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CLERK U.S. DISTRICT COURT
CENTRAL DIST. OF CALIF.
LOS ANGELES

BY:

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8 Attorneys for Plaintiff
9 MEDSQUIRE, LLC

10 UNITED STATES DISTRICT COURT
11 CENTRAL DISTRICT OF CALIFORNIA

12 MEDSQUIRE, LLC,

13 Plaintiff,

14 vs.

15 PULSE SYSTEMS, INC.,

16 Defendant.

Case No. CV 11-10125 RBK (UBKX)

COMPLAINT FOR PATENT
INFRINGEMENT

DEMAND FOR JURY TRIAL

MCKOOL SMITH HENNIGAN, P.C.
LOS ANGELES, CALIFORNIA

1 For its Complaint against PULSE SYSTEMS, INC., Plaintiff MEDSQUIRE,
2 LLC (“Plaintiff” or “Medsquire”) alleges as follows:

3 **THE PARTIES**

4 1. Plaintiff Medsquire, LLC is a limited liability company duly organized
5 and existing under the laws of the State of California, with its principal place of
6 business at 225 South Lake Avenue, Suite 300, Pasadena, California 91101. Plaintiff
7 is the owner, by assignment, of all right, title and interest to U.S. Patent No.
8 5,682,526.

9 2. Defendant Pulse Systems, Inc (“Pulse” or “Defendant”) is a corporation
10 duly organized and existing under the laws of the State of Kansas, with its principal
11 place of business at 3017 North Cypress Drive, Wichita, KS 67226. Defendant
12 Pulse’s registered agent for service of process is Alif Hourani, 2959 N Rock Rd Ste
13 400, Wichita, KS 67226-1197.

14 **NATURE OF THE ACTION**

15 3. In this civil action, Plaintiff seeks damages against Defendant for acts of
16 patent infringement in violation of the Patent Act of the United States, 35 U.S.C. §§ 1
17 *et seq.*

18 **JURISDICTION AND VENUE**

19 4. This Court has subject matter jurisdiction of such federal question claims
20 pursuant to 28 U.S.C. §§ 1331 and 1338(a).

21 5. Venue is proper under 28 U.S.C. §§ 1391(c) and 1400(b), in that the acts
22 and transactions complained of herein were conceived, carried out, made effective, or
23 had effect within the State of California and within this district, among other places.
24 On information and belief, Defendant conducts business activities in this judicial
25 district including regularly doing or soliciting business, engaging in conduct and/or
26 deriving substantial revenue from goods and services provided to consumers in the
27 State of California and in this district.

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1 6. On information and belief, this Court has personal jurisdiction over
2 Defendant. Defendant conducts continuous and systematic business in California and
3 in this district by offering to sell and/or selling infringing electronic health records
4 system in this State and in this district.

5 **FACTS COMMON TO EACH CLAIM FOR RELIEF**

6 7. Plaintiff is the owner by assignment of the entire right, title, and interest,
7 including the right to enforce U.S. Patent Number 5,682,526, entitled "Method and
8 System For Flexibly Organizing, Recording, and Displaying Medical Patient Care
9 Information Using Fields In a Flowsheet" ("the '526 patent"). A true and correct
10 copy of the '526 patent is attached as Exhibit A and incorporated herein by reference.

11 8. The inventors of the '526 patent are Timothy L. Smokoff, Tom Marlin,
12 and Herbert J. Uhrig. The application resulting in the '526 patent was filed on July
13 20, 1995, and the patent issued on October 28, 1997. The inventors originally
14 assigned the application resulting in the '526 patent to SpaceLabs Medical, Inc., an
15 early pioneer in the electronic health record field.

16 9. The '526 Patent is directed to methods for flexibly organizing, recording,
17 and displaying medical patient care information. The invention discloses a software
18 system that enables users to customize a patient information hierarchy. The patient
19 information hierarchy defines and organizes the information that may be stored about
20 each patient, as well as patient data flowsheets, which define views in which the
21 patient data may be entered and viewed.

22 10. The claims of the '526 Patent recite a method of designing a patient
23 information hierarchy, which has parameters and values. Certain parameters are
24 linked to each other and to values. When a user creates a new parameter (New
25 Parameter) and specifies a possible value for the new parameter (New Value), the user
26 may also link that New Value to other parameters (Other Parameter). Therefore,
27 when the New Parameter and New Value are selected and/or displayed, the Other
28 Parameter, to which the New Value is linked, is also pulled up and displayed. This

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1 ensures that a patient management system will efficiently and accurately alert or
2 remind a health care provider of an important variable, condition or issue (Other
3 Parameter) when a separate variable, condition or issue (New Parameter/New Value)
4 is selected.

5 11. In July 2010, the Office of the National Coordinator (ONC) of the U.S.
6 Department of Health and Human Services (HHS) issued a Final Rule to qualify EHR
7 technology for the American Recovery and Reinvestment Act (ARRA). Rules
8 governing ONC certification are available in 45 C.F.R. Part 170. ONC has approved
9 certain organizations as an Authorized Testing and Certification Body (“ATCB”).
10 ONC-ATCB certification is a program that tests complete EHR systems or EHR
11 modules against the Final Rule issued by the ONC. Vendors who wish to deliver a
12 ONC-ATCB certified solution to a healthcare provider must use software that
13 conforms to all certification criteria adopted at 45 CFR Part 170, Part C and must
14 program that software accordingly.

15 12. The Certification Commission for Health Information Technology
16 (CCHIT) is an independent, 501(c)(3) nonprofit organization with the public mission
17 of accelerating the adoption of robust, interoperable health information technology.
18 The Commission has been certifying electronic health record technology since 2006
19 and is approved by the ONC as an Authorized Testing and Certification Body (ONC-
20 ATCB).

21 13. The ONC-ATCB certification criteria and implementation specifications
22 require an EHR system to conform to predefined operative standards, in order to meet
23 certain functional objectives, such as the ability to readily exchange information
24 between parties, insure accurate identification of drug-drug interactions, enable
25 electronic prescribing and order entry, calculate and submit clinical quality measures,
26 and support clinical decisions.

27 14. To achieve those functional objectives, in particular electronically
28 exchanging data with other systems, a certified EHR system must organize patient

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1 data into a plurality of structured documents, which are generally defined by a
2 Continuity of Care Document (“CCD”) or Continuity of Care Record (“CCR”). The
3 CCD and CCR are defined as acceptable content exchange standards for the purposes
4 of electronically exchanging a patient summary record in 45 C.F.R. Section 170.205.
5 One or more these structured documents (“Hierarchy Documents”) comprise the
6 patient information hierarchy.

7 15. One example of a Hierarchy Document is a CCR described in ASTM
8 E2369. According to ASTM E2369, Section A2.5.3, “the core patient-specific data
9 contained within the CCR is within the Body of the CCR Document...<body> is
10 comprised of sections, which contain the discrete data objects that make up the core
11 elements and content of the CCR.” The <Body> data objects include Payer, Advance
12 Directives, Support, Functional Status, Problems, Family History, Social History,
13 Alerts, Medications, Medical Equipment, Immunizations, Vital Signs, Results,
14 Procedures, Encounters, Plan of Care, and Health Care Provider, among other objects.
15 An example data object (parameter) is shown below:

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Example 21 – Data Object <Description>

```

1      <Description>
2      <ObjectAttribute>
3      <Attribute>Diagnosis</Attribute>
4      <AttributeValue>
5      <Value>Myocardial Infarction</Value>
6      <Code>
7      <Value>22298006</Value>
8      <CodingSystem>SNOMED CT</CodingSystem>
9      <Version>20050131</Version>
10     </Code>
11     </AttributeValue>
12 </ObjectAttribute>
13 <ObjectAttribute>
14 <Attribute>Acuity</Attribute>
15 <AttributeValue>
16 <Value>Acute</Value>
17 <Code>
18 <Value>53737009</Value>
19 <CodingSystem>SNOMED CT</CodingSystem>
20 <Version>20050131</Version>
21 </Code>
22 </AttributeValue>
23 </ObjectAttribute>
24 <ObjectAttribute>
25 <Attribute>Site</Attribute>
26 <AttributeValue>
27 <Value>Anterocepal</Value>
28

```

16. As shown above, part of the CCR is a parameter, Diagnosis, which has a value “Myocardial Infarction”. The structure of the data object (parameter) allows the data object and associated value (myocardial infarction) to be linked to other data objects (i.e. medications, plan of care, etc.).

17. In one example, this link is effectuated through the “InternalCCRLink”. The InternalCCRLink is the mechanism used to link one CCR data object (Diagnosis) to another data object (Medications). The claims of the ’526 patent do not require any particular form of linking. Thus, while the use of an InternalCCRLink satisfies the linking requirements in the ’526 patent, other forms of linking satisfy the claims of the ’526 patent as well.

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1 18. To pass certain ONC-ATCB certification tests, namely tests for drug-
2 drug interactions and clinical support decisions, EHR software must implement rules
3 that operate by linking possible result values for certain parameters (i.e. within one
4 data object) to other parameters (i.e. within another data object) in the patient
5 hierarchy. Accordingly, certified EHR software and systems must use a patient
6 information hierarchy (Hierarchy Document), which contains a plurality of
7 parameters (data objects) including a linked-from parameter (e.g. Diagnosis) having a
8 linked-from possible result value (e.g., Myocardial Infarction) that is linked to one or
9 more linked-to parameters (e.g., Medications, Plan of care, etc.).

10 19. The linking functionality required to obtain ONC-ATCB certification is
11 described and claimed in the '526 Patent. Depending on whether the certified
12 software uses a CCD or CCR, the linking functionality may be done in underlying
13 software or in the user interface. Additionally, the linked parameters may define rules
14 or alerts.

15 20. To obtain ONC-ATCB certification, an EHR provider's software and
16 system must satisfy all other limitations of the independent claims in the '526 patent.
17 In other words, EHR software and systems cannot receive ONC-ATCB certification
18 under the published rules without also infringing one or more claims of the '526
19 patent.

20 **FIRST CLAIM FOR RELIEF FOR**
21 **DIRECT INFRINGEMENT OF U.S. PATENT NO. 5,682,526**

22 21. Plaintiff incorporates herein by reference the allegations set forth in
23 paragraphs 1-20 of this Complaint as though fully set forth herein.

24 22. Defendant Pulse has directly infringed and continues to directly infringe
25 the '526 patent by making, using, selling, and/or offering for sale its 2011 Pulse
26 Complete EHR system, which embodies and/or otherwise practices one or more of the
27 claims of the '526 patent.
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1 23. Pulse has received certification from HHS that its 2011 Pulse Complete
2 EHR System is ONC compliant.

3 24. The 2011 Pulse Complete EHR system directly infringes one or more
4 claims of the '526 patent in that it contains categories of patient information for
5 logically organizing patient information in the form of a patient information
6 hierarchy. Relationships between the patient information, or parameters, within 2011
7 Pulse Complete EHR are well-defined and the parameters have result values may be
8 programmed to link to other parameters.

9 25. Pulse also infringes the '526 Patent because 2011 Pulse Complete EHR
10 creates alerts and reminders. 2011 Pulse Complete EHR creates parameters and
11 values (new parameters/new values) such that the specifying of patient's data would
12 trigger health reminders (other parameters) that alert providers and staff to other tests,
13 medical screenings, and procedures.

14 26. The 2011 Pulse Complete EHR software complies with the requirement
15 for a Hierarchy Document. To comply, when a vendor or healthcare provider inputs
16 information, the 2011 Pulse Complete EHR System receives an instruction to create a
17 new parameter, i.e. data object, within the patient hierarchy. In response, the 2011
18 Pulse Complete EHR System creates that new parameter (data object) within the
19 patient hierarchy.

20 27. The 2011 Pulse Complete EHR System has passed test procedures
21 established for various sections of 45 CFR Section 170, including Section 170.304(e)
22 (Clinical Decision Support) and 170.302(a) (drug-drug, drug-allergy, formulary
23 checks), among other tests for both ambulatory and inpatient software.

24 28. The 2011 Pulse Complete EHR System is capable of being programmed
25 so that rules, such as drug-drug interaction notifications or clinical support decisions,
26 can be effectuated. When a possible result value (e.g., a disease state) is placed into
27 the 2011 Pulse Complete EHR System with a parameter (e.g., a diagnosis), the 2011
28 Pulse Complete EHR System associates that new value or values with the parameter.

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1 29. To support certain features within the certification standard, such as
2 alerts/notifications as required by the testing procedures of Section 170.304(e)
3 (Clinical Decision Support) and 170.302(a), the 2011 Pulse Complete EHR System
4 includes a link between a parameter/value with another data object within the patient
5 hierarchy using the link mechanism.

6 30. In response, the 2011 Pulse Complete EHR System links the
7 parameter/value (e.g., a Diagnosis/Myocardial Infarction) to the indicated parameters
8 (e.g., Medications, Plan of Care, etc.). By doing so, an alert or notification is
9 effectuated such that when the new parameter (e.g., a Diagnosis) is displayed for a
10 particular patient that has the indicated value (e.g., Myocardial Infarction), the linked-
11 to parameters (e.g., Medications, Plan of Care, etc.) are also displayed. The same data
12 object/value pairing, linking, and alert function is also used for notifying users of
13 drug-drug interactions, allergy-drug interactions, or clinical support decisions. While
14 the claims of the '526 patent recite a linking ability, the claims do not require that any
15 particular parameter of value be linked.

16 31. As a direct and proximate result of Pulse's infringement of the '526
17 patent, Plaintiff has been and continues to be damaged in an amount yet to be
18 determined.

19 **SECOND CLAIM FOR RELIEF FOR**
20 **INDIRECTLY INFRINGING U.S. PATENT NO. 5,682,526**

21 32. Plaintiff incorporates herein by reference the allegations set forth in
22 paragraphs 1-31 of this Complaint as though fully set forth herein.

23 33. Defendant Pulse has indirectly infringed and continues to indirectly
24 infringe the '526 patent by actively inducing direct infringement by other persons.

25 34. Customers of Pulse, including hospitals, medical groups, and/or
26 individual medical providers, use the Pulse Complete EHR system. Pulse's
27 customers, who directly infringe the '526 patent include, for example, Hillside
28

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1 Medical Partners. Pulse provides instruction regarding the use of the Pulse Complete
2 EHR system.

3 35. The Pulse Complete EHR system infringes one or more of the claims of
4 the '526 patent for the reasons set forth under the Facts Common to Each Claim for
5 Relief and the allegations regarding direct infringement.

6 36. Pulse had knowledge of the '526 patent at least by May 26, 2011, when
7 Plaintiff notified Pulse of the patent and its infringement. After this date, Pulse knew
8 or should have known that its continued sale of the Pulse Complete EHR system, and
9 its continued support of the Pulse Complete EHR system by existing users would
10 induce direct infringement by those users. Further, Pulse intended that its continued
11 actions would induce direct infringement by those users.

12 37. As a direct and proximate result of Pulse's indirect infringement of the
13 '526 patent, Plaintiff has been and continues to be damaged in an amount yet to be
14 determined.

15 **THIRD CLAIM FOR RELIEF FOR**
16 **CONTRIBUTING TO THE INFRINGEMENT OF U.S. PATENT NO. 5,682,526**

17 38. Plaintiff incorporates herein by reference the allegations set forth in
18 paragraphs 1-37 of this Complaint as though fully set forth herein.

19 39. Defendant Pulse has contributorily infringed and continues to
20 contributorily infringe the '526 patent.

21 40. By distributing, selling and/or installing its 2011 Pulse Complete EHR
22 software, Pulse provides non-staple articles of commerce to others for use in
23 infringing EHR systems. Users of the 2011 Pulse Complete EHR software directly
24 infringe the '526 patent for the reasons set forth under the Facts Common to Each
25 Claim for Relief and the allegations regarding direct infringement. Pulse's customers,
26 who directly infringe the '526 patent include, for example, Hillside Medical Partners.

27 41. Since at least by May 26, 2011, Pulse had knowledge of the '526 patent.
28 After this date, Pulse had knowledge that its 2011 Pulse Complete EHR software,

1 which are non-staple articles of commerce, was used as a material part of the claimed
2 invention of the '526 patent.

3 42. As a direct and proximate result of Pulse's contributory infringement of
4 the '526 patent, Plaintiff has been and continues to be damaged in an amount yet to be
5 determined.

6 **PRAYER FOR RELIEF**

7 WHEREFORE, Plaintiff prays for judgment against Defendant as follows:

8 1. For a judicial determination and declaration that Defendant has infringed
9 and continues to infringe the '526 patent by making, using, importing, offering for
10 sale, and/or selling EHR systems;

11 2. For a judicial determination and declaration that Defendant has induced,
12 and continues to induce, the infringement of the '526 patent;

13 3. For a judicial determination and declaration that Defendant has
14 contributorily infringed, and continues to contributorily infringe, the '526 patent;

15 4. For damages resulting from Defendant's past and present infringement of
16 the '526 patent;


17 5. For a declaration that this is an exceptional case under 35 U.S.C. § 285
18 and for an award of attorneys' fees and costs in this action;

19 6. For an assessment of prejudgment interest; and

20 7. For such other and further relief as the Court may deem just and proper
21 under the circumstances.

22 DATED: December 5, 2011

MCKOOL SMITH HENNIGAN, P,C,

23
24
25 By 
Lawrence M. Hadley

26 Attorneys for Plaintiff MEDSQUIRE LLC
27
28

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DEMAND FOR JURY TRIAL

Plaintiff hereby demands a jury trial pursuant to Rule 38 of the Federal Rules of Civil Procedure as to all issues in this lawsuit.

DATED: December 5, 2011 MCKOOL SMITH HENNIGAN, P.C.

By 
Lawrence M. Hadley

Attorneys for Plaintiff MEDSQUIRE LLC

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EXHIBIT A



United States Patent [19]
Smokoff et al.

[11] **Patent Number:** 5,682,526
 [45] **Date of Patent:** Oct. 28, 1997

- [54] **METHOD AND SYSTEM FOR FLEXIBLY ORGANIZING, RECORDING, AND DISPLAYING MEDICAL PATIENT CARE INFORMATION USING FIELDS IN A FLOWSHEET**
- [75] **Inventors:** Timothy L. Smokoff, Renton; Tom Marlin, Edmonds, both of Wash.; Herbert J. Uhrig, Duluth, Ga.
- [73] **Assignee:** SpaceLabs Medical, Inc., Redmond, Wash.
- [21] **Appl. No.:** 504,801
- [22] **Filed:** Jul. 20, 1995
- [51] **Int. Cl.⁵** G06F 17/30
- [52] **U.S. Cl.** 395/615; 395/602; 395/611; 128/710
- [58] **Field of Search** 364/413.01; 395/161, 395/600, 700, 608, 764, 768, 601, 603, 765, 202; 340/172.5; 128/710

Fackler et al. "Integration of Intermittent Clinical Data with Continuous Data from Bedside Monitors", Computer-Based Medical Systems, 1993 Symposium, pp. 289-294.

Petroni et al. "An Automatic Speech Recognition System for Bedside Data Entry in an Intensive Care Unit", Circuits and Systems, 1990 IEEE Midwest Symposium, pp. 791-794.

Saab et al. "Data Modeling and Design of a Patient Data Management System in an Intensive Care Unit", Computer Based Medical Systems, 1992 Symposium, May 1992, pp. 54-63.

Primary Examiner—Thomas G. Black
Assistant Examiner—Charles L. Roncs
Attorney, Agent, or Firm—Seed and Berry LLP

[57] **ABSTRACT**

A method and system for flexibly organizing, recording, and displaying medical patient care information is provided. In a preferred embodiment, a patient information management facility enables users to customize a patient information hierarchy, which defines and organizes the information that may be stored about each patient, as well as patient data flowsheets, which define views in which the patient data stored according to the hierarchy may be entered and viewed, in a way that is optimized for the structure and procedures of the particular health care organization. The facility enables users to add, modify, and rearrange global or local patient information parameters that make up the hierarchy. Users may define the parameters to be any of a number of types. The user may also customize flowsheets used for entering and displaying result values of parameters defined in the hierarchy for particular patients. The user may expand and contract overview encapsulating parameters to display or hide the encapsulated parameters encapsulated therein. The facility also allows the user to link a result value of one parameter to other parameters, causing the linked-to parameters to be displayed when the result value is entered.

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,872,448	3/1975	Mitchell, Jr.	340/172.5
4,878,175	10/1989	Norden-Paul et al.	364/413.01
5,077,666	12/1991	Brimm et al.	364/413.02
5,247,611	9/1993	Norden-Paul et al.	395/161
5,253,361	10/1993	Thurman et al.	395/603
5,253,362	10/1993	Nolan et al.	395/601
5,301,319	4/1994	Thurman et al.	395/600
5,307,262	4/1994	Ertel	364/413.01
5,325,478	6/1994	Shelton et al.	395/768
5,337,405	8/1994	Lindauer	395/764
5,410,704	4/1995	Norden-Paul et al.	395/700
5,482,050	1/1996	Smokoff et al.	128/710
5,546,580	8/1996	Seliger et al.	395/600
5,592,945	1/1997	Fiedler	128/710

OTHER PUBLICATIONS

- "System Administrator Guide," SpaceLabs Medical, Inc. PC Chartmaster, 1994.
- "Operations Manual," SpaceLabs Medical Inc., PC Chartmaster, 1994.

25 Claims, 21 Drawing Sheets

parameter id	parameter name	is used (root)	parameter data type	normal value	unit type-specific information
10001	cough	yes	select	none	none
10002	respiration	no	select	normal	10013, 10014
10003	chest sounds	no	select	none	normal, heavy, none, soft
10004	sleep	no	select		awake, asleep
10006	Demerol	no	encapsulating		*10007, 10008, 10009
10008	Amoxicillin	no	encapsulating		*10010, 10011, 10012
10007	dose	no	integer		
10008	dose units	no	select	cc	mg, cc
10009	route	no	select	intravenous	oral, intravenous
10010	dose	no	integer		
10011	dose units	no	select	mg	mg, cc
10012	route	no	select	oral	oral, intravenous
10013	sputum color	no	select		white, yellow, green
10014	sputum character	no	select		white, yellow, green

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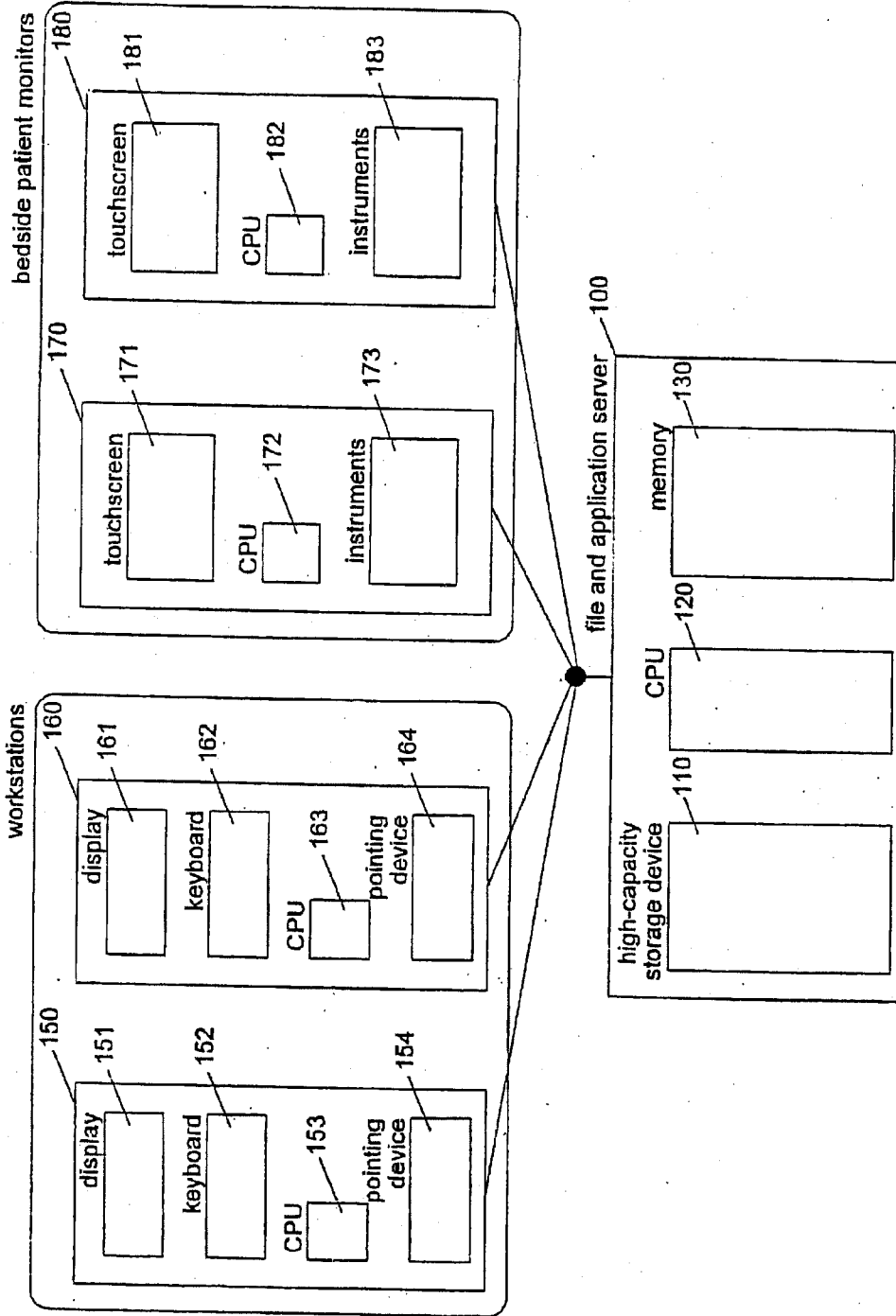


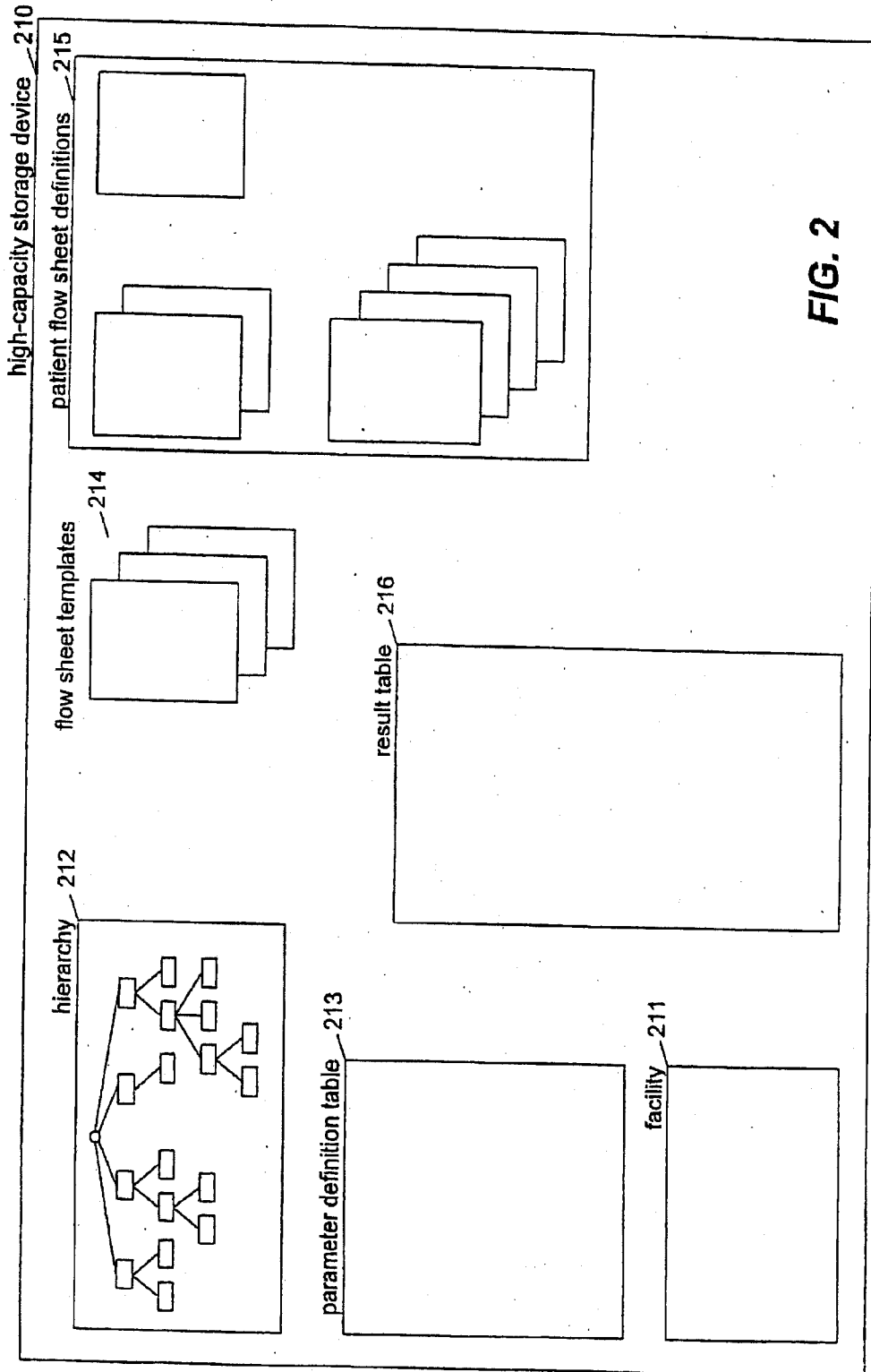
FIG. 1

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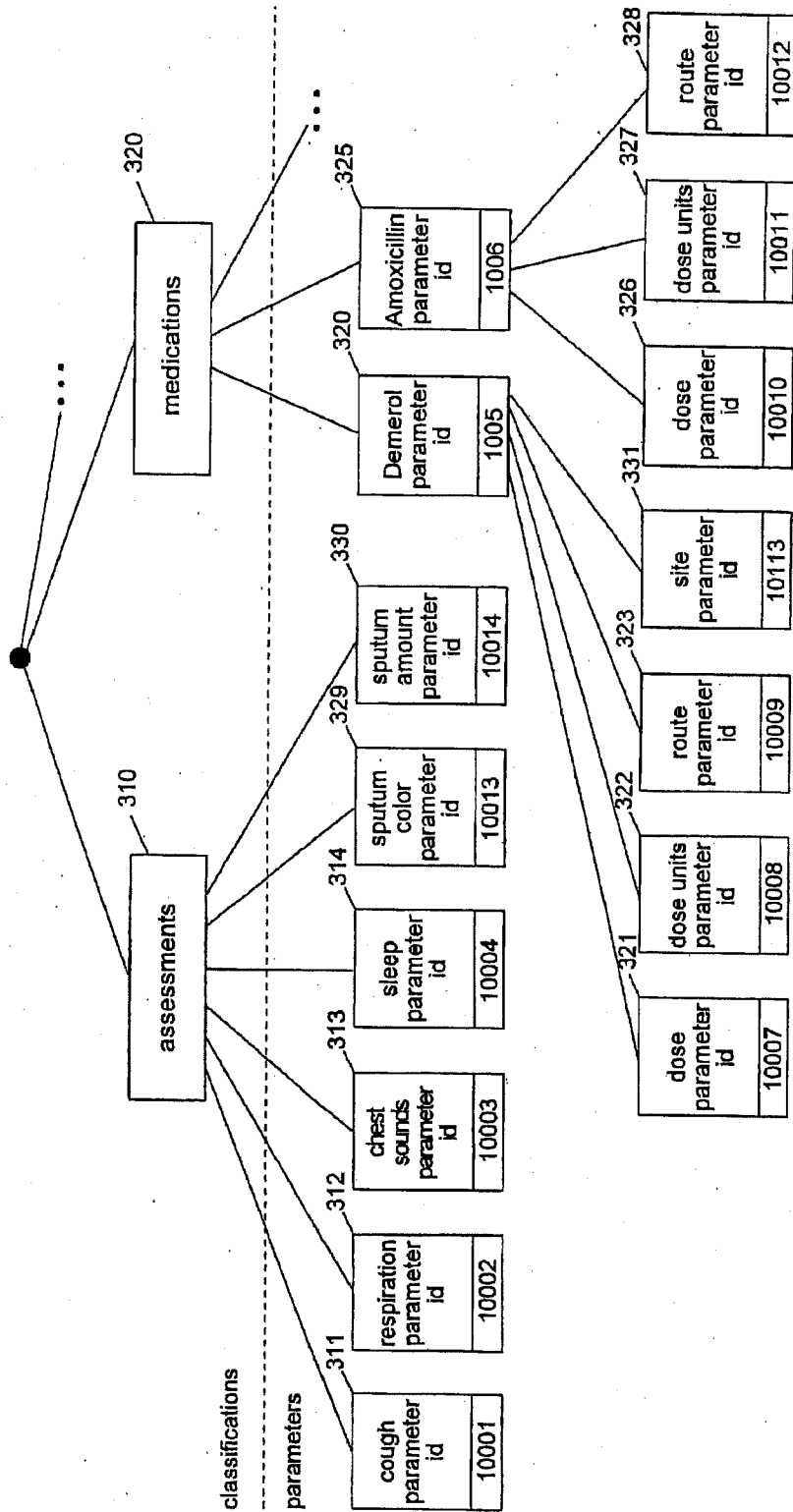


FIG. 3

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parameter definition table 400

401 parameter id	402 parameter name	403 linked from parameter	404 parameter data type	405 normal value	406 data type - specific information
10001	cough	yes	select	none	non-productive productive 10013, 10014
10002	respiration	no	select	normal	normal heavy shallow
10003	chest sounds	no	select	none	none soft loud
10004	sleep	no	select		awake asleep
10005	Demerol	no	encapsulating		*10007, 10008, 10009
10006	Amoxicillin	no	encapsulating		*10010, 10011, 10012
10007	dose	no	integer		
10008	dose units	no	select	cc	mg cc
10009	route	no	select	intravenous	oral intravenous
10010	dose	no	integer		
10011	dose units	no	select	mg	mg cc
10012	route	no	select	oral	oral intravenous
10013	sputum color	no	select		white yellow green
10014	sputum amount	no	select		white yellow green
...					

FIG. 4

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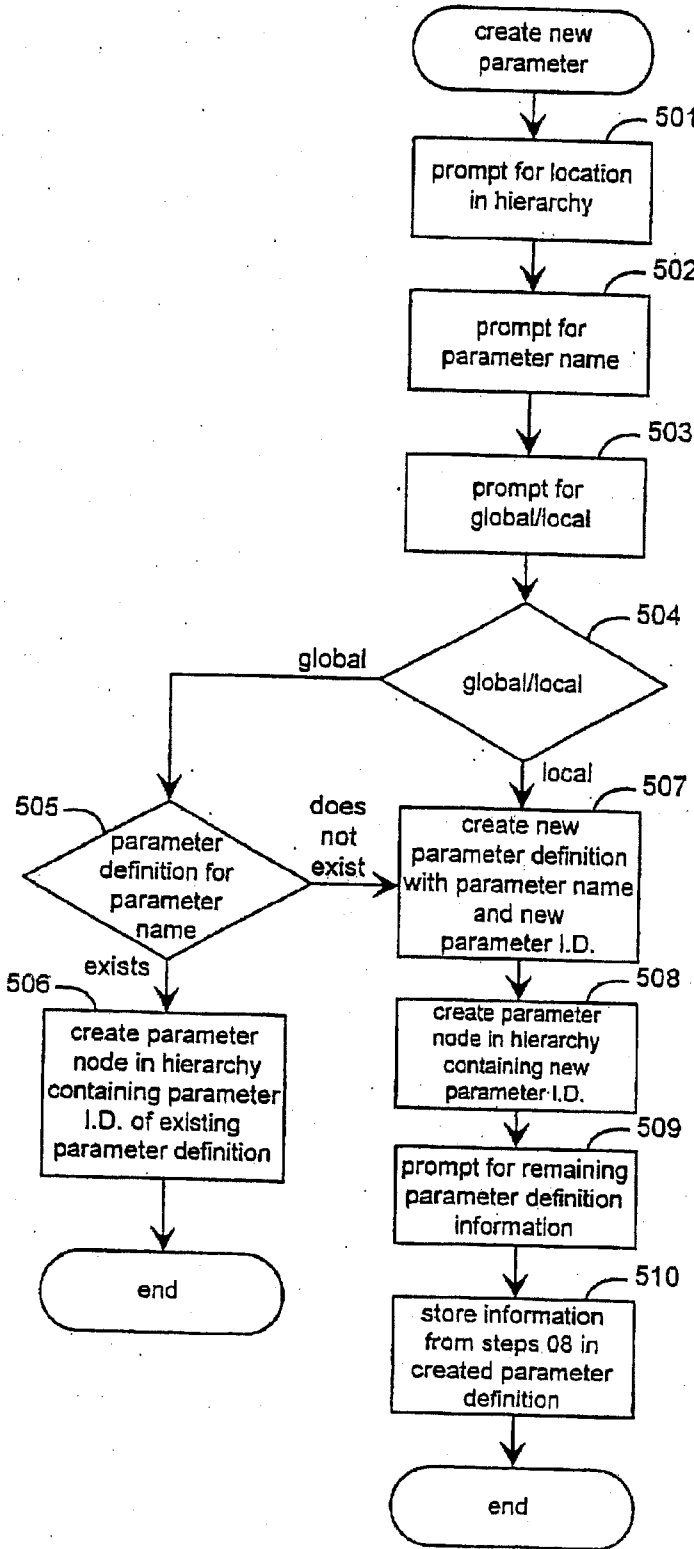


FIG. 5

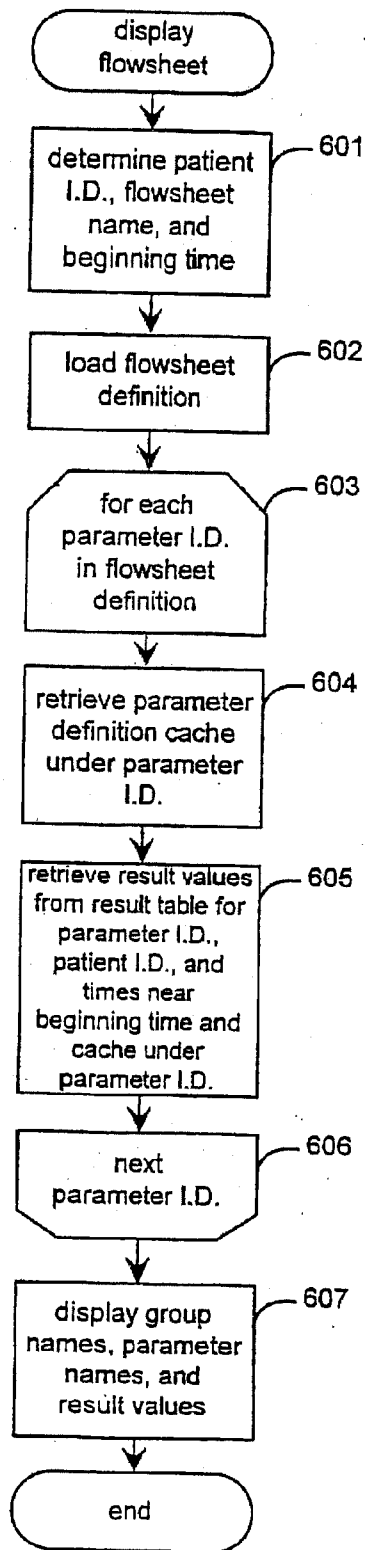


FIG. 6

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flowsheet 800

patient name 801

patient I.D. 802

flowsheet name 803
general

	851 01/25 23:00	852 01/26 00:00	853 01/26 01:00	854 01/26 02:00	855 01/26 03:00
811 cough	891 none				
812 chest sounds					
813 • endotracheal tube					
810 r e s p i r a t o r y					
821 • Demerol			50		
822 • Aminophylline					
823 • Amoxicillin					
824 medication infusions					
820 PLACEHOLDER					
m e d i c a t i o n					

FIG. 8

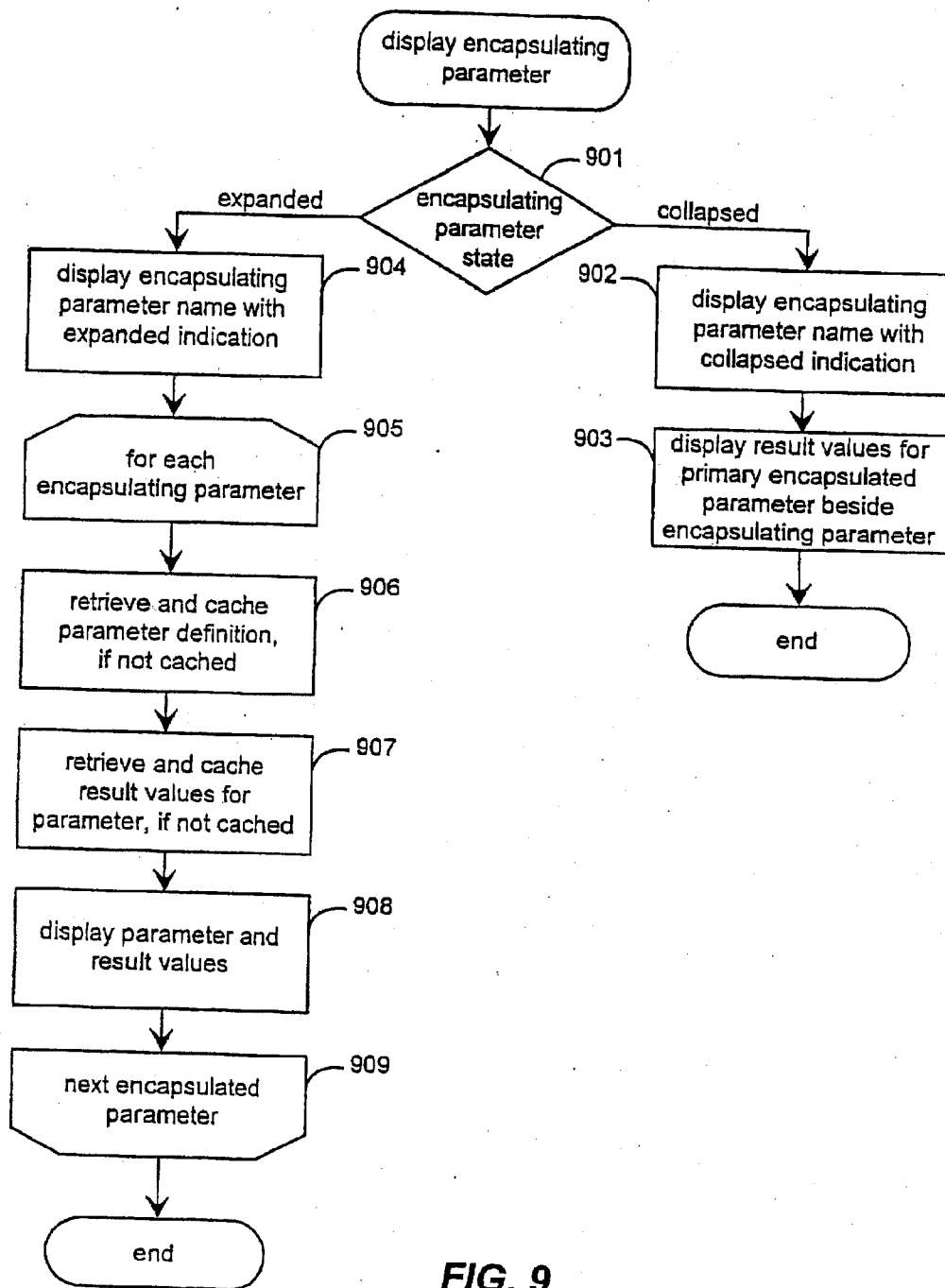


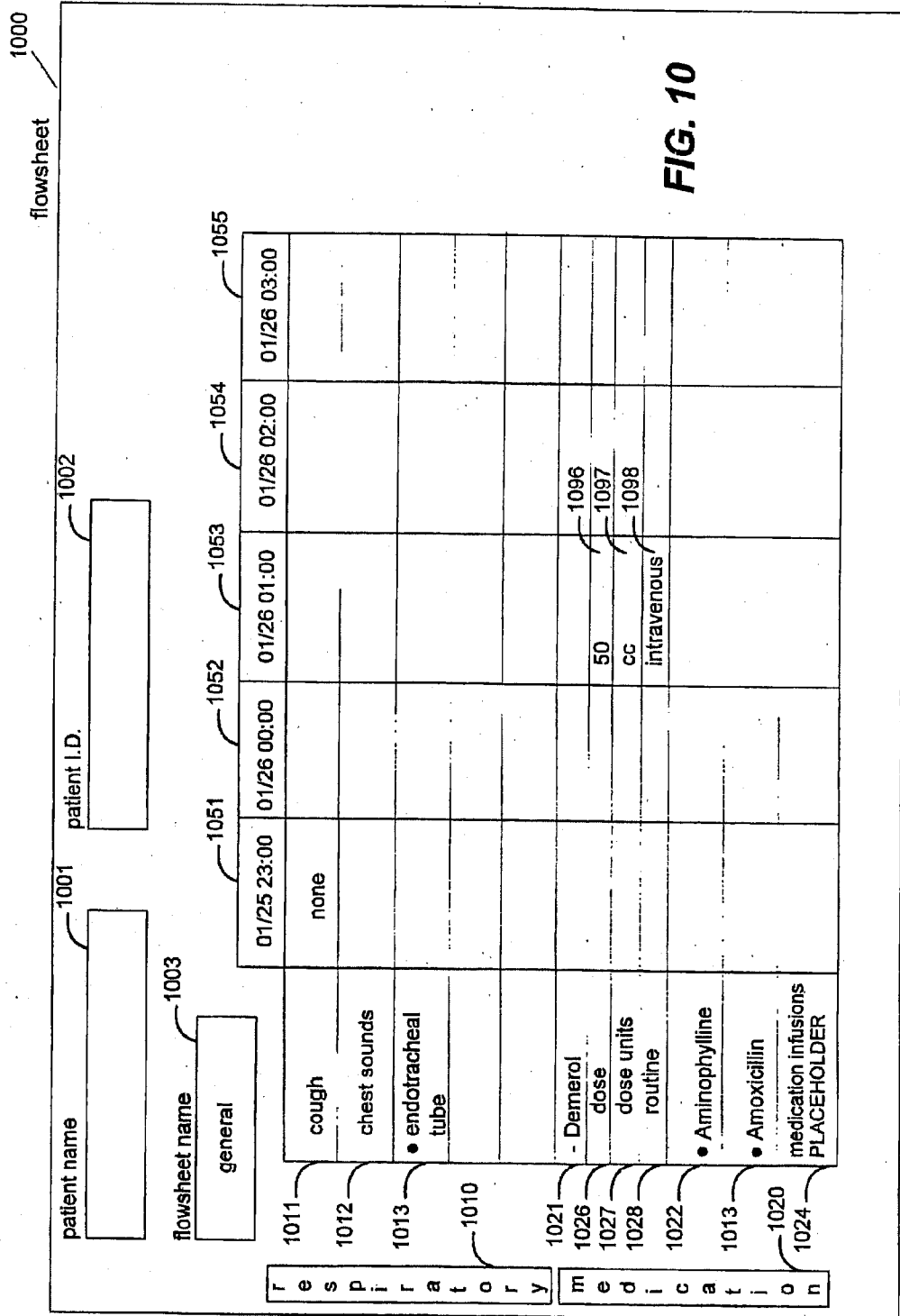
FIG. 9

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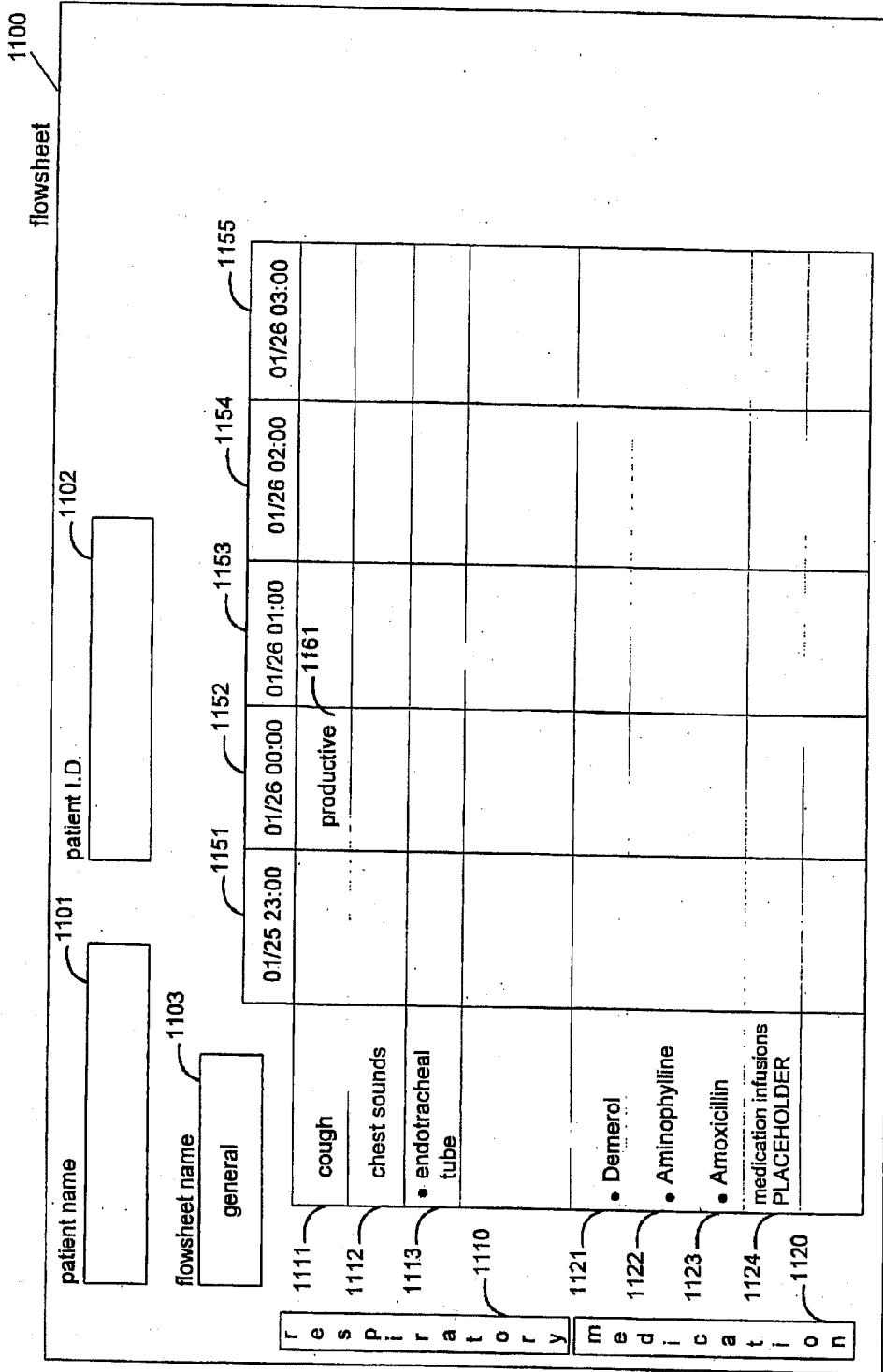


FIG. 11

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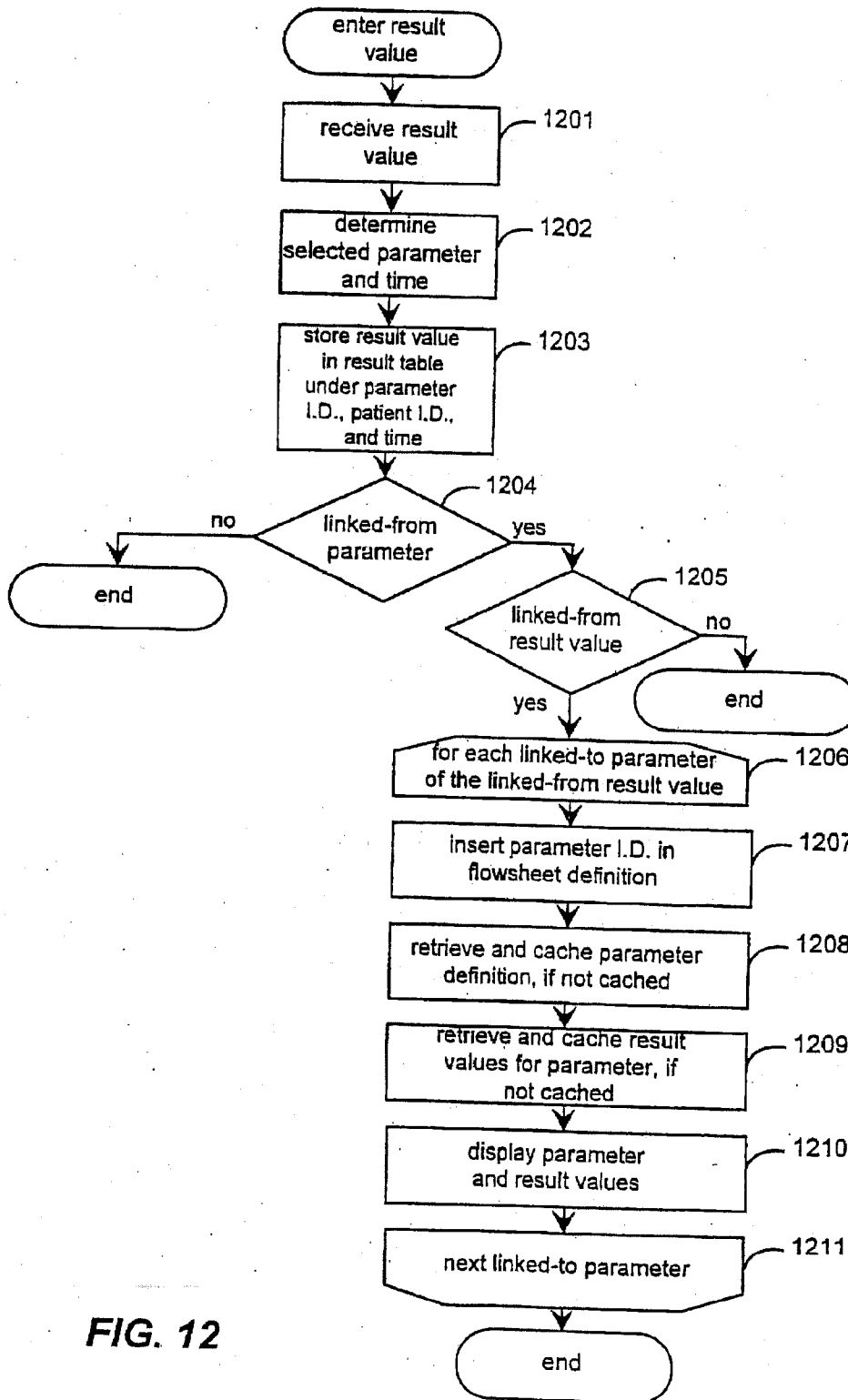


FIG. 12

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1300
flowsheet

1301 patient name

1302 patient I.D.

	1351 01/25 23:00	1352 01/26 00:00	1353 01/26 01:00	1354 01/26 02:00	1355 01/26 03:00
1311 cough	none	productive			
1314 sputum color					
1315 sputum amount					
1312 chest sounds					
1315 ● endotracheal tube					
1310 ● Demerol					
1321 ● Aminophylline					
1322 ● Amoxicillin					
1323 medication infusions					
1324 PLACEHOLDER					
1320					

1303 flowsheet name
general

1311 r 1314 e 1315 s 1312 p 1315 i 1310 r 1321 a 1322 t 1323 o 1324 r 1320 y

1311 m 1314 e 1315 d 1312 i 1315 c 1310 a 1321 t 1322 i 1323 o 1324 n 1320

FIG. 13

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flowsheet 1400

patient name 1401

patient I.D. 1402

flowsheet name 1403

general

	1451 01/25 23:00	1452 01/26 00:00	1453 01/26 01:00	1454 01/26 02:00	1455 01/26 03:00
1411 cough					
1412 chest sounds					
1413 • endotracheal tube					
1416 respiratory notes					
1421 • Demerol					
1422 • Aminophylline					
1423 • Amoxicillin					
1424 medication infusions					
1420 PLACEHOLDER					

1411
1412
1413
1416
1410
1421
1422
1423
1424
1420

r e s p i r a t o r y m e d i c a t i o n

FIG. 14

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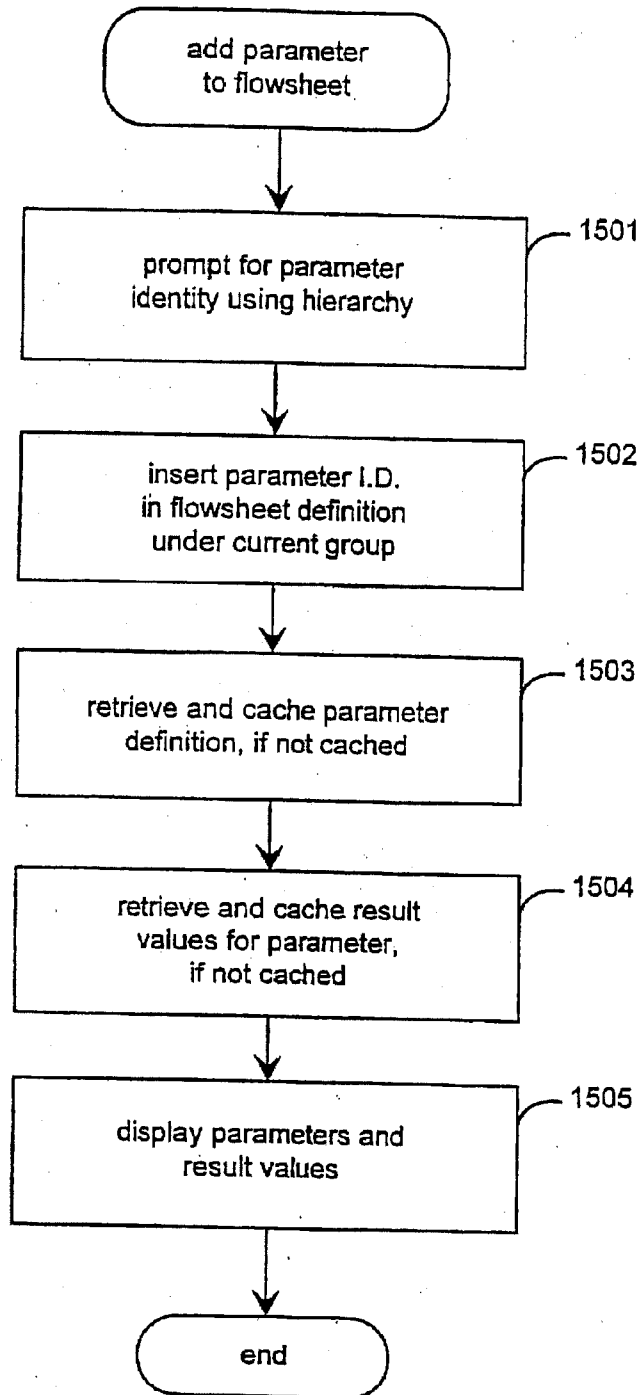


FIG. 15

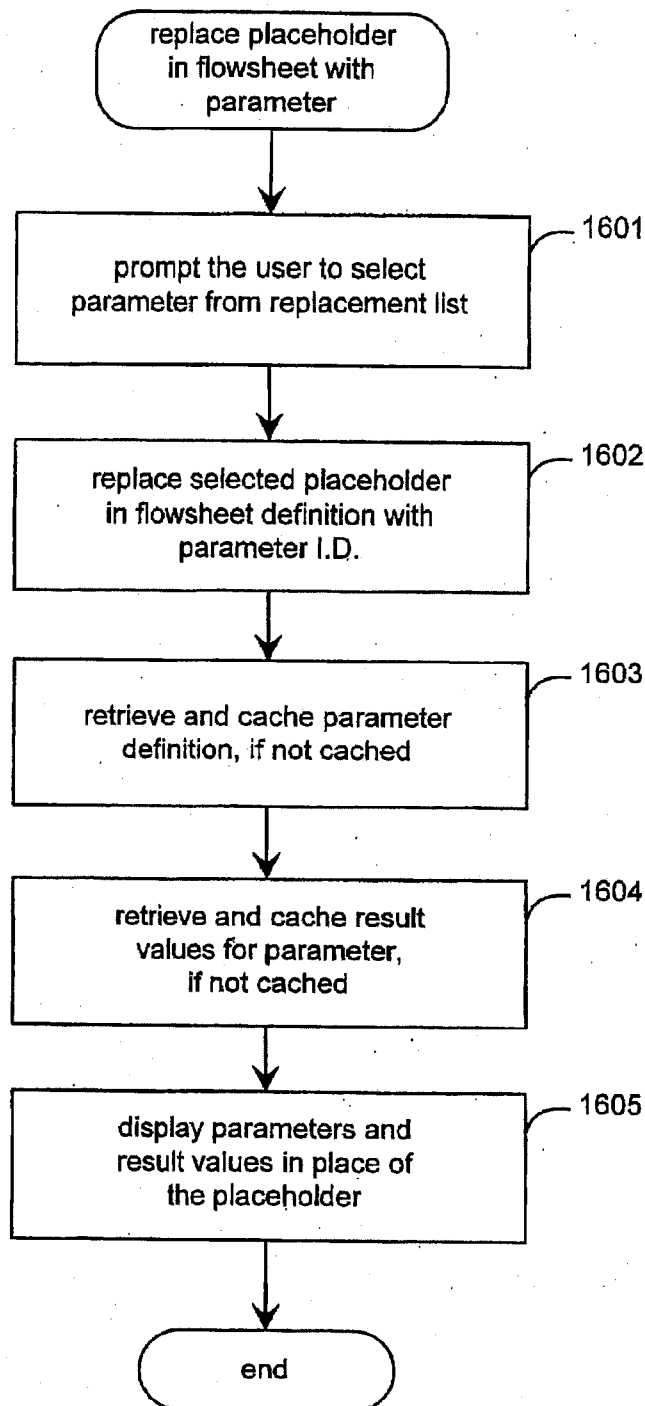


FIG. 16

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1700
flowsheet

1701 patient Name

1702 patient I.D.

1703 flowsheet name
general

	1751 01/25 23:00	1752 01/26 00:00	1753 01/26 01:00	1754 01/26 02:00	1755 01/26 03:00
1711 r e s p i r a t o r y					
1712 cough					
1713 chest sounds					
1710 • endotracheal tube					
1721 • Demerol					
1722 • Aminophylline					
1723 • Amoxicillin					
1725 • Dopamine infusion					
1720 m e d i c a t i o n					

FIG. 17

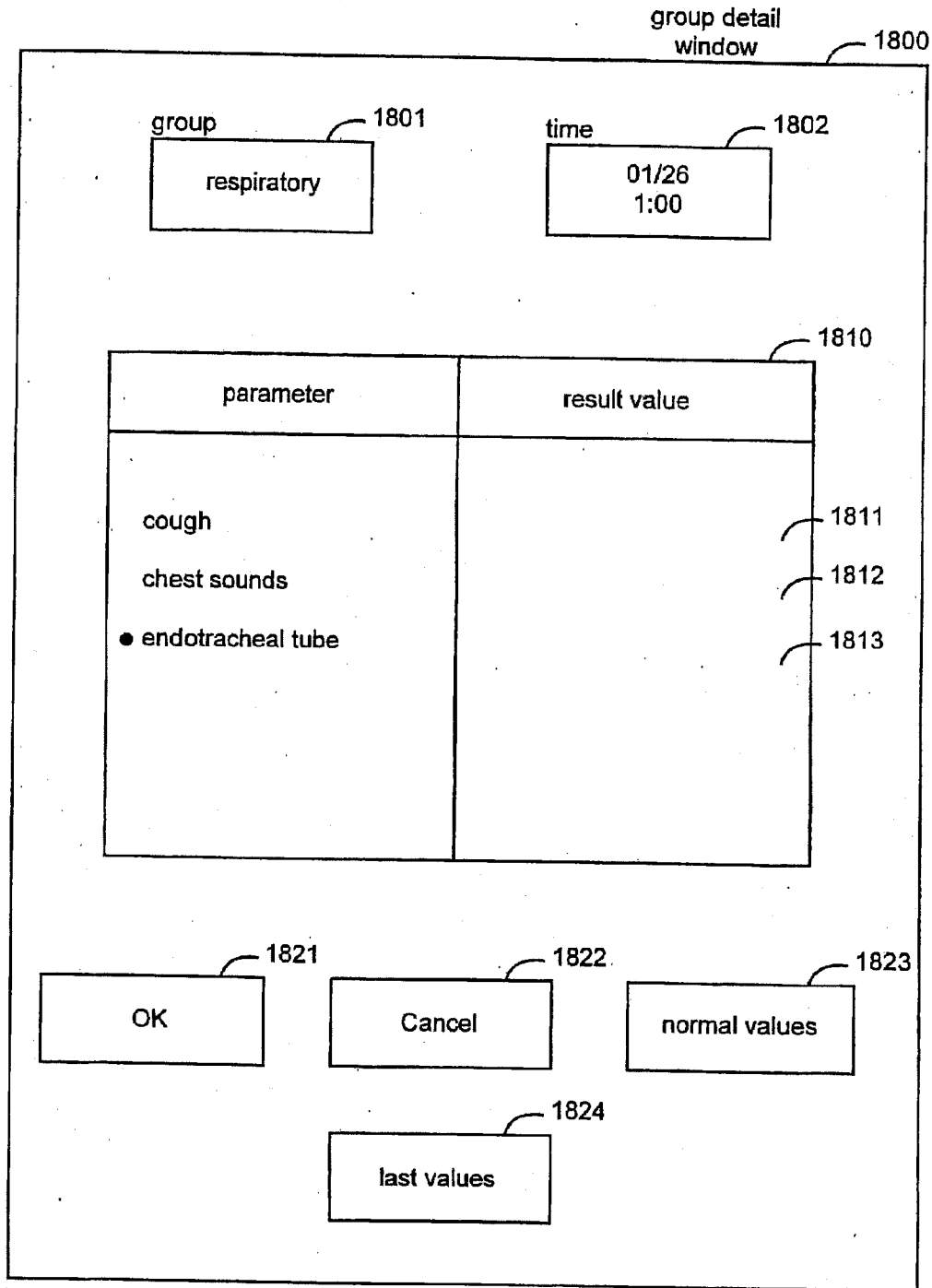


FIG. 18

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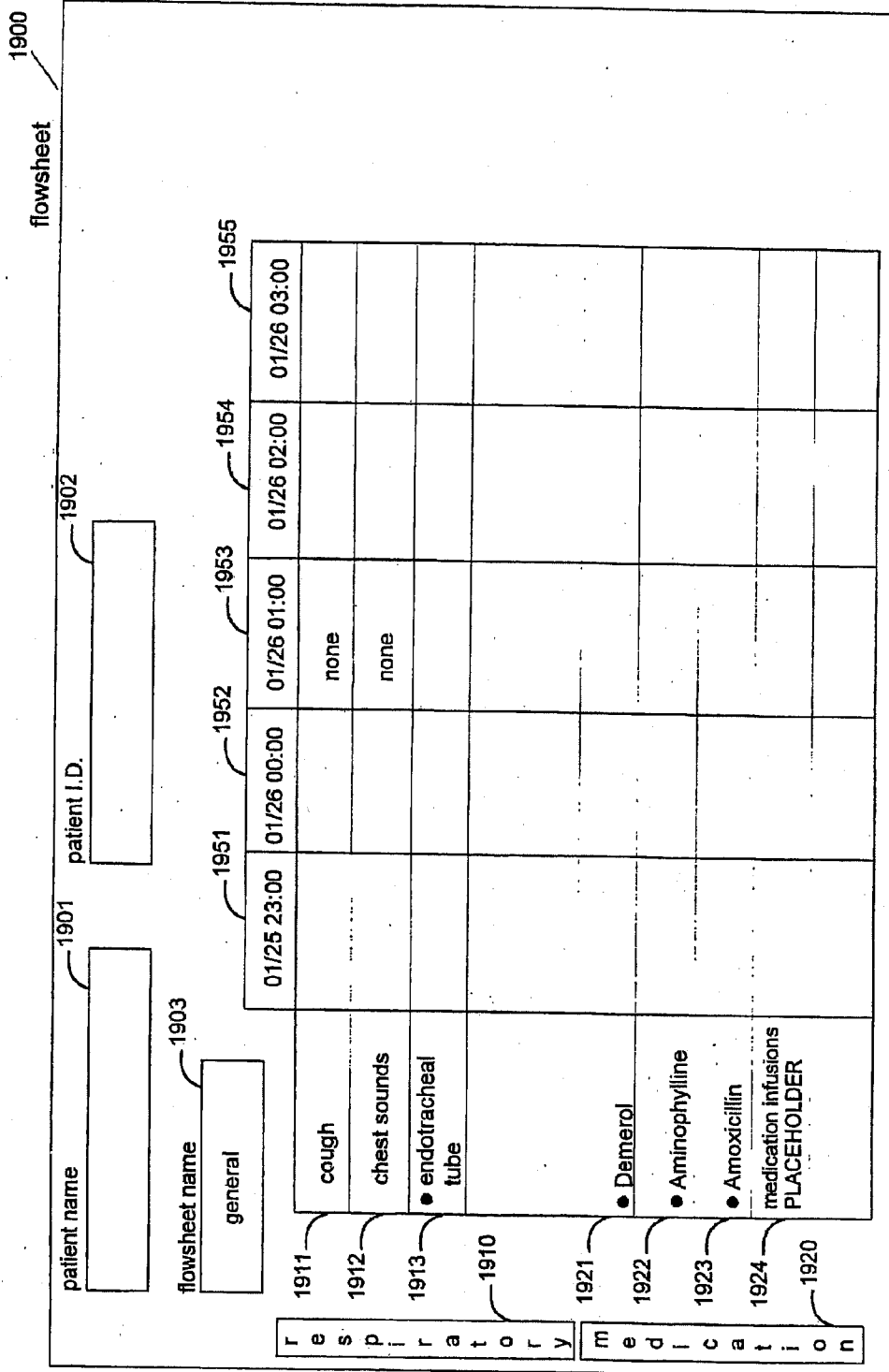


FIG. 19

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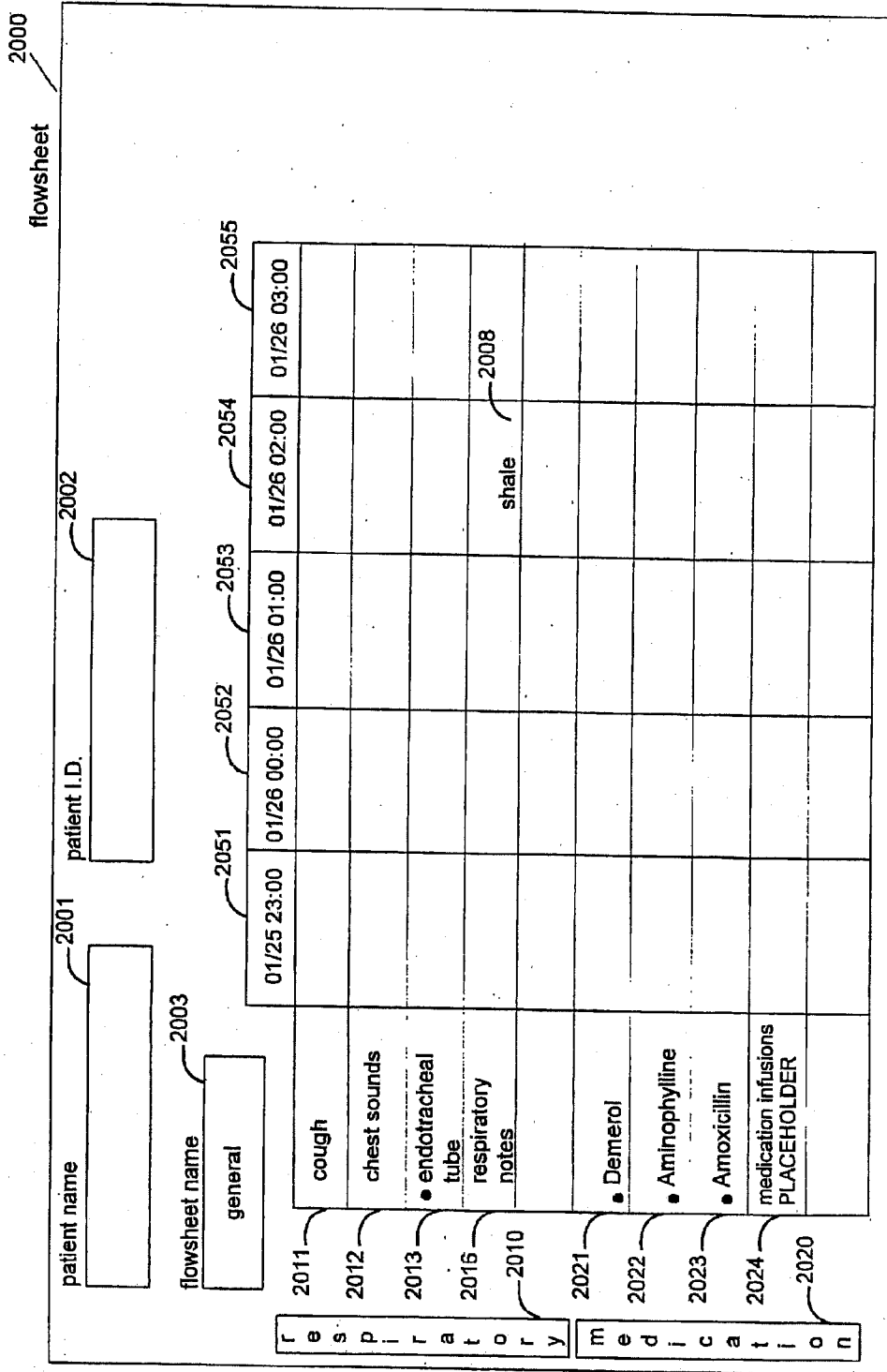


FIG. 20

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flowsheet 2100

patient name 2101

flowsheet name 2103
general

patient I.D. 2102

	2151 01/25 23:00	2152 01/26 00:00	2153 01/26 01:00	2154 01/26 02:00	2155 01/26 03:00
2111 cough					
2112 chest sounds					
2113 ● endotracheal tube					
2116 respiratory notes				shale	2188
2120	<div style="border: 1px solid black; padding: 5px;"> <p>written by 2191 Martha Shale, R.N. text</p> <p>time 2192 01/26 02:00</p> <p>2193 Staff not available to observe respiratory parameters.</p> <p>2194 <input type="button" value="OK"/> <input type="button" value="cancel"/> 2195</p> </div>				

2121 ● Demerol

2122 ● Aminophylline

2123 ● Amoxicillin

2124 medication infusions

2120 PLACEHOLDER

FIG. 21

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**METHOD AND SYSTEM FOR FLEXIBLY
ORGANIZING, RECORDING, AND
DISPLAYING MEDICAL PATIENT CARE
INFORMATION USING FIELDS IN A
FLOWSHEET**

TECHNICAL FIELD

The invention relates generally to the field of patient information management, and, more specifically, to the field of medical patient care information organization and display.

BACKGROUND OF THE INVENTION

The provision of health care services to patients depends on the maintenance of significant quantities of patient information, including both clinical information relating to patient treatment and patient management information, such as referral, admission, insurance, and billing information. Health care providers have traditionally maintained such patient information manually, on physical "charts" comprised of paper forms, also known as "flowsheets." Such flowsheets typically show a time series progression of different pieces of patient information. Such pieces of patient information are commonly called "parameters," and may include information about indications of patient condition, laboratory test results, assessments, and the administration of treatments. Parameters may also include administrative information, such as details relating to facility, supply, and human resource usage.

The maintenance of patient information in physical charts often has significant disadvantages. Physical charts may only be viewed or modified in a single physical location. Also, data collected automatically from medical sensors and medical laboratories may not be automatically posted to physical charts. Physical charts further are subject to inadvertent destruction, and may contain illegible information. Disadvantages such as the above militate toward automating the maintenance of patient information.

Existing alternatives for automating the maintenance of patient information fall into the categories of general-purpose databases and rigid patient information databases, both of which have significant disadvantages. General-purpose databases generally lack any measure of support for the medical environment, as they generally do not include tools for entering and viewing information in familiar flowsheet formats and do not provide any basis for organizing patient information in a manner useful to health care providers. Rigid patient information databases, on the other hand, define a particular organization of particular parameters. Neither the parameter organization nor the parameters themselves are typically modifiable by the health care provider. It can be difficult for a health care provider to adapt to a rigid organization of patient information. More seriously, a health care provider that deems the tracking of a particular parameters not specified by the rigid patient information database to be necessary to responsible patient care may be precluded from recording these parameters, or may at least be forced to record these parameters manually. The above-discussed drawbacks of general-purpose databases and rigid patient information databases demonstrate a need for a method and system for flexibly organizing, recording, and displaying medical patient care information.

SUMMARY OF THE INVENTION

The present invention provides a method and system for flexibly organizing, recording, and displaying medical

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patient care information. In a preferred embodiment, a patient information management facility enables users to customize a patient information hierarchy, which defines and organizes the information that may be stored about each patient, as well as patient data flowsheets, which define views in which the patient data stored according to the hierarchy may be entered and viewed, in a way that is optimized for the structure and procedures of the particular health care organization. The facility enables users to add, modify, and rearrange global or local patient information parameters that make up the hierarchy. Users may define the parameters to be any of a number of types. The user may also customize flowsheets used for entering and displaying result values of parameters defined in the hierarchy for particular patients. The user may expand and contract overview encapsulating parameters to display or hide the encapsulated parameters encapsulated therein. The facility also allows the user to link a result value of one parameter to other parameters, causing the linked-to parameters to be displayed when the result value is entered.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a high-level block diagram of the general-purpose computer system upon which the facility preferably operates.

FIG. 2 is a block diagram showing the contents of the high-capacity storage device of the file and application server computer system.

FIG. 3 is a diagram showing the patient information hierarchy.

FIG. 4 is a tabular diagram showing the parameter definition table.

FIG. 5 is a flow diagram showing the steps performed by the facility in order to create a new parameter.

FIG. 6 is a flow diagram showing the steps preferably performed by the facility in order to display a flowsheet for a particular patient.

FIG. 7 is a diagram showing the contents of a sample result table.

FIG. 8 shows the display of a flowsheet having the sample flowsheet definition.

FIG. 9 is a flow diagram showing the steps preferably performed by the facility in order to display each encapsulating parameter.

FIG. 10 is a screen diagram of the sample flowsheet in which an encapsulating parameter has been expanded.

FIG. 11 is a screen diagram showing the user entering a result value.

FIG. 12 is a flow diagram showing the steps preferably performed by the facility in order to enter a received result value.

FIG. 13 is a display diagram showing the addition of linked-to parameters to the flowsheet in response to the entry of a linked-from result value.

FIG. 14 is a screen diagram showing the addition of a respiration parameter to the sample flowsheet.

FIG. 15 is a flow diagram showing the steps preferably performed by the facility in order to add a parameter to a flowsheet.

FIG. 16 is a flow diagram showing the steps preferably performed by the facility in order to replace such a placeholder with a particular parameter.

FIG. 17 is a display diagram showing the replacement of placeholder 824 with the Ibuprofen parameter 925.

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FIG. 18 is a partial screen diagram showing such a group detail window 1800 that contains indications of the selected group 1801 and of the selected time 1802.

FIG. 19 is a screen diagram showing the entry of the normal values for the respiratory group 1910 at 1:00 A.M. on Jan. 26th.

FIG. 20 is a screen diagram showing a parameter of the note data type displayed in abbreviated form.

FIG. 21 is a screen diagram showing the display of an entire note parameter result value.

DETAILED DESCRIPTION OF THE INVENTION

A method and system for flexibly organizing, recording, and displaying medical patient care information is provided. In a preferred embodiment, health care organizations are provided with a patient information system. A patient information management facility of the patient information system ("the facility") is comprised of software tools that enable each health care organization to customize the patient information system in a way that is optimized for the structure and procedures of the health care organization. The facility permits users to customize a patient information hierarchy ("the hierarchy"), which defines and organizes the information that may be stored about each patient. The facility further permits users to customize patient data flowsheets ("flowsheets"), which define views in which patient data stored according to the hierarchy may be entered and viewed.

The facility enables authorized users of the patient information system to add to, modify, and rearrange the patient information parameters ("parameters") that make up the hierarchy. If parameters at two different points in the hierarchy have the same name, the parameters may either be global or local. If the parameters are global, they share a single set of result values for each patient. On the other hand, if they are local, the parameters each have their own set of result values for each patient. Users may flexibly define the parameters to be any of a number of types. Many of the parameter types specify a time sequence of values.

The facility further enables users to customize flowsheets that may be used for entering and displaying result values for subsets of the parameters defined in the hierarchy for particular patients. Flowsheets may contain parameters defined in the hierarchy as encapsulating parameters and parameters that are linked to other parameters. When displaying a flowsheet containing an encapsulating parameter that encapsulates one or more other parameters, the facility preferably enables the user to toggle between expanding the encapsulating parameter to display its encapsulated parameters and their result values and contracting the encapsulating parameter to display only the encapsulating parameter name. When displaying a flowsheet containing a parameter defined as a linked-from parameter, if the user enters a result value for the linked-from parameter that is linked to other fields, the facility preferably adds these linked-to parameters to the flowsheet. The flowsheets displayed by the facility may further contain parameter placeholders that the user may replace with particular parameters.

FIG. 1 is a high level block diagram showing the computer network upon which the facility preferably operates. The network connects a file and application server computer system 100 with workstation computer systems, such as 150 and 160, and bedside patient monitor in computer systems, such as 170 and 180. While only a small number of workstation computer systems and bedside patient monitor-

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ing computer systems are shown for clarity, it will be recognized by those skilled in the art that a typical network may contain many more of both types of computer systems. The file and application server computer system 100 contains a high-capacity storage device 110, such as a hard disk drive; one or more central processing units (CPUs) 120; and random access memory 130. The patient information system is maintained on the file and application server 100. Workstation computer systems, such as 150, contain a display device 151 such as a video monitor, a keyboard 152; one or more CPUs 153; and a pointing device 154 such as a mouse. The workstation computer systems 150, 160 may be used to access the patient information system. Bedside patient monitoring computer systems, such as 170, are used for collecting data from electronic medical instruments 173 and displaying it on a touch screen 171. The bedside patient monitoring computer systems 170, 180 also have one or more CPUs 172, and may be used to access the patient information system. While the preferred embodiment is shown in FIG. 1, those skilled in the art will appreciate that the facility may operate on virtually any network configuration.

FIG. 2 is a block diagram showing the contents of the high-capacity storage device 110 of the file and application server computer system 100. The high-capacity storage device 110 contains a facility 211 that enables users to interact with the patient information system. The facility is discussed in greater detail below. The high-capacity storage device contains a patient information hierarchy 212. The patient information hierarchy is used to organize the parameters, in conjunction with which pieces of patient information are stored, in a logical organization from which users may easily select them. Authorized users may modify the hierarchy by adding or deleting parameters, or by relocating parameters within the hierarchy. The patient information hierarchy is discussed in greater detail below in conjunction with FIG. 3. The high-capacity storage device also contains a parameter definition table 213. The parameter definition table contains definitional information for each parameter identified in the patient information hierarchy 212, and is discussed below in greater detail in conjunction with FIG. 4. The high-capacity storage device also contains flowsheet definition templates 214. Authorized users may modify existing flowsheet definition templates and add new flowsheet definition templates. The flowsheet definition templates each define a patient-independent flowsheet for entering and viewing parameters in their result values. Any of the flowsheet definition templates may be used for any patient. The high-capacity storage device further contains patient flowsheet definitions 215. The patient flowsheet definitions are used for particular patients to enter and display parameters and their result values. The patient flowsheet definitions may either be automatically copied ("templated") from the flowsheet definition templates 214, or may be created from scratch. Users may modify patient flowsheet definitions. The high-capacity storage device further contains a result table 216. The result table stores all of the parameter result values corrected for each station. The result table is discussed in greater detail below in conjunction with FIG. 7.

FIG. 3 is a diagram showing the patient information hierarchy, which is comprised of classifications, such as 310 and 320, and parameters, such as 311-331. The classifications correspond to different categories of parameters, under which parameters may be grouped in a way that is logical to users of the patient information system. For example, the assessments classification 310 contains parameters relating to observable aspects of patient condition, while the medi-

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cations 320 contains parameters relating to the administration of particular medications. The parameters correspond to actual pieces of patient data that may be stored and displayed for each patient. For example, the cough parameter 311 corresponds to a parameter that indicates whether a particular patient at a particular time exhibits no cough, a non-productive cough, or a productive cough. Each of the parameters contains a parameter identifier ("parameter i.d."). The labels shown in conjunction with each parameter, such as "cough parameter i.d." shown in conjunction with cough parameter 311, are for illustrative purposes only and not actually stored in the tree comprising the patient information hierarchy. Each of the parameters that constitutes a leaf of the tree, e.g., 311-314, 321-323, 326-328, and 329-331, is called a result parameter, and may contain a result value for a particular patient at a particular time. Parameters that are not leaves of the tree, e.g., 320 and 325, are called encapsulating parameters. Encapsulating parameters may not contain result values, but rather "encapsulate," or represent at a high level, one or more other parameters, called "encapsulated parameters." For example, encapsulating parameter 320 (Demerol) encapsulates encapsulated parameters 321, 322, 323, and 331 (dose, dose units, route, and site).

FIG. 4 is a tabular diagram showing the parameter definition table. The parameter definition table contains definitional information for each parameter identified in the patient information hierarchy. The parameter definition table 400 contains the following columns, or fields, which may each contain information for each parameter: parameter i.d. column 401, parameter name 402, linked-from parameter column 403 which contains an indication of whether the parameter is linked to any other parameters, a parameter data type 404, a normal value 405 containing a result value for the parameter that a well patient, and a column containing data type-specific information 406. Table 1 below shows the nature of data type-specific information for several data types.

TABLE 1

parameter data type	data type-specific information
selection	choices, linked parameters i.d.s therefor and primary encapsulated parameter
encapsulating	parameter i.d.s of encapsulated parameters
calculated	formula
string	(none)
integer	(none)
note	(none)
float	(none)

The rows are preferably indexed on the parameter i.d. column to allow the row for a particular parameter to be quickly retrieved using the parameter i.d. of the parameter. Each row of the table corresponds to a single parameter identified in the patient information hierarchy. For example, the row for parameter i.d. 10001 shows the name of the parameter to be cough, the parameter to be a linked-from parameter, the parameter to be of the select data type, the normal value of the parameter to be none and the selection choices stored in the data-type-specific information column to be none, non-productive, and productive. The data-type-specific information column further indicates that the productive selection choice is linked to the parameters having parameter i.d.s 10013 and 10014. The row for parameter i.d. 1005 shows that the Demerol parameter is of the encapsulating data type, that it encapsulates the parameters having parameter i.d.s 10007, 10008, and 10009, and that the

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parameter having parameter i.d. 10007 is its primary encapsulated parameter.

Authorized users may create new parameters in order to store and display new pieces of patient information, or to represent an existing piece of patient information at an additional location in the hierarchy. FIG. 5 is a flow diagram showing the steps performed by the facility in order to create a new parameter. In step 501, the facility prompts the user for the location of the parameter in the hierarchy. Step 501 preferably involves presenting the user with a list of classifications and receiving input from the user selecting one of the classifications. Step 501 further preferably involves displaying a list of the encapsulating parameters for the selected classification and receiving from the user an indication of which of the encapsulating parameters, if any, the new parameter should be an encapsulated parameter of. In step 502, the facility prompts the user for the name of the new parameter and receives the name of the new parameter from the user. In step 503, the facility prompts the user for an indication of whether the new parameter is global or local. An indication that the new parameter is local indicates that a new row in the parameter definition table should be created for the new parameter, and that a new, unique parameter i.d. should be assigned to the new parameter. A global indication indicates that the facility should search for an existing parameter in the parameter definition table having the same parameter name, and assign the parameter i.d. of the existing parameter to the new parameter. In step 504, if the user indicates that the new parameter is global, then the facility continues at step 505, else if the user indicates that the new parameter should be local, then the facility continues at step 507. In step 505, if a parameter definition for the parameter name selected by the user exists, then the facility continues at step 506, else the facility continues at step 507. In step 506, the facility creates a parameter node in the hierarchy containing the parameter i.d. of the existing parameter definition for the selected parameter name. After step 506, these steps conclude.

In step 507, the facility creates a new parameter definition in the parameter definition table having the selected parameter name and a new, unique parameter i.d. In step 508, the facility creates a parameter node in the hierarchy containing the new parameter i.d. In step 509, the facility prompts the user for the remaining parameter definition information, including parameter data type, normal value, and data type-specific information. The facility preferably uses the data type to determine which data type-specific information to prompt the user for. For example, for a parameter having the encapsulating data type, the facility preferably prompts the user to identify encapsulated parameters, and to indicate which of the encapsulated parameters is the primary encapsulated parameter that is to be displayed in conjunction with the encapsulating parameter when the encapsulating parameter is collapsed. The facility preferably prompts the user for encapsulated parameters by prompting the user to choose them from a list of parameters organized according to the hierarchy. As is discussed in further detail below, to do so, the facility preferably displays a list of default encapsulated parameters associated with the new parameter's classification as encapsulated parameters of the encapsulating parameter, which may each either be retained or deleted by the user. For parameters of the select data type, the facility preferably prompts the user for the selection choices for parameters of the select data type. The facility further preferably prompts the user for any linked-to parameters for each of the selection choices. For parameters of the calculated type, the facility preferably prompts the user for a

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formula from which result values for the parameter may be calculated. The facility preferably allows the user to enter such a formula using a special visual interface discussed in detail in U.S. application Ser. No. 08/504,703 which is filed concurrently herewith and is hereby incorporated by reference. In step 510, the facility stores the information received in step 509 and the parameter definition created in step 507. These steps then conclude.

A user may use a flowsheet to display a set of parameters and their result values for a particular patient over a time. FIG. 6 is a flow diagram showing the steps preferably performed by the facility in order to display a flowsheet for a particular patient. In step 601, the facility determines the name of the flowsheet to display, the patient i.d. of the patient for which the flowsheet is to be displayed, and a beginning time at which to begin displaying result values. The user may select either the name of an existing patient flowsheet definition 215, or the name of a flowsheet definition template 214. If a patient flowsheet definition having the selected name exists for the selected patient i.d., the facility loads this patient flowsheet definition in step 602. If no patient flowsheet definition exists for this flowsheet name, the facility preferably copies the flowsheet definition template having this flowsheet name to create a patient flowsheet definition having this name and the patient i.d. of the selected patient in step 602. The facility then loads this new patient flowsheet definition in step 602. Table 2 below shows a sample flowsheet definition.

TABLE 2

Sample flowsheet definition	
1	group respiratory
2	{ <cough parameter i.d.> 10001
3	<chest sounds parameter i.d.> 10103
4	<endotracheal tube parameter i.d.> 10204
5	}
6	
7	group medications
8	{ <Demerol parameter i.d.> 10005
9	<Aminophylline parameter i.d.> 10037
10	<Amoxicillin parameter i.d.> 10006
11	<medication infusions placeholder> 90005
12	}

The sample flowsheet definition is comprised of definitions for two flowsheet groups. A flowsheet group is a collection of parameters that are related for purposes of displaying result values for and adding result values to parameters in the flowsheet. The parameters contained in a particular flowsheet group may be selected from any point in the hierarchy, including points in the hierarchy under different classifications. A respiratory group is defined in lines 1-5, and a medications group is defined in lines 7-12. Each of lines 2-4 identify a parameter in the respiratory group. For example, line 2 identifies the cough parameter of the assessments classification, and contains the parameter i.d. for the cough parameter, 10001. The label text, e.g., "<cough parameter i.d. >", is merely illustrative, and is not actually included in the flowsheet definition. The sample flowsheet definition further contains a parameter placeholder on line 11, which allows users to easily add a particular parameter to the flowsheet during flowsheet use. Lines 3 and 4 identify a chest sounds parameter of the respiratory assessments classification and an endotracheal tube parameter of the tubes classification. The sample flowsheet definition causes the facility to display a flowsheet containing a respiratory group and a medications group. Each parameter identified with each group is displayed in conjunction with its result

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values for the relevant period of time. FIG. 8 shows the display of a flowsheet having the sample flowsheet definition, and is discussed in greater detail below.

In steps 602-606, the facility loops through each parameter i.d. contained in the flowsheet definition. Steps 604-605 are therefore repeated for each parameter i.d. In step 604, the facility retrieves the parameter definition for the parameter i.d. from the parameter definition table 400 and caches it in memory, indexed by the parameter i.d. In step 605, the facility retrieves the result values from the result table 700 having the parameter i.d., the current patient i.d., and a time near the beginning time. The facility further caches the retrieved result values in memory, indexed by the parameter i.d.

FIG. 7 is a diagram showing the contents of a sample result table. The sample result table contains patient i.d. column 701, parameter i.d. column 702, result time column 703, and result value column 704. The table is preferably indexed by the patient i.d., parameter i.d., and result time columns to facilitate rapid retrieval of its rows. Each row of the result table, e.g., 711-718, contains a single result value for a particular parameter at a particular time for a particular patient. For example, row 712 indicates that the patient having patient i.d. 100001 for the respiration parameter having parameter i.d. 100003 at 11:00 p.m. on Jan. 25th had a result value of high. While the contents of the result time and the result value column may be encoded to minimize the storage resources consumed by the result table, the contents of these columns are preferably stored in full textual form in order to ensure that backups of the result table will be restorable. After each parameter i.d. in the flowsheet definition has been processed, the facility continues at step 607. In step 607, the facility displays the group names in the flowsheet definition, and, for each parameter i.d. in the flowsheet definition, the parameter name and result values. These steps then conclude.

FIG. 8 is a screen diagram showing the display of the sample flowsheet 800. The flowsheet displays the name of the patient 801 and the corresponding patient i.d. 802 to identify the patient for which result values are displayed. The flowsheet also displays the name of the flowsheet 803. Along the left, the flowsheet displays the names of the parameters in each of the groups identified in the flowsheet definition. For example, the respiratory group 810 is displayed, which contains the cough parameter 811, the chest sounds parameter 812, and the endotracheal parameter 813. The medications group 820 similarly contains parameters 821-823. To the right of each parameter is a series of cells in which to display result values for that parameter for the designated patient times near the beginning time. Above the cells are time labels 851-855. Each time label represents a point in time for which parameters may have a result value. For example, cell 891 shows that the cough parameter 811 has a result value of none for time 851, i.e., 11:00 p.m. on Jan. 25th.

In FIG. 8, the facility has displayed round bullets in front of parameter names for parameters 821-823, indicating that they are encapsulating parameters rather than result parameters and that they do not directly contain any result values. As discussed above, encapsulating parameters may either be displayed in collapsed form, in which only the encapsulating parameter is displayed (as shown in FIG. 8), or in an expanded form, in which the encapsulated parameters encapsulated by the encapsulating parameter are displayed beneath the encapsulating parameter.

FIG. 9 is a flow diagram showing the steps preferably performed by the facility in order to display each encapsu-

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lating parameter. The collapsed/expanded state of the encapsulating parameter may be toggled by the user by clicking on the expanded or collapsed indication with which the encapsulating parameter name is displayed. In step 901, if the encapsulating parameter is collapsed, then the facility continues at step 902, else if the encapsulating parameter expanded, then the facility continues at step 904. In step 902, the facility displays the name of the encapsulating parameter with a round bullet to indicate that the encapsulating parameter is collapsed. In step 903, if a primary encapsulated parameter is defined in the parameter definition for the encapsulating parameter, the facility displays result values for the primary encapsulated parameter beside the encapsulating parameter. An example is result value 892, which is a result value for the dose encapsulated parameter of the Demerol encapsulating parameter that is displayed beside the Demerol encapsulating parameter. After step 903, these steps conclude.

In step 904, the facility displays the encapsulating parameter name with an expanded indication. FIG. 10 is a screen diagram of the sample flowsheet in which the Demerol parameter 1021 has been expanded. The diagram shows that the Demerol parameter 1021 is displayed with a horizontal bar indicating that the encapsulating parameter expanded. In steps 905-909, the facility loops through each encapsulated parameter of the encapsulating parameter. Steps 906-908 are therefore repeated for each encapsulated parameter. In step 906, the facility retrieves and caches the parameter definition for the encapsulated parameter if it is not already cached. In step 907, if the encapsulated parameter has a result value, the facility retrieves and caches result values for the parameter if result values are not already cached. In step 908, the facility displays the encapsulated parameter and any result values. If the encapsulated parameter is itself an encapsulating parameter, it has its own collapsed/expanded state, and the facility preferably repeats the steps of FIG. 9 recursively for the encapsulated parameter. FIG. 10 shows the display of encapsulated parameters 1026-1028, as well as their corresponding result values 1096-1098. After the facility loops through each encapsulated parameter, these steps conclude.

Users may use a flowsheet to enter one or more result values. Result values may also preferably be entered automatically in response to automatically receiving data from electronic medical sensors or from medical laboratories. If the user enters a linked-from result value, the parameters to which the result value are linked are added to the flowsheet. FIG. 12 is a flow diagram showing the steps preferably performed by the facility in order to enter such a received result value. In step 1201, the facility receives the result value. In step 1202, the facility determines the parameter and time for which the result value were received. If the result value is received from a user, step 1202 is performed by determining the parameter and time of the cell that the user selected before entering the result value. FIG. 11 is a screen diagram showing the user entering a result value. The diagram shows the user entering a productive result value 1161 for the cough parameter 1111 at midnight on Jan. 26th. If the result value is received from an external source such as an electronic medical sensor or a medical laboratory, the parameter and time for which the result value was sent is preferably transmitted with the result value. In step 1203, the facility stores the result value by creating a new row in the result table containing the current parameter i.d., patient i.d., and time and the received result value. In step 1204, if the cached parameter definition indicates that the current parameter is a linked-from parameter, then the facility continues at

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step 1205, else these steps conclude. In step 1205, if the received result value is a linked-from result value for which linked-to parameters are listed in the parameter definition, then the facility continues at step 1206, else these steps conclude. In steps 1206-1211, the facility loops through each linked-to parameter to which the result value is linked. Steps 1207-1210 are therefore repeated for each linked-to parameter. In step 1207, the facility inserts the parameter i.d. for the linked-to parameter in the flowsheet definition after the linked-from parameter. In step 1208, the facility retrieves and caches the parameter definition for the linked-to parameter if it is not already cached. In step 1209, the facility retrieves and caches result values for the linked-to parameter, if not already cached. In step 1210, the facility displays the linked-to parameter and its result values beneath the linked-from parameter. After the facility processes each linked-to parameter, these steps conclude.

FIG. 13 is a display diagram showing the addition of linked-to parameters to the flowsheet in response to the entry of the productive result value 1361 for the linked-from cough parameter 1311. Linked-to parameters sputum color 1314 and sputum amount 1315 have been added to the flowsheet and are displayed under the cough parameter 1311. This permits the user to enter results for these parameters, which often occur in conjunction with the linked-from result value.

Users may also add a parameter to a flowsheet. A new parameter may be added either to a patient flowsheet or to a flowsheet template. FIG. 14 is a screen diagram showing the addition of a respiratory notes parameter 1416 to the sample flowsheet. FIG. 15 is a flow diagram showing the steps preferably performed by the facility in order to add a parameter to a flowsheet. In step 1501, the facility prompts the user for the identity of the parameter to add to the flowsheet. Step 1501 preferably involves displaying the parameters according to the patient information hierarchy and allowing the user to select one. In step 1502, the facility inserts the parameter i.d. in the flowsheet definition under the current group of the flowsheet. Table 3 shows the addition of line 4A to the sample flowsheet definition, which contains the respiratory notes parameter i.d. 10251.

TABLE 3

Sample flowsheet definition	
1	group respiratory
2	{ <cough parameter i.d.> 10001
3	<chest sounds parameter i.d.> 10103
4	<endotracheal tube parameter i.d.> 10204
4A	respiratory notes parameter i.d.> 10251
5	}
6	
7	group medications
8	{ <Demerol parameter i.d.> 10005
9	<Aminophylline parameter i.d.> 10037
10	<Amoxicillin parameter i.d.> 10006
11	<medication infusion placeholder i.d.> 90005
12	}

In step 1503, the facility retrieves and caches the parameter definition for the new parameter if it is not already cached. In step 1504, the facility retrieves and caches result values for the new parameter if they are not already cached. In step 1505, the facility displays the new parameter and its result values. These steps then conclude.

The facility permits parameter placeholders to be included in flowsheet definitions in order to represent a large number of combinations of parameters that are likely to be displayed

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on the flowsheet. For example, displaying information about a medication infusion can involve the display of many different combinations of parameters. Placeholders are preferably defined in a table analogous to the parameter definition table. Each placeholder has a placeholder i.d., a name, and a list of parameters with which the placeholder may be replaced by the user. When the flowsheet is displayed, a user may select a display placeholder and replace it with one of its replacement parameters. In response, the facility replaces the placeholders with the selected replacement parameter, including any encapsulated parameters encapsulated by the selected replacement parameter. Placeholders, like parameters, may preferably be created and modified by authorized users in order to optimize them for the procedures of a particular health care organization. A placeholder may also encapsulate one or more other parameters or placeholders. Placeholders and parameters encapsulated by a placeholder are handled in the same manner as other placeholders and parameters. FIG. 16 is a flow diagram showing the steps preferably performed by the facility in order to replace such a placeholder with a particular parameter. These steps are largely similar to those shown in FIG. 15 for adding a parameter to the flowsheet, with the following exceptions: step 1601 prompts the user to select the parameter with which to replace the placeholder from the replacement list defined for the placeholder; step 1602 replaces the selected placeholder in the flowsheet definition with the selected parameter i.d.; and step 1605 displays the selected parameter and its results in place of the placeholder. FIG. 17 is a display diagram showing the replacement of medication infusion placeholder 824 with the dopamine infusion parameter 925.

The facility preferably also enables a user to quickly enter normal result values for each parameter in a group at a particular time. If the user selects a group, such as respiratory group 810 and a time label, such as time label 853 for 1:00 A.M. on Jul. 26th, the facility displays a group detail window. FIG. 18 is a partial screen diagram showing such a group detail window 1800 that contains indications of the selected group 1801 and of the selected time 1802. The window 1800 further contains a table 1810 containing the current result values 1811-1813 for the parameters of the selected group. The window 1800 further contains a normal values button 1823. If the user issues a normal values command by pressing the normal values button, the normal values for each of the parameters in the group are retrieved from their cached parameter definitions and entered as the result values for these parameters at the selected time. FIG. 19 is a screen diagram showing the entry of the normal values for the respiratory group 1910 at 1:00 A.M. on Jan. 26th. For example, the result value for the cough parameter 1911 is none, the normal value for the cough parameter.

Similarly, the facility preferably also enables a user to quickly copy the last result values recorded for each parameter in a flowsheet group forward to a later time. In order to do so, the user presses a last values button 1824 (FIG. 18).

Users may enter result values for parameters of a notes type, which can contain several paragraphs of text. Result values of parameters of the notes type are shown normally shown within a flowsheet in an abbreviated form. FIG. 20 is a screen diagram that showing a note parameter result value 2088 in abbreviated form, which is the last name of the writer. FIG. 21 is a screen diagram showing the display of the entire note parameter result value 2190 when the user selects the cell containing the abbreviated note parameter result value 2188. The entire result value shows all of the information associated with the note, including the full name

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of the writer 2191, the time at which the note was written 2192, and the complete note text 2193. The user may dismiss the window containing the entire result value by selecting either the OK button 2194 or the cancel button 2195.

The facility further permits users to specify, for each classification, one or more default parameters. When the user creates a new encapsulating parameter in a classification, the facility displays the default parameters for the classification as proposed encapsulated parameters for the encapsulating parameters. The user may then delete any of the default parameters, and add any other desired encapsulating parameters to the created encapsulating parameters. Default parameters are useful in classifications such as medications, in which many drug parameters encapsulate the same encapsulated parameters, such as dose, dose units, and route.

In an additional preferred embodiment, the facility permits encapsulating parameters, as well as non-encapsulating result parameters, to be defined to contain result values. Those skilled in the art will recognize that the description of the facility described above may straightforwardly be adapted to enable encapsulating parameters to have result values. Such an adaptation merely requires the separation of data type and encapsulating information in the parameter definition table, which is discussed above in conjunction with FIG. 4; separate treatment of encapsulation and data type information in the parameter creation process, which is discussed above in conjunction with FIG. 5; and displaying an encapsulating parameter's result values instead of the result values of a primary encapsulated parameter of the encapsulating parameter beside the encapsulating parameter's name in a flowsheet, which is discussed above in conjunction with FIG. 8.

While this invention has been shown and described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes or modifications in form and detail may be made without departing from the scope of the invention.

We claim:

1. A method in a computer system for designing, under the control of a user, a patient information hierarchy, the hierarchy containing a plurality of parameters including a linked-from parameter having a linked-from possible result value that is linked to one or more linked-to parameters, the method comprising the steps of:

- (a) receiving an instruction from the user to create a new parameter within the patient information hierarchy;
- (b) in response to step (a), creating a new parameter within the patient information hierarchy;
- (c) receiving an instruction from the user to specify a plurality of indicated possible result values for the new parameter;
- (d) in response to step (c), specifying the indicated possible result values as possible result values of the new parameter;
- (e) receiving an instruction from the user to link an indicated linked-from possible result value among the possible result values of the new parameter to one or more indicated linked-to parameters contained within the patient information hierarchy; and
- (f) in response to step (e), within the patient information hierarchy, linking the indicated linked-from possible result value to the indicated linked-to parameters, such that the new parameter is a linked-from parameter, and such that, when the new parameter is displayed for a particular patient, if the new parameter has the linked-

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from possible result value, the linked-to parameters are displayed in conjunction with the new parameter.

2. The method of claim 1 wherein step (e) comprises the steps of:

(e)(1) receiving an instruction from the user to link an indicated linked-from possible result value among the possible result values for the new parameter to other parameters within the patient information hierarchy;

(e)(2) in response to step (e)(1), displaying a representation of the patient information hierarchy showing the parameters contained therein; and

(e)(3) receiving one or more indications each indicating that an indicated parameter contained within the patient information hierarchy displayed in step (e)(2) has been selected as a linked-to parameter by the user.

3. The method of claim 1, further including the steps of, for a particular patient:

displaying the linked-from parameter;

receiving a result value for the linked-from parameter;

determining whether the received result value is a linked-from possible result value; and

in response to determining that the received result value is a linked-from possible result value, displaying each of the linked-to parameters that are linked to the linked-from possible result value.

4. A method in a computer system for designing, under the control of a user, a patient information hierarchy, the patient information hierarchy containing a plurality of parameters that may be displayed in conjunction with a particular patient, the parameters including both result parameters that may have a result value for each patient and encapsulating parameters that each identify and encapsulate one or more other parameters to represent them together at a higher conceptual level, the method comprising the steps of:

(a) receiving an instruction to create a first result parameter that may have a result value for each patient, the instruction specifying a parameter name and a data type;

(b) in response to step (a), creating within the patient information hierarchy a first result parameter having the parameter name and data type specified in the instruction received in step (a);

(c) receiving an instruction to create a second result parameter that may have a result value for each patient, the instruction specifying a parameter name and a data type;

(d) in response to step (c), creating within the patient information hierarchy a second result parameter having the parameter name and data type specified in the instruction received in step (c);

(e) receiving an instruction to create a first encapsulating parameter and for encapsulating one or more other parameters to represent them together at a higher conceptual level, the instruction specifying a parameter name and a list of encapsulated parameters, the specified list of encapsulated parameters including the first result parameter and excluding the second result parameter;

(f) in response to step (e), creating within the patient information hierarchy a first encapsulating parameter having the parameter name and the list of encapsulated parameters specified in the instruction received in step (e);

(g) receiving an instruction to display the patient information hierarchy for a particular patient in a user-

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selected flowsheet, the user-selected flowsheet including the second result parameter and the first encapsulatory parameter; and

(h) in response to step (g), displaying a list of parameters including the first encapsulating parameter and the second result parameter and excluding the first result parameter.

5. The method of claim 4, further including the steps of:

(i) after step (h), receiving an instruction from the user to expand the first encapsulating parameter; and

(j) in response to step (i), displaying the encapsulated parameters of the first encapsulating parameter, including the first result parameter, in conjunction with the first encapsulating parameter.

6. The method of claim 5, further including the steps of:

(k) after step (j), receiving an instruction from the user to collapse the first encapsulating parameter; and

(l) in response to step (k), displaying the first encapsulating parameter without the encapsulated parameters of the first encapsulating parameter, including the first result parameter.

7. The method of claim 4, further including the step of receiving an instruction to display the result value for a selected primary one of the list of encapsulated parameters of the first encapsulating parameter as the result value for the first encapsulating parameter, and wherein step (h) includes the step of displaying the result value for the selected primary encapsulated parameter as the result value for the first encapsulating parameter.

8. The method of claim 4 wherein the patient information hierarchy further includes a plurality of classifications each for grouping related parameters, each of the parameters in the patient information hierarchy being associated with one of the classifications, and wherein a set of default encapsulated parameters may be associated with each classification, and wherein step (e) includes the step of receiving an indication of a classification with which to associate the first encapsulating parameter, and wherein step (f) includes the step of defaulting the list of encapsulated parameters of the created first encapsulating parameter to contain the parameters in the set of default encapsulated parameters associated with the classification indicated by the received classification indication.

9. The method of claim 8, further including the step of permitting the user to override the default encapsulated parameters in the list of encapsulated parameters of the first encapsulating parameter.

10. A method in a computer system for designing and maintaining the contents of a patient information hierarchy comprised of a plurality of parameters that may contain result values for a particular patient, the patient information hierarchy having associated with it one or more flowsheets for displaying and modifying the result values of parameters for a particular patient, each flowsheet being comprised of one or more flowsheet groups that specify a subset of the parameters of the patient information hierarchy, the method comprising the steps of:

(a) associating predetermined result values with a plurality of the parameters specified by a selected flowsheet group of a selected flowsheet;

(b) receiving an instruction from the user to display the parameters specified by the selected flowsheet group of the selected flowsheet for a specified patient;

(c) in response to step (b), displaying the parameters specified by the selected flowsheet group of the selected flowsheet for the specified patient;

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(d) receiving an instruction from the user to set to the predetermined result values the result values for the specified patient of the displayed the parameters specified by the selected flowsheet group of the selected flowsheet; and

(e) in response to step (d), for each parameter specified by the selected flowsheet group of the selected flowsheet with which a predetermined result value is associated, storing the predetermined result value in conjunction with the parameter for the specified patient.

11. A method in a computer system for designing and maintaining the contents of a plurality of named parameters identified by parameter identifiers that may contain result values for a particular patient, the parameters being arranged in a patient information hierarchy, the method comprising the steps of:

(a) receiving instructions from a user to create a parameter having a first name at a first location in the patient information hierarchy and a second location in the patient information hierarchy, the instructions further specifying that the parameter having the first name is a global parameter;

(b) in response to step (a), creating parameters at the first and second locations in the patient information hierarchy that are both identified by a first parameter identifier;

(c) receiving instructions from a user to create a parameter having a second name at a third location in the patient information hierarchy and a fourth location in the patient information hierarchy, the instructions further specifying that the parameter having the second name is a local parameter;

(d) in response to step (c), creating a parameter at the third location in the patient information hierarchy that is identified by a second parameter identifier and creating a parameter at the fourth location in the patient information hierarchy that is identified by a third parameter identifier, wherein the second and third parameter identifiers are distinct.

12. The method of claim 11 wherein each result value contained by a parameter is stored in a row of a result table containing the parameter identifier that identifies the parameter, further including the steps of:

(e) receiving a first result value for the parameter having the first name at the first location in the patient information hierarchy;

(f) in response to step (e), storing the first result value in a row of the result table containing the first parameter identifier;

(g) receiving a second result value for the parameter having the first name at the second location in the patient information hierarchy;

(h) in response to step (g), storing the second result value in a row of the result table containing the first parameter identifier;

(i) receiving a third result value for the parameter having the second name at the third location in the patient information hierarchy;

(j) in response to step (i), storing the third result value in a row of the result table containing the second parameter identifier;

(k) receiving a fourth result value for the parameter having the second name at the fourth location in the patient information hierarchy; and

(l) in response to step (k), storing the fourth result value in a row of the result table containing the third parameter identifier.

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13. The method of claim 12, further including the steps of:

(m) after step (e), receiving an instruction to display the result value for the parameter having the first name at the first location in the patient information hierarchy;

(n) in response to step (m), retrieving the first result value from the row of the result table containing the first parameter identifier;

(o) after step (g), receiving an instruction to display the result value for the parameter having the first name at the second location in the patient information hierarchy;

(p) in response to step (o), retrieving the second result value from a row of the result table containing the first parameter identifier;

(q) after step (l), receiving an instruction to display the result value for the parameter having the second name at the third location in the patient information hierarchy;

(r) in response to step (q), retrieving the third result value from a row of the result table containing the second parameter identifier;

(s) after step (k), receiving an instruction to display the result value for the parameter having the second name at the fourth location in the patient information hierarchy; and

(t) in response to step (s), retrieving the fourth result value from a row of the result table containing the third parameter identifier.

14. A method in a computer system for designing and maintaining the contents of a patient information hierarchy comprised of a plurality of parameters that may contain result values for a particular patient, the patient information hierarchy having associated with it a flowsheet for displaying and modifying the result values of a subset of the parameters of the patient information hierarchy for a particular patient, the subset of the parameters that may be displayed and modified using the flowsheet including a parameter of a patient note type, having a result value comprising an author name field, a time field, and a note text field, the method comprising the steps of:

(a) receiving an instruction from the user to display parameter result values for a selected patient using the flowsheet;

(b) in response to step (a), displaying parameter result values for the selected patient using the flowsheet such that the result value of the parameter of the patient note type is displayed in an abbreviated form in conjunction with the other parameters in the subset, such that at least a portion of the author name field is displayed;

(c) receiving an indication that the user has selected the result value of the parameter of the patient note type is displayed in an abbreviated form; and

(d) in response to step (c), displaying the entire contents of the result value of the parameter of the patient note type, such that the complete contents of the author name, time and note text fields are displayed.

15. A method in a computer system for designing and maintaining the contents of a patient information hierarchy comprised of a plurality of parameters that may contain result values for a particular patient, the patient information hierarchy having associated with it one or more flowsheets for displaying and modifying the result values of parameters for a particular patient, each flowsheet being comprised of one or more flowsheet groups that specify a subset of the parameters of the patient information hierarchy, a selected

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flowsheet group of a selected flowsheet further specifying a parameter placeholder not associated with any particular parameter, the method comprising the steps of:

- (a) receiving an instruction from the user to display the parameters specified by the selected flowsheet group of the selected flowsheet for a specified patient;
- (b) in response to step (a), displaying the parameters and the parameter placeholder specified by the selected flowsheet group of the selected flowsheet for the specified patient;
- (c) receiving an instruction from the user to replace the parameter placeholder with a selected parameter of the patient information hierarchy;
- (d) in response to step (c), replacing the parameter placeholder specified by the selected flowsheet group of the selected flowsheet for the specified patient with the selected parameter; and
- (e) after step (d), displaying the parameters specified by the selected flowsheet group of the selected flowsheet for the specified patient, including the selected parameter and excluding the parameter placeholder.

16. The method of claim 15, further including the steps of: after step (d), receiving a result value for the selected parameter for the selected patient; and

storing the received result value in conjunction with the selected parameter for the selected patient, and wherein step (e) includes the step of displaying the received result value in conjunction with the selected parameter.

17. The method of claim 15 wherein the parameter placeholder encapsulates an encapsulated parameter, and wherein step (b) also displays the encapsulated parameter.

18. The method of claim 15 wherein the parameter placeholder encapsulates a second parameter placeholder, and wherein step (b) also displays the second parameter placeholder, further including the steps of:

- (f) receiving an instruction from the user to replace the second parameter placeholder with a second selected parameter of the patient information hierarchy;
- (g) in response to step (f), replacing the second parameter placeholder with the second selected parameter; and
- (h) after step (g), displaying the parameters specified by the selected flowsheet group of the selected flowsheet for the specified patient, including the second selected parameter and excluding the second parameter placeholder.

19. The method of claim 15 wherein the selected parameter is an encapsulating parameter encapsulating one or more encapsulated parameters, and wherein step (e) includes the step of displaying the encapsulated parameters of the selected parameter.

20. The method of claim 15 wherein a list of a plurality of parameters of the hierarchy that may be substituted for the parameter placeholder is associated with the parameter placeholder, and wherein step (c) includes the steps of:

displaying the list of parameters that may be substituted for the parameter placeholder; and

receiving input indicating that the user has selected the selected parameter from the displayed list.

21. A method in a computer system for designing, under the control of a user, a patient information hierarchy, the hierarchy containing a plurality of parameters that may each have a result value for each patient, the hierarchy further containing a plurality of classifications each for grouping related parameters, each of the parameters in the patient information hierarchy being associated with one of the

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classifications, and wherein the patient information hierarchy has associated with it one or more flowsheets for displaying and modifying the result values of parameters for a particular patient, each flowsheet being comprised of one or more flowsheet groups that specify a subset of the parameters of the patient information hierarchy, the method comprising the steps of, in response to a step of receiving an instruction from the user to create a new parameter:

- (a) prompting the user for the name of a new parameter;
- (b) receiving from the user the name of a new parameter;
- (c) prompting the user to identify the classification with which the new parameter should be associated;
- (d) receiving from the user an indication of the classification with which the new parameter should be associated;
- (e) prompting the user to select the data type of the new parameter;
- (f) receiving from the user an indication of the data type of the new parameter;
- (g) creating in the patient information hierarchy a new parameter that has the received name, that is associated with the indicated classification, and that has the indicated data type;
- (h) displaying the parameters specified by a selected flowsheet group of a selected flowsheet in conjunction with their result values for a selected patient, the displayed parameters excluding the new parameter;
- (i) receiving an instruction from the user to add a parameter to the selected flowsheet group of the selected flowsheet;
- (j) in response to step (i), displaying a portion of the patient information hierarchy including the name of the new parameter;
- (k) receiving an instruction from the user selecting the displayed name of the new parameter;
- (l) in response to step (k), adding the new parameter to the selected flowsheet group of the selected flowsheet; and
- (m) in response to step (l), displaying the new parameter among the parameters specified by a selected flowsheet group of a selected flowsheet in conjunction with their result values for a selected patient.

22. The method of claim 21 wherein step (e) includes the step of prompting the user to select the data type of the new parameter from a plurality of available data types, and wherein the plurality of data types includes a selection data type, parameters of which may contain one of a predefined set of possible result values, and further including the steps of, if the indication of the data type of the new parameter received in step (f) indicates the selection data type:

- (h) prompting the user to input the set of possible result values for the new parameter; and
- (i) receiving from the user the set of possible result values for the new parameter, and wherein step (g) creates a new parameter having the received set of possible result values.

23. The method of claim 21 wherein step (e) includes the step of prompting the user to select the data type of the new parameter from a plurality of available data types, and wherein the plurality of data types includes a calculated data type, parameters of which may contain a formula based on the result values of other parameters, and further including the steps of, if the indication of the data type of the new parameter received in step (f) indicates the selection data type:

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(h) prompting the user to input the formula for the new parameter; and

(i) receiving from the user the formula for the new parameter, and wherein step (g) creates a new parameter having the received formula.

24. The method of claim 21 wherein step (c) includes the step of displaying a list of the plurality of classifications, and wherein step (d) includes the step of receiving an indication that the user has selected a particular one of the classifications in the displayed list, and wherein step (e) includes the

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step of displaying a list of available data types, and wherein step (f) includes the step of receiving an indication that the user has selected a particular one of the available data types in the displayed list.

5 25. The method of claim 10 wherein the associating step associates with the plurality of the parameters specified by the selected flowsheet group of the selected flowsheet normal result values for these parameters.

* * * * *

**UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA**

NOTICE OF ASSIGNMENT TO UNITED STATES MAGISTRATE JUDGE FOR DISCOVERY

This case has been assigned to District Judge R. Gary Klausner and the assigned discovery Magistrate Judge is Victor B. Kenton.

The case number on all documents filed with the Court should read as follows:

CV11- 10125 RGK (VBKx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge

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NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

Western Division
312 N. Spring St., Rm. G-8
Los Angeles, CA 90012

Southern Division
411 West Fourth St., Rm. 1-053
Santa Ana, CA 92701-4516

Eastern Division
3470 Twelfth St., Rm. 134
Riverside, CA 92501

Failure to file at the proper location will result in your documents being returned to you.

ORIGINAL

AO 440 (Rev. 12/09) Summons in a Civil Action

UNITED STATES DISTRICT COURT
for the
CENTRAL DISTRICT OF CALIFORNIA

MEDSQUIRE, LLC
Plaintiff
v.
PULSE SYSTEMS, INC.
Defendant

Civil Action No.

CV11-10125 R6K(VBKx)

SUMMONS IN A CIVIL ACTION

To: *(Defendant's name and address)*

PULSE SYSTEMS, INC.
c/o Alif Hourani
2959 N. Rock Road, Suite 400
Wichita, KS 67226-1197

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it) — or 60 days if you are the United States or a United States agency, or an officer or employee of the United States described in Fed. R. Civ. P. 12 (a)(2) or (3) — you must serve on the plaintiff an answer to the attached complaint or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff or plaintiff's attorney, whose name and address are:

McKool Smith Hennigan, P.C.
Lawrence M. Hadley
865 South Figueroa Street, Suite 2900
Los Angeles, California 90017

If you fail to respond, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

DEC - 6 2011

CLERK OF COURT

Date: _____

Signature of Clerk or Deputy Clerk

**UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET**

I (a) PLAINTIFFS (Check box if you are representing yourself <input type="checkbox"/>) MEDSQUIRE, LLC	DEFENDANTS PULSE SYSTEMS, INC.
(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.)	
MCKOOL SMITH HENNIGAN, P.C. Lawrence M. Hadley 865 South Figueroa Street, Suite 2900 Los Angeles, CA 90017 (213) 694-1200	

II. BASIS OF JURISDICTION (Place an X in one box only.)	III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only (Place an X in one box for plaintiff and one for defendant.)																		
<input type="checkbox"/> 1 U.S. Government Plaintiff <input type="checkbox"/> 2 U.S. Government Defendant	<input checked="" type="checkbox"/> 3 Federal Question (U.S. Government Not a Party) <input type="checkbox"/> 4 Diversity (Indicate Citizenship of Parties in Item III)																		
	<table style="width:100%;"> <tr> <td style="width:33%;">Citizen of This State</td> <td style="width:10%;">PTF <input type="checkbox"/> 1</td> <td style="width:10%;">DEF <input type="checkbox"/> 1</td> <td style="width:33%;">Incorporated or Principal Place of Business in this State</td> <td style="width:10%;">PTF <input type="checkbox"/> 4</td> <td style="width:10%;">DEF <input type="checkbox"/> 4</td> </tr> <tr> <td>Citizen of Another State</td> <td>PTF <input type="checkbox"/> 2</td> <td>DEF <input type="checkbox"/> 2</td> <td>Incorporated and Principal Place of Business in Another State</td> <td>PTF <input type="checkbox"/> 5</td> <td>DEF <input type="checkbox"/> 5</td> </tr> <tr> <td>Citizen or Subject of a Foreign Country</td> <td>PTF <input type="checkbox"/> 3</td> <td>DEF <input type="checkbox"/> 3</td> <td>Foreign Nation</td> <td>PTF <input type="checkbox"/> 6</td> <td>DEF <input type="checkbox"/> 6</td> </tr> </table>	Citizen of This State	PTF <input type="checkbox"/> 1	DEF <input type="checkbox"/> 1	Incorporated or Principal Place of Business in this State	PTF <input type="checkbox"/> 4	DEF <input type="checkbox"/> 4	Citizen of Another State	PTF <input type="checkbox"/> 2	DEF <input type="checkbox"/> 2	Incorporated and Principal Place of Business in Another State	PTF <input type="checkbox"/> 5	DEF <input type="checkbox"/> 5	Citizen or Subject of a Foreign Country	PTF <input type="checkbox"/> 3	DEF <input type="checkbox"/> 3	Foreign Nation	PTF <input type="checkbox"/> 6	DEF <input type="checkbox"/> 6
Citizen of This State	PTF <input type="checkbox"/> 1	DEF <input type="checkbox"/> 1	Incorporated or Principal Place of Business in this State	PTF <input type="checkbox"/> 4	DEF <input type="checkbox"/> 4														
Citizen of Another State	PTF <input type="checkbox"/> 2	DEF <input type="checkbox"/> 2	Incorporated and Principal Place of Business in Another State	PTF <input type="checkbox"/> 5	DEF <input type="checkbox"/> 5														
Citizen or Subject of a Foreign Country	PTF <input type="checkbox"/> 3	DEF <input type="checkbox"/> 3	Foreign Nation	PTF <input type="checkbox"/> 6	DEF <input type="checkbox"/> 6														

IV. ORIGIN (Place an X in one box only.)

<input checked="" type="checkbox"/> 1 Original Proceeding	<input type="checkbox"/> 2 Removed from State Court	<input type="checkbox"/> 3 Remanded from Appellate Court	<input type="checkbox"/> 4 Reinstated or Reopened	<input type="checkbox"/> 5 Transferred from another district (specify):	<input type="checkbox"/> 6 Multi-District Litigation	<input type="checkbox"/> 7 Appeal to District Judge from Magistrate Judge
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V. REQUESTED IN COMPLAINT: JURY DEMAND: Yes No (Check 'Yes' only if demanded in complaint.)

CLASS ACTION under F.R.C.P. 23: Yes No **MONEY DEMANDED IN COMPLAINT: \$** _____

VI. CAUSE OF ACTION (Cite the U. S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)
 35 U.S.C. Section 1, Patent Infringement

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES <input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce/ICC Rates/etc. <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Act <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Info. Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes	CONTRACT <input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Defaulted Student Loan (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise REAL PROPERTY <input type="checkbox"/> 210 Land Condemnation <input type="checkbox"/> 220 Foreclosure <input type="checkbox"/> 230 Rent Lease & Ejectment <input type="checkbox"/> 240 Torts to Land <input type="checkbox"/> 245 Tort Product Liability <input type="checkbox"/> 290 All Other Real Property	TORTS PERSONAL INJURY <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Fed. Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury <input type="checkbox"/> 362 Personal Injury-Med Malpractice <input type="checkbox"/> 365 Personal Injury-Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability IMMIGRATION <input type="checkbox"/> 462 Naturalization Application <input type="checkbox"/> 463 Habeas Corpus-Alien Detainee <input type="checkbox"/> 465 Other Immigration Actions	TORTS PERSONAL PROPERTY <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability BANKRUPTCY <input type="checkbox"/> 22 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 CIVIL RIGHTS <input type="checkbox"/> 441 Voting <input type="checkbox"/> 442 Employment <input type="checkbox"/> 443 Housing/Accommodations <input type="checkbox"/> 444 Welfare <input type="checkbox"/> 445 American with Disabilities - Employment <input type="checkbox"/> 446 American with Disabilities - Other <input type="checkbox"/> 440 Other Civil Rights	PRISONER PETITIONS <input type="checkbox"/> 510 Motions to Vacate Sentence Habeas Corpus <input type="checkbox"/> 530 General <input type="checkbox"/> 535 Death Penalty <input type="checkbox"/> 540 Mandamus/Other <input type="checkbox"/> 550 Civil Rights <input type="checkbox"/> 555 Prison Condition FORFEITURE / PENALTY <input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs <input type="checkbox"/> 660 Occupational Safety /Health <input type="checkbox"/> 690 Other	LABOR <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act PROPERTY RIGHTS <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark SOCIAL SECURITY <input type="checkbox"/> 61 HIA(1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW 405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) FEDERAL TAX SUITS <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS-Third Party 26 USC 7609
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FOR OFFICE USE ONLY: Case Number: _____

CV11-10125

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

**UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET**

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? No Yes

If yes, list case number(s): 11-cv-04504-JHN (PLAx)

VIII(b). RELATED CASES: Have any cases been previously filed in this court that are related to the present case? No Yes

If yes, list case number(s): 11-cv-04504-JHN (PLAx); 11-cv-01755-JHN (PLAx)

Civil cases are deemed related if a previously filed case and the present case:

- (Check all boxes that apply) A. Arise from the same or closely related transactions, happenings, or events; or
 B. Call for determination of the same or substantially related or similar questions of law and fact; or
 C. For other reasons would entail substantial duplication of labor if heard by different judges; or
 D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named plaintiff resides.
 Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
LOS ANGELES	

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named defendant resides.
 Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	KANSAS

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
LOS ANGELES	

* Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties

Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): Lawrence M. Hadley Date December 6, 2011
 Lawrence M. Hadley

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3 -1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)