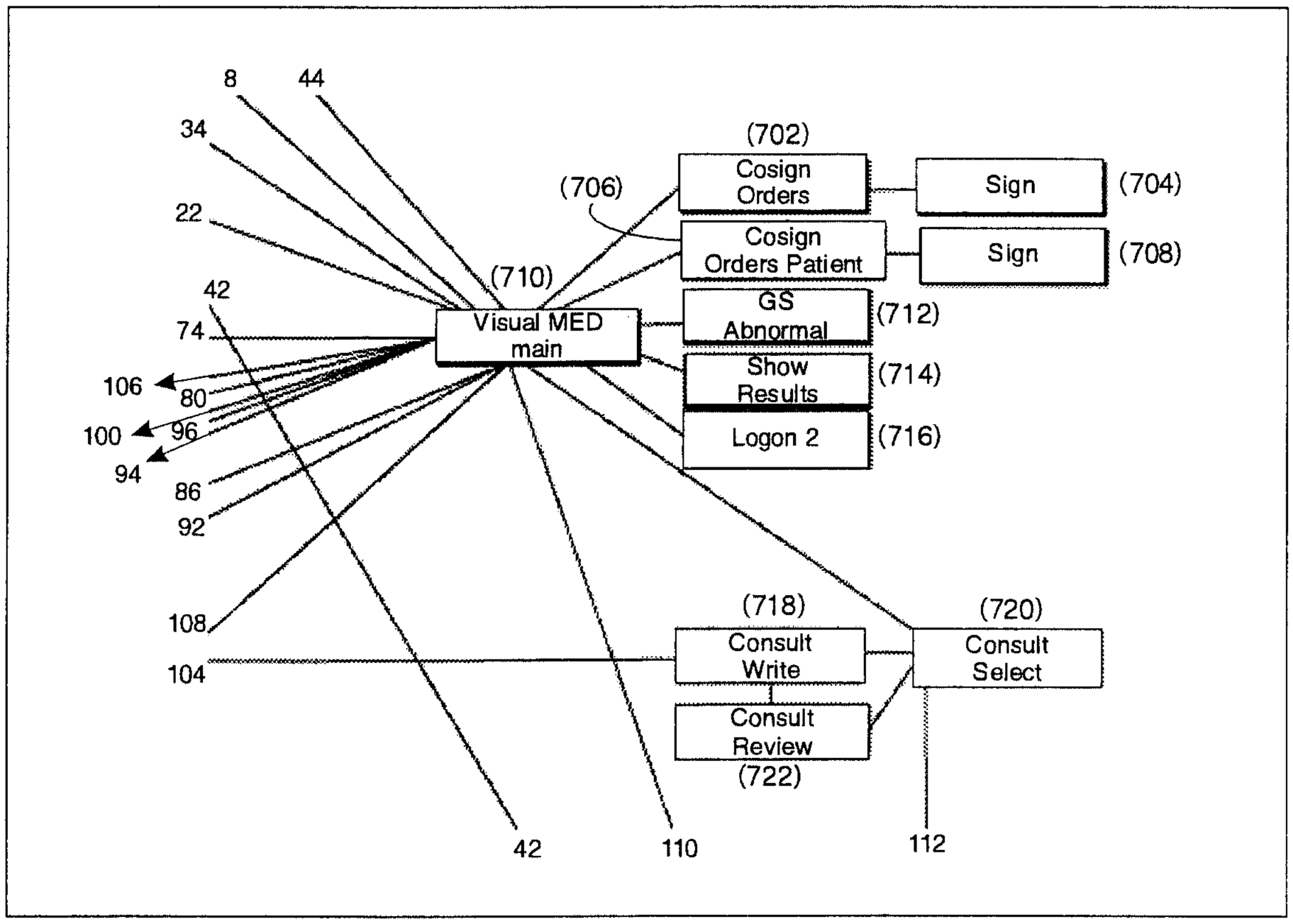

(502)
8 Internal Navigation Screens
(504)
Sign
(506)
Select Rooms
(508)
Activity Data Entry
(510)
Record Activity
(512)
Formal Assessment
(514)
Select Patient
(516)
Kardex List
Select Nurse
(518)
Nursing History
(520)
Current Medications
(522)
Scroll
(524)
(528)
Personal Care 1
(530)
Select Patient
Sign
(532)
(534)
Nursing
(536)
V Nurse Admin
(538)
Pickup
(540)
Patient Nurse Assign
Logon 2
(542)
Select Shift
(544)
10
2
12
20
32
46
26
48
50
52
54
56
58
60
72
66
64
62
12
26
70
68
Nursing Functions (500)

Figure 4



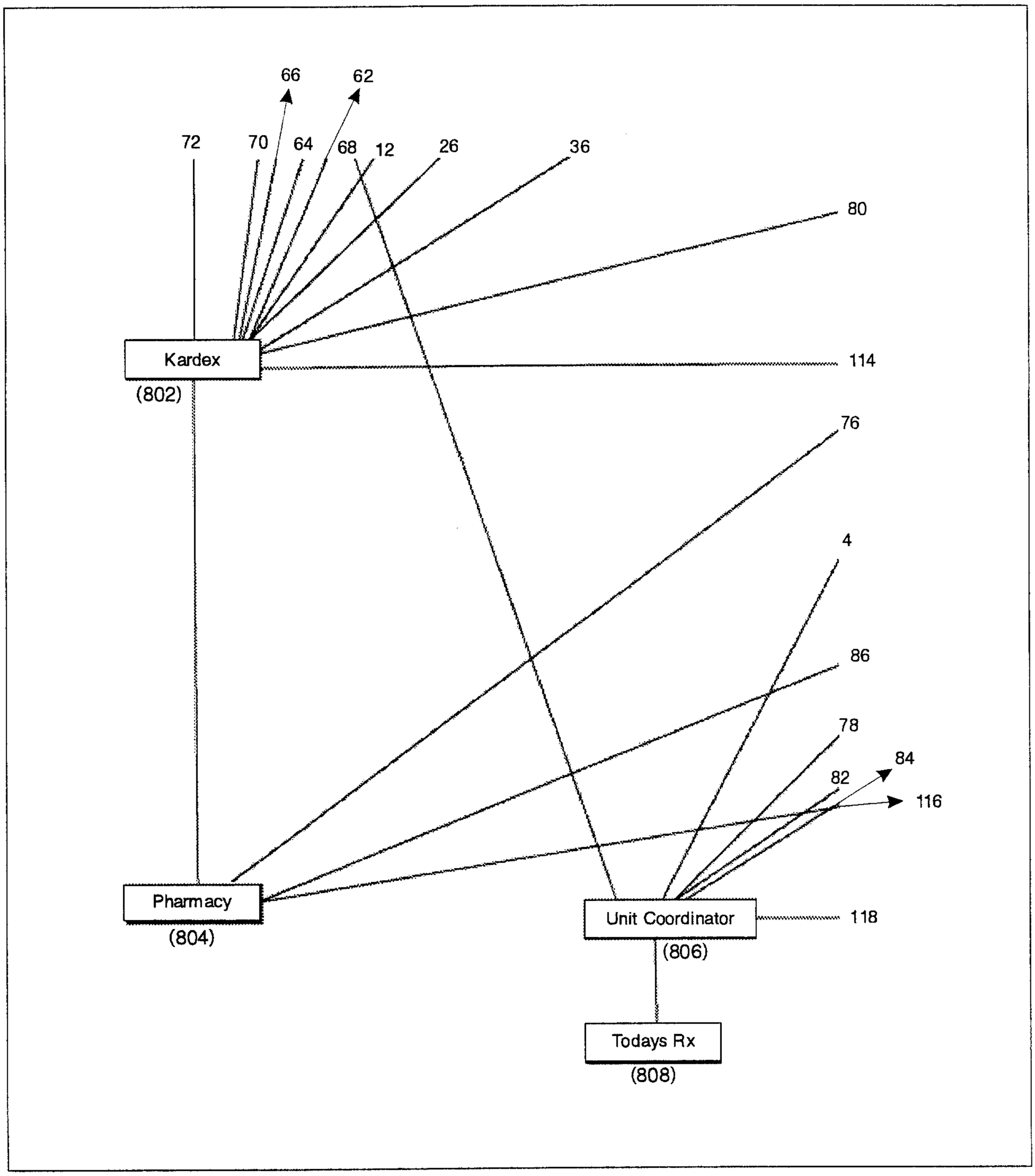
Clinical Guide (600)

Figure 5



MD Functions (700)

Figure 6



Kardex and Pharmacy (800)

Figure 7

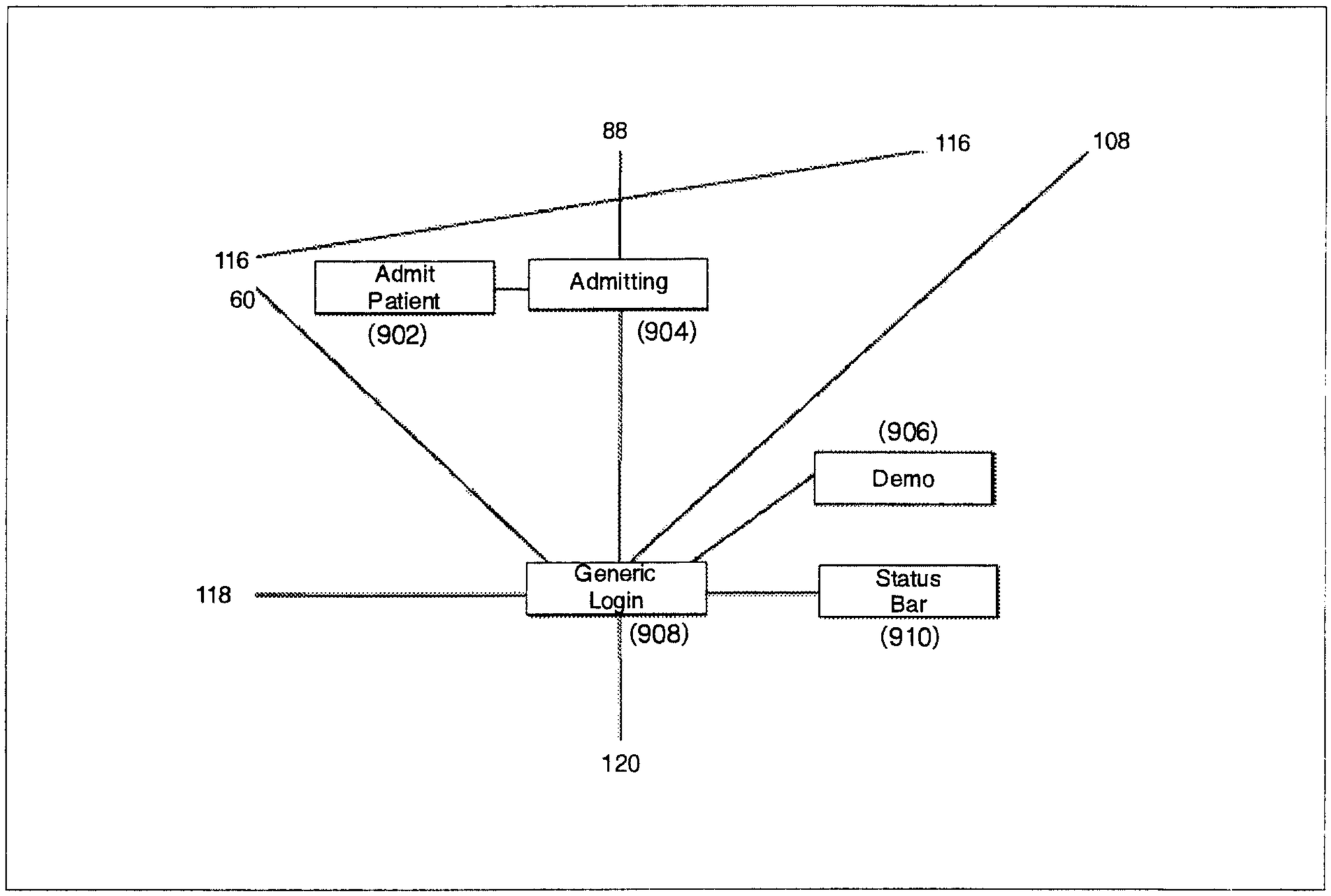

88
116
108
116
60
Admit Patient
(902)
Admitting
(904)
(906)
Demo
118
Generic Login
(908)
Status Bar
(910)
120
Admitting (900)

Figure 8

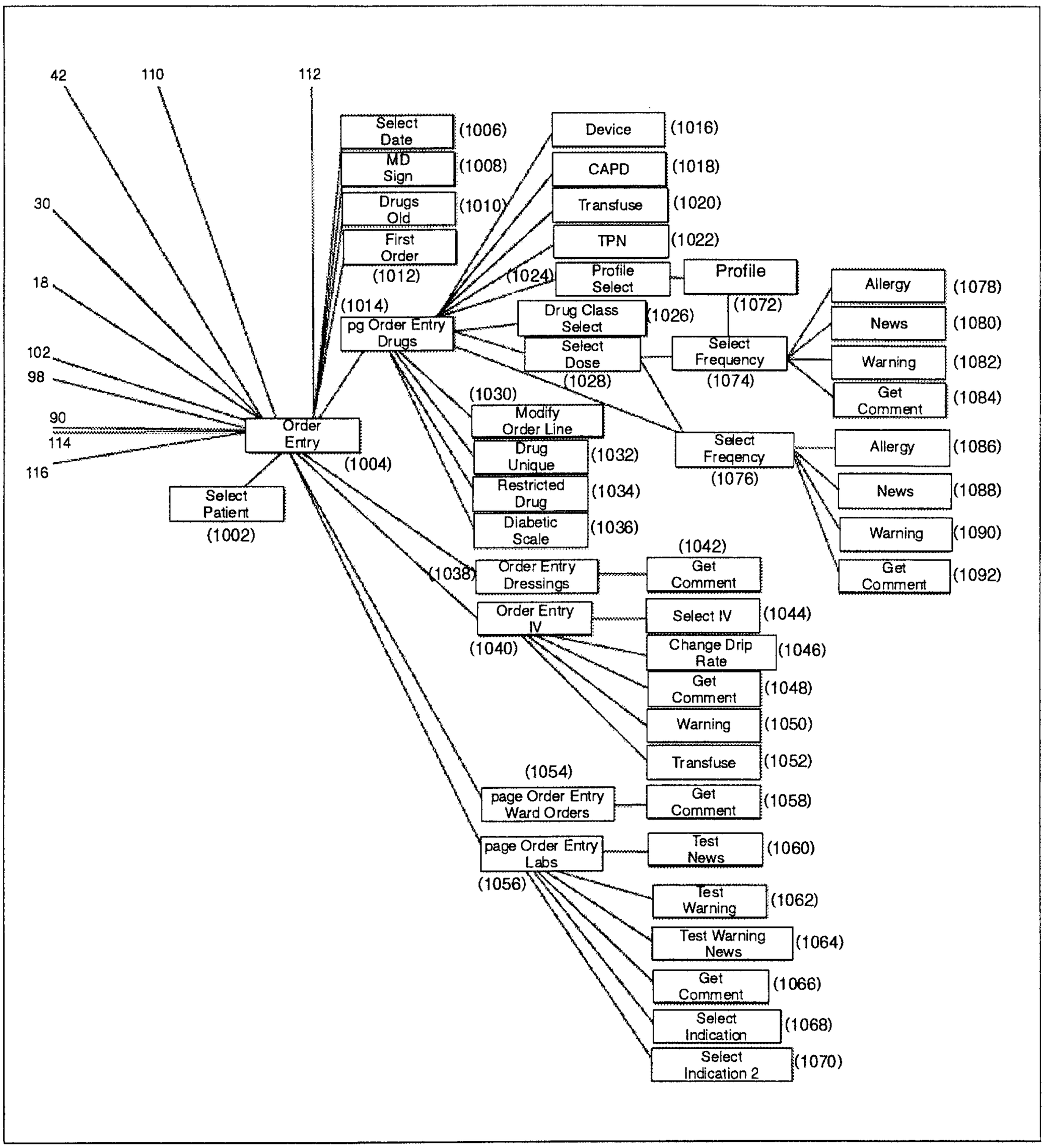

42
110
112
30
18
102
98
90
114
116
Order Entry
(1004)
Select Patient
(1002)
Select Date
(1006)
MD Sign
(1008)
Drugs Old
(1010)
First Order
(1012)
(1014)
pg Order Entry Drugs
Device
(1016)
CAPD
(1018)
Transfuse
(1020)
TPN
(1022)
(1024)
Profile Select
Profile
(1072)
Drug Class Select
(1026)
Select Dose
(1028)
Select Frequency
(1074)
Allergy
(1078)
News
(1080)
Warning
(1082)
Get Comment
(1084)
(1030)
Modify Order Line
Drug Unique
(1032)
Restricted Drug
(1034)
Diabetic Scale
(1036)
Select Freqency
(1076)
Allergy
(1086)
News
(1088)
Warning
(1090)
Get Comment
(1092)
(1038)
Order Entry Dressings
(1042)
Get Comment
Order Entry IV
(1040)
Select IV
(1044)
Change Drip Rate
(1046)
Get Comment
(1048)
Warning
(1050)
Transfuse
(1052)
(1054)
page Order Entry Ward Orders
Get Comment
(1058)
page Order Entry Labs
(1056)
Test News
(1060)
Test Warning
(1062)
Test Warning News
(1064)
Get Comment
(1066)
Select Indication
(1068)
Select Indication 2
(1070)
Order Entry (1000)

Figure 9

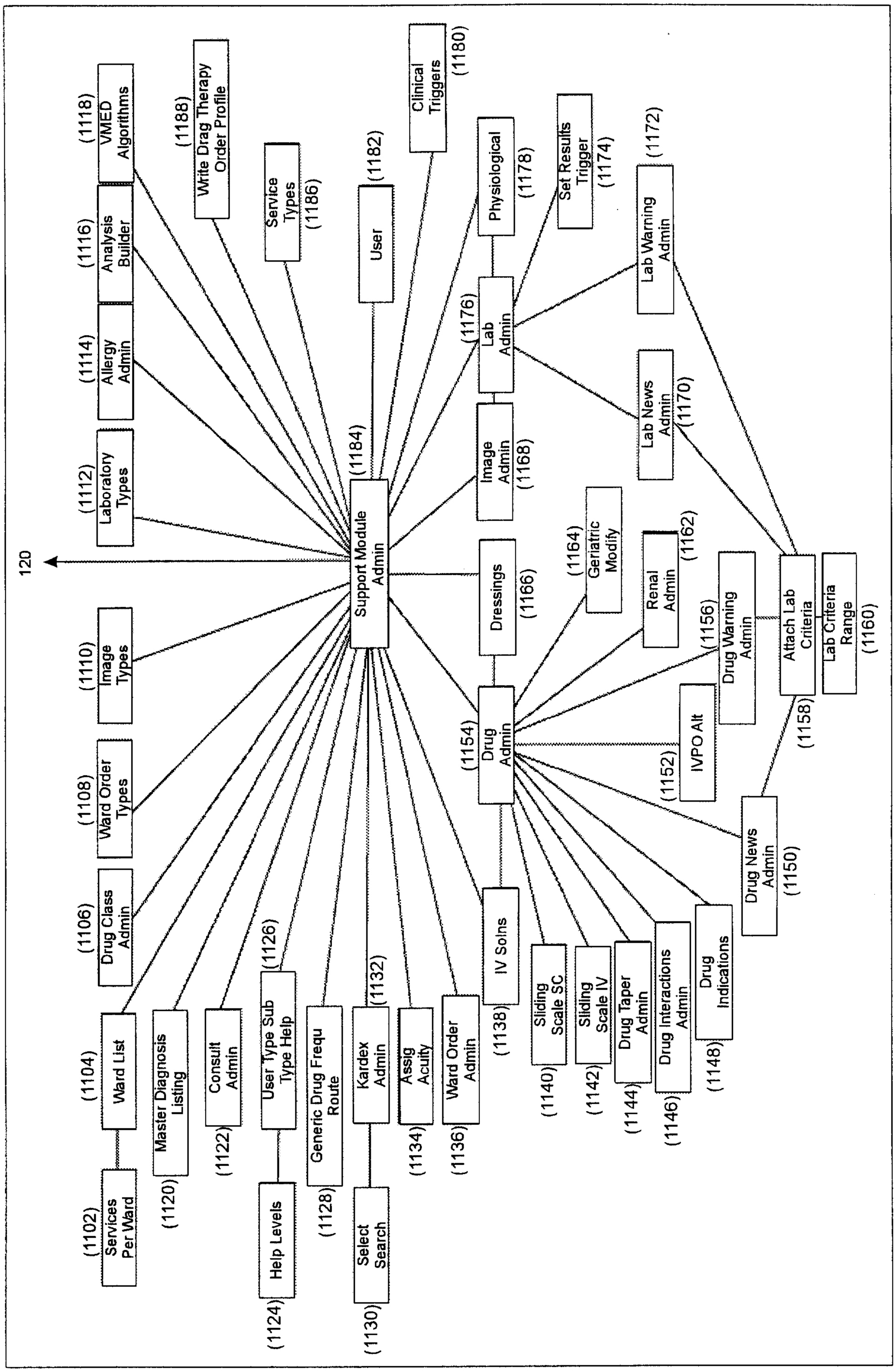

Administration (1100)
120
Support Module Admin (1184)
Analysis Builder (1116)
VMED Algorithms (1118)
Allergy Admin (1114)
Laboratory Types (1112)
Image Types (1110)
Ward Order Types (1108)
Drug Class Admin (1106)
Ward List (1104)
Services Per Ward (1102)
Write Drug Therapy Order Profile (1188)
Service Types (1186)
User (1182)
Clinical Triggers (1180)
Physiological (1178)
Set Results Trigger (1174)
Lab Warning Admin (1172)
Lab News Admin (1170)
Image Admin (1168)
Dressings (1166)
Geriatric Modify (1164)
Renal Admin (1162)
Drug Warning Admin (1156)
Attach Lab Criteria (1158)
Lab Criteria Range (1160)
Lab Admin (1176)
Drug Admin (1154)
IVPO Alt (1152)
Drug News Admin (1150)
IV Soins (1138)
Sliding Scale SC (1140)
Sliding Scale IV (1142)
Drug Taper Admin (1144)
Drug Interactions Admin (1146)
Drug Indications (1148)
Master Diagnosis Listing (1120)
Consult Admin (1122)
User Type Sub Type Help (1126)
Generic Drug Frequ Route (1128)
Kardex Admin (1132)
Assig Acuity (1134)
Ward Order Admin (1136)
Help Levels (1124)
Select Search (1130)

Figure 10

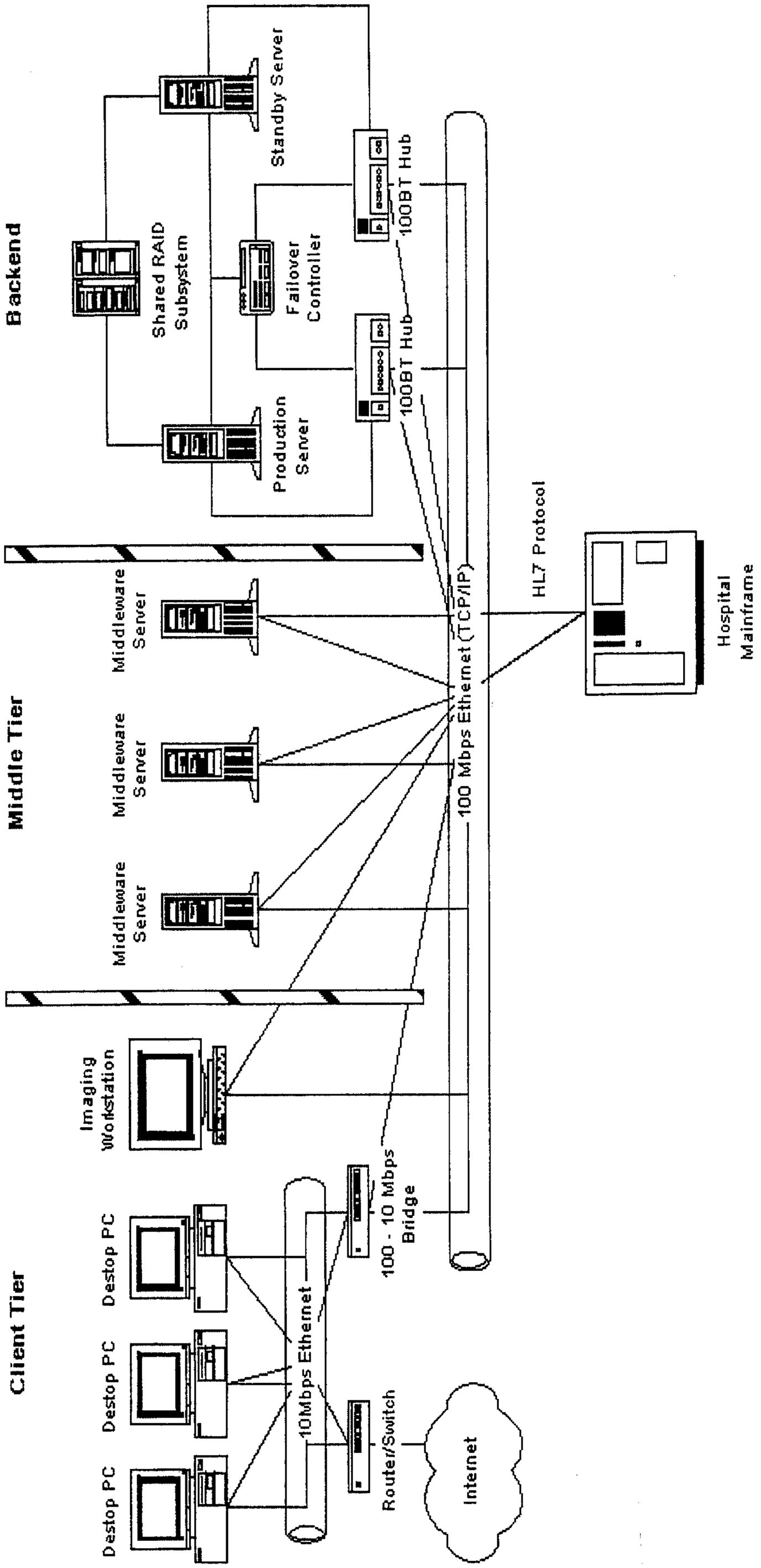

VisualMed High-Availability Architecture
Backend
Shared RAID Subsystem
Failover Controller
Standby Server
Production Server
100BT Hub
100BT Hub
Middle Tier
Middleware Server
Middleware Server
Middleware Server
HL7 Protocol
Hospital Mainframe
100 Mbps Ethernet (TCP/IP)
Imaging Workstation
Destop PC
Destop PC
Destop PC
100 - 10 Mbps Bridge
10Mbps Ethernet
Router/Switch
Internet
Client Tier

Figure 11

VisualMed Software Architecture

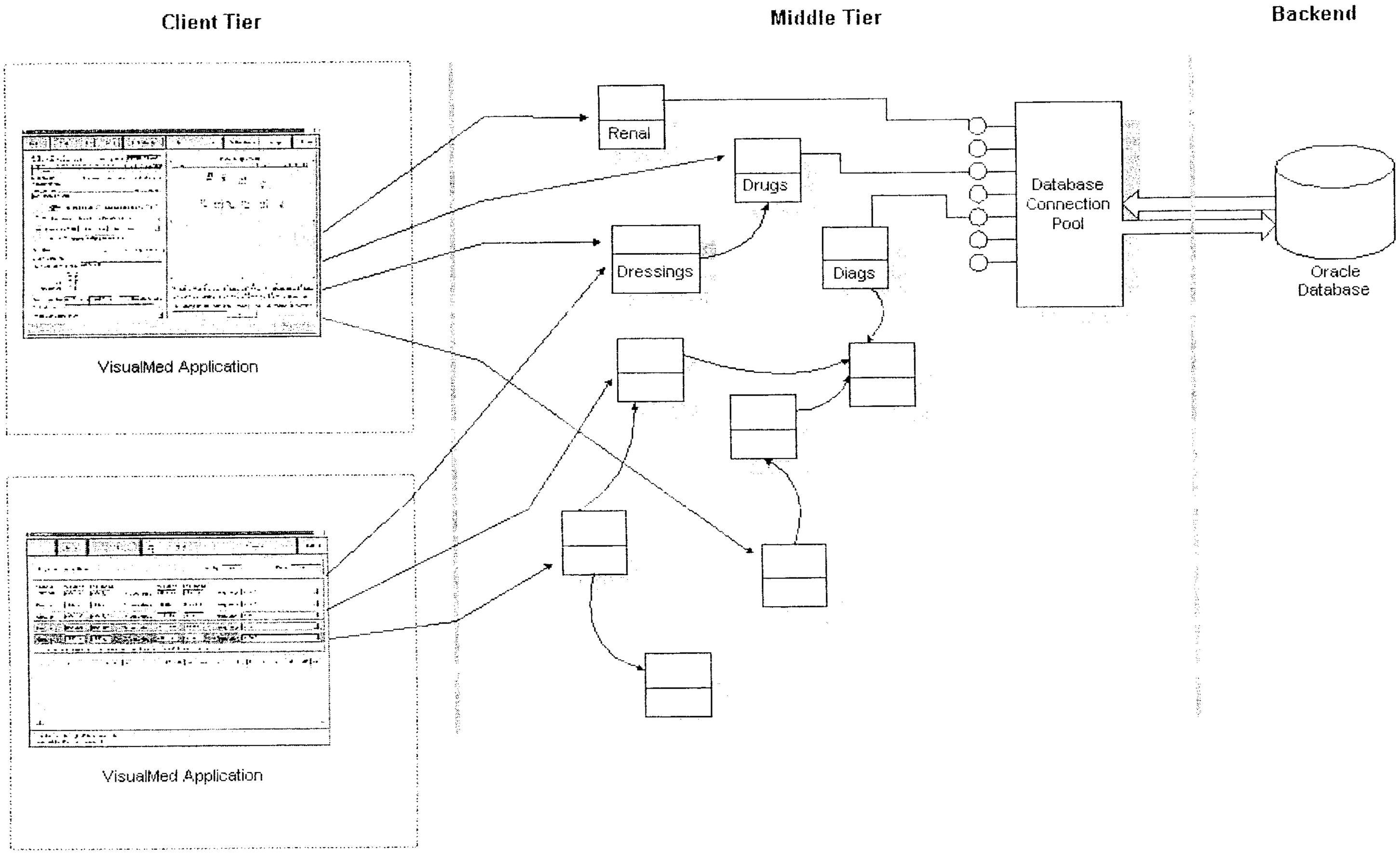


Figure 12

2328545 (Drws.)

UNSCANNABLE ITEM

RECEIVED WITH THIS APPLICATION

(ITEM ON THE 10TH FLOOR ZONE 5 IN THE FILE PREPARATION SECTION)

DOCUMENT REÇU AVEC CETTE DEMANDE

NE POUVANT ÊTRE BALAYÉ

(DOCUMENT AU 10 IÈME ÉTAGE AIRE 5 DANS LA SECTION DE LA

PRÉPARATION DES DOSSIERS)

Chart (300)

Clinical Data Entry (400)

Nursing Functions (500)

Clinical Guide (600)

MD Functions (700)

Kardex and Pharmacy (800)

Admitting (900)

Order Entry (1000)

Administration (1100)