US 20200294640A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2020/0294640 A1

Ginsburg (43) Pub. Date: Sep. 17, 2020

(54) **DATA COMMAND CENTER VISUAL DISPLAY SYSTEM**

(71) Applicant: **Leonard H. Ginsburg**, Merion, PA (US)

(72) Inventor: **Leonard H. Ginsburg**, Merion, PA (US)

(21) Appl. No.: **16/802,547**

(22) Filed: **Feb. 26, 2020**

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/275,223, filed on Sep. 23, 2016, now Pat. No. 10,685,743, which is a continuation-in-part of application No. 15/204,900, filed on Jul. 7, 2016, now Pat. No. 10,573,407, which is a continuation-in-part of application No. 14/666,278, filed on Mar. 23, 2015, now Pat. No. 10,319,468.

(60) Provisional application No. 62/810,868, filed on Feb. 26, 2019, provisional application No. 61/968,693, filed on Mar. 21, 2014.

Publication Classification

(51) **Int. Cl.**

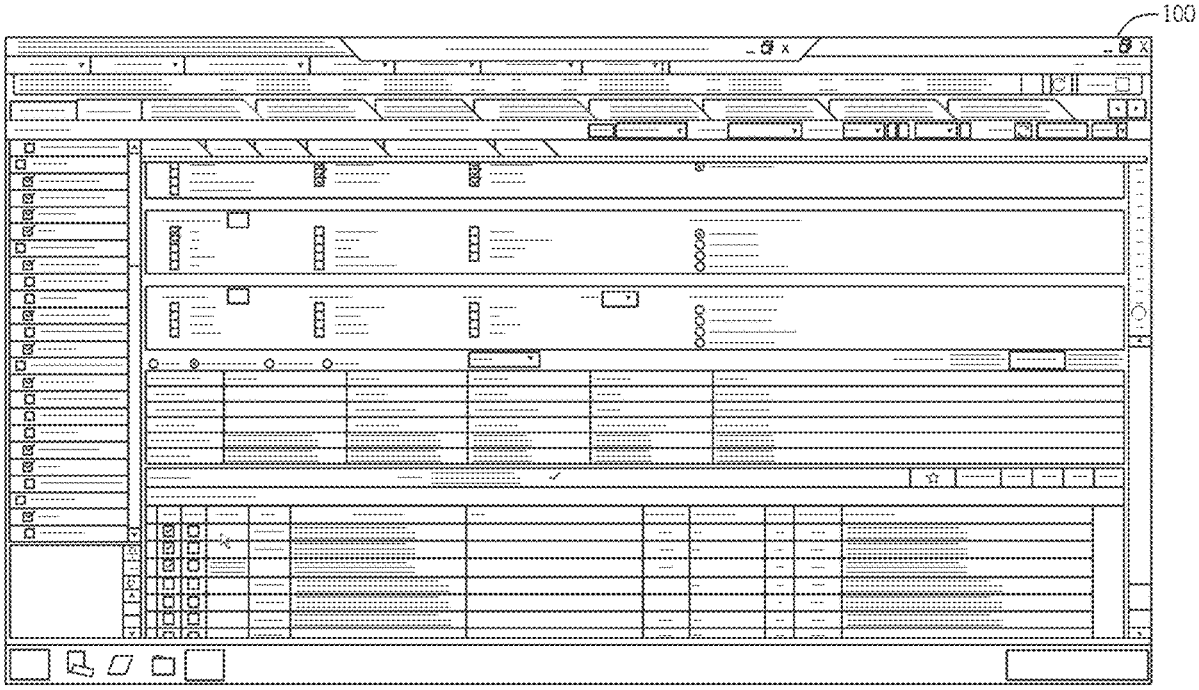
G16H 15/00	(2006.01)
G16H 10/60	(2006.01)
G16H 40/63	(2006.01)
G16H 40/20	(2006.01)

(52) **U.S. Cl.**

CPC ***G16H 15/00*** (2018.01); ***G16H 10/60*** (2018.01); *G06F 3/04842* (2013.01); ***G16H 40/20*** (2018.01); ***G16H 40/63*** (2018.01)

(57) **ABSTRACT**

A data command center visual display system presents dynamic data to a display screen. The command center visual display system includes a plurality of adjustable display panels configured to display predetermined combinations of patient identification information and patient medical information. A patient flowsheet is created that includes a table that presents the patient's medical information by medical service, medical procedure, diagnostic test, medication, and diagnosis that is prescribed, ordered, performed, or selected during respective encounters with at least one medical provider. In response to selection by a user, at least two adjustable display panels containing medical information relating to one or more patients in the patient flowsheet are presented to the display in a single view. The user may edit or move the medical information or the patient identification information within the display panels while the display panels are simultaneously open.



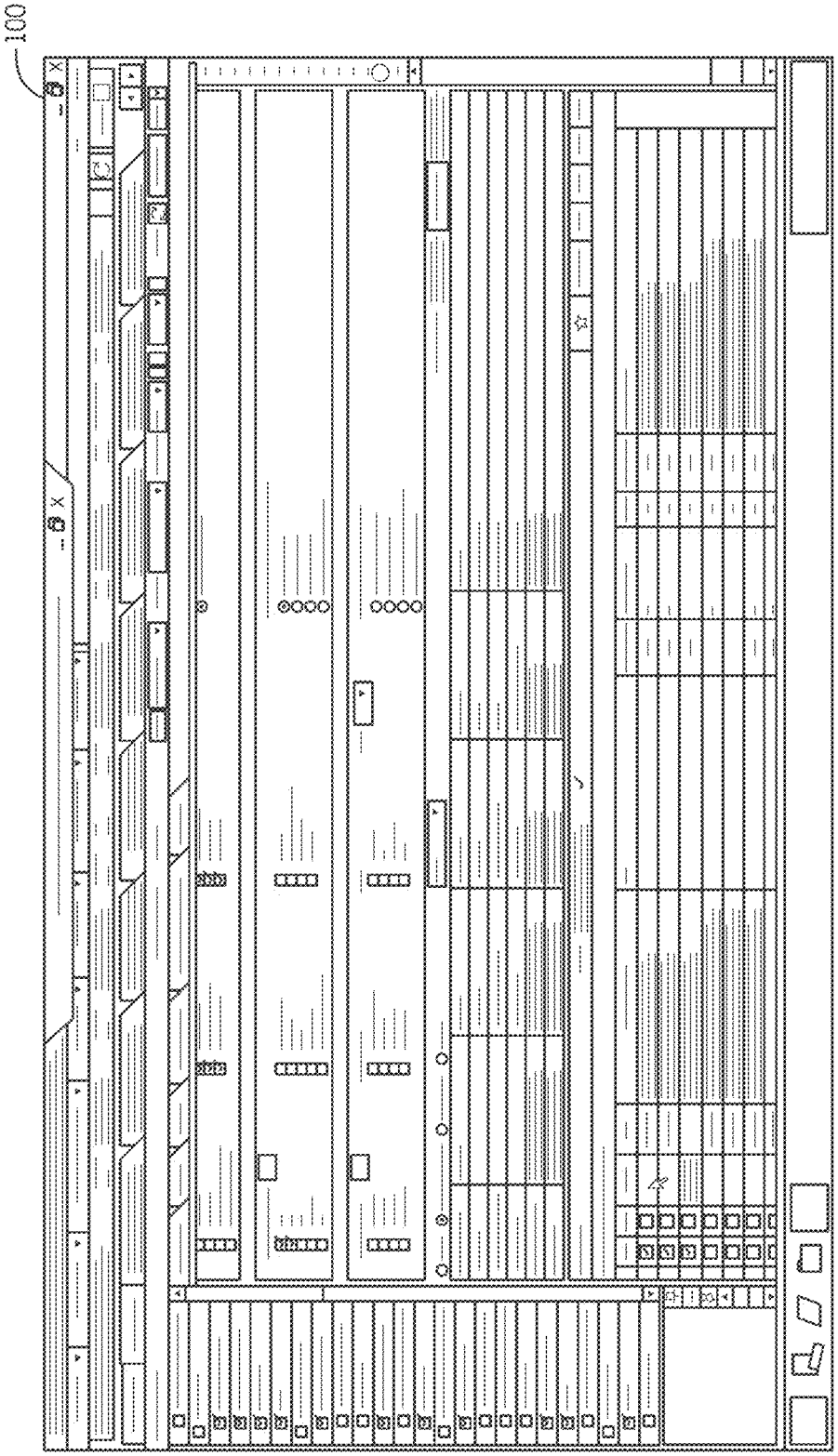


FIG. 1

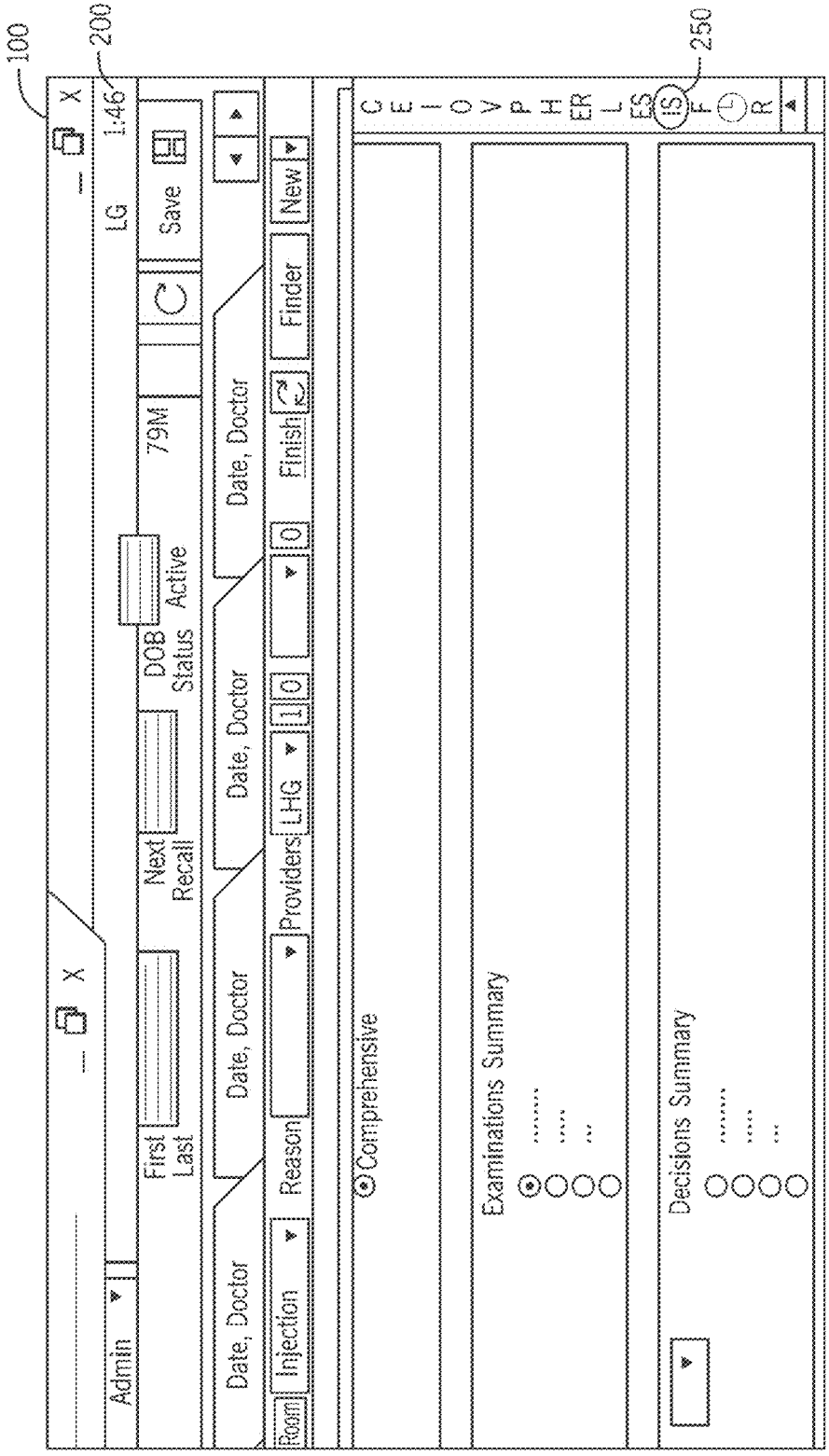

100
200
250
Admin
LG
1:46
First
Last
Next
Recall
DOB
Status
Active
79M
Save
Date, Doctor
Date, Doctor
Date, Doctor
Finish
Finder
New
Room
Injection
Reason
Providers
LHG
Comprehensive
Examinations Summary
Decisions Summary
C
E
I
O
V
P
H
ER
L
ES
IS
F
R

FIG. 2

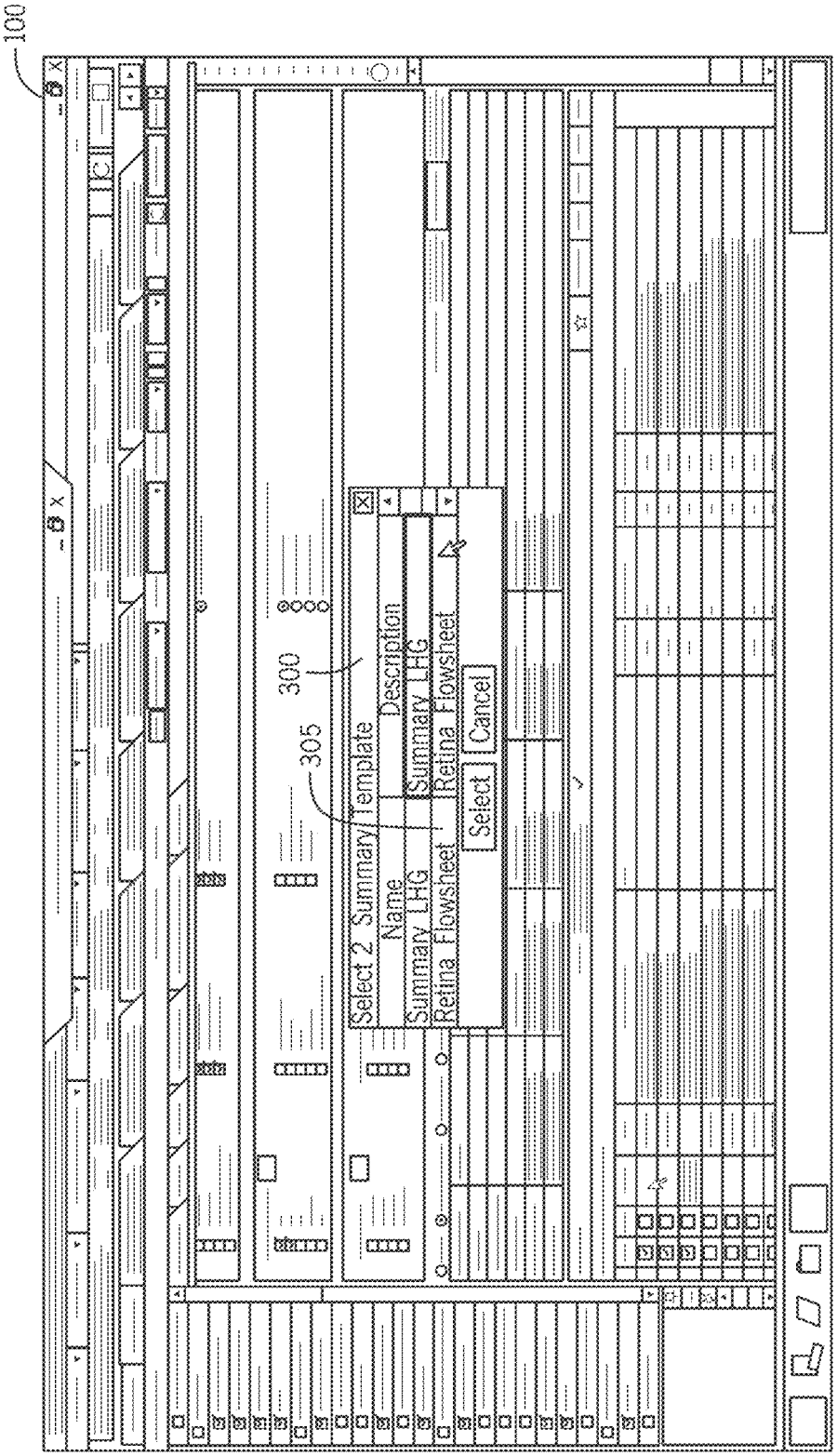

100
300
305
Select 2 Summary Template
Name
Summary_LHG
Retina Flowsheet
Description
Summary_LHG
Retina Flowsheet
Select
Cancel

FIG. 3

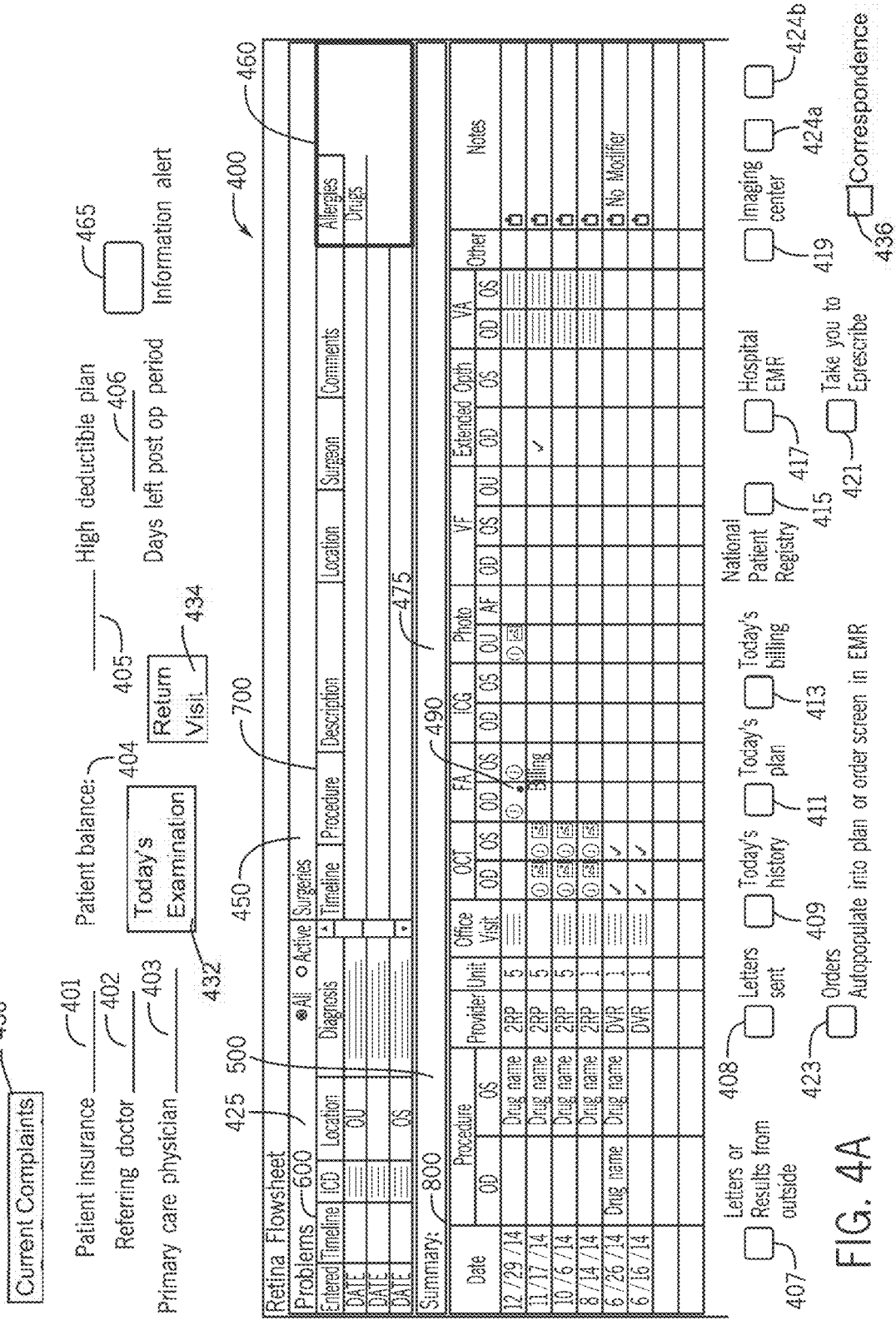

Current Complaints
430
Patient insurance
401
Referring doctor
402
Primary care physician
403
Patient balance:
404
High deductible plan
405
Days left post op period
406
Information alert
465
Today's Examination
432
Return Visit
434
Retina Flowsheet
400
460
Problems
600
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
Location
Surgeon
Comments
Allergies
Drugs
DATE
OU
DATE
DATE
OS
Summary:
800
490
475
700
450
500
425
Date
Procedure
OD
OS
Provider
Until
Office Visit
OCT
FA
ICG
Photo
VF
Extended Ophth
VA
Other
Notes
12/29/14
Drug name
2RP
5
11/17/14
Drug name
2RP
5
Billing
10/6/14
Drug name
2RP
5
8/14/14
Drug name
2RP
1
6/26/14
Drug name
DVR
1
No Modifier
6/16/14
DVR
1
Letters or Results from outside
407
Letters sent
408
Orders
423
Autopopulate irito plan or order screen in EMR
Today's history
409
Today's plan
411
Today's billing
413
National Patient Registry
415
Hospital EMR
417
Take you to Eprescribe
421
Imaging center
419
424a
424b
Correspondence
436

FIG. 4A

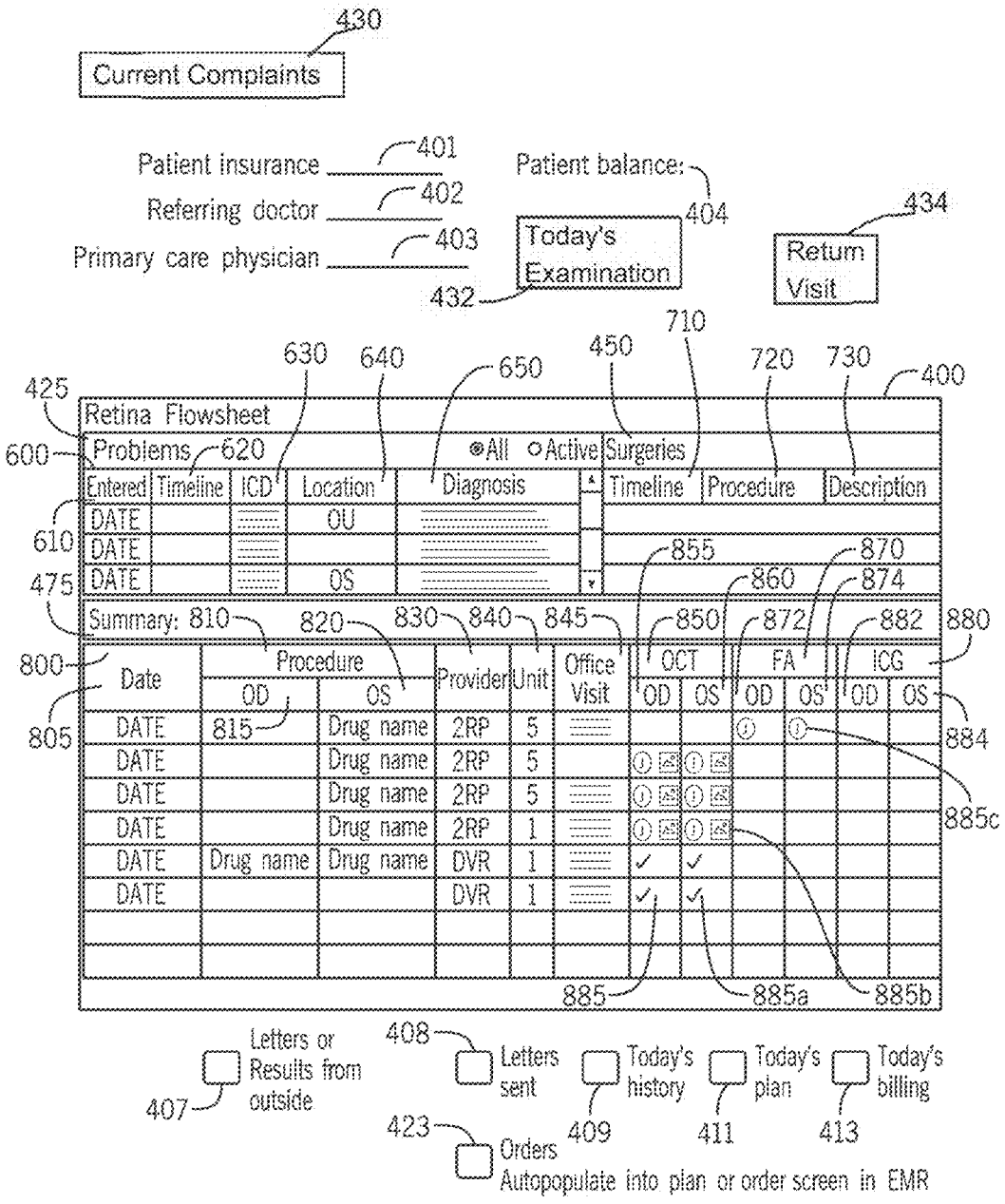

430
Current Complaints
Patient insurance
401
Referring doctor
402
Primary care physician
403
Patient balance:
404
Today's Examination
432
Return Visit
434
425
600
Retina Flowsheet
Problems
620
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
630
640
650
450
710
720
730
400
610
DATE
OU
OS
855
860
870
874
475
Summary:
810
820
830
840
845
850
872
882
880
800
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
FA
ICG
805
815
Drug name
2RP
DVR
884
885c
885
885a
885b
Letters or Results from outside
407
408
Letters sent
Today's history
409
Today's plan
411
Today's billing
413
423
Orders
Autopopulate into plan or order screen in EMR

FIG. 4B

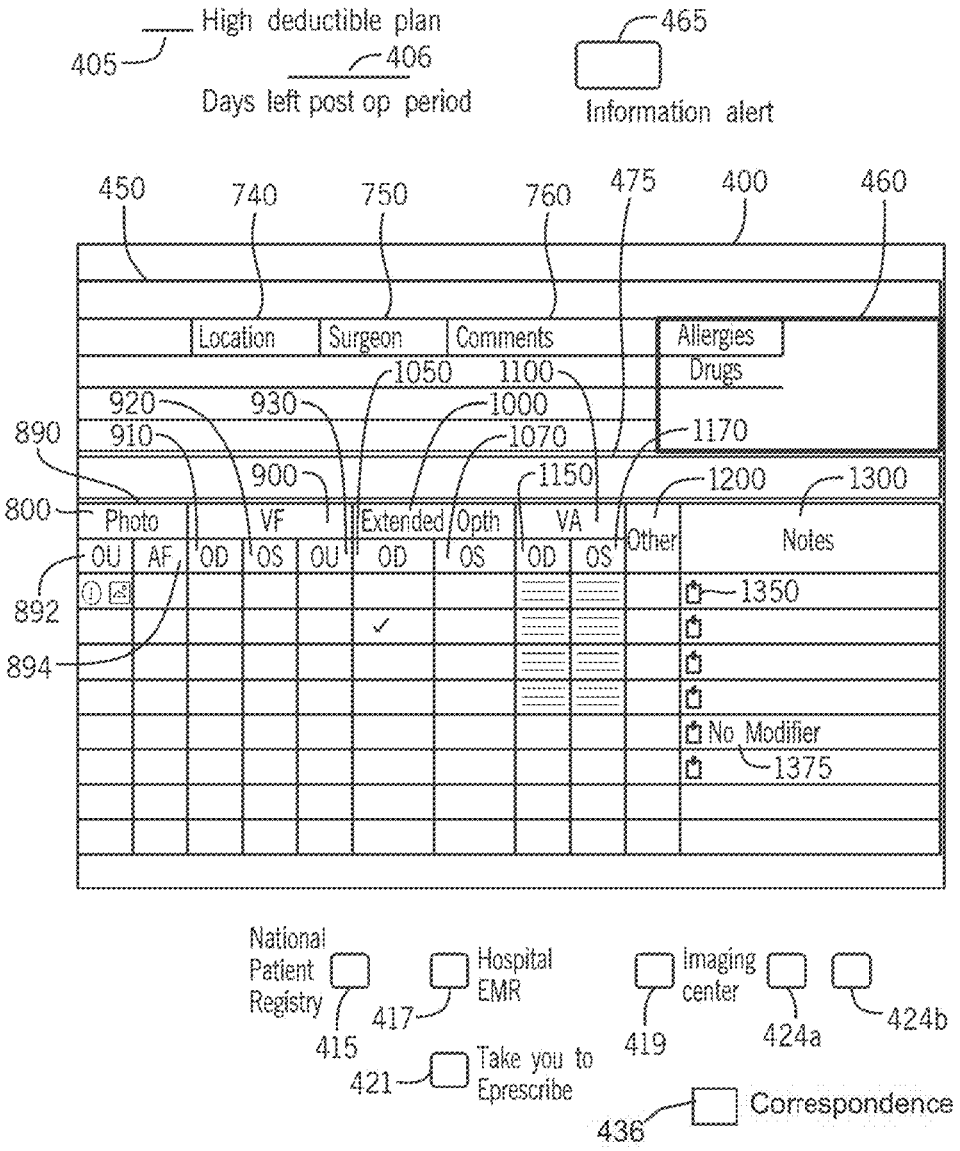

High deductible plan
405
406
Days left post op period
465
Information alert
450
740
750
760
475
400
460
Location
Surgeon
Comments
Allergies
Drugs
1050
1100
920
930
1000
890
910
1070
1170
900
1150
1200
1300
800
Photo
VF
Extended
Opth
VA
Other
Notes
OU
AF
OD
OS
OU
OD
OS
OD
OS
892
1350
894
No Modifier
1375
National Patient Registry
415
Hospital EMR
417
Imaging center
419
424a
424b
421
Take you to Eprescribe
436
Correspondence

FIG. 4C

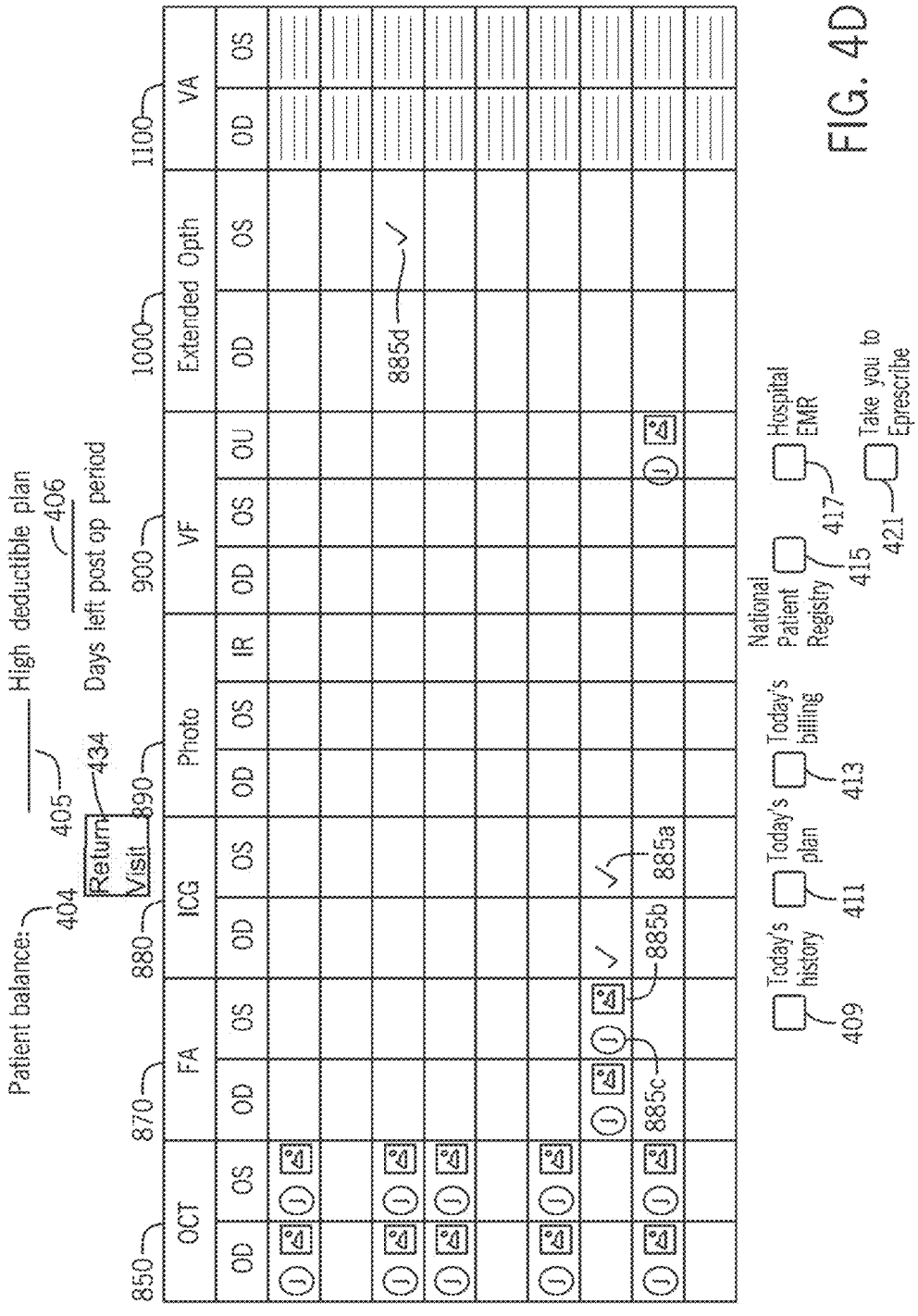

Patient balance:
404
High deductible plan
405
406
Days left post op period
Return Visit
434
890
850
870
880
900
1000
1100
OCT
FA
ICG
Photo
VF
Extended Opth
VA
OD
OS
885a
885b
885c
885d
Today's history
409
Today's plan
411
Today's billing
413
National Patient Registry
415
Hospital EMR
417
Take you to Eprescribe
421

FIG. 4D

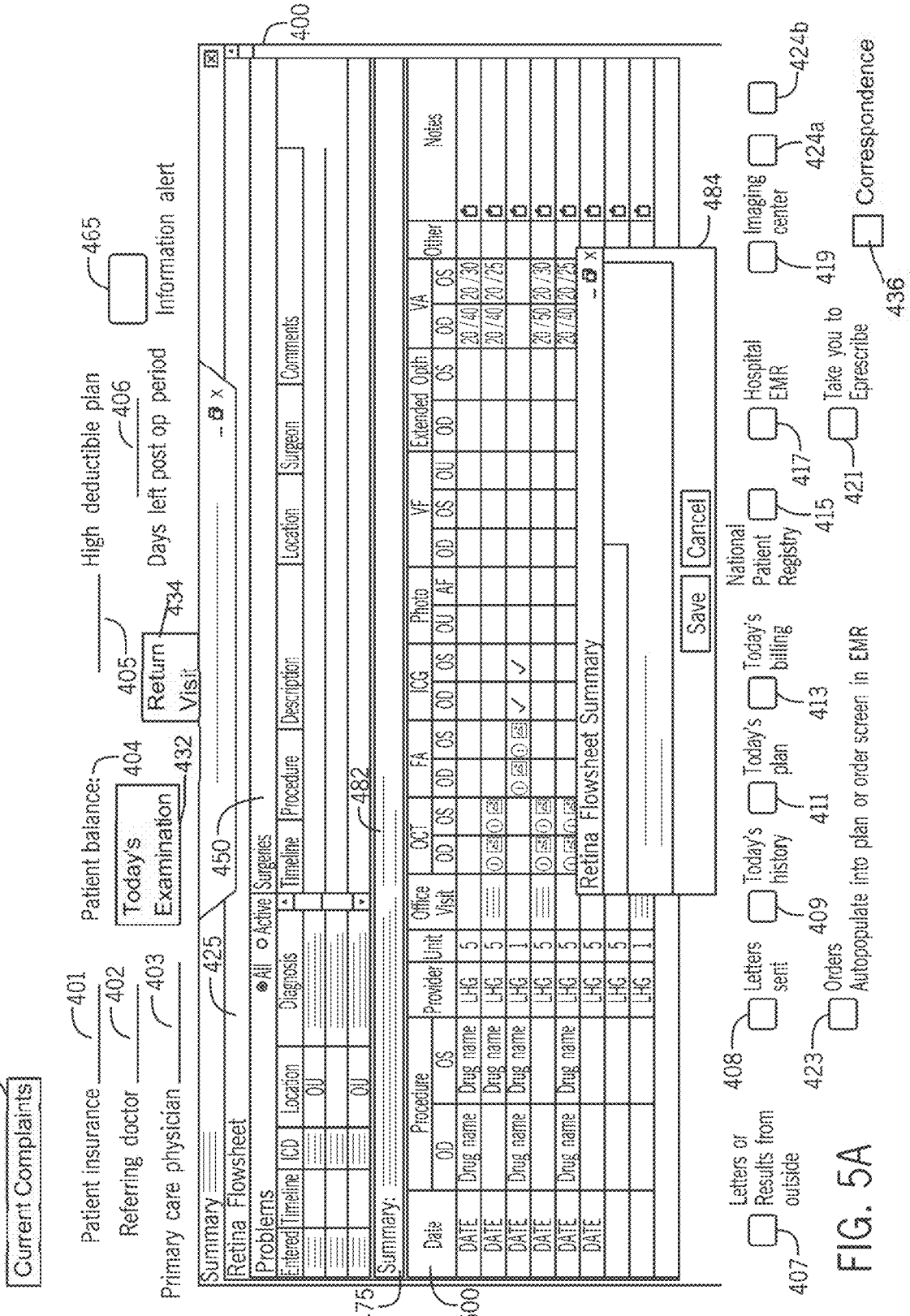

Current Complaints
430
Patient insurance
401
Referring doctor
402
Primary care physician
403
Patient balance:
404
Today's Examination
432
Return Visit
434
405
High deductible plan
406
Days left post op period
Information alert
465
400
Summary
425
450
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Procedure
Timeline
Location
Surgeon
Comments
OU
482
475
Summary:
Date
Procedure
Provider
Unit
Office Visit
OCT
FA
ICG
Photo
VF
Extended Opth
VA
Other
Notes
OD
OS
Drug name
LHG
Retina Flowsheet Summary
Save
Cancel
484
Letters or Results from outside
407
Letters sent
408
Orders
423
Autopopulate into plan or order screen in EMR
Today's history
409
Today's plan
411
Today's billing
413
National Patient Registry
415
Hospital EMR
417
Take you to Eprescribe
421
Imaging center
419
424a
424b
Correspondence
436
500

FIG. 5A

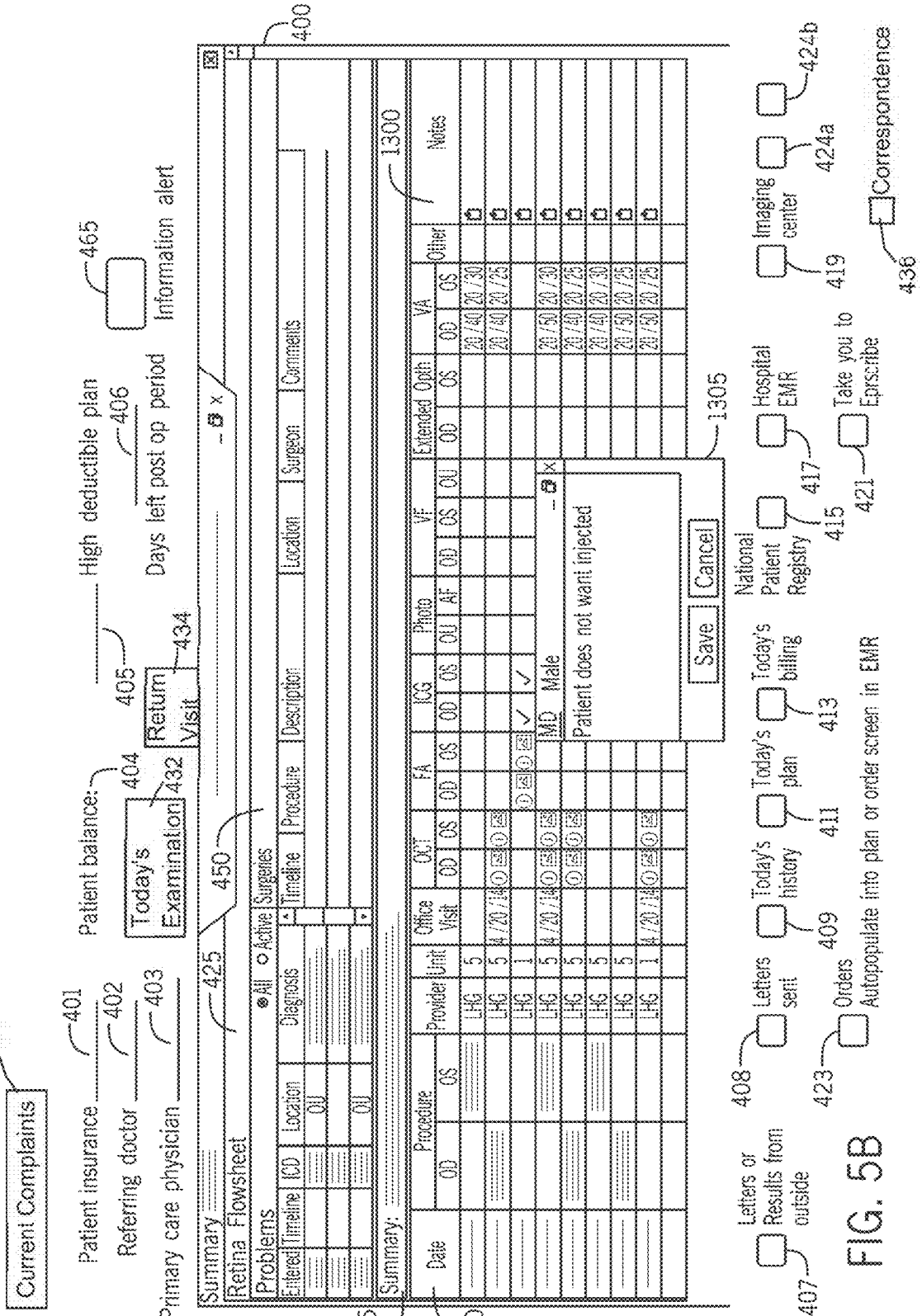

Current Complaints
Patient insurance
Referring doctor
Primary care physician
Patient balance:
High deductible plan
Days left post op period
Information alert
Today's Examination
Return Visit
Summary
Retina Flowsheet
Problems
Summary:
Save
Cancel
Letters or Results from outside
Letters sent
Orders
Autopopulate into plan or order screen in EMR
Today's history
Today's plan
Today's billing
National Patient Registry
Hospital EMR
Take you to Eprscribe
Imaging center
Correspondence
400
401
402
403
404
405
406
407
408
409
411
413
415
417
419
421
423
424a
424b
425
430
432
434
436
450
465
475
500
1300
1305

FIG. 5B

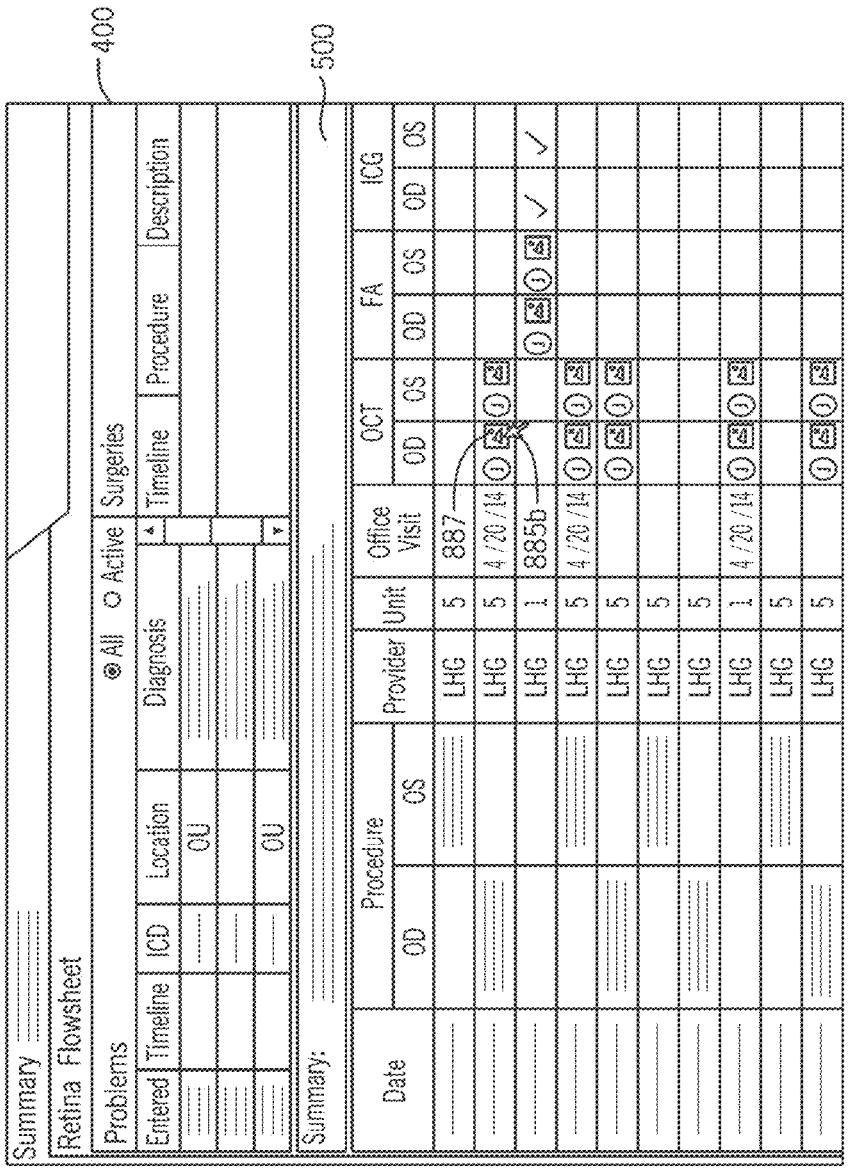

400
500
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
OU
OU
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
OD
OS
FA
OD
OS
ICG
OD
OS
LHG
5
887
4/20/14
885b

FIG. 6

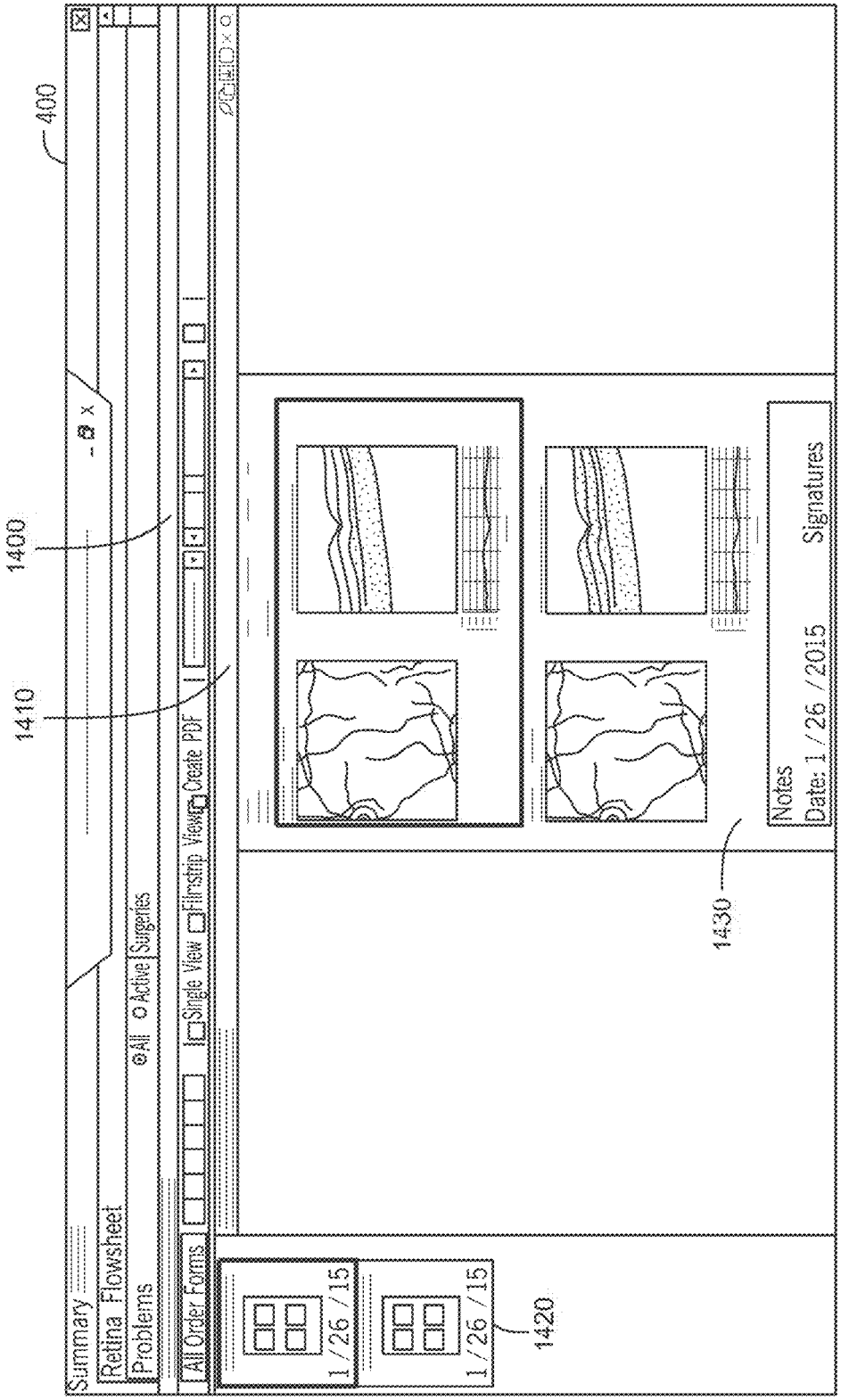

400
1400
1410
1420
1430
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
All Order Forms
Single View
Filmstrip View
Create PDF
1/26/15
1/26/15
Notes
Date: 1/26/2015
Signatures

FIG. 7

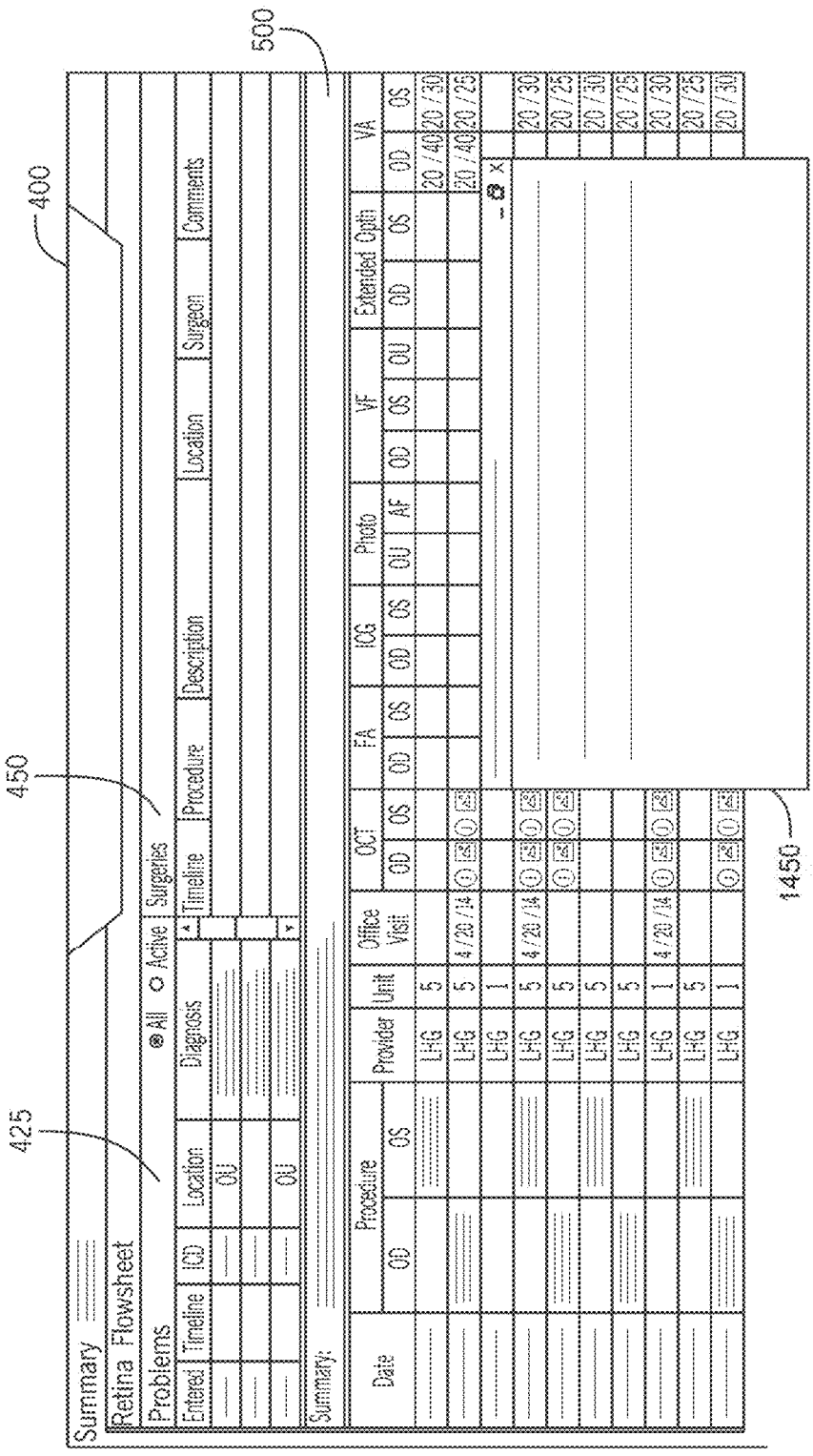

500
400
450
425
1450
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
Location
Surgeon
Comments
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
FA
IOL
Photo
VF
Extended Opth
VA
LHG
4 / 28 / 14
20 / 40
20 / 30
20 / 25

FIG. 8

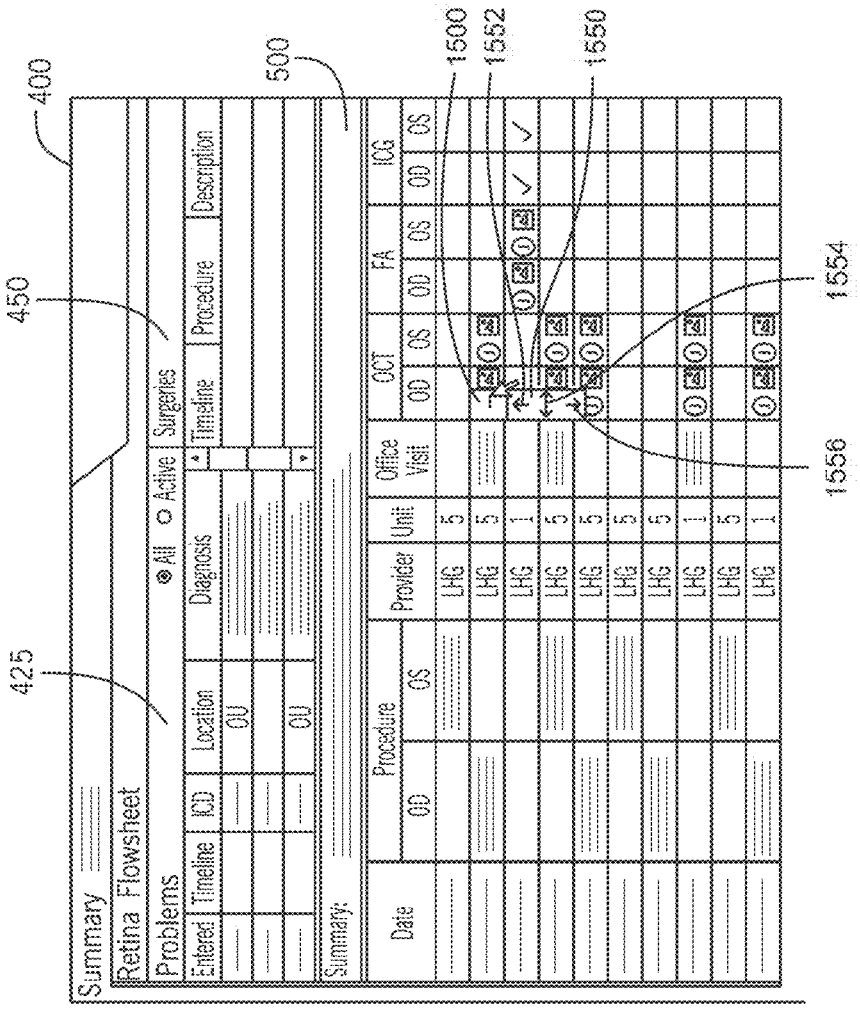

400
450
425
500
1500
1552
1550
1554
1556
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
OU
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
FA
ICG
LHG
5
1

FIG. 9

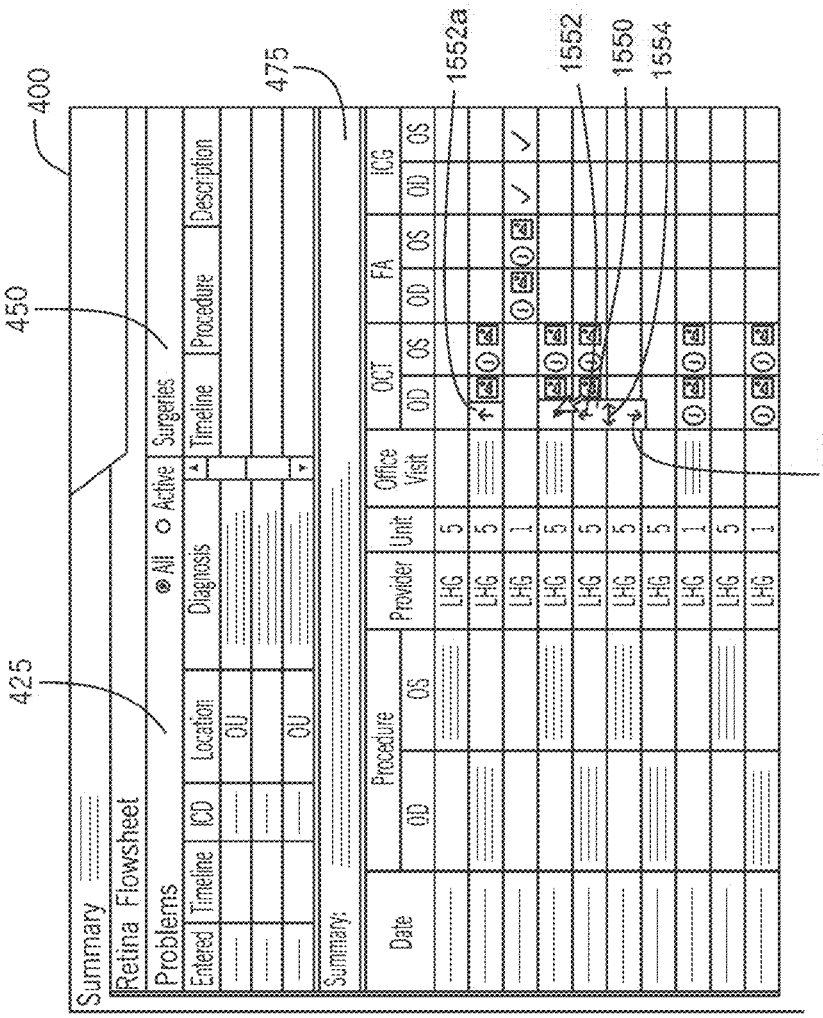

400
450
425
475
1552a
1552
1550
1554
1556
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
OU
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
FA
ICG
LHG
5
1

FIG. 10A

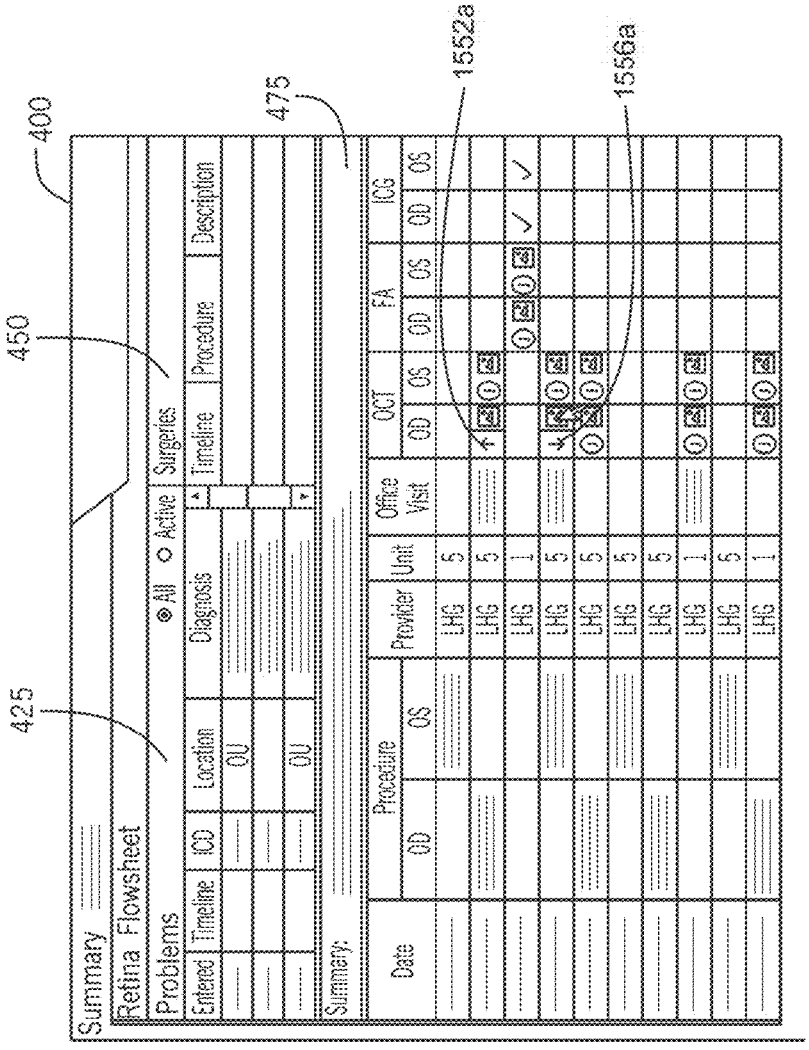

400
450
425
475
1552a
1556a
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
OU
OU
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
OD
OS
FA
OD
OS
ICG
OD
OS
LHG
5
1

FIG. 10B

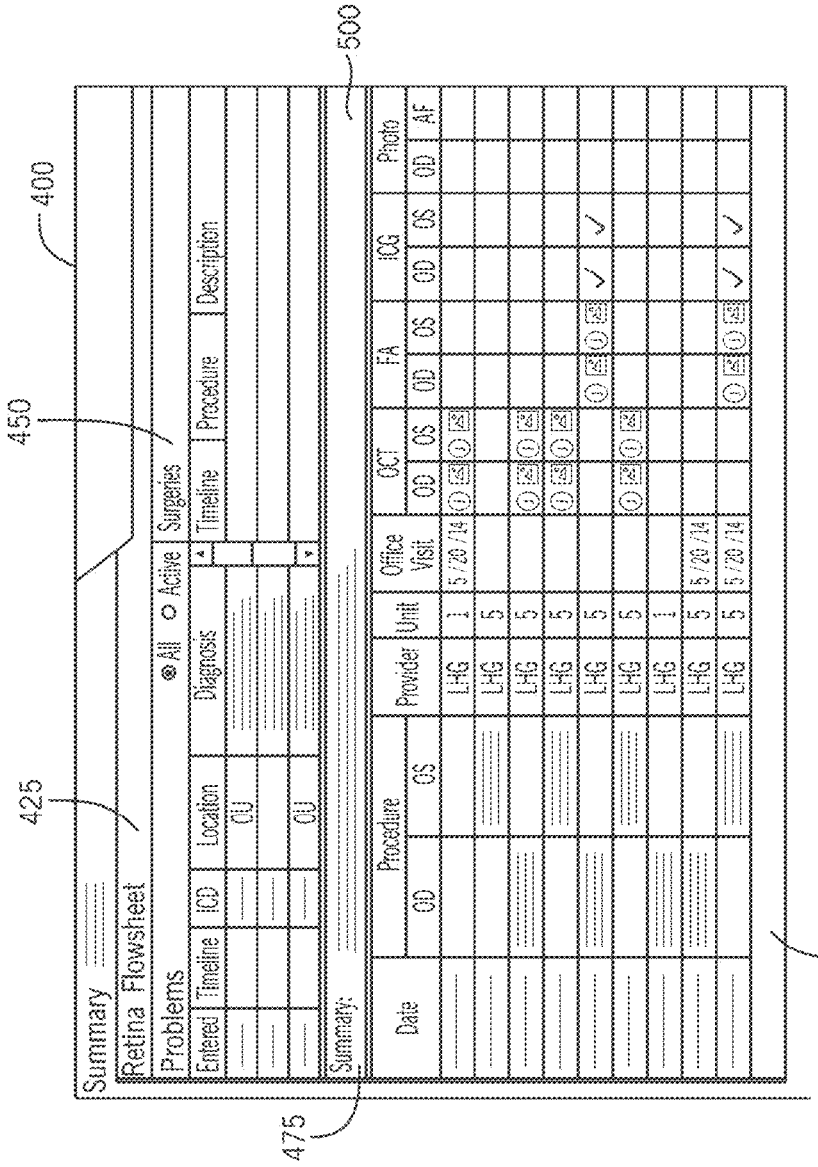

400
425
450
475
500
505
Summary
Retina Flowsheet
Problems
All
Active
Surgeries
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
OU
OU
Summary:
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
OD
OS
FA
OD
OS
ICG
OD
OS
Photo
OD
AF
LHG
1
5 / 20 / 14
LHG
5
LHG
5
LHG
5
LHG
5
LHG
5
LHG
5
LHG
1
LHG
5
5 / 20 / 14
LHG
5
5 / 20 / 14

FIG. 11

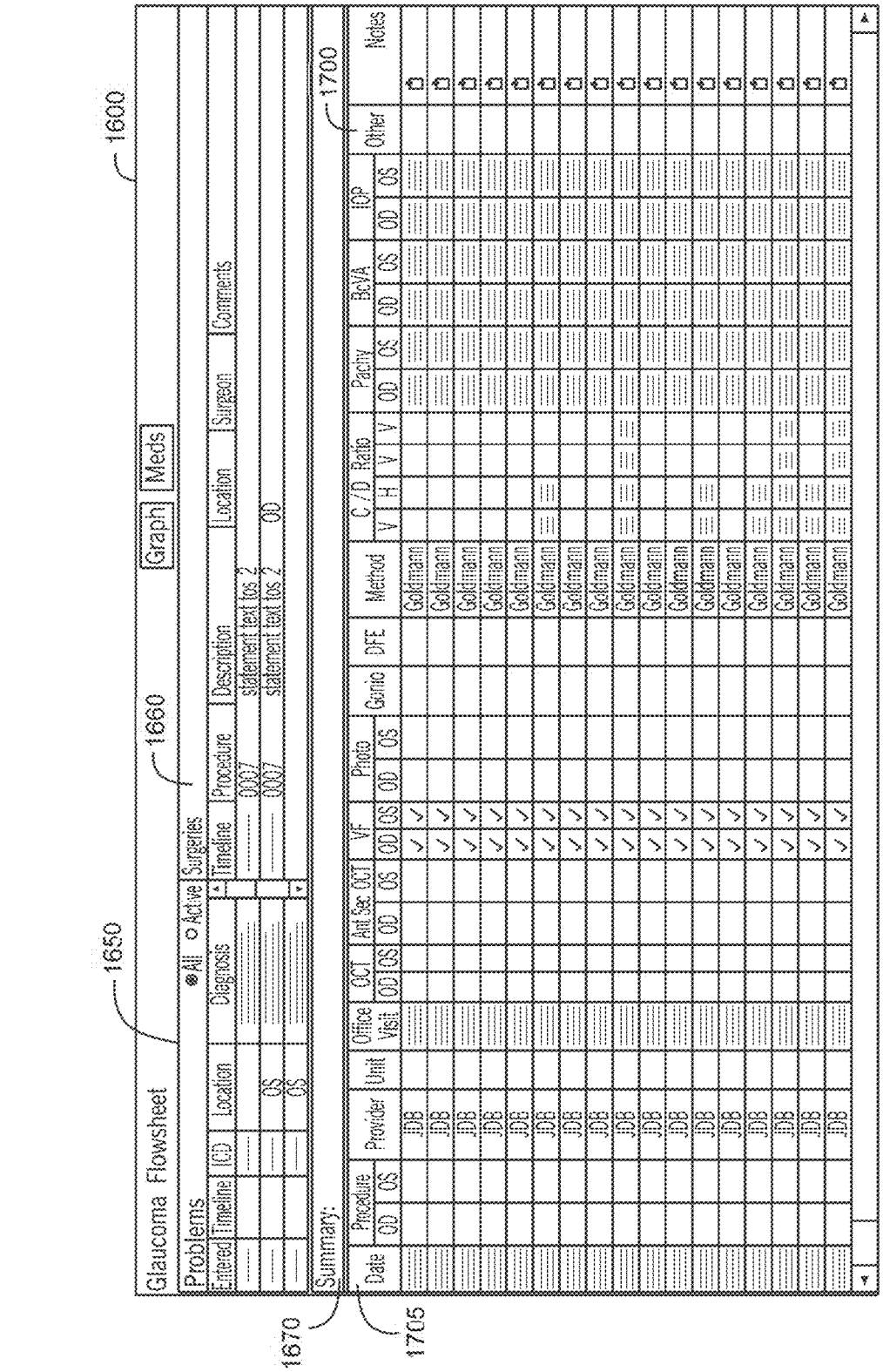

1600
1650
1660
1670
1700
1705
Glaucoma Flowsheet
Graph
Meds
Problems
All
Active
Surgeries
Summary:
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
Location
Surgeon
Comments
Date
Procedure
Provider
Unit
Office Visit
OCT
Ant Seg OCT
VF
Photo
Gonio
DFE
Method
C/D Ratio
Pachy
BCVA
IOP
Other
Notes
OD
OS
JDB
Goldmann
0007 statement text tos 2
OD
OS

FIG. 12A

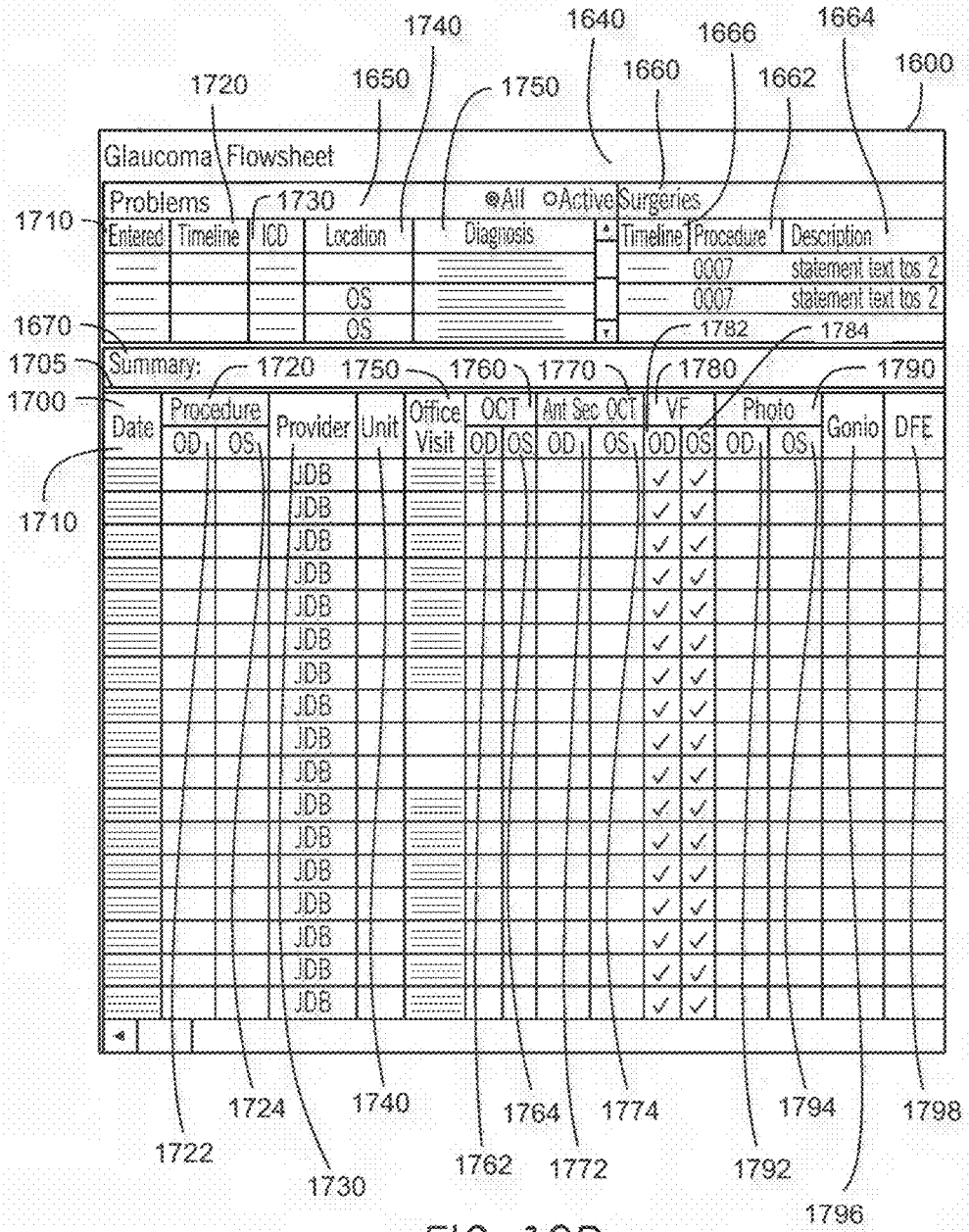

1740
1640
1666
1664
1720
1650
1750
1660
1662
1600
Glaucoma Flowsheet
Problems
1730
All
Active
Surgeries
1710
Entered
Timeline
ICD
Location
Diagnosis
Timeline
Procedure
Description
0007
statement text tos 2
OS
1670
1782
1784
1705
Summary:
1720
1750
1760
1770
1780
1790
1700
Date
Procedure
OD
OS
Provider
Unit
Office Visit
OCT
Ant Sec OCT
VF
Photo
Gonio
DFE
JDB
1710
1722
1724
1730
1740
1762
1764
1772
1774
1792
1794
1796
1798

FIG. 12B

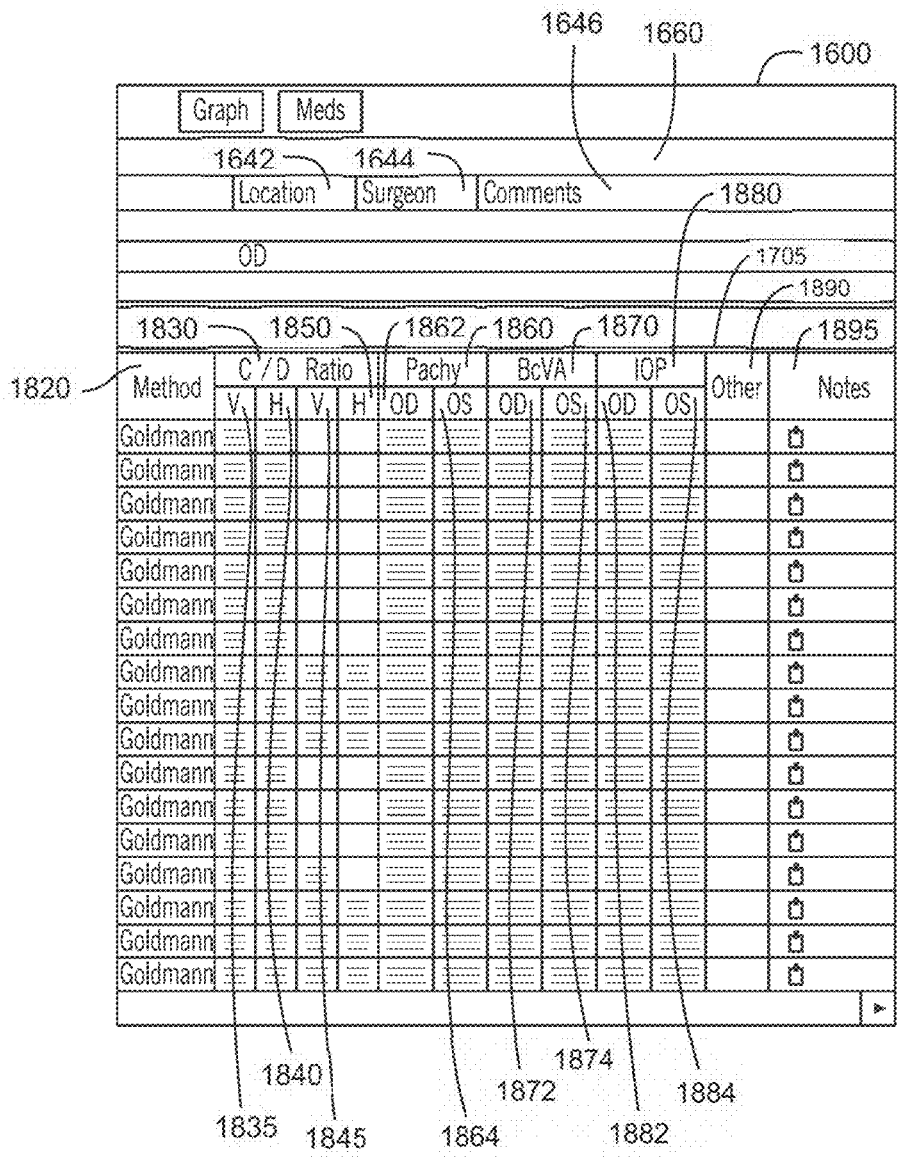

1646
1660
1600
Graph
Meds
1642
1644
Location
Surgeon
Comments
1880
OD
1705
1890
1830
1850
1862
1860
1870
1895
1820
Method
C / D Ratio
Pachy
BcVA
IOP
Other
Notes
V
H
V
H
OD
OS
OD
OS
OD
OS
Goldmann
1840
1874
1872
1884
1835
1845
1864
1882

FIG. 12C

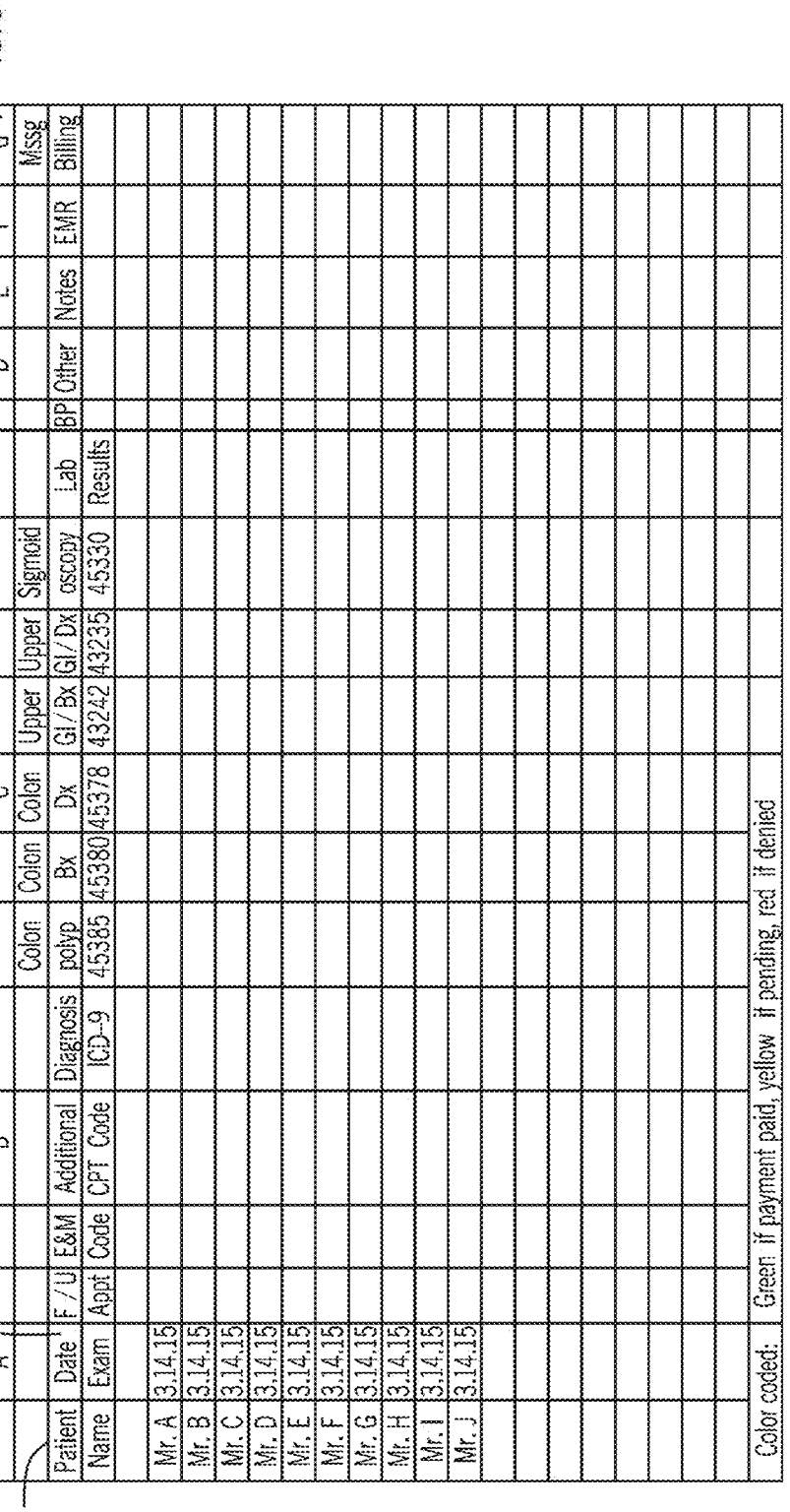

1905
1910
1920
1930
1900
1940
1950
1960
1970
A
B
C
D
E
F
G
Patient Name
Date Exam
F / U Appt
E&M Code
Additional CPT Code
Diagnosis ICD-9
Colon polyp
Colon Bx
Colon Dx
Upper GI / Bx
Upper GI / Dx
Sigmoid oscopy
Lab Results
BP
Other
Notes
EMR
Msg Billing
Mr. A 3.14.15
Mr. B 3.14.15
Mr. C 3.14.15
Mr. D 3.14.15
Mr. E 3.14.15
Mr. F 3.14.15
Mr. G 3.14.15
Mr. H 3.14.15
Mr. I 3.14.15
Mr. J 3.14.15
45385
45380
45378
43242
43235
45330
Color coded:
Green if payment paid, yellow if pending, red if denied

FIG. 12D

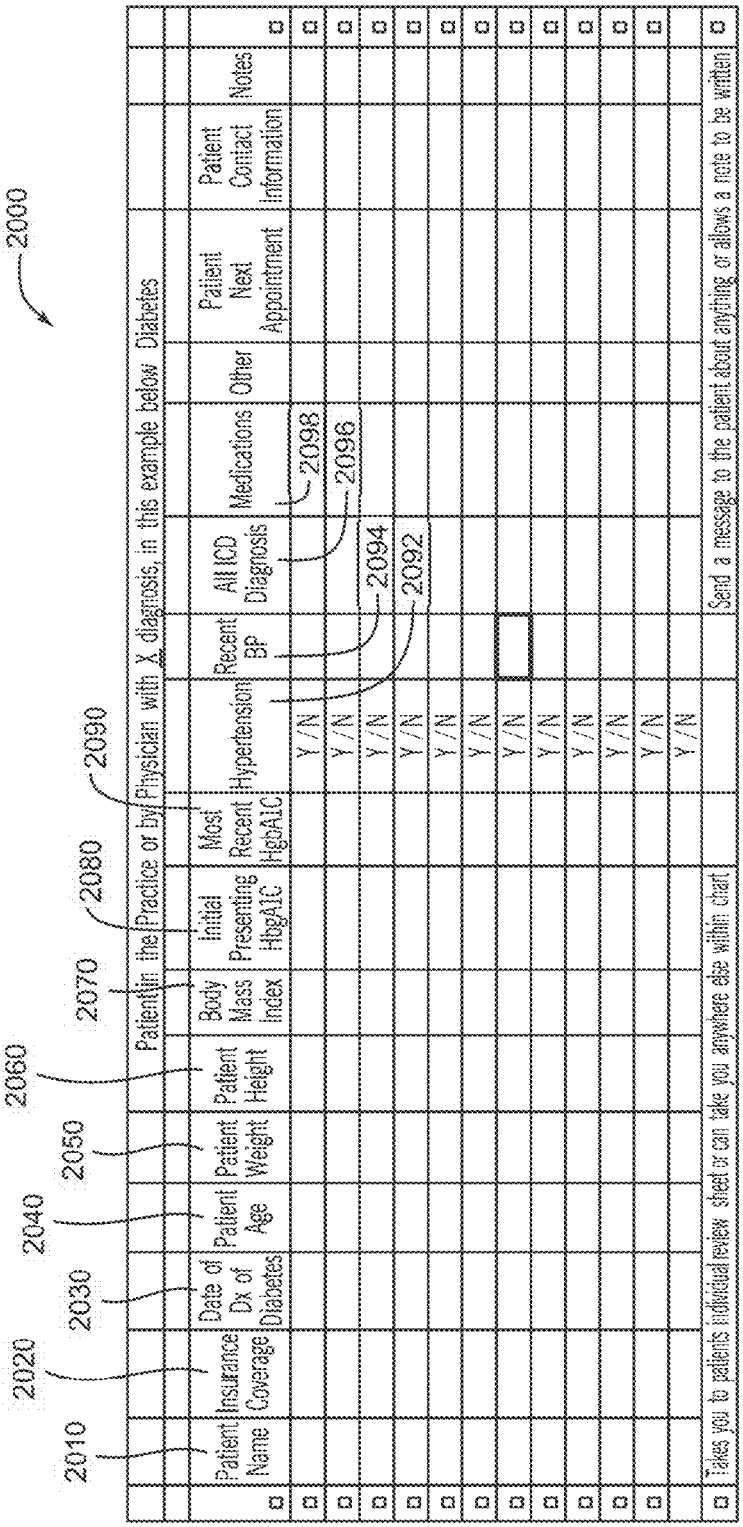

2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2092
2094
2096
2098
Patient Name
Insurance Coverage
Date of Dx of Diabetes
Patient Age
Patient Weight
Patient Height
Body Mass Index
Initial Presenting HbgA1C
Most Recent HgbA1C
Hypertension
Recent BP
All ICD Diagnosis
Medications
Other
Patient Next Appointment
Patient Contact Information
Notes
Patient in the Practice or by Physician with X diagnosis, in this example below Diabetes
Y / N
Takes you to patients individual review sheet or can take you anywhere else within chart
Send a message to the patient about anything or allows a note to be written

FIG. 12E

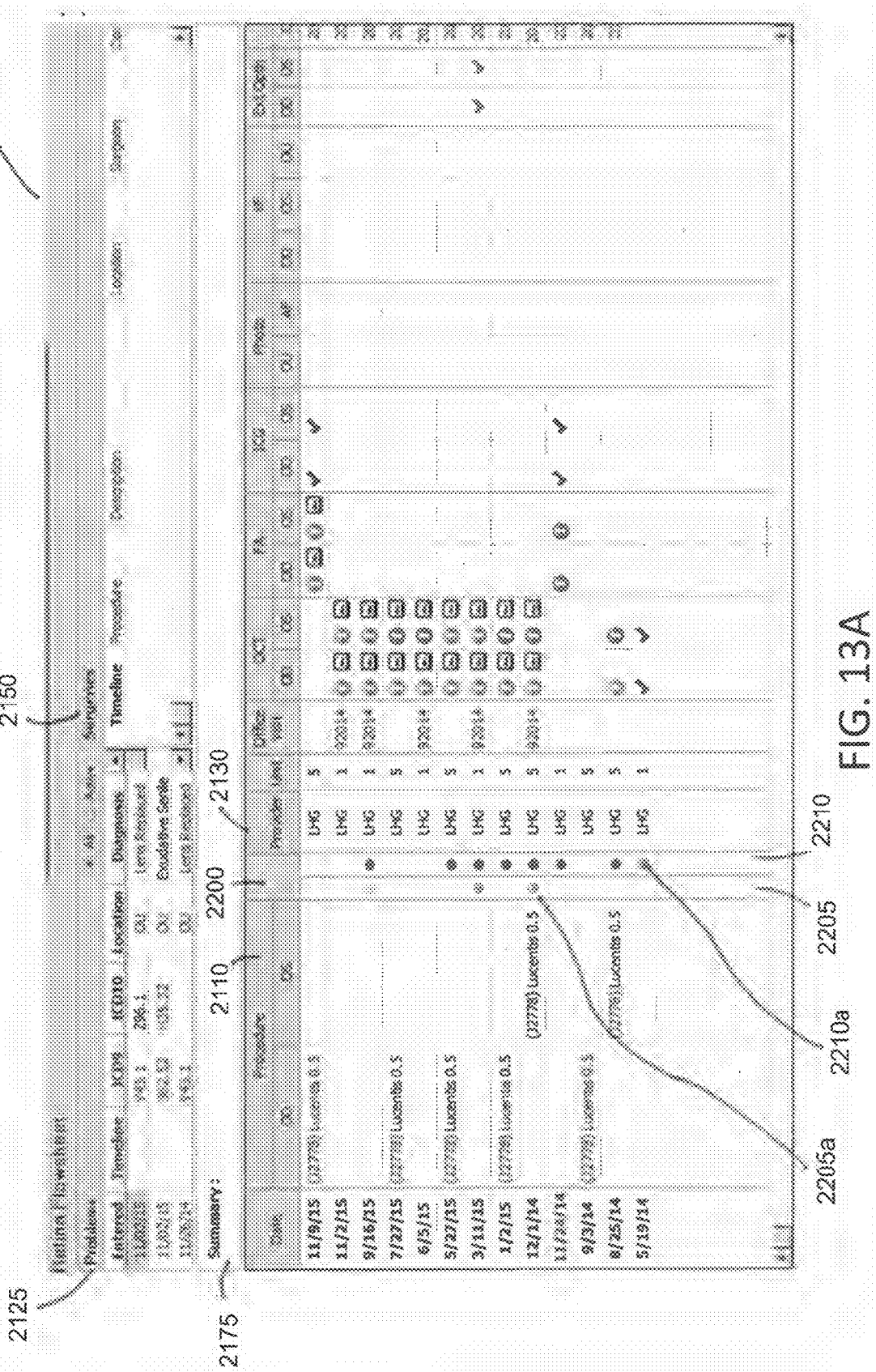


FIG. 13A

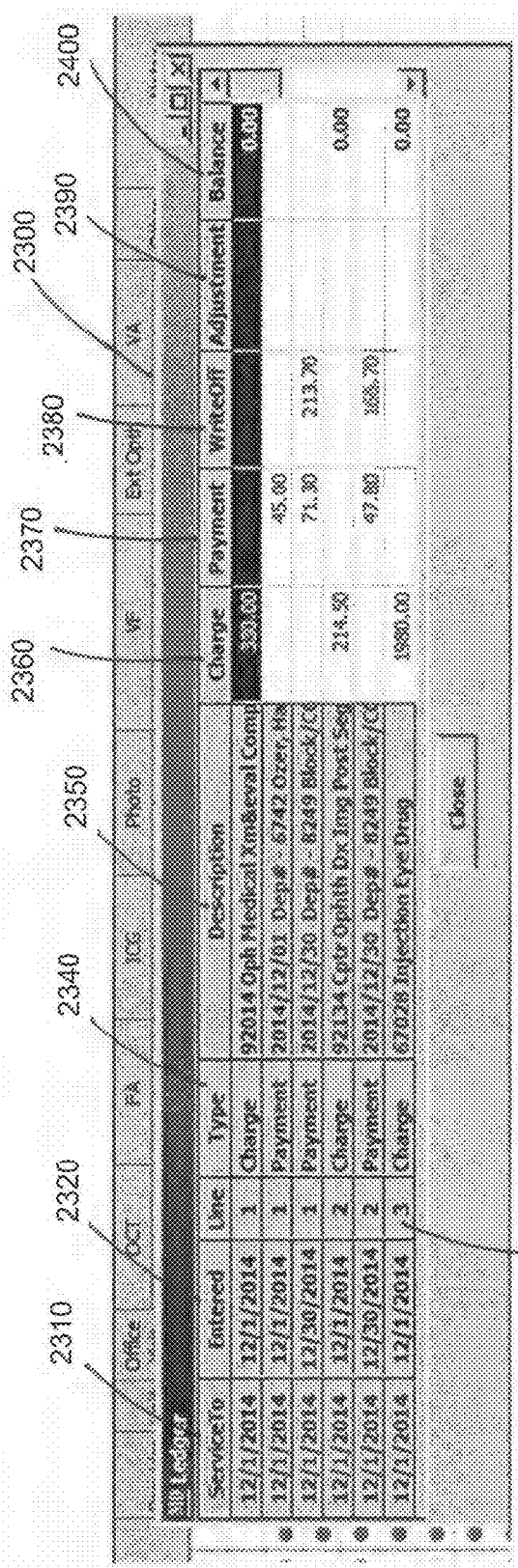

2310
2320
2330
2340
2350
2360
2370
2380
2390
2400
2300
Office
ACT
PA
ICS
Photo
RF
Ext Ord
VA
Sub Ledger
Service to
Entered
Line
Type
Description
Charge
Payment
WriteOff
Adjustment
Balance
12/1/2014
12/1/2014
1
Charge
92014 Oph Medical Xm&eval Cont
300.00
0.00
12/1/2014
12/1/2014
1
Payment
2014/12/01 Dep# 6742 Oreg, Ha
45.00
12/1/2014
12/30/2014
1
Payment
2014/12/23 Dep# 8249 Black/Cl
71.30
213.70
12/1/2014
12/1/2014
2
Charge
92134 Cptr Ophth Dx Img Post Seg
214.50
0.00
12/1/2014
12/30/2014
2
Payment
2014/12/24 Dep# 8249 Black/Cl
97.80
116.70
12/1/2014
12/1/2014
3
Charge
67028 Injection Eye Drug
1860.00
0.00
Close

FIG. 13B

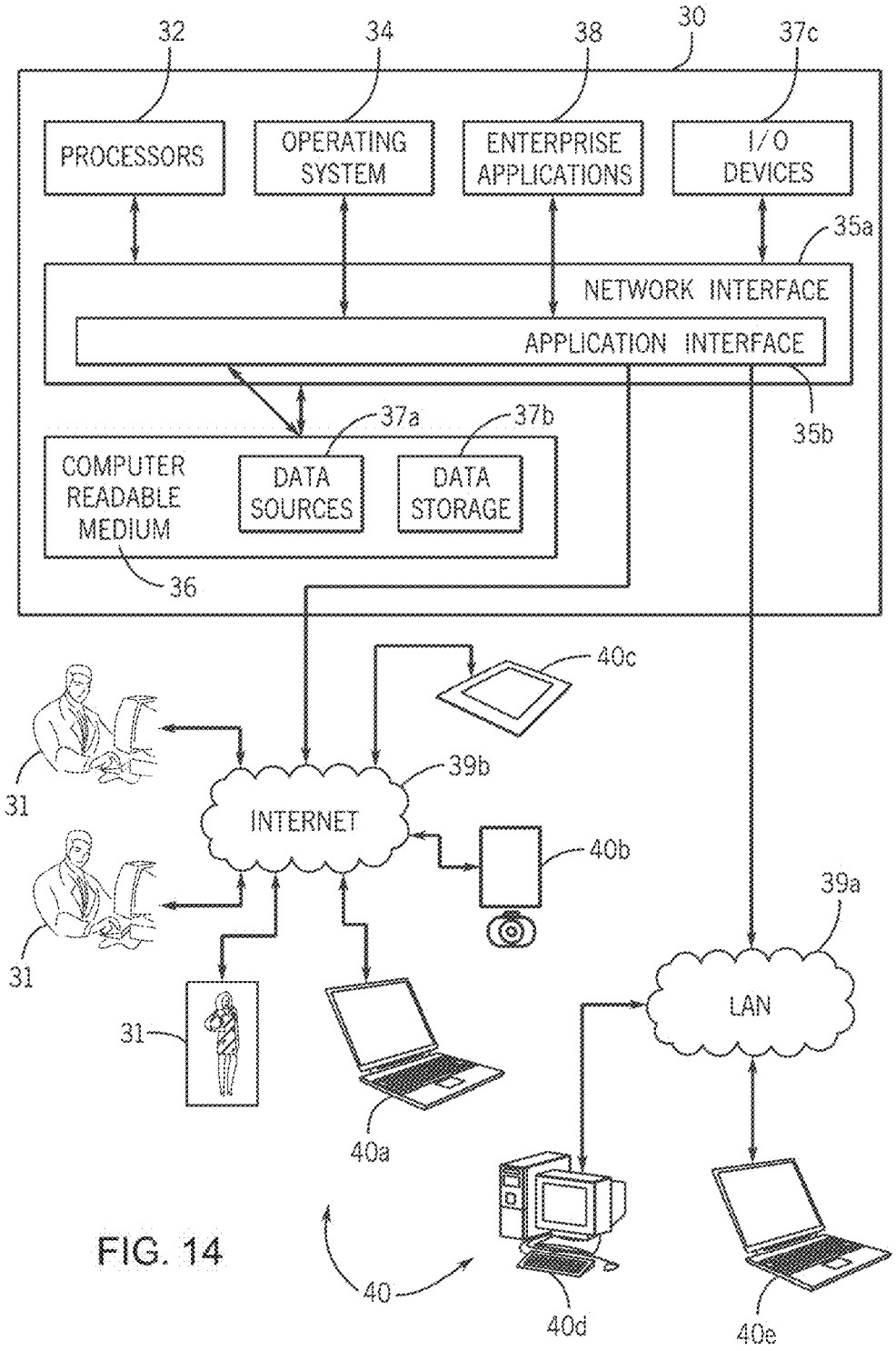

32
34
38
30
37c
PROCESSORS
OPERATING SYSTEM
ENTERPRISE APPLICATIONS
I/O DEVICES
35a
NETWORK INTERFACE
APPLICATION INTERFACE
35b
37a
37b
COMPUTER READABLE MEDIUM
DATA SOURCES
DATA STORAGE
36
40c
39b
INTERNET
40b
39a
LAN
31
31
31
40a
40d
40e
40

FIG. 14

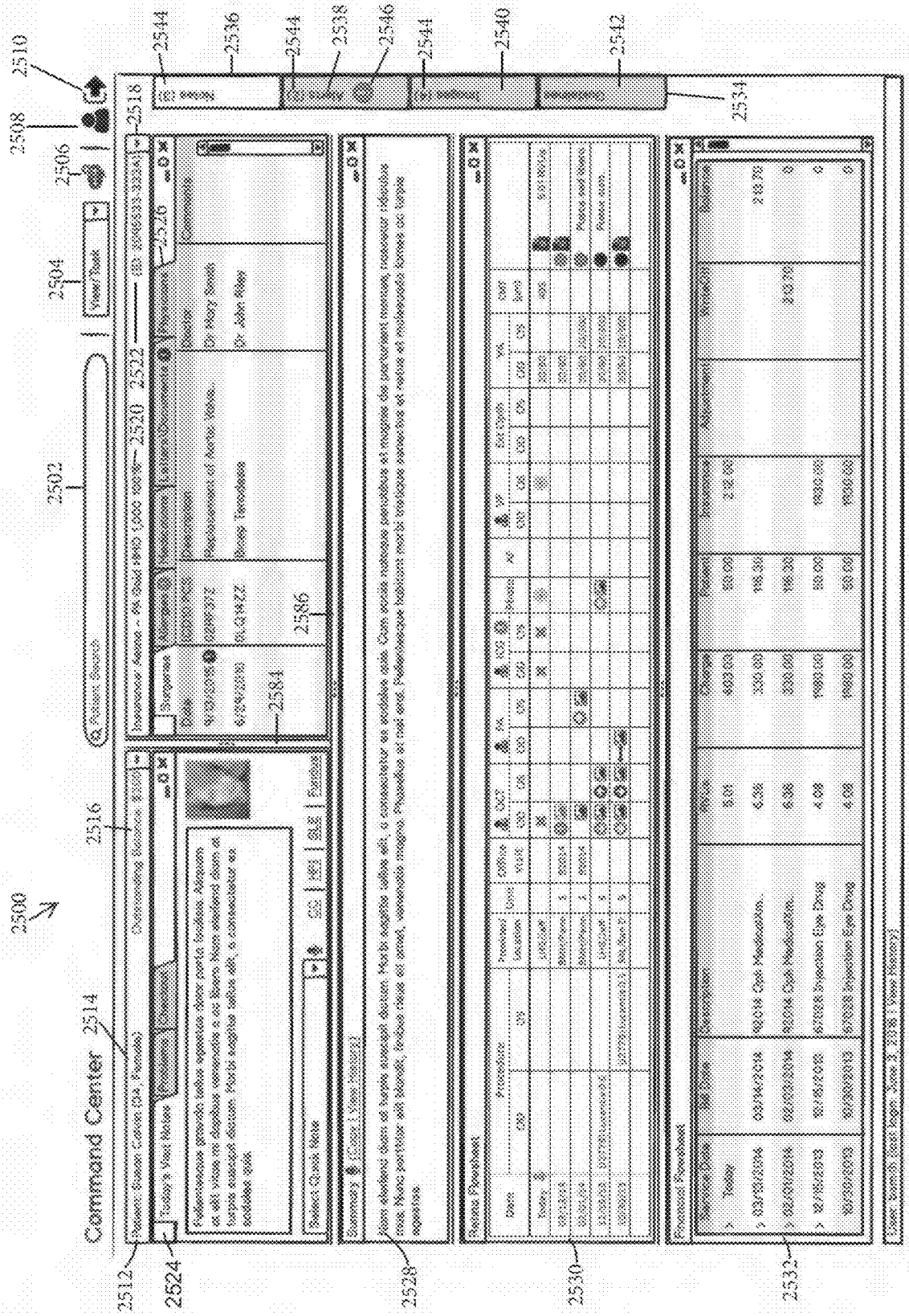

2500
2502
2504
2506
2508
2510
2512
2514
2516
2518
2520
2522
2524
2526
2528
2530
2532
2534
2536
2538
2540
2542
2544
2546
2584
2586
Command Center

Figure 15

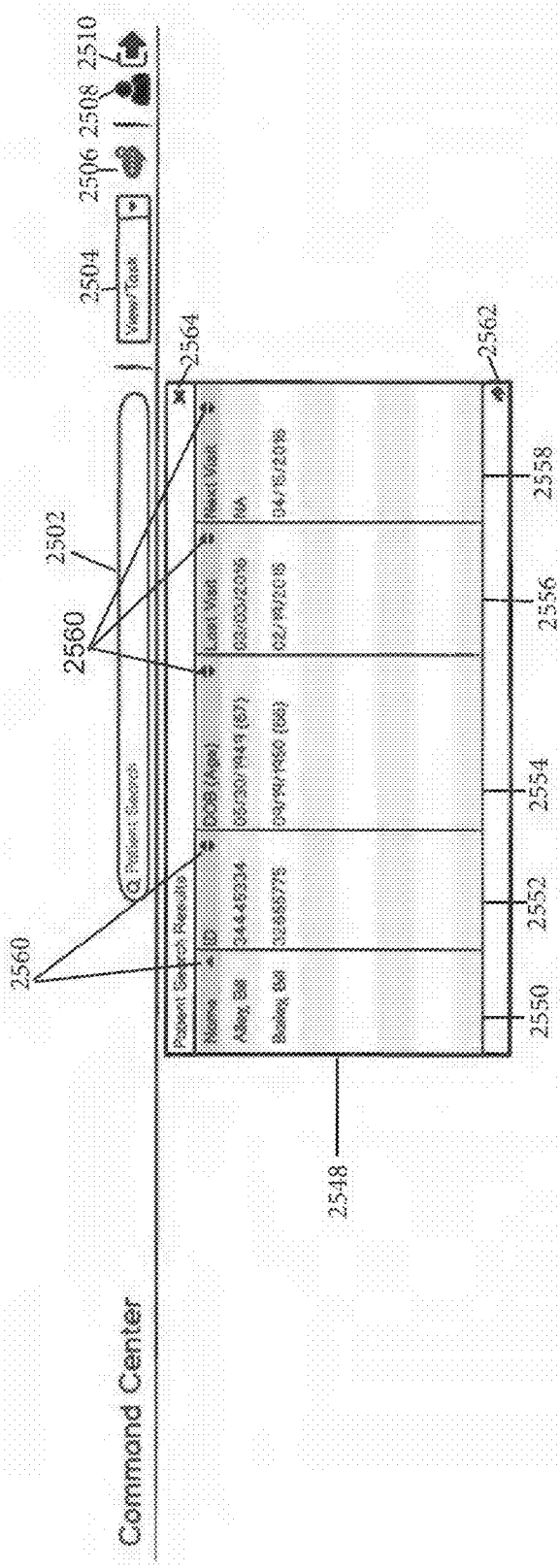

2510
2508
2506
2504
2564
2562
2502
2560
2558
2556
2554
2552
2550
2548
2560
Command Center

Figure 16

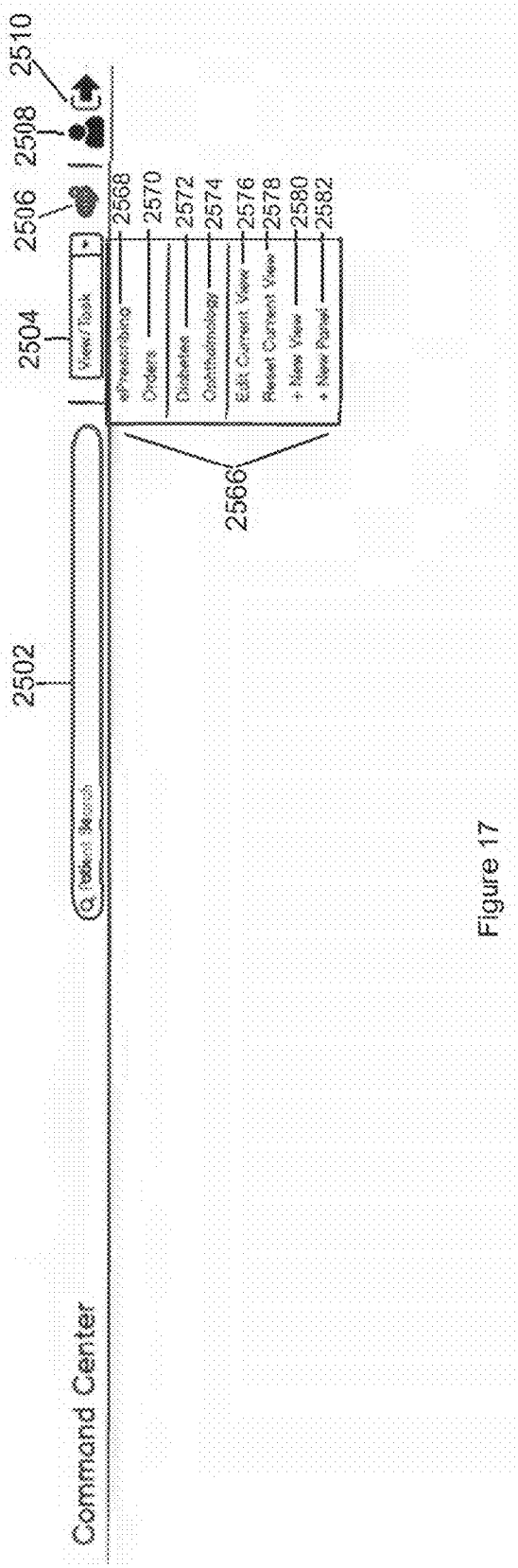

2510
2508
2506
2504
2502
2566
2568
2570
2572
2574
2576
2578
2580
2582
Command Center

Figure 17

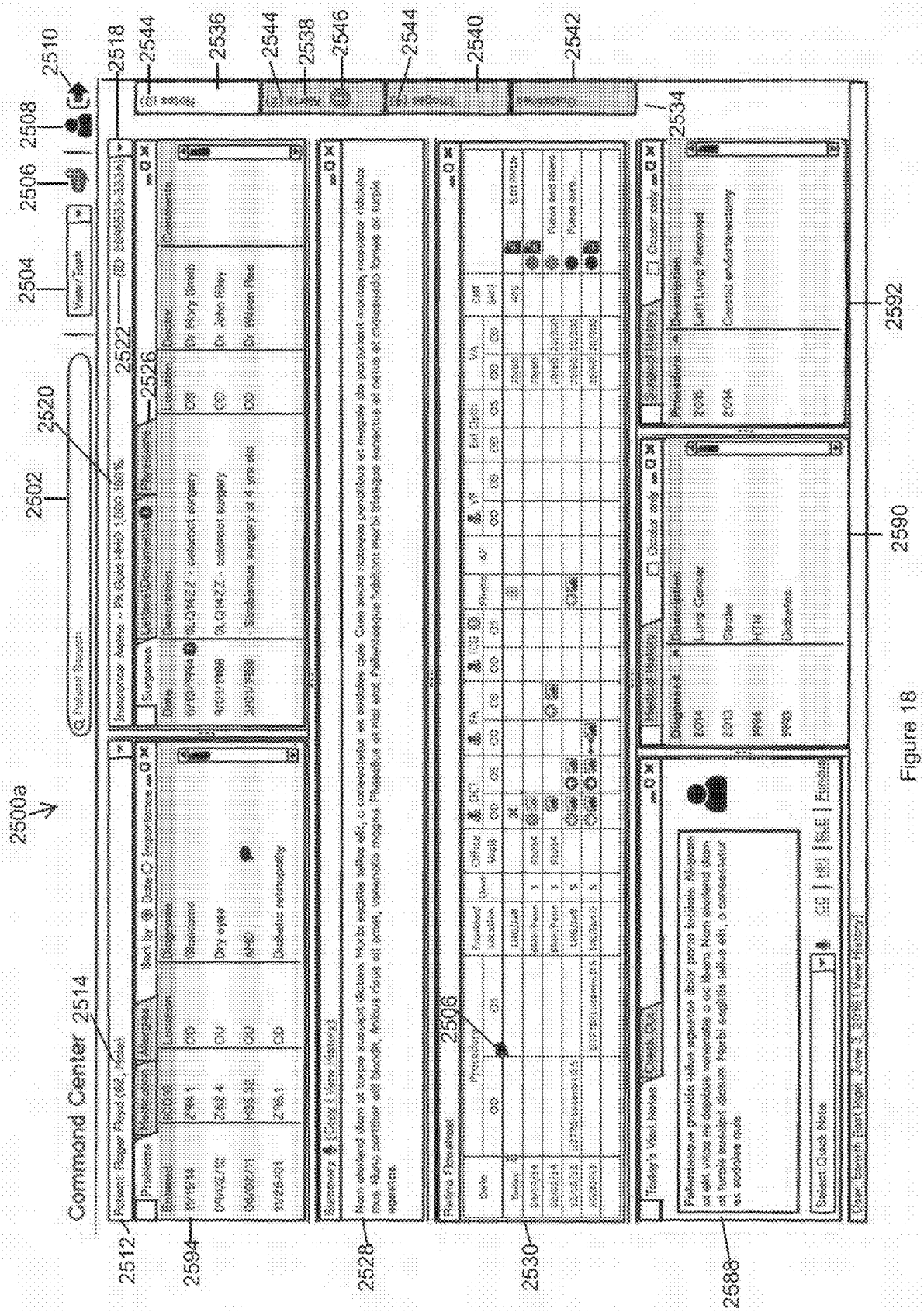

2500a
Command Center
2502
2504
2506
2508
2510
2512
2514
2518
2520
2522
2526
2528
2530
2534
2536
2538
2540
2542
2544
2546
2588
2590
2592
2594

Figure 18

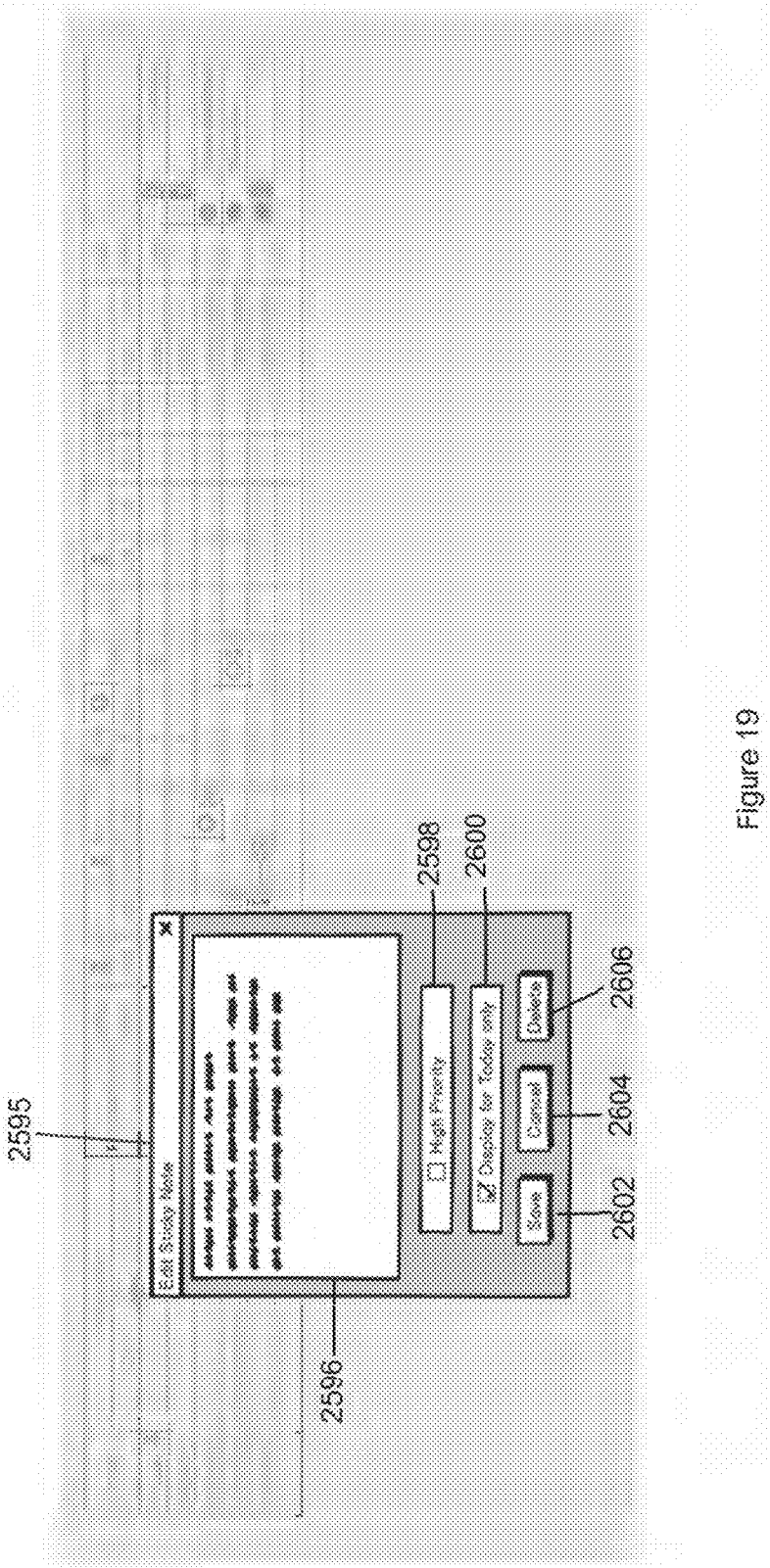

2595
2596
2598
2600
2602
2604
2606
Edit Sticky Note
High Priority
Desktop for Today only
Delete
Cancel
Save

Figure 19

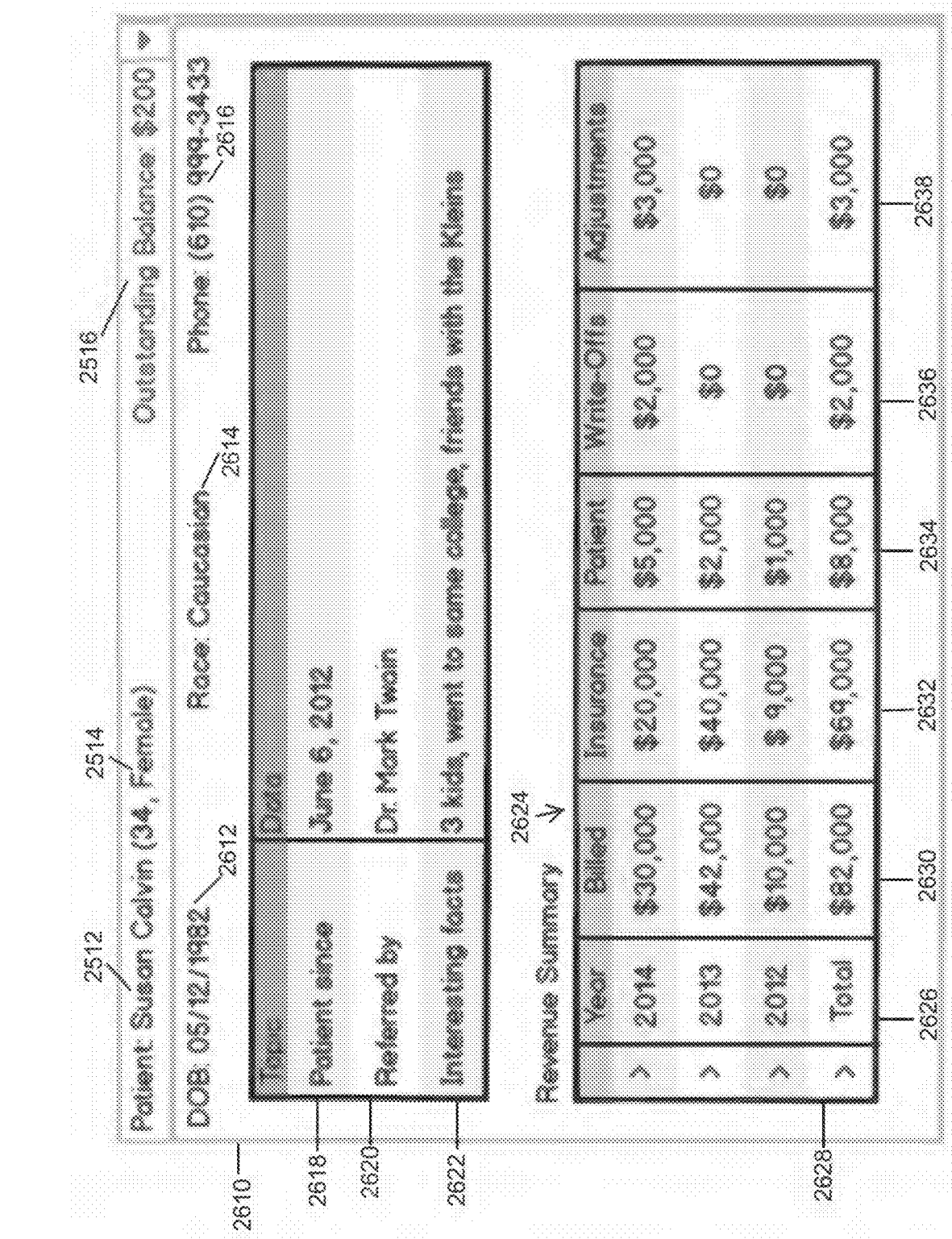

2516
2514
2512
Patient: Susan Calvin (34, Female)
Outstanding Balance: $200
DOB: 05/12/1982
2612
Race: Caucasian
2614
Phone: (610) 999-3433
2616
Title
Data
Patient since
June 6, 2012
Referred by
Dr. Mark Twain
Interesting facts
3 kids, went to same college, friends with the Kleins
2610
2618
2620
2622
2624
Revenue Summary
Year
Billed
Insurance
Patient
Write-Offs
Adjustments
2014
$30,000
$20,000
$5,000
$2,000
$3,000
2013
$42,000
$40,000
$2,000
$0
$0
2012
$10,000
$ 9,000
$1,000
$0
$0
Total
$82,000
$69,000
$8,000
$2,000
$3,000
2626
2630
2632
2634
2636
2638
2628

Figure 20

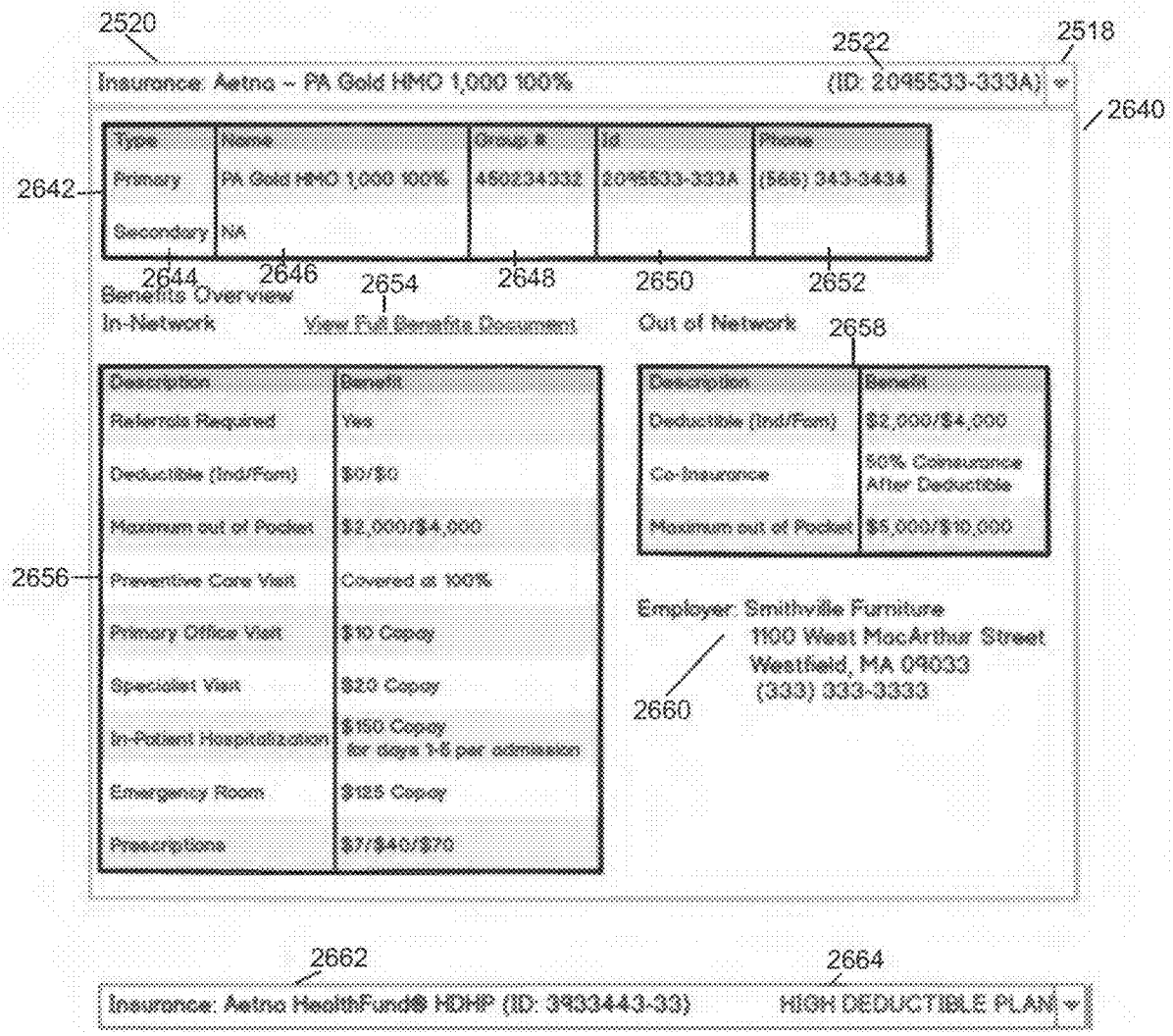

2520
2522
2518
Insurance: Aetna ~ PA Gold HMO 1,000 100%
(ID: 2095533-333A)
2640
2642
Type
Name
Group #
ID
Phone
Primary
PA Gold HMO 1,000 100%
46023433Z
2095533-333A
(566) 343-3434
Secondary
N/A
2644
2646
2654
2648
2650
2652
Benefits Overview
In-Network
View Full Benefits Document
Out of Network
2658
Description
Benefit
Referrals Required
Yes
Deductible (Ind/Fam)
$0/$0
Maximum out of Pocket
$2,000/$4,000
2656
Preventive Care Visit
Covered at 100%
Primary Office Visit
$10 Copay
Specialist Visit
$20 Copay
In-Patient Hospitalization
$150 Copay
for days 1-6 per admission
Emergency Room
$125 Copay
Prescriptions
$7/$40/$70
Deductible (Ind/Fam)
$2,000/$4,000
Co-Insurance
50% Coinsurance
After Deductible
Maximum out of Pocket
$5,000/$10,000
Employer: Smithville Furniture
1100 West MacArthur Street
Westfield, MA 09033
(333) 333-3333
2660
2662
2664
Insurance: Aetna HealthFund® HDHP (ID: 3933443-33)
HIGH DEDUCTIBLE PLAN

Figure 21

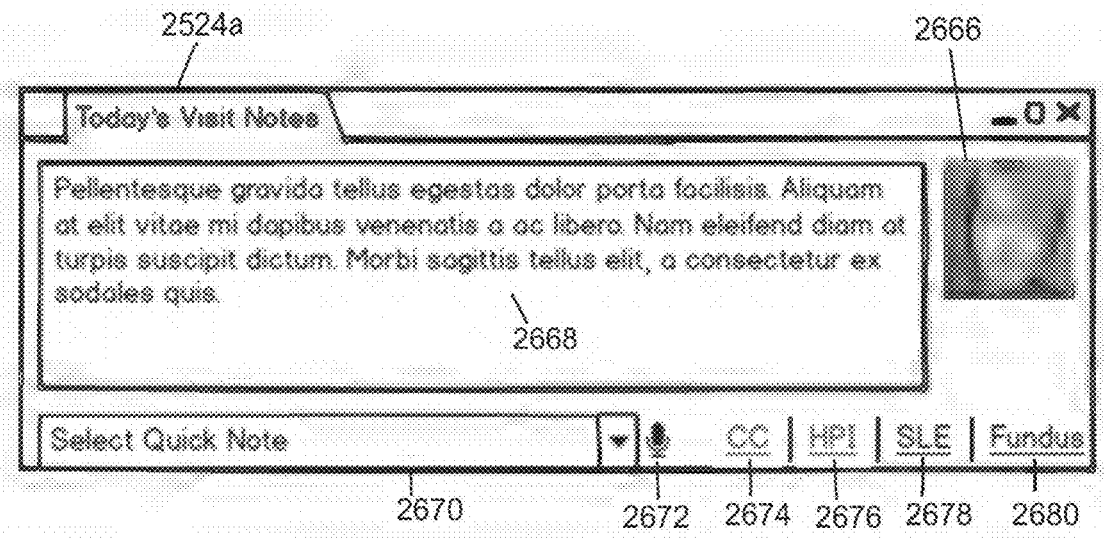

2524a
2666
Today's Visit Notes
Pellentesque gravida tellus egestas dolor porta facilisis. Aliquam at elit vitae mi dapibus venenatis a ac libero. Nam eleifend diam at turpis suscipit dictum. Morbi sagittis tellus elit, a consectetur ex sodales quis.
2668
Select Quick Note
CC
HPI
SLE
Fundus
2670
2672
2674
2676
2678
2680

Figure 22

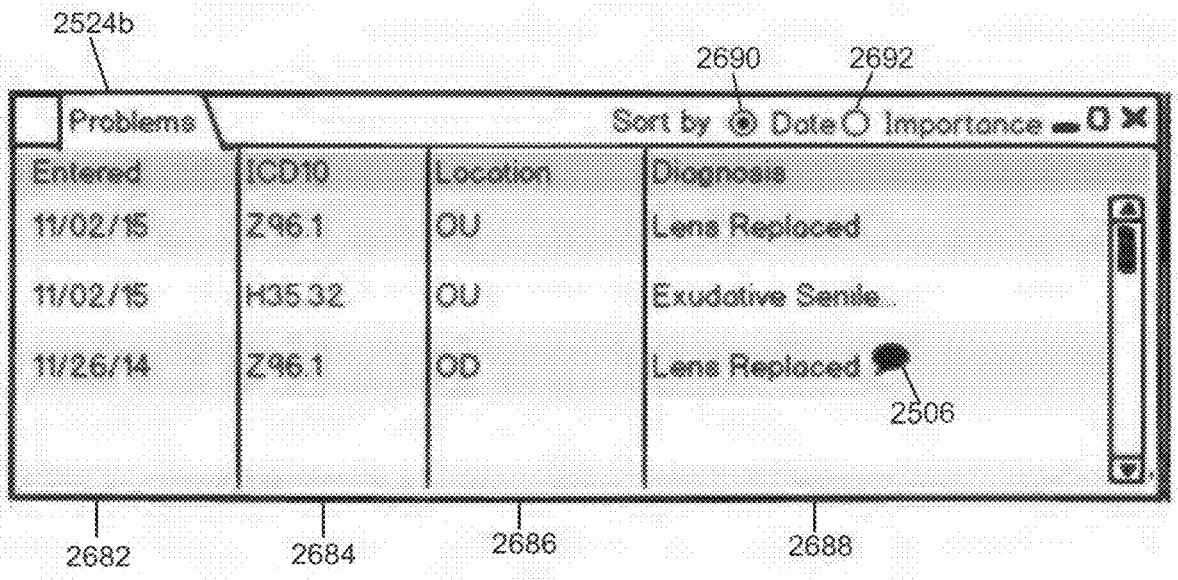

2524b
2690
2692
Problems
Sort by Date Importance
Entered
ICD10
Location
Diagnosis
11/02/15
Z96.1
OU
Lens Replaced
11/02/15
H35.32
OU
Exudative Senile...
11/26/14
Z96.1
OD
Lens Replaced
2506
2682
2684
2686
2688

Figure 23

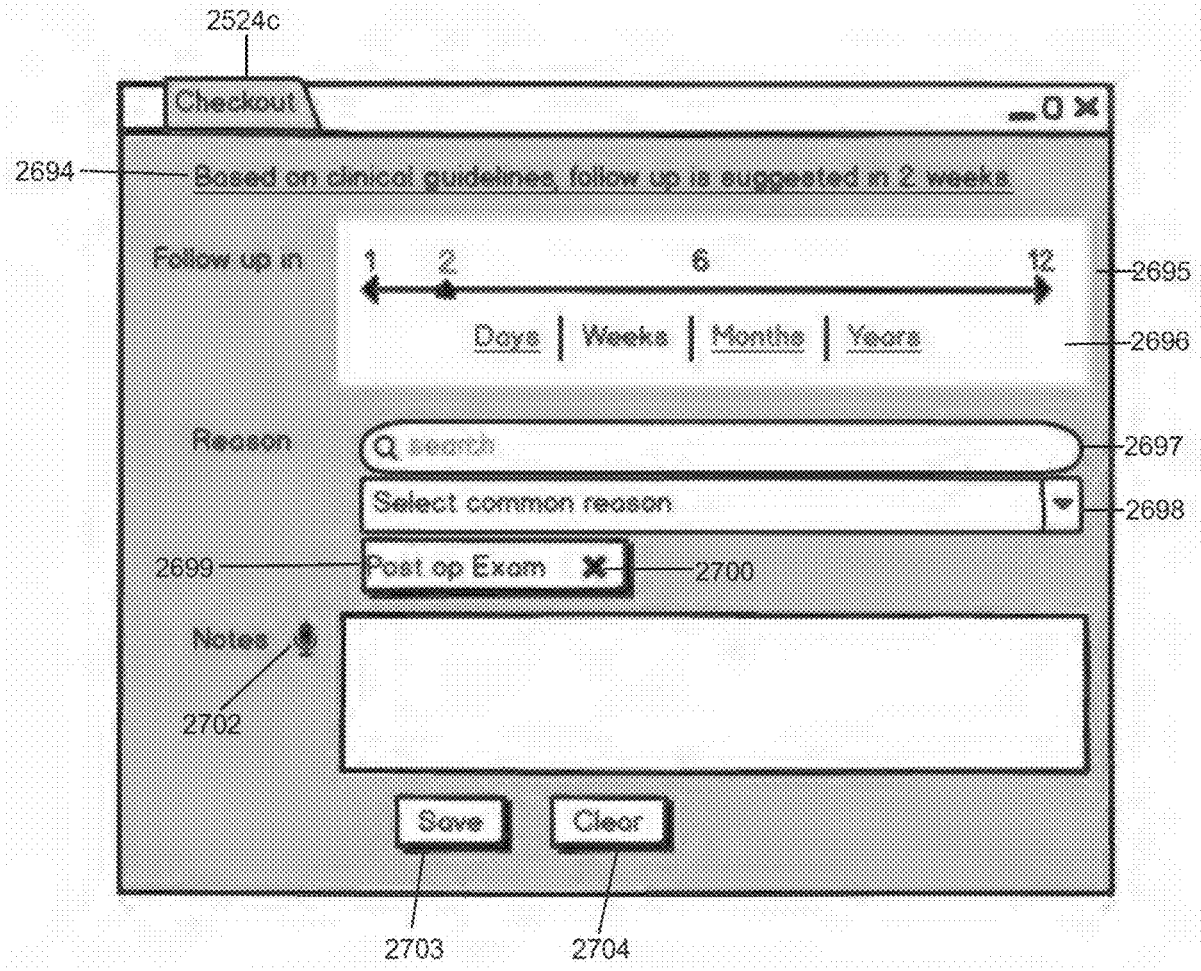

2524c
Checkout
2694
Based on clinical guidelines, follow up is suggested in 2 weeks
Follow up in
1
2
6
12
2695
Days
Weeks
Months
Years
2696
Reason
search
2697
Select common reason
2698
2699
Post op Exam
2700
Notes
2702
Save
Clear
2703
2704

Figure 24

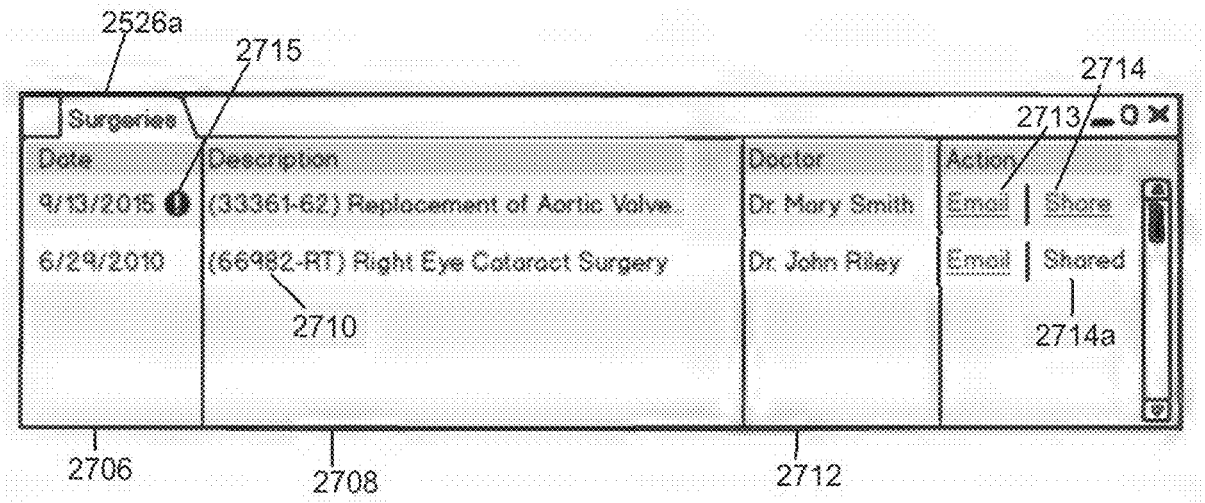

2526a
2715
2714
2713
Surgeries
Date
Description
Doctor
Action
9/13/2015
(33361-62) Replacement of Aortic Valve...
Dr. Mary Smith
Email | Share
6/29/2010
(66982-RT) Right Eye Cataract Surgery
Dr. John Riley
Email | Shared
2710
2714a
2706
2708
2712

Figure 25

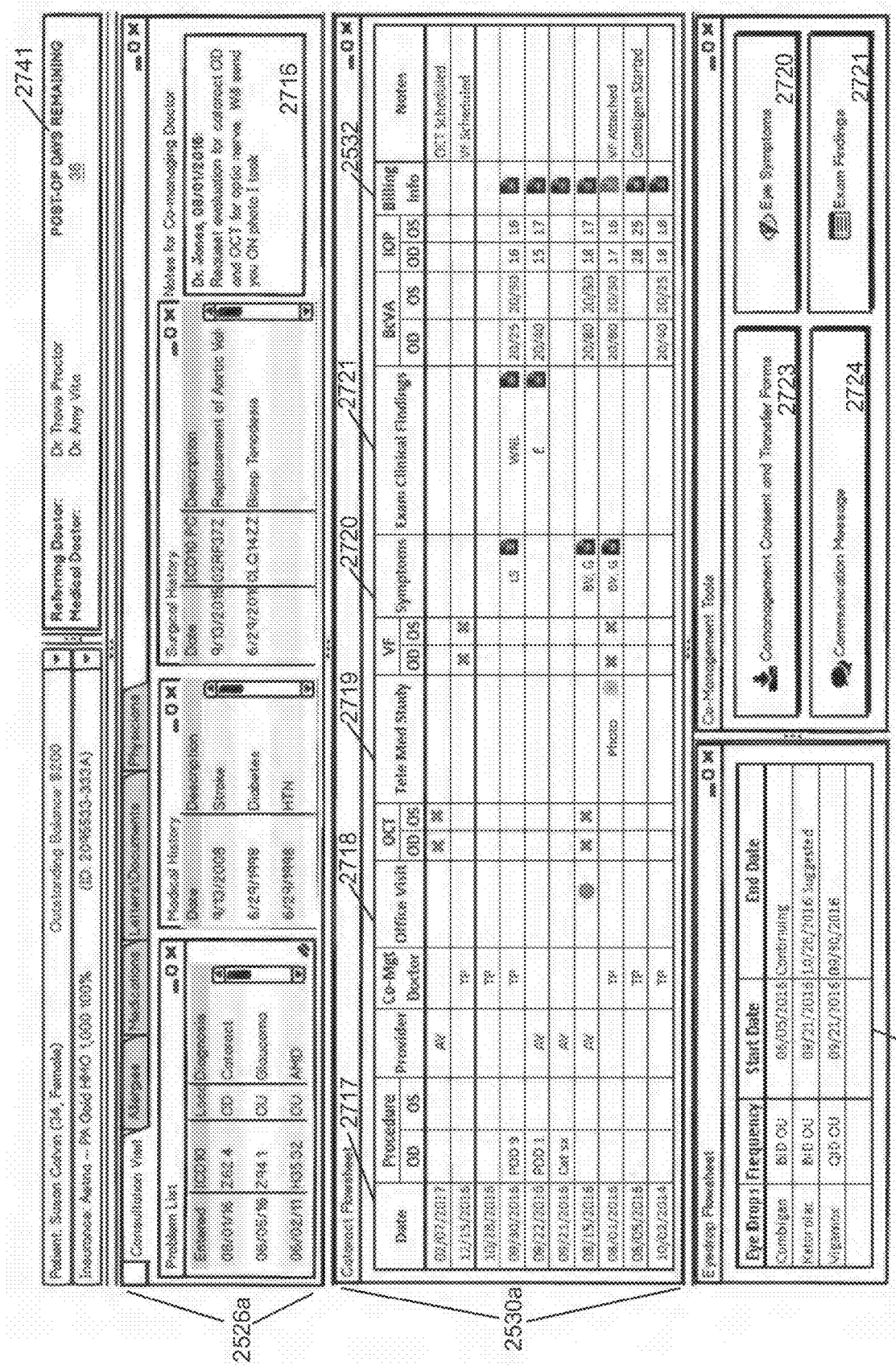

2741
2526a
2530a
2722
2716
2717
2718
2719
2720
2721
2532
2723
2724
2720
2721

Figure 25A

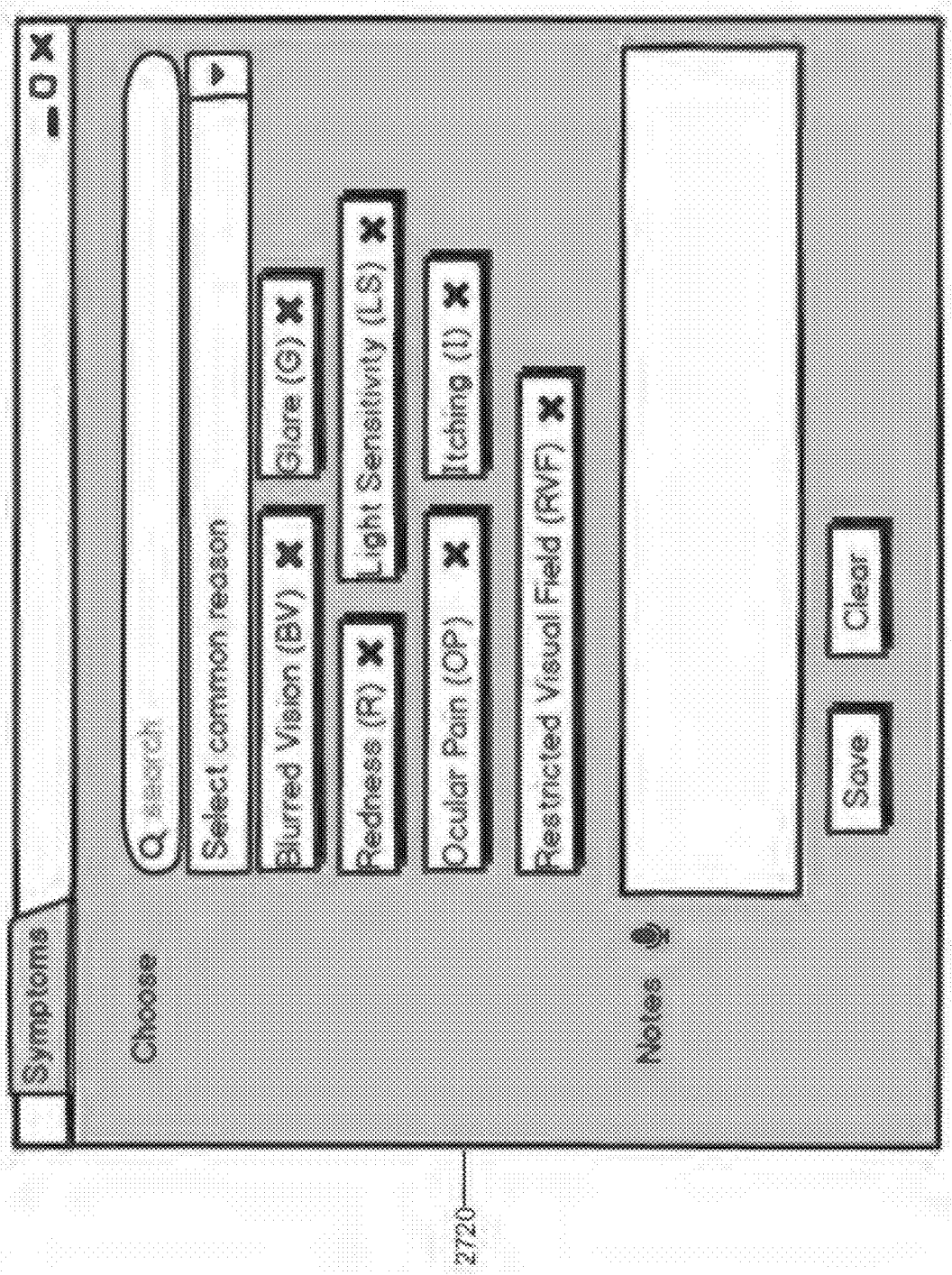

Symptoms
Choose
Q search
Select common reason
Blurred Vision (BV)
Redness (R)
Ocular Pain (OP)
Restricted Visual Field (RVF)
Glare (G)
Light Sensitivity (LS)
Itching (I)
Notes
Clear
Save
2720

Figure 25B

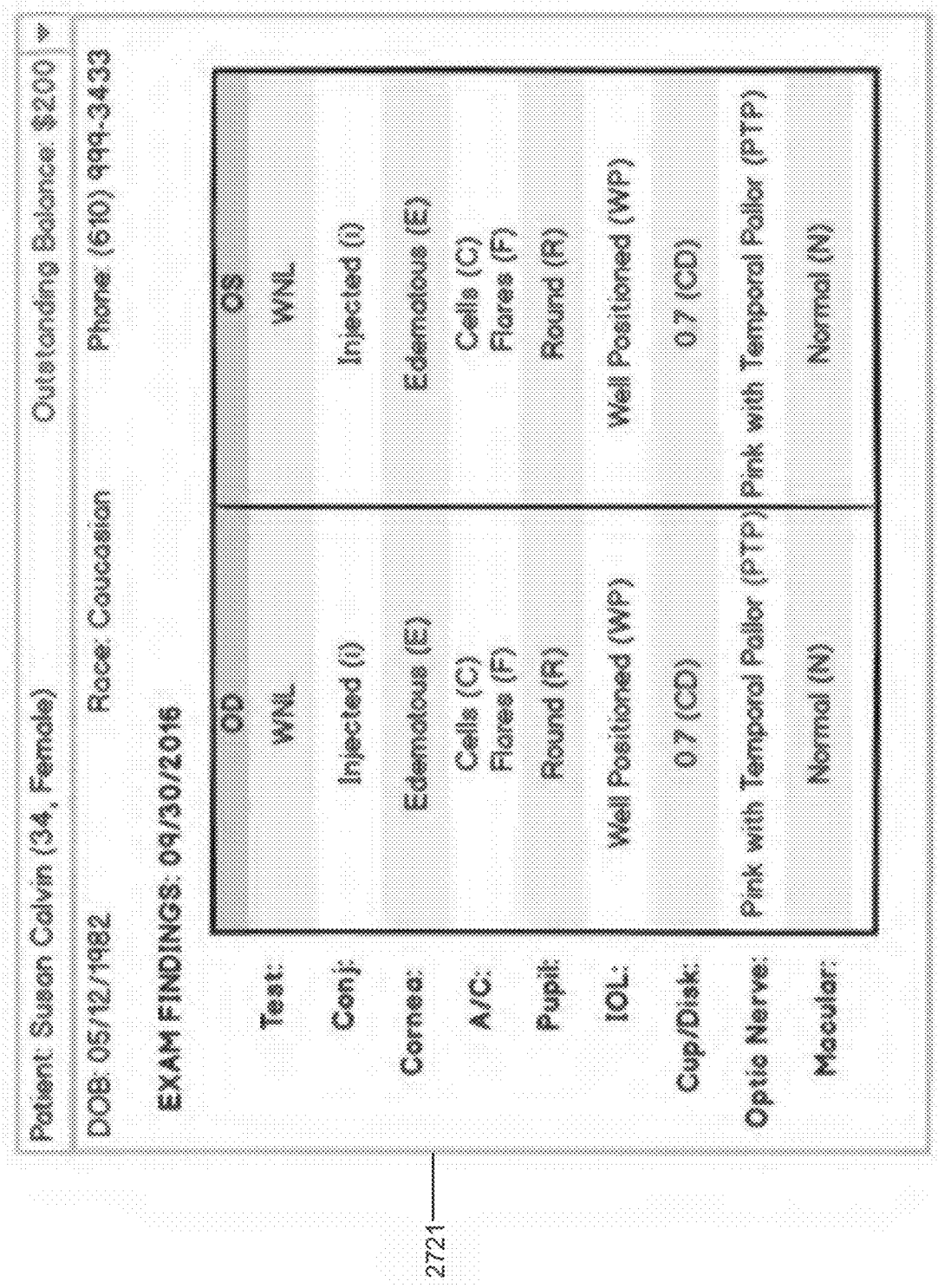

Patient: Susan Calvin (34, Female)
Outstanding Balance: $200
DOB: 05/12/1982
Race: Caucasian
Phone: (610) 999-3433
EXAM FINDINGS: 09/30/2016
OD
OS
Test:
WNL
WNL
Conj:
Injected (i)
Injected (i)
Cornea:
Edematous (E)
Edematous (E)
A/C:
Cells (C)
Flares (F)
Cells (C)
Flares (F)
Pupil:
Round (R)
Round (R)
IOL:
Well Positioned (WP)
Well Positioned (WP)
Cup/Disk:
0.7 (CD)
0.7 (CD)
Optic Nerve:
Pink with Temporal Pallor (PTP)
Pink with Temporal Pallor (PTP)
Macular:
Normal (N)
Normal (N)
2721

Figure 25C

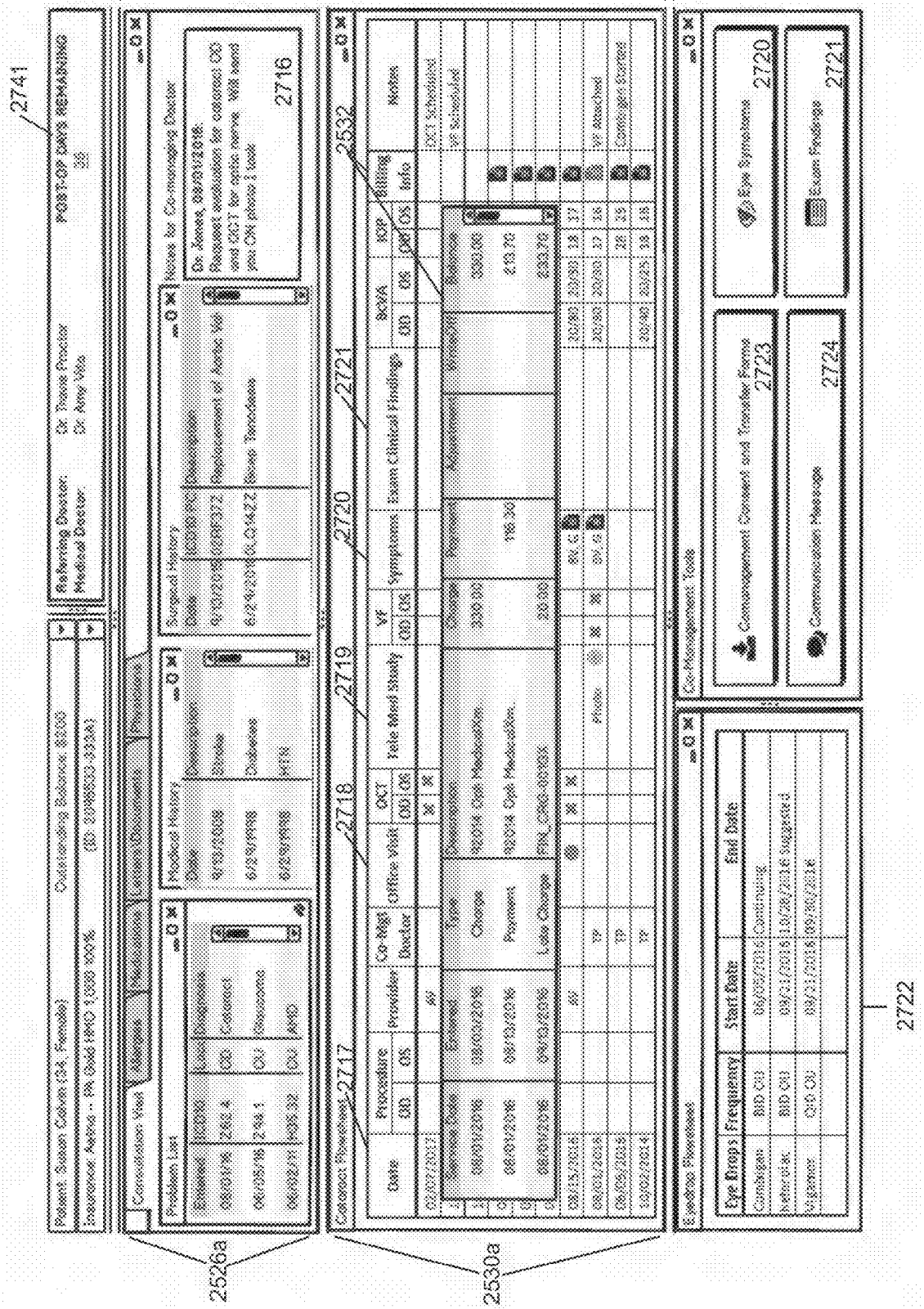

2741
2716
2718
2719
2720
2721
2717
2532
2723
2724
2720
2721
2722
2526a
2530a

Figure 25D

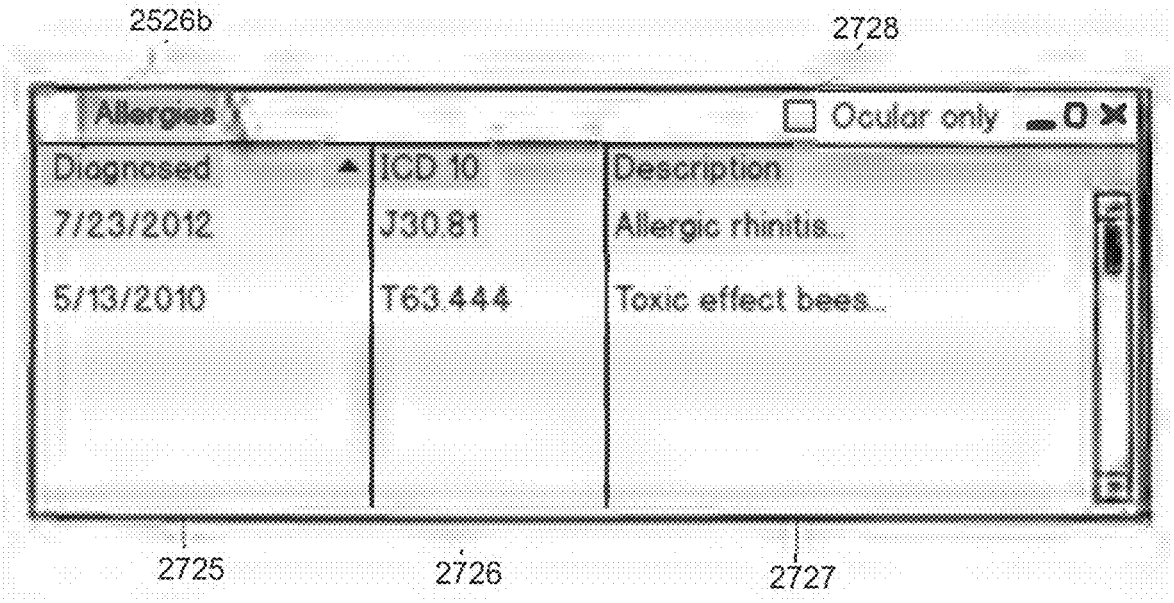

2526b
2728
Allergies
Ocular only
Diagnosed
ICD 10
Description
7/23/2012
J30.81
Allergic rhinitis...
5/13/2010
T63.444
Toxic effect bees...
2725
2726
2727

Figure 26

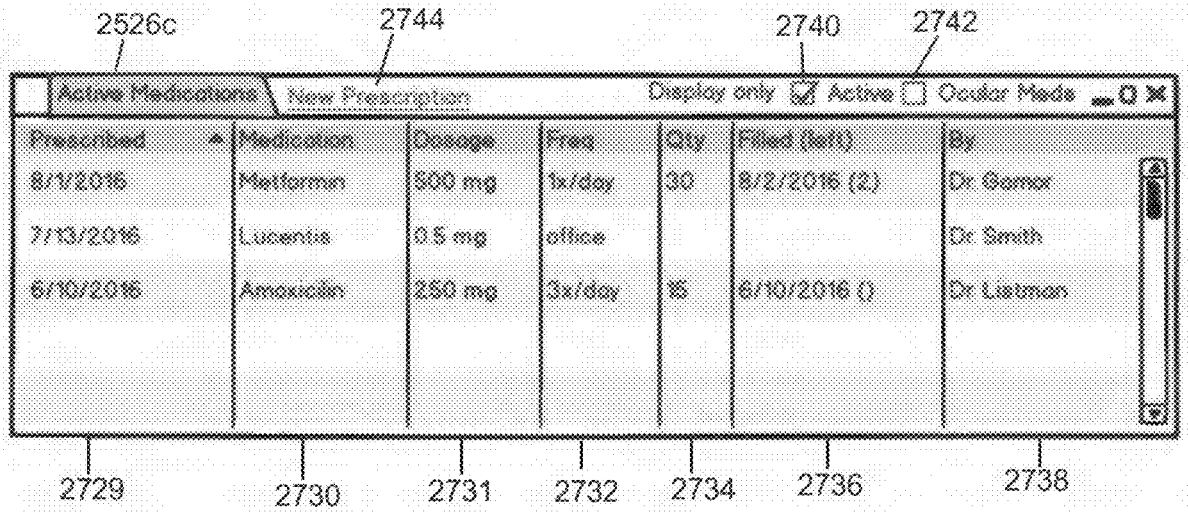

2526c
2744
2740
2742
Active Medications
New Prescription
Display only
Active
Ocular Meds
Prescribed
Medication
Dosage
Freq
Qty
Filled (left)
By
8/1/2016
Metformin
500 mg
1x/day
30
8/2/2016 (2)
Dr Garner
7/13/2016
Lucentis
0.5 mg
office
Dr Smith
6/10/2016
Amoxicillin
250 mg
3x/day
15
6/10/2016 ()
Dr Lastman
2729
2730
2731
2732
2734
2736
2738

Figure 27

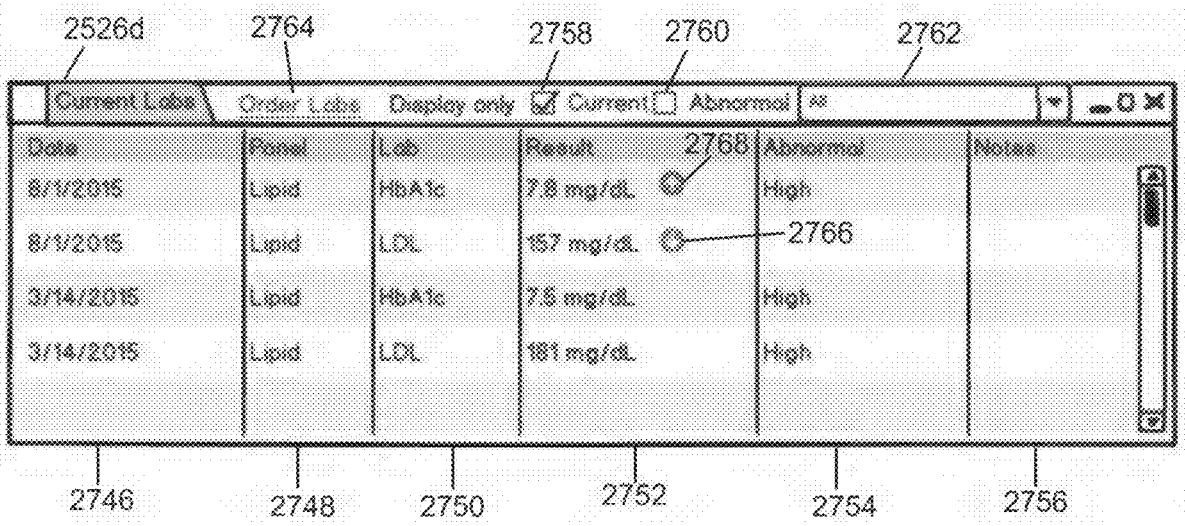

2526d
2764
2758
2760
2762
Current Labs
Order Labs
Display only
Current
Abnormal
All
Date
Panel
Lab
Result
2768
Abnormal
Notes
8/1/2015
Lipid
HbA1c
7.8 mg/dL
High
8/1/2015
Lipid
LDL
157 mg/dL
2766
3/14/2015
Lipid
HbA1c
7.5 mg/dL
High
3/14/2015
Lipid
LDL
181 mg/dL
High
2746
2748
2750
2752
2754
2756

Figure 28

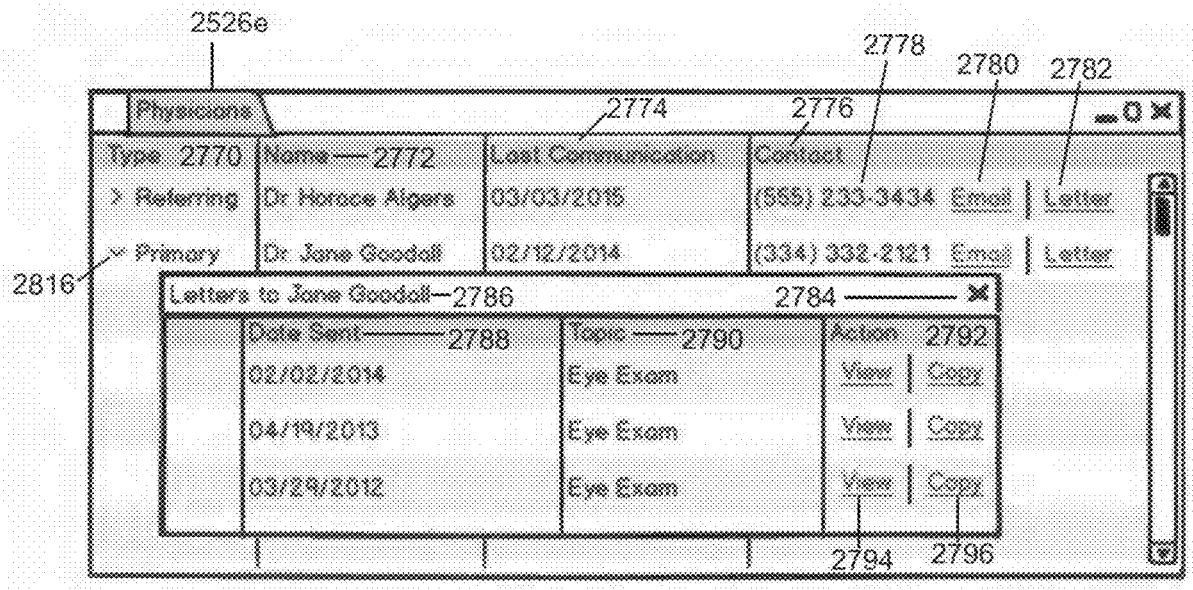

2526e
2778
2780
2782
Physicians
2774
2776
Type 2770
Name 2772
Last Communication
Contact
Referring
Dr. Horace Algers
03/03/2015
(555) 233-3434
Email
Letter
Primary
Dr. Jane Goodall
02/12/2014
(334) 332-2121
Email
Letter
2816
Letters to Jane Goodall 2786
2784
Date Sent 2788
Topic 2790
Action 2792
02/02/2014
Eye Exam
View
Copy
04/19/2013
Eye Exam
View
Copy
03/29/2012
Eye Exam
View
Copy
2794
2796

Figure 29A

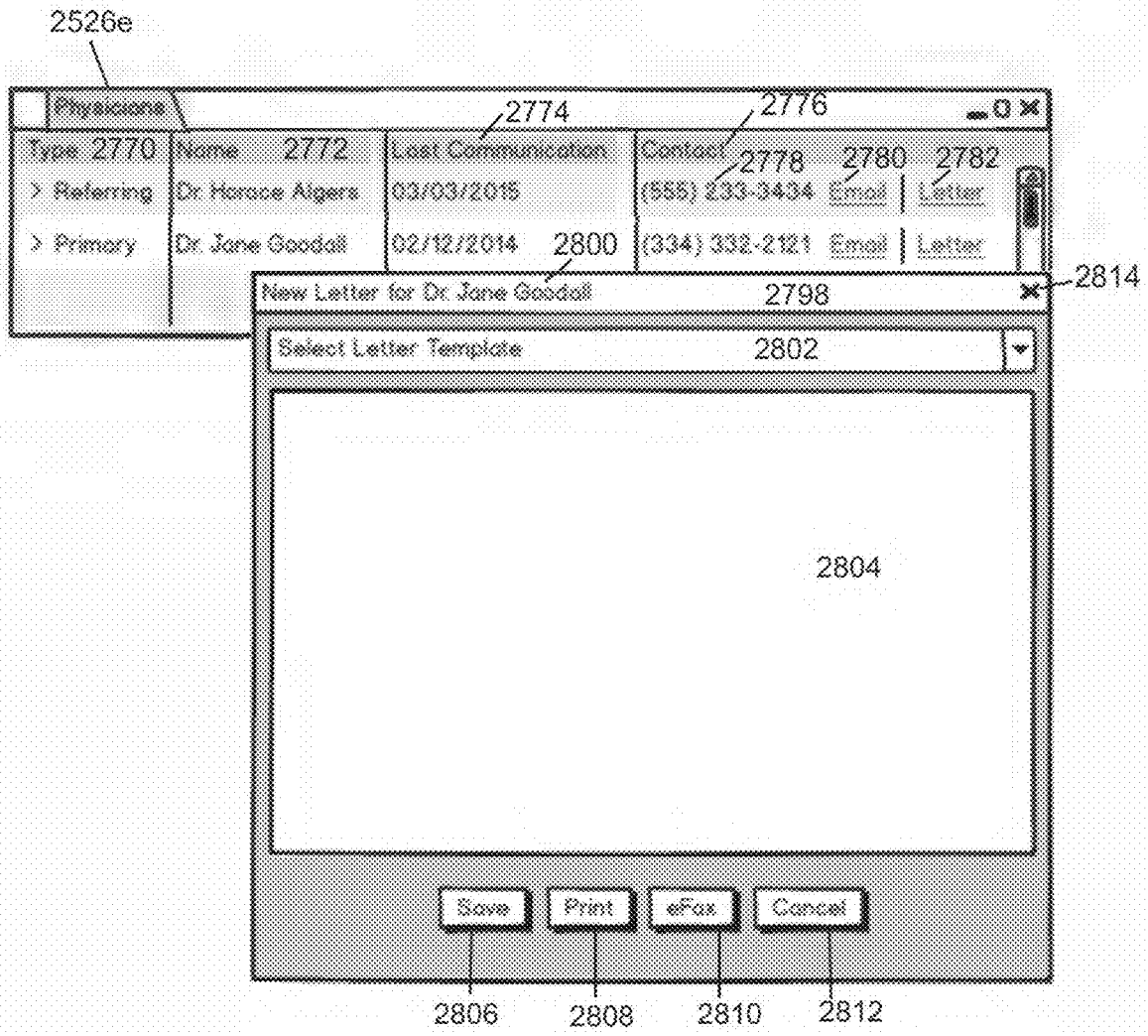

2526e
Physicians
2774
2776
Type 2770
Name 2772
Last Communication
Contact
2778
2780
2782
> Referring
Dr. Horace Algers
03/03/2015
(555) 233-3434
Email
Letter
> Primary
Dr. Jane Goodall
02/12/2014
2800
(334) 332-2121
Email
Letter
New Letter for Dr. Jane Goodall
2798
2814
Select Letter Template
2802
2804
Save
Print
eFax
Cancel
2806
2808
2810
2812

Figure 29B

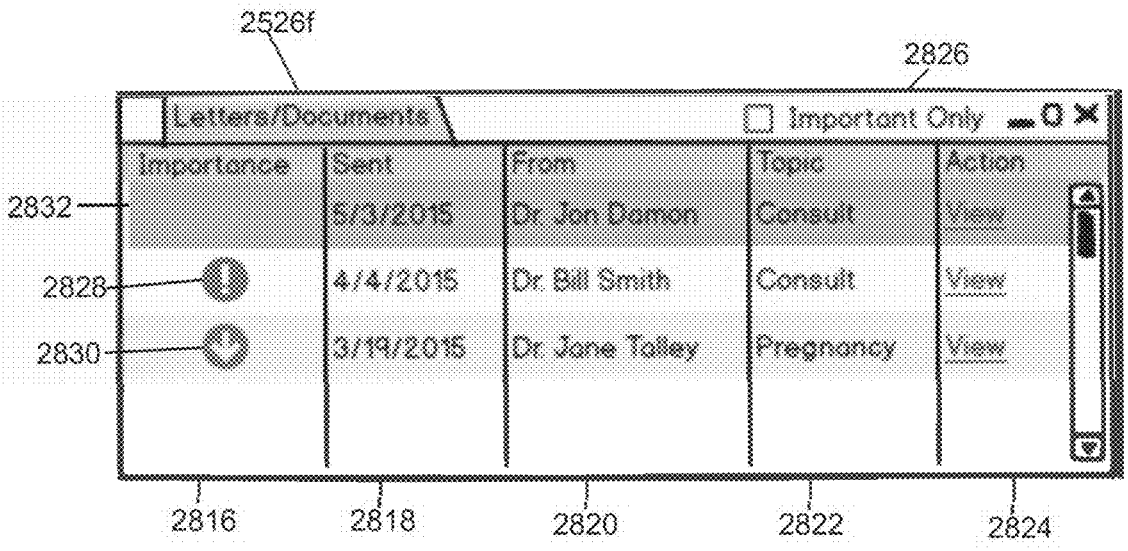

2526f
2826
Letters/Documents
Important Only
Importance
Sent
From
Topic
Action
2832
3/3/2015
Dr. Jon Damon
Consult
View
2828
4/4/2015
Dr. Bill Smith
Consult
View
2830
3/19/2015
Dr. Jane Talley
Pregnancy
View
2816
2818
2820
2822
2824

Figure 30

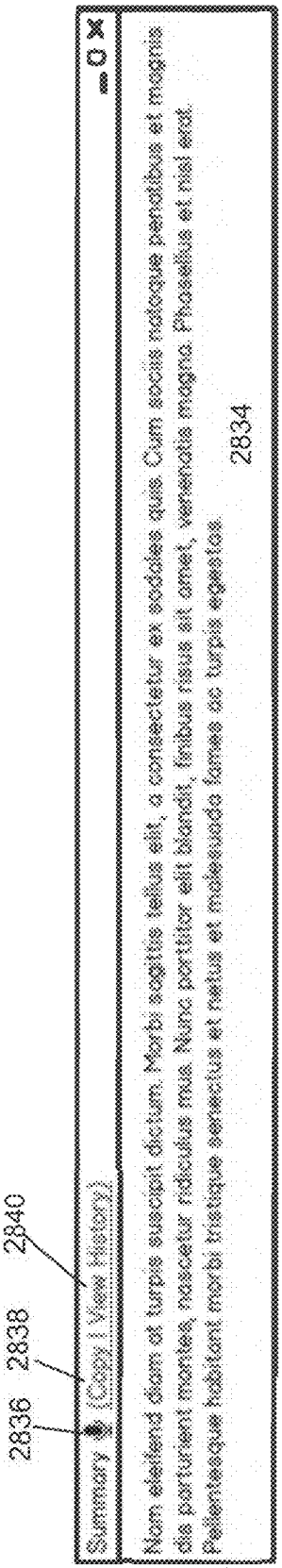

2840
2838
2836
Summary (Copy | View History)
Nam eleifend dum et turpis suscipit dictum. Morbi sagittis tellus elit, a consectetur ex sodales quis. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Nunc porttitor elit blandit, finibus risus sit amet, venenatis magna. Phasellus et nisl erat. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas.
2834

Figure 31

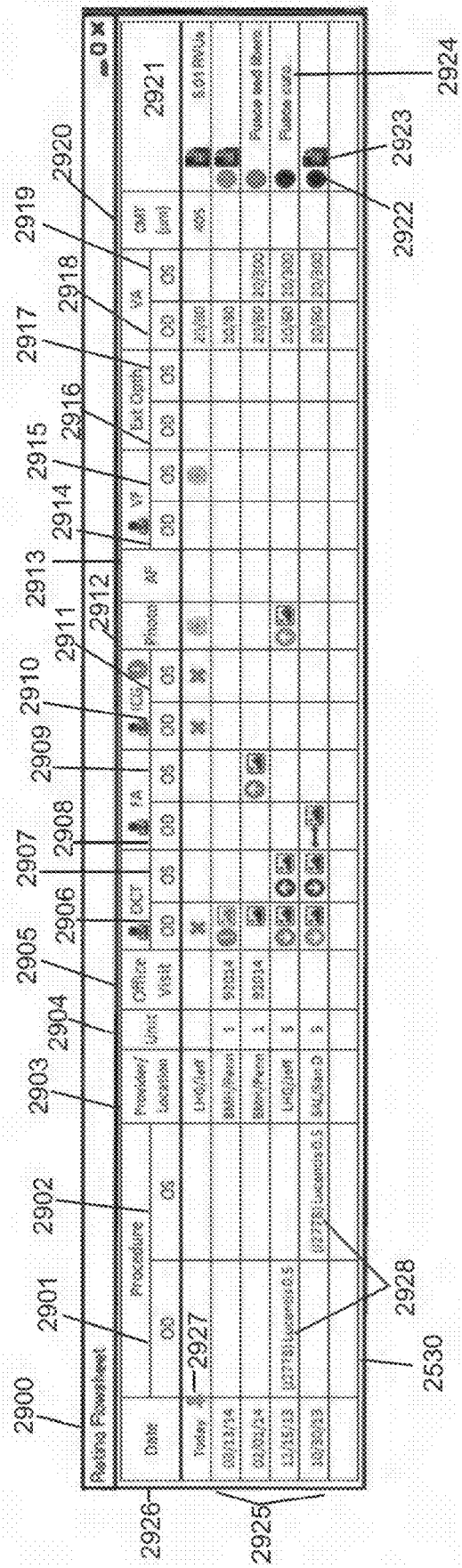

2900
2901
2902
2903
2904
2905
2906
2907
2908
2909
2910
2911
2912
2913
2914
2915
2916
2917
2918
2919
2920
2921
2922
2923
2924
2925
2926
2927
2928
2530

Figure 32A

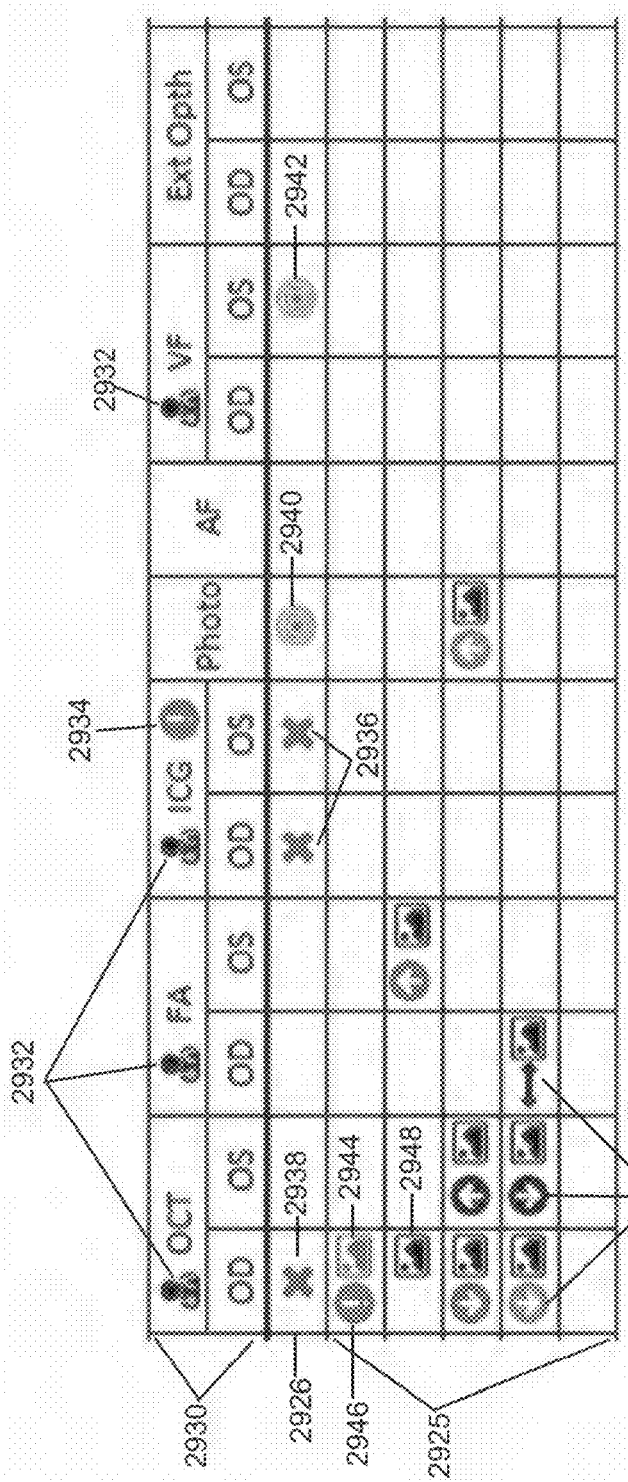

OCT
FA
ICG
Photo
AF
VF
Ext Opth
OD
OS
2930
2932
2934
2936
2938
2940
2942
2944
2946
2948
2950
2925
2926

Figure 32B

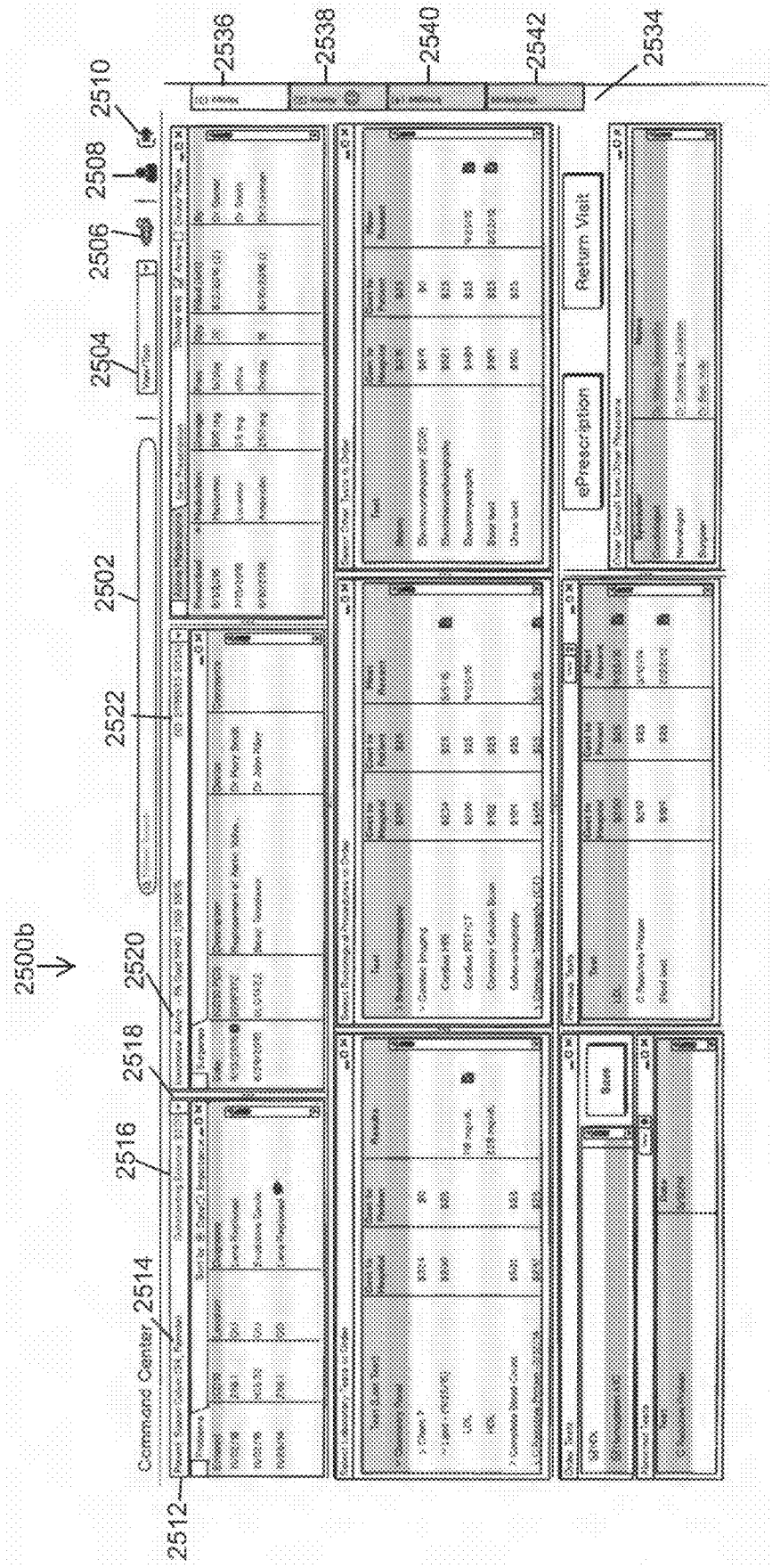

2500b
2502
2504
2506
2508
2510
2512
2514
2516
2518
2520
2522
2534
2536
2538
2540
2542
Command Center
ePrescription
Return Visit

Figure 33A

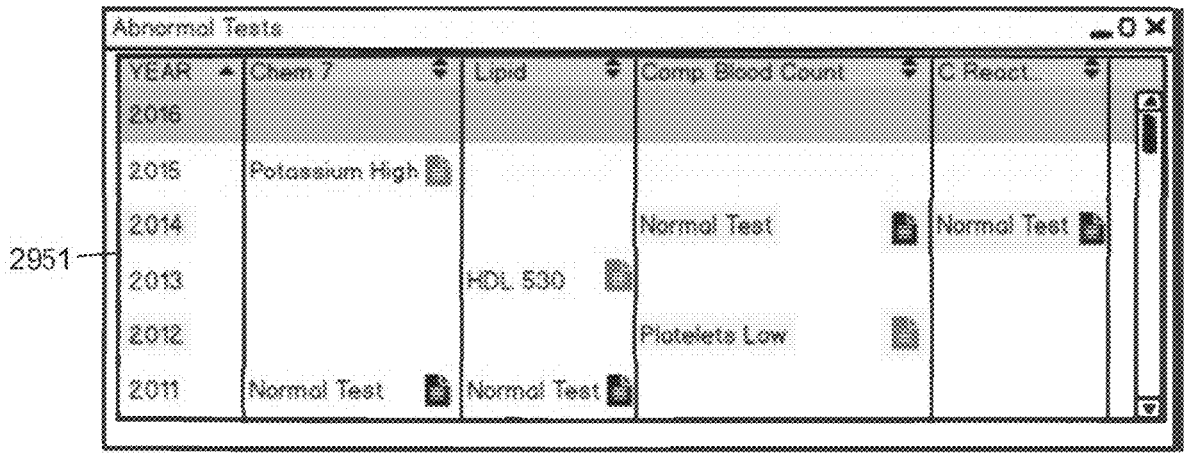

Abnormal Tests
YEAR
Chem 7
Lipid
Comp Blood Count
C React
2016
2015
Potassium High
2014
Normal Test
Normal Test
2013
HDL 530
2012
Platelets Low
2011
Normal Test
Normal Test
2951

Figure 33B

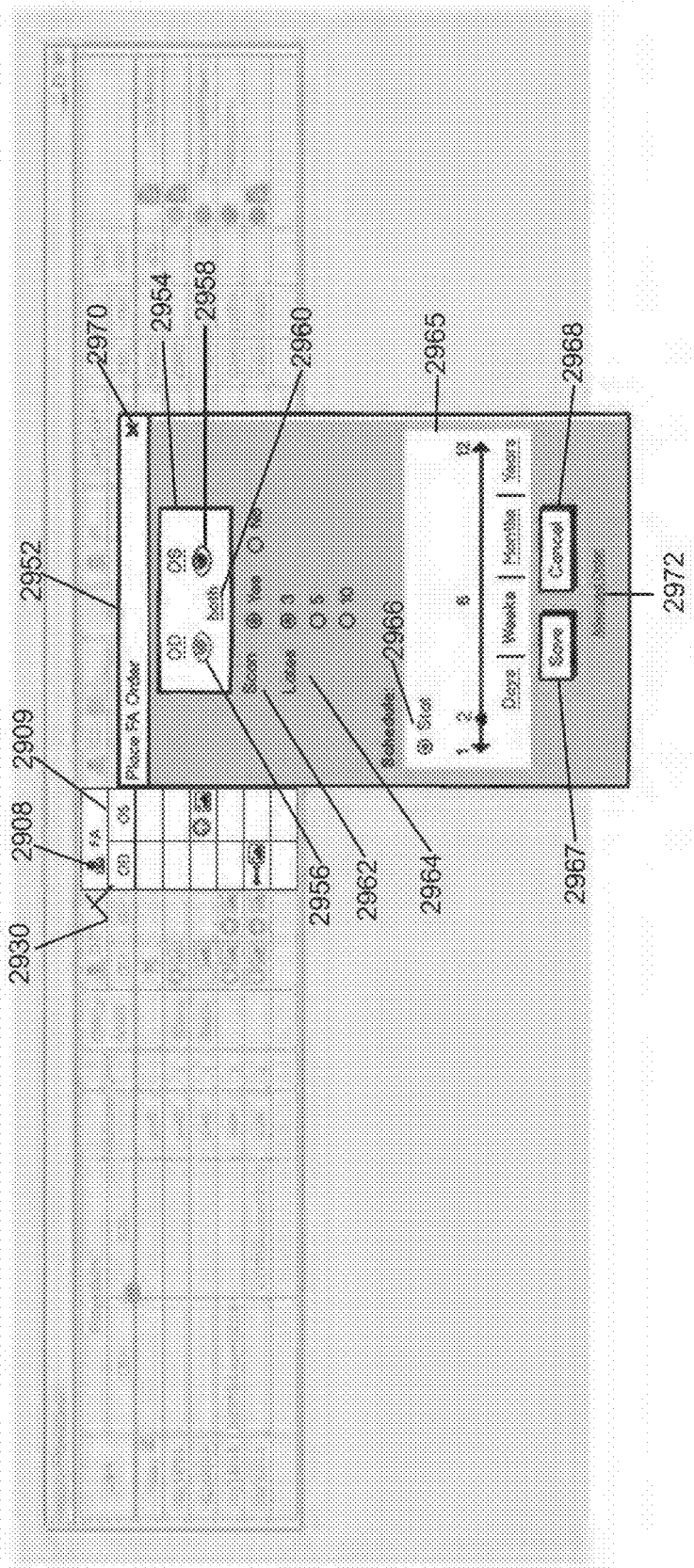

2970
2954
2958
2960
2965
2968
2952
2909
2908
2930
2956
2962
2964
2967
2966
2972
Place SA Order
Cancel
Save

Figure 34A

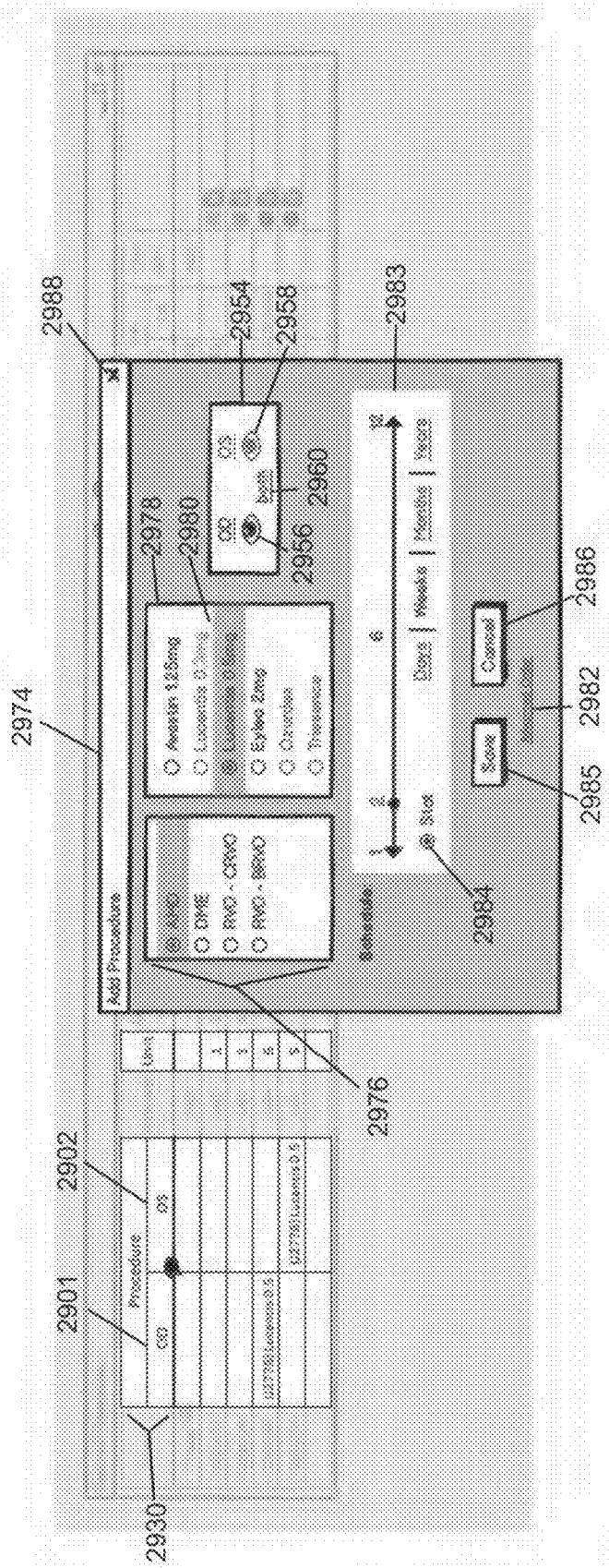

2988
2954
2958
2983
2978
2980
2960
2956
2974
2986
2982
2985
2984
2976
2902
2901
2930

Figure 34B

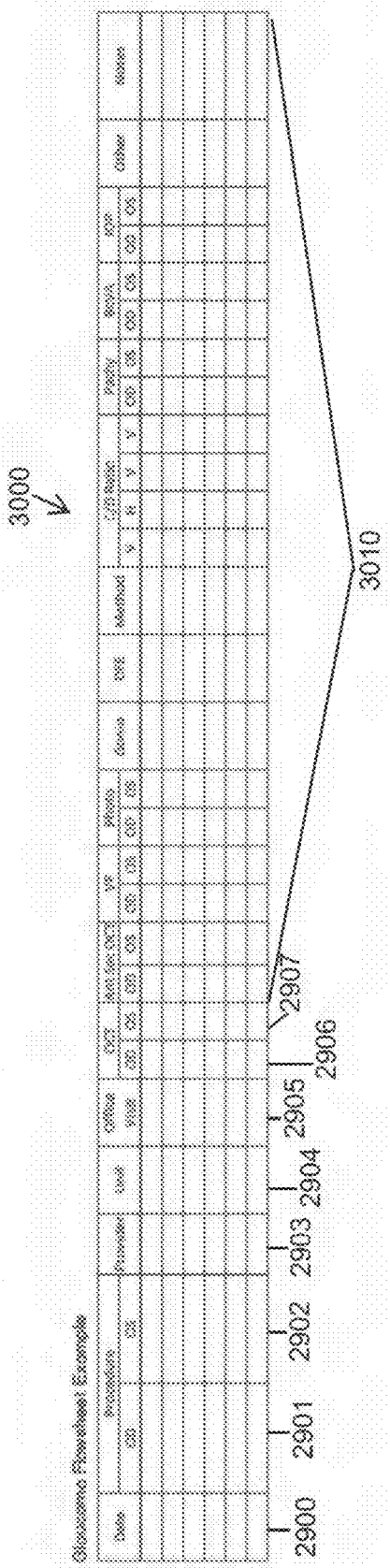


Figure 35

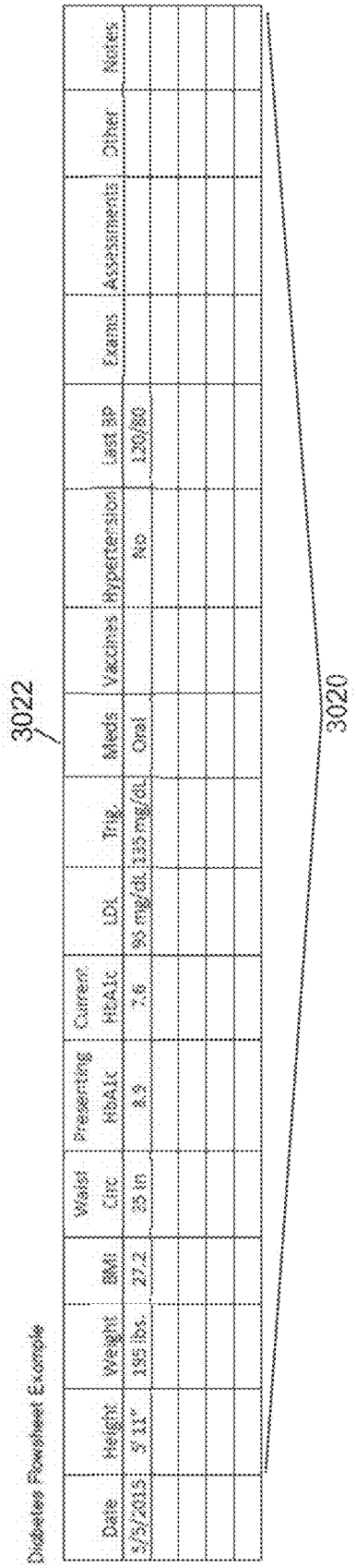

Diabetes Flowsheet Example
Date
Height
Weight
BMI
Waist Circ
Preventive HbA1c
Current HbA1c
LDL
Trig
Meds
Vaccines
Hypertension
Last BP
Exams
Assessments
Other
Notes
5/5/2015
5' 11"
185 lbs.
27.2
35 in
7.6
120/80
No
Crel
3022
3020

Figure 36

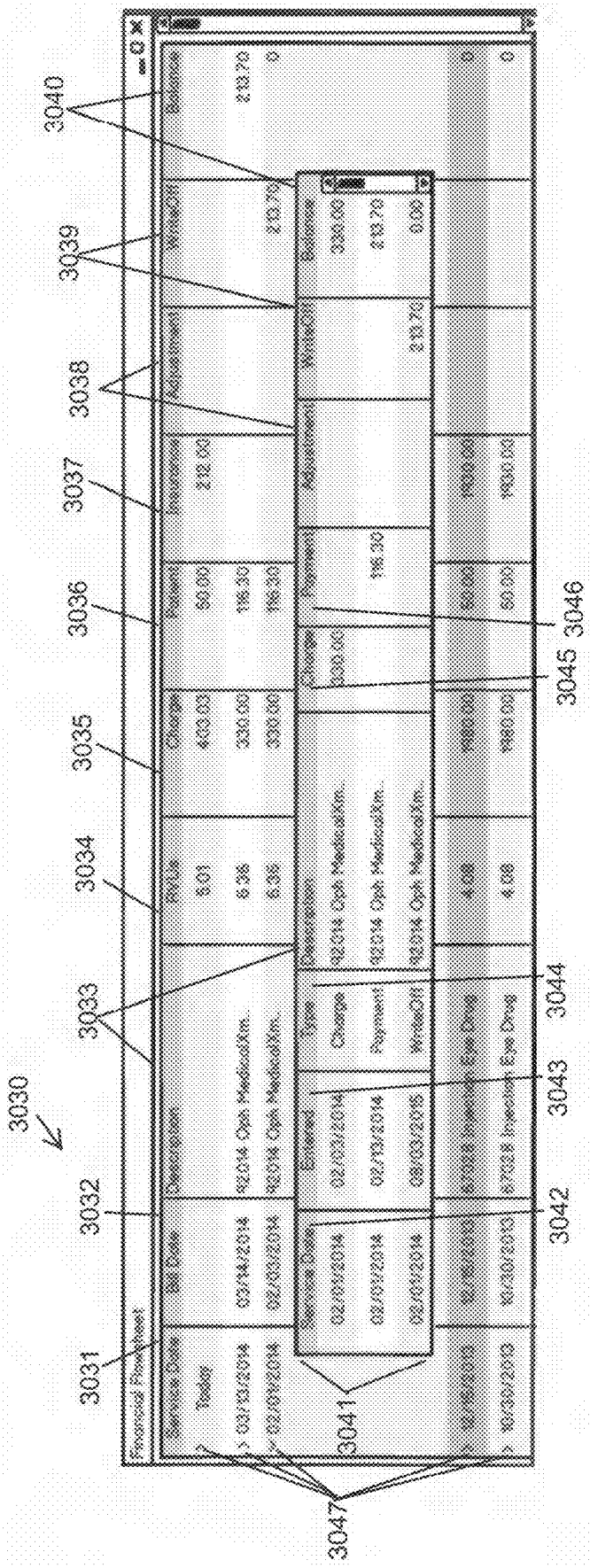

3030
3031
3032
3033
3034
3035
3036
3037
3038
3039
3040
3041
3042
3043
3044
3045
3046
3047

Figure 37

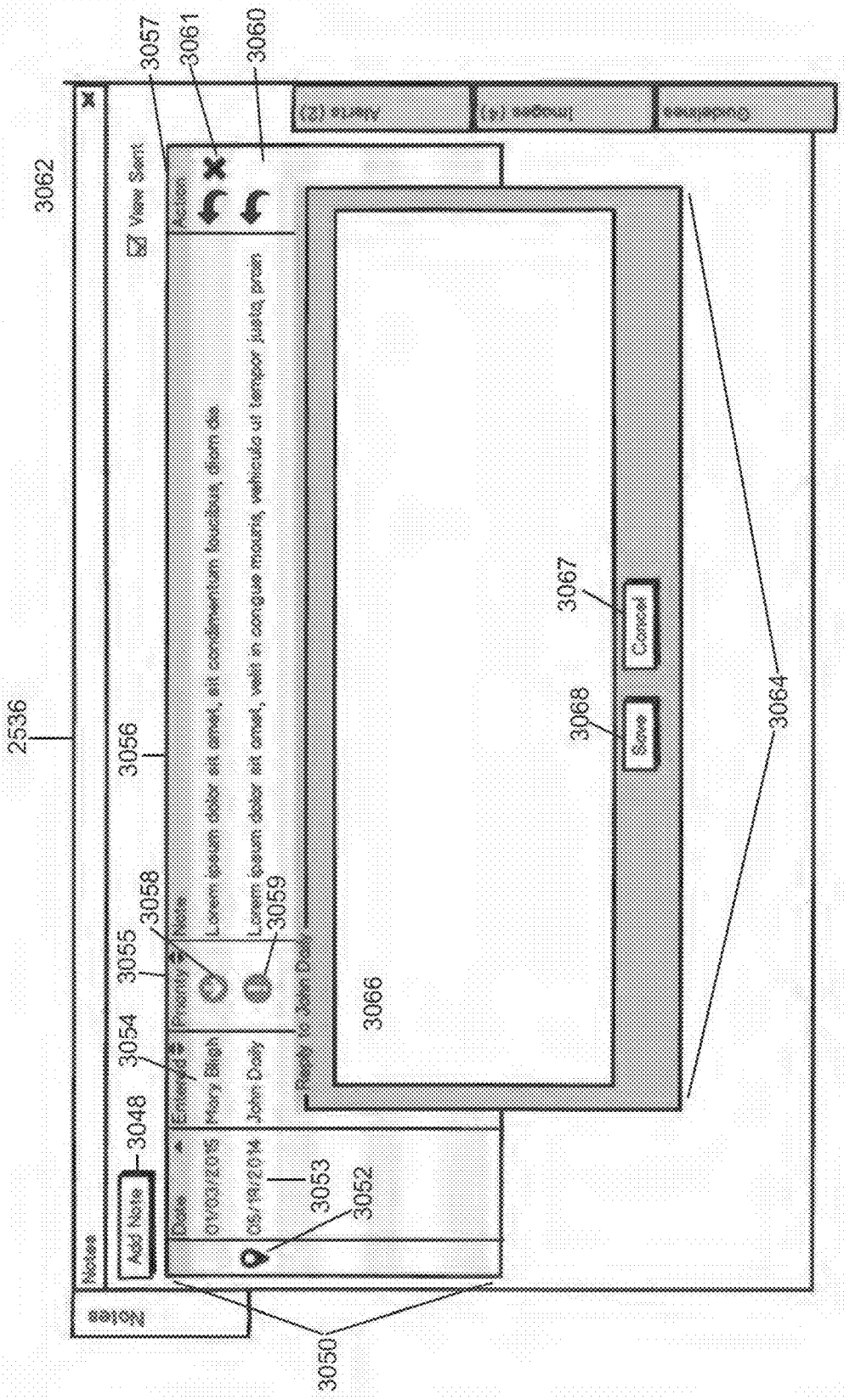

3062
3057
3061
3060
2536
3056
3058
3055
3059
3054
3048
3053
3052
3050
3066
3067
3068
3064
Notes
Add Note
View Sheet
Actions
Cancel
Save

Figure 38

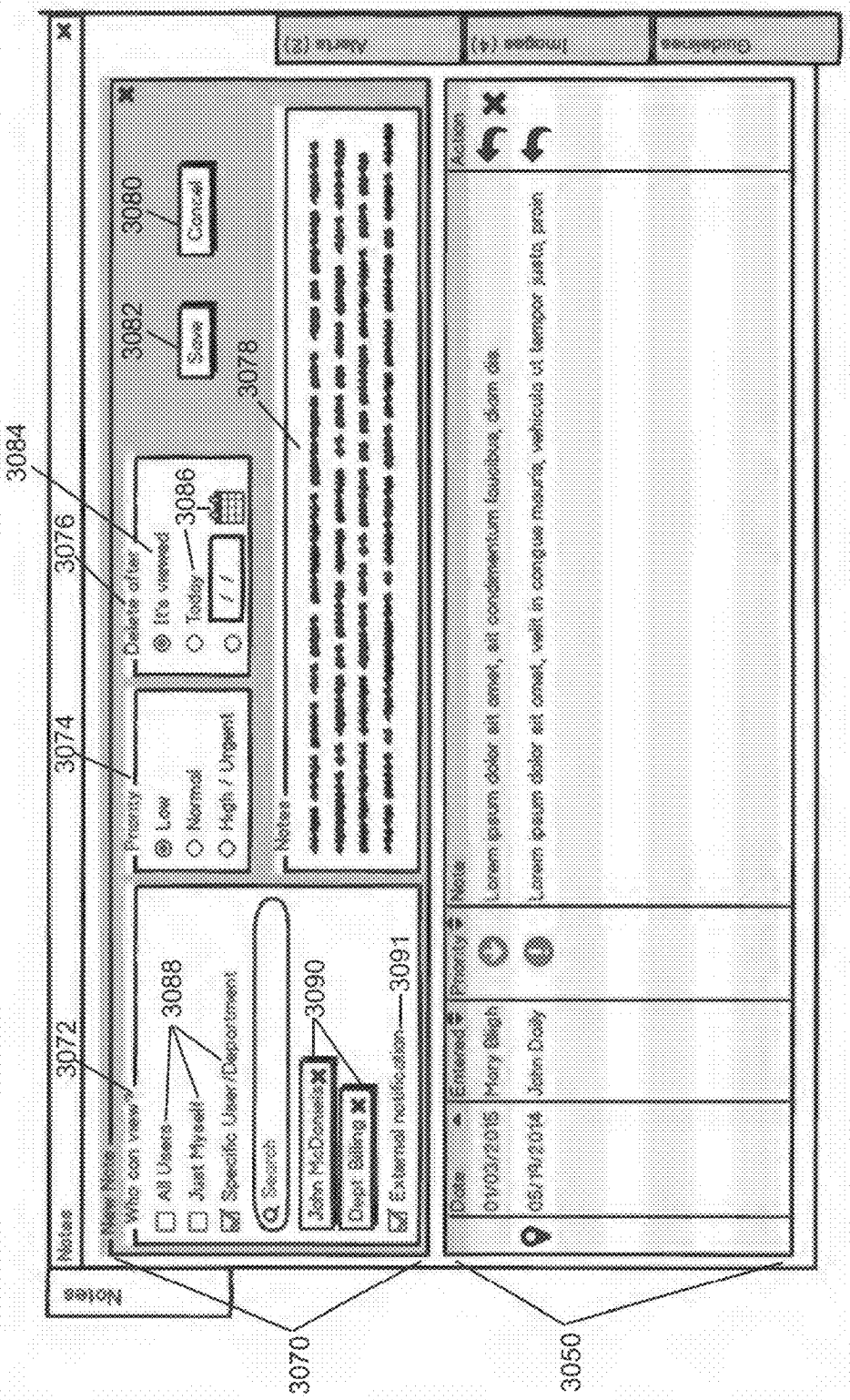

3084
3076
3074
3072
3088
3090
3091
3086
3082
3080
3078
3070
3050

Figure 39

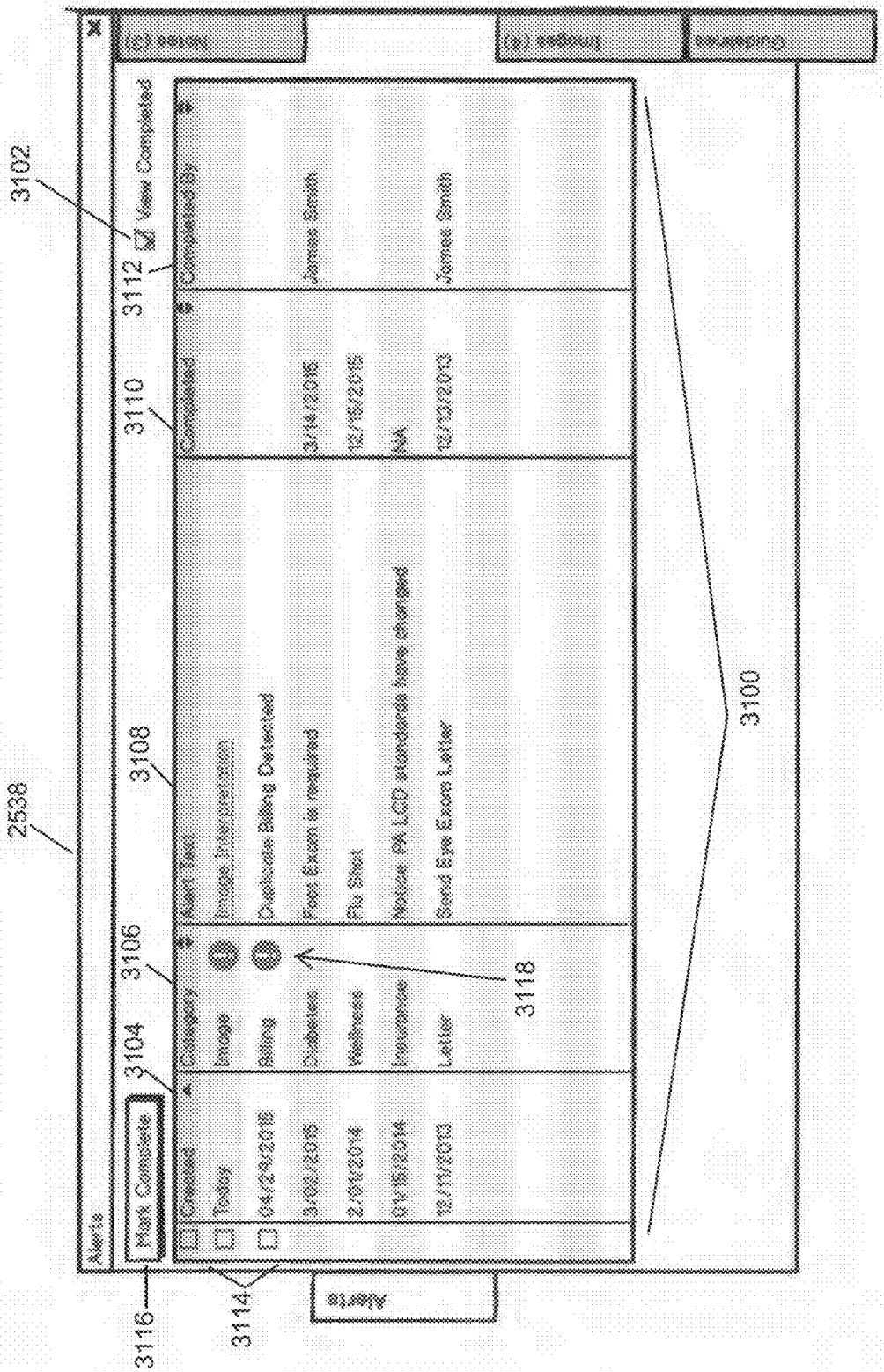

3102
2538
3108
3106
3104
3110
3112
3116
3114
3118
3100
Alerts
Mark Complete
View Completed
Created
Today
04/24/2016
3/03/2015
2/01/2014
01/15/2014
12/11/2013
Category
Image
Billing
Diabetes
Wellness
Insurance
Letter
Alert Text
Image Interpretation
Duplicate Billing Detected
Foot Exam is required
Flu Shot
Notice: PA LCD standards have changed
Send Eye Exam Letter
Completed
3/14/2015
12/15/2015
NA
12/13/2013
Completed By
James Smith
James Smith

Figure 40

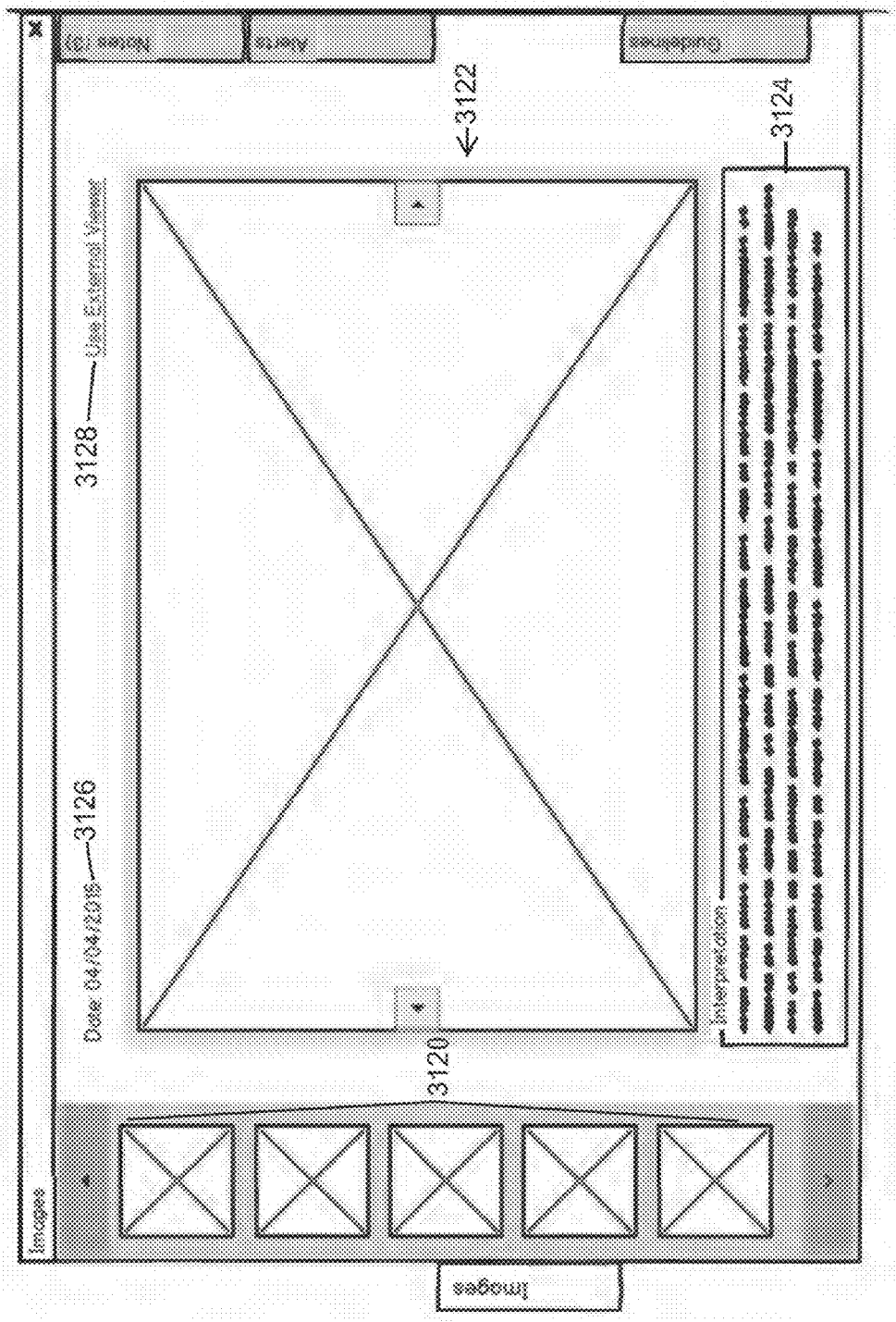


Figure 41A

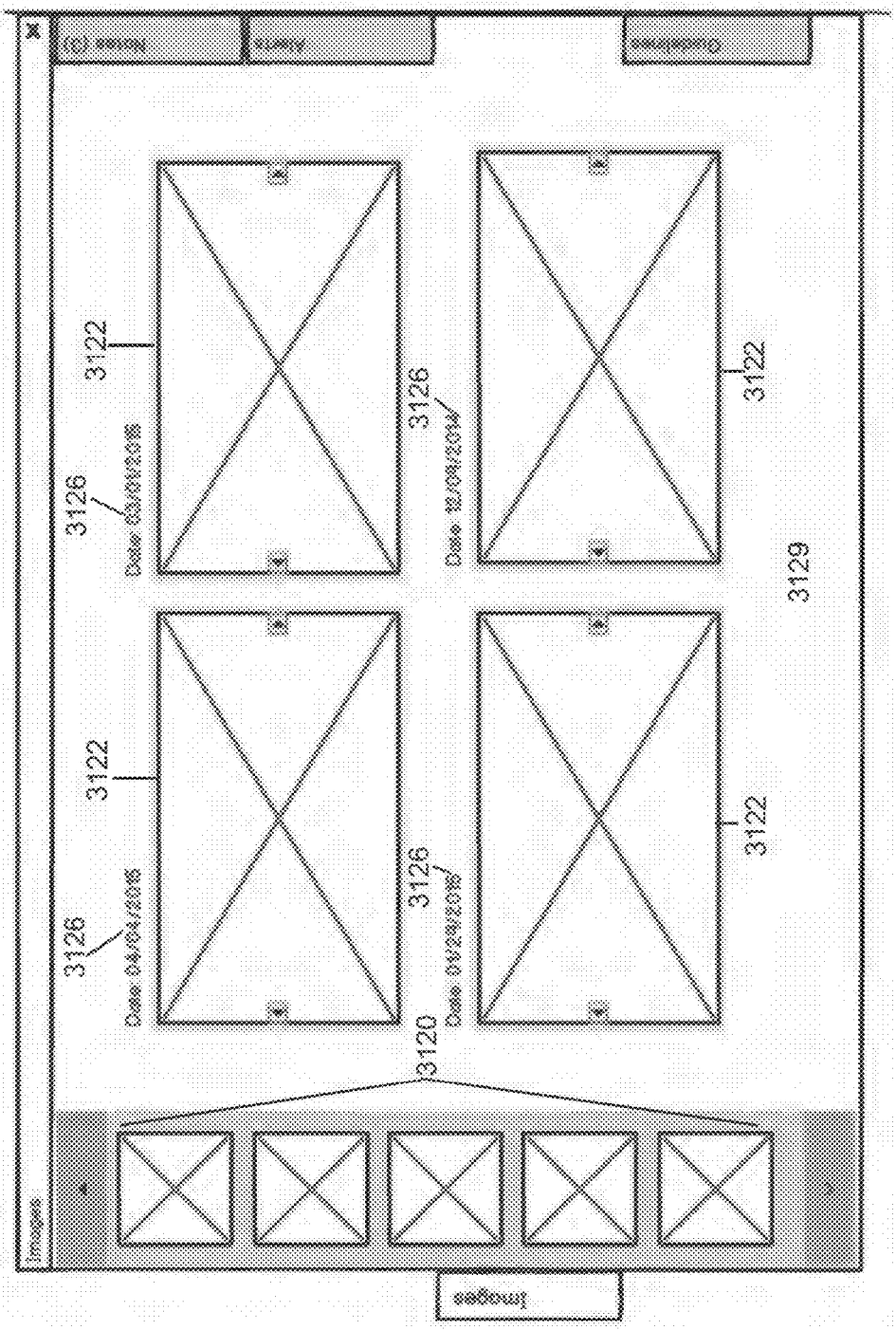


Figure 41B

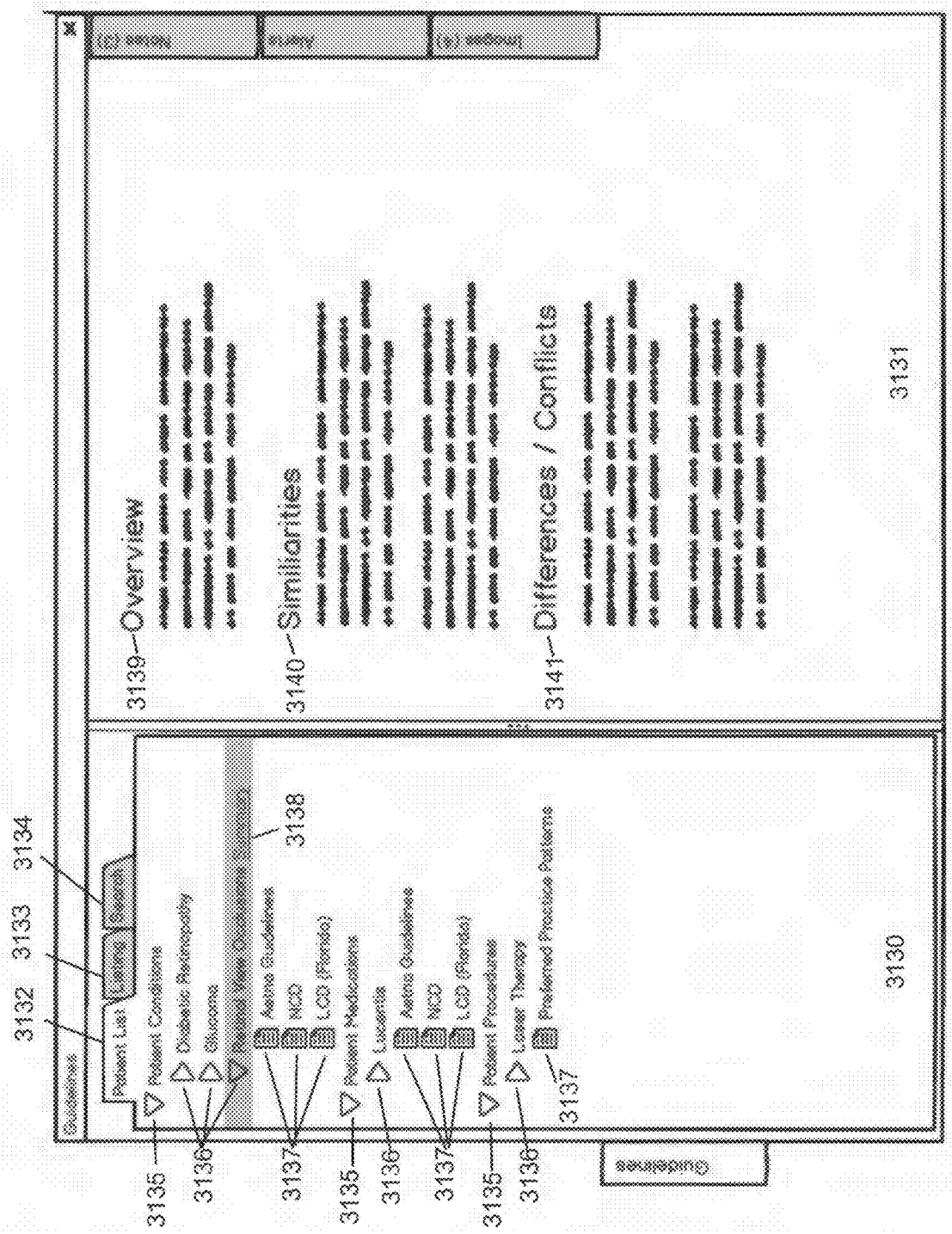

3132
3133
3134
Guidelines
Patient Lists
Patient Conditions
Diabetes Retinopathy
Glaucoma
Patient Medications
Lucentis
Avastin Guidelines
NICE
LCD (Florida)
Patient Procedures
Laser Therapy
Preferred Practice Patterns
3135
3136
3137
3138
3130
3131
3139
Overview
3140
Similiarities
3141
Differences / Conflicts

Figure 42A

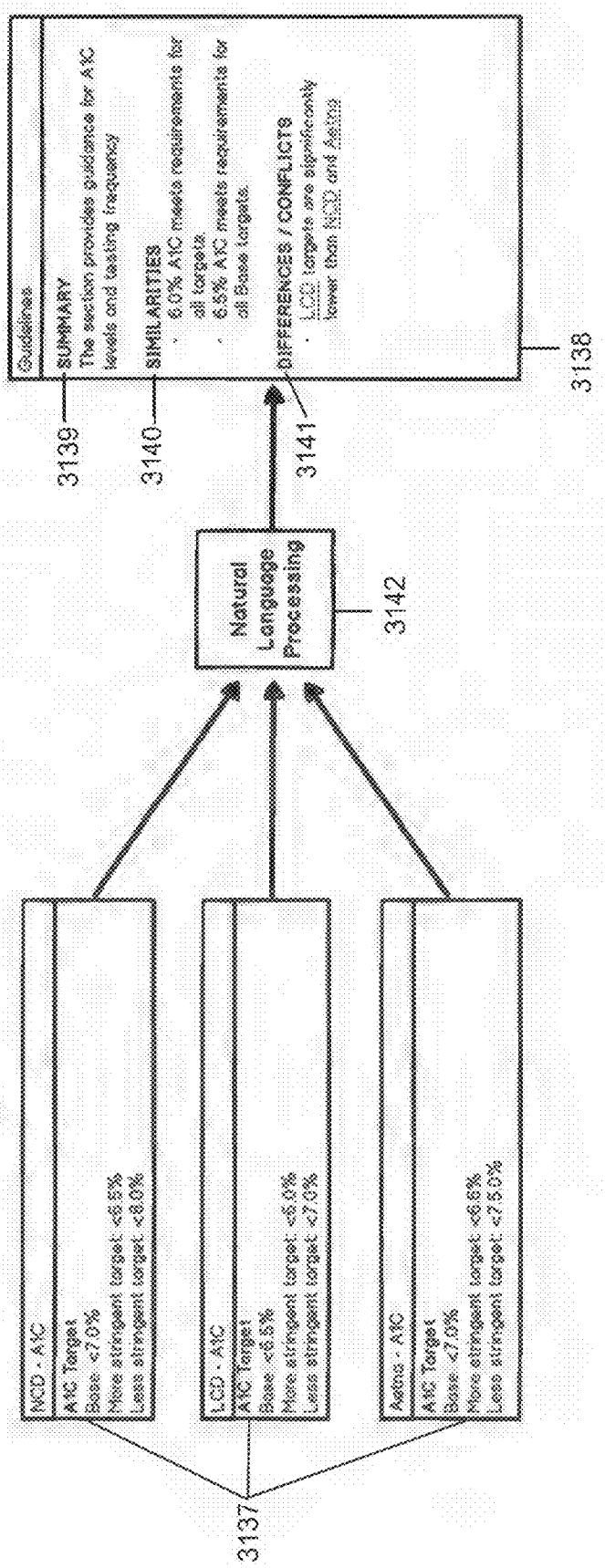

NCD - A1C
A1C Target
Base: <7.0%
More stringent target: <6.5%
Less stringent target: <8.0%
LCD - A1C
A1C Target
Base: <6.5%
More stringent target: <6.0%
Less stringent target: <7.0%
Aetna - A1C
A1C Target
Base: <7.0%
More stringent target: <6.6%
Less stringent target: <7.5.0%
3137
Natural Language Processing
3142
Guidelines
SUMMARY
The section provides guidance for A1C levels and testing frequency
SIMILARITIES
6.0% A1C meets requirements for all targets
6.5% A1C meets requirements for all Base targets
DIFFERENCES / CONFLICTS
LCD targets are significantly lower than NCD and Aetna
3139
3140
3141
3138

Figure 42B

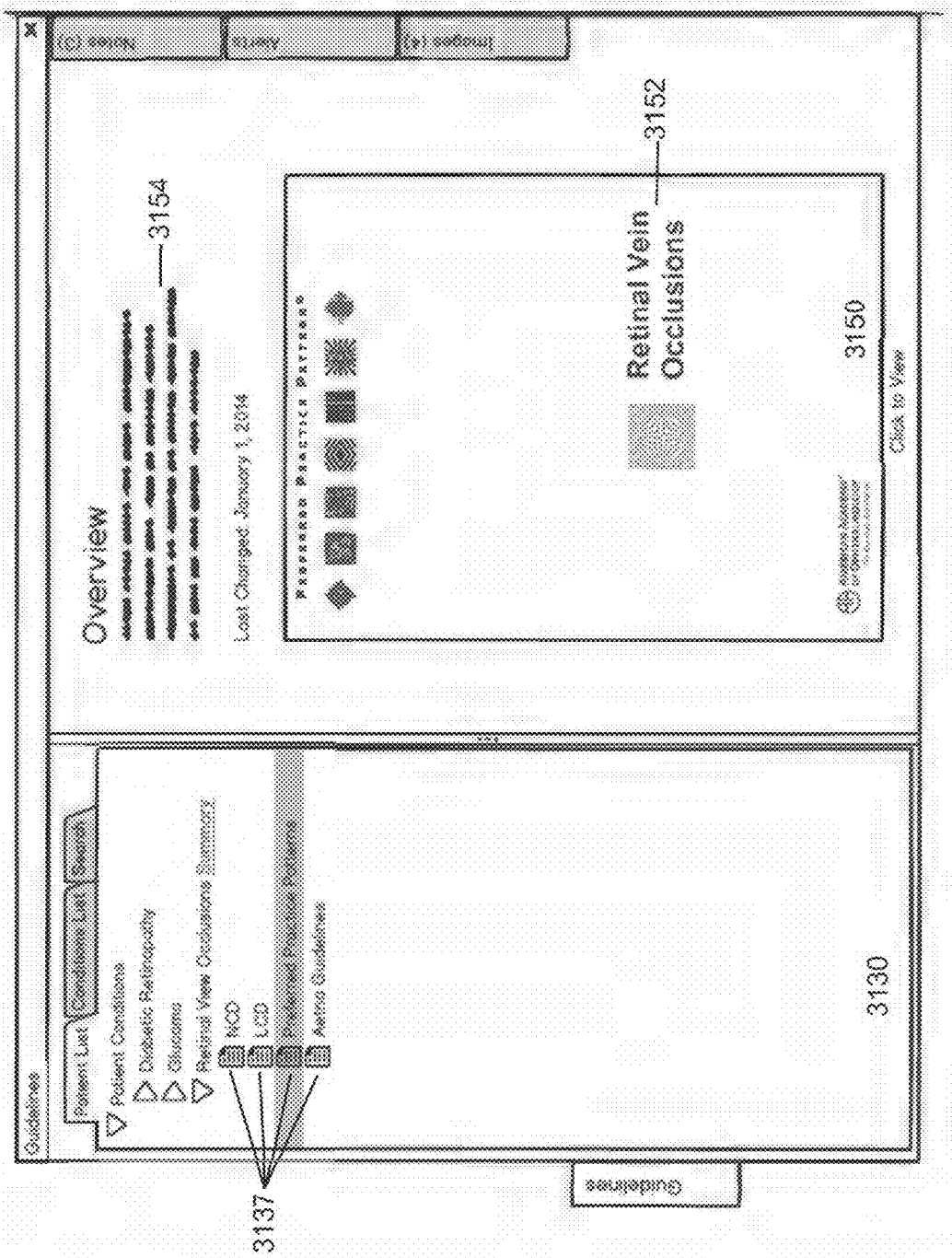

Guidelines
Patient List
Evidence List
Search
Patient Conditions
Diabetic Retinopathy
Glaucoma
Retinal Vein Occlusions Summary
NCO
LCO
Retinal Vein Occlusions
Asthma Guidelines
3137
3130
Guidelines
Overview
3154
Last Changed: January 1, 2016
Progression Practices Patterns
Retinal Vein Occlusions
3152
3150
Click to View

Figure 43

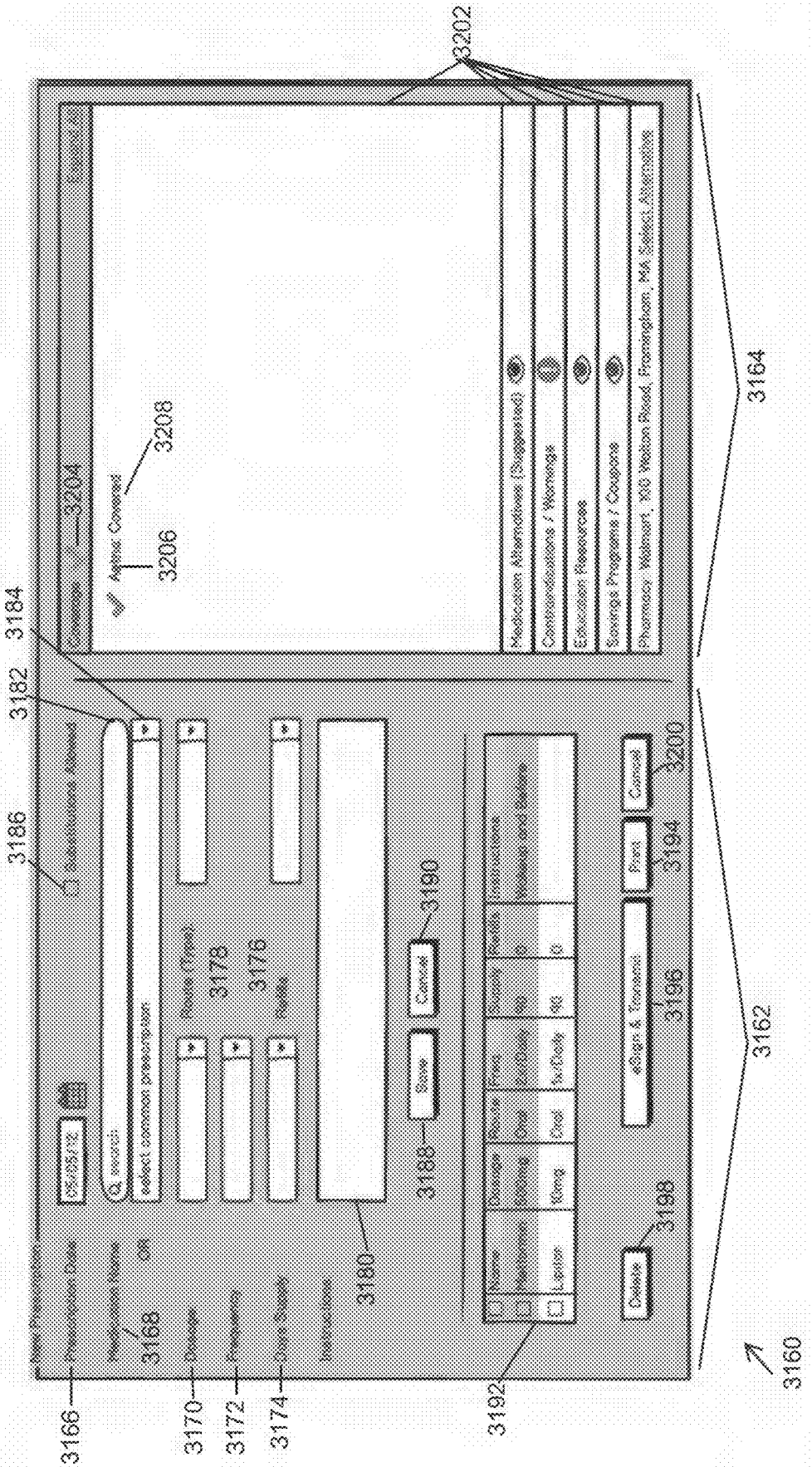

3202
3164
3184
3182
3186
3208
3206
3204
3168
3178
3178
3190
3188
3180
3200
3194
3196
3198
3192
3162
3160
3166
3170
3172
3174

Figure 44

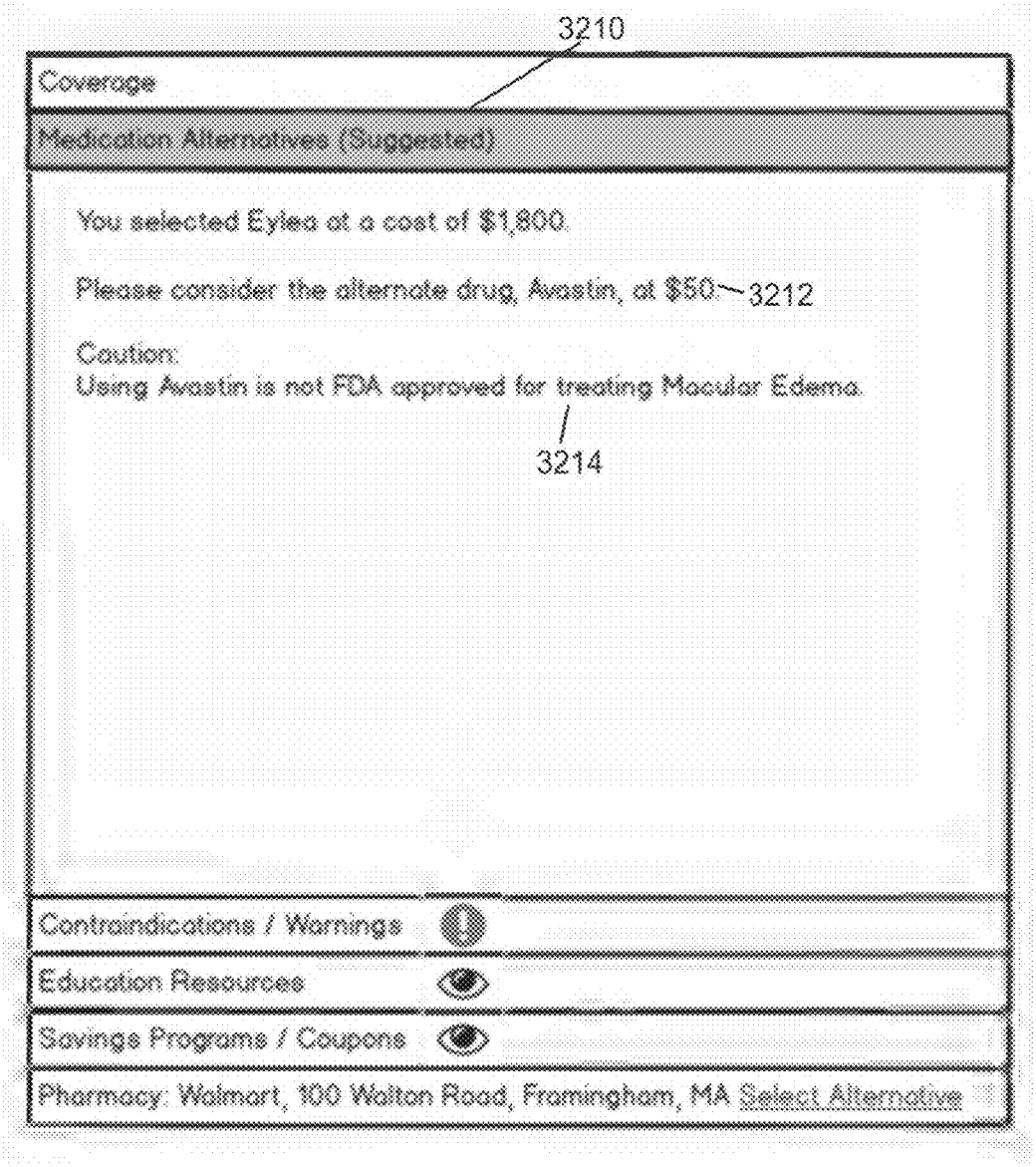

3210
Coverage
Medication Alternatives (Suggested)
You selected Eylea at a cost of $1,800.
Please consider the alternate drug, Avastin, at $50
3212
Caution:
Using Avastin is not FDA approved for treating Macular Edema.
3214
Contraindications / Warnings
Education Resources
Savings Programs / Coupons
Pharmacy: Walmart, 100 Walton Road, Framingham, MA Select Alternative

Figure 45

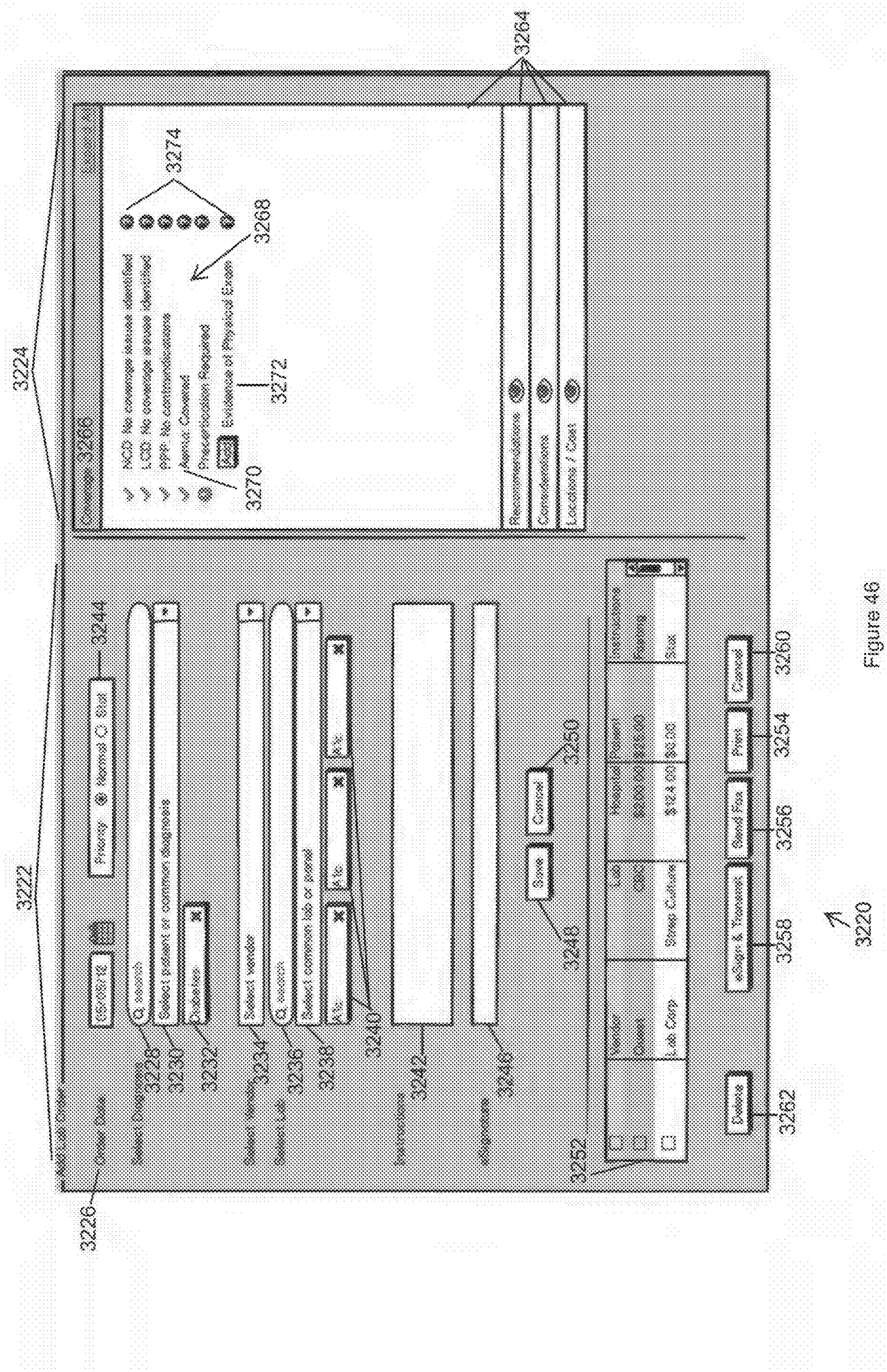

3222
3224
3264
3274
3268
3266
3272
3270
NCD: No coverage issues identified
LCD: No coverage issues identified
PPP: No contraindications
Annual Covered
Precertification Required
Evidence of Physical Exam
Recommendations
Contraindications
Locations / Cost
Priority
Normal
Stat
3244
3226
Order Date
3228
3230
3232
Select Diagnosis
Select Vendor
Select Lab
Select vendor
Select common lab or panel
3234
3236
3238
3240
Instructions
3242
Diagnosis
3246
Save
Cancel
3248
3250
Vendor
Lab Corp
Strep Culture
Stat
3252
Delete
eSign & Transmit
Send Fax
Print
Cancel
3262
3258
3256
3254
3260
3220

Figure 46

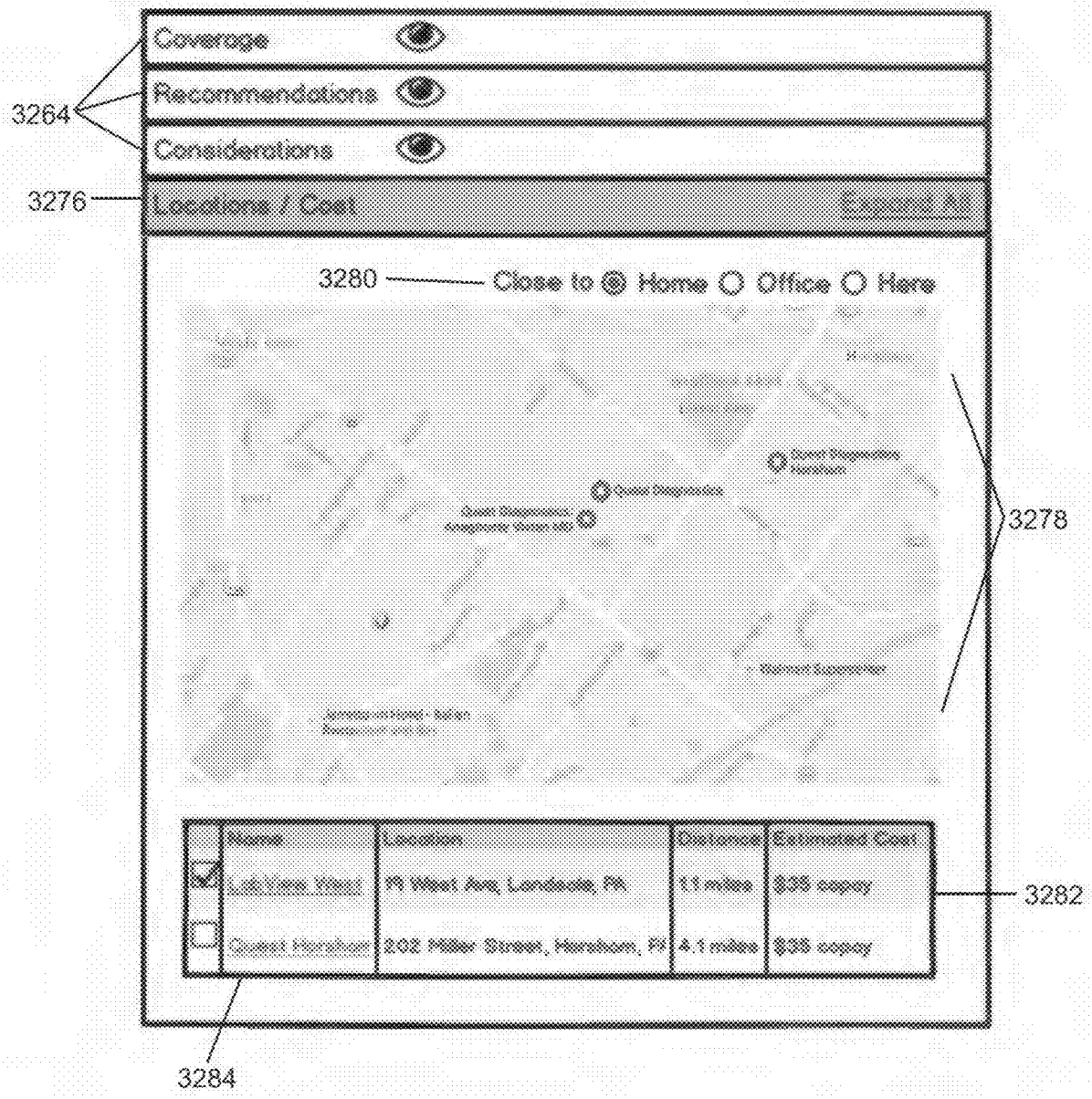

Coverage
Recommendations
Considerations
3264
3276
Locations / Cost
3280
Close to
Home
Office
Here
3278
Name
Location
Distance
Estimated Cost
3282
3284

Figure 47

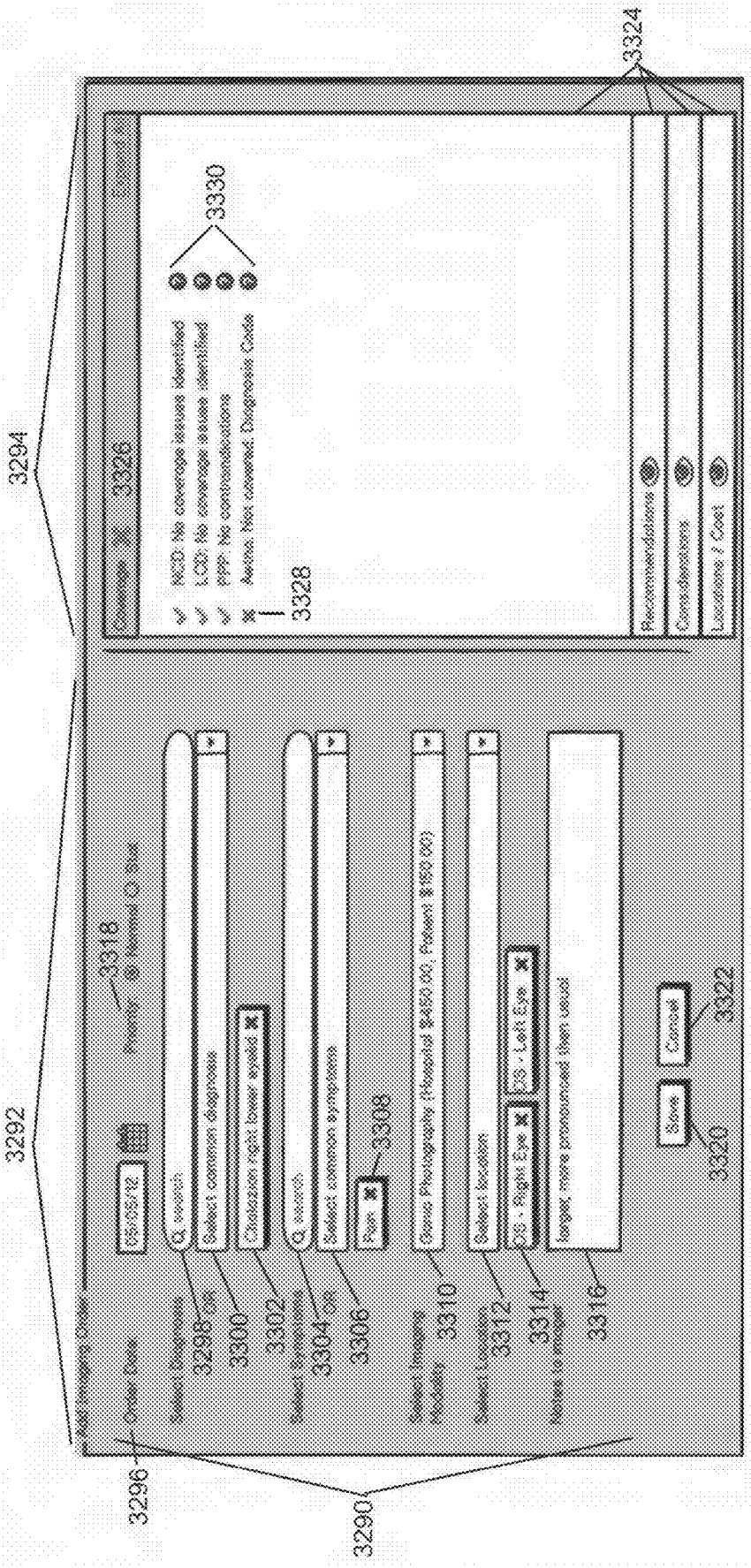

3294
3324
3330
3328
3326
3292
3318
3296
3290
3298
3300
3302
3304
3306
3308
3310
3312
3314
3316
3320
3322

Figure 48

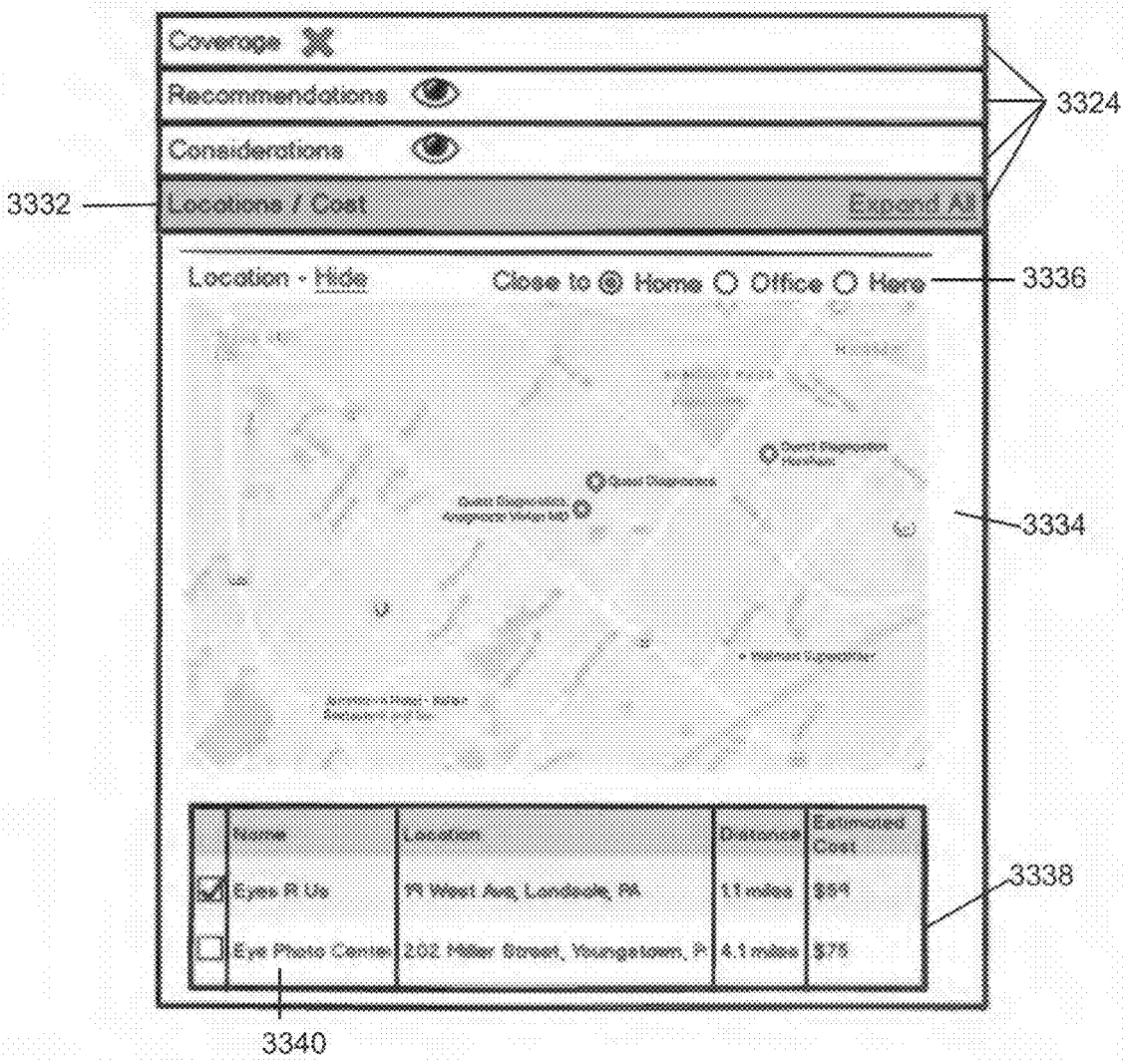

Coverage
Recommendations
Considerations
Locations / Cost
Export to Xl
3324
3332
Location - Hide
Close to Home Office Here
3336
3334
3338
3340

Figure 49

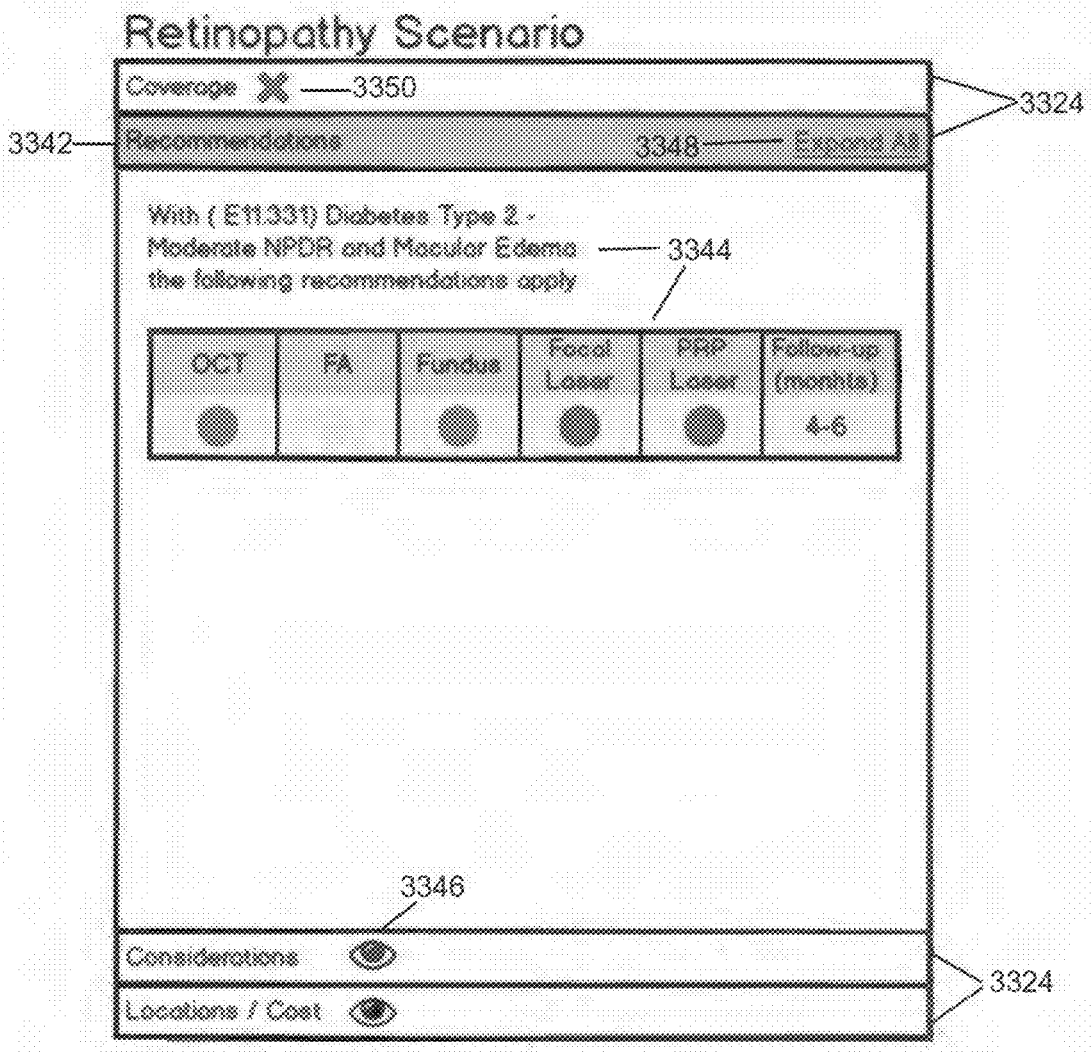

Retinopathy Scenario
Coverage
3350
3324
3342
3348
With (E11.331) Diabetes Type 2 -
Moderate NPDR and Macular Edema
the following recommendations apply
3344
OCT
FA
Fundus
Focal Laser
PRP Laser
Follow-up (months)
4-6
3346
Considerations
Locations / Cost
3324

Figure 50

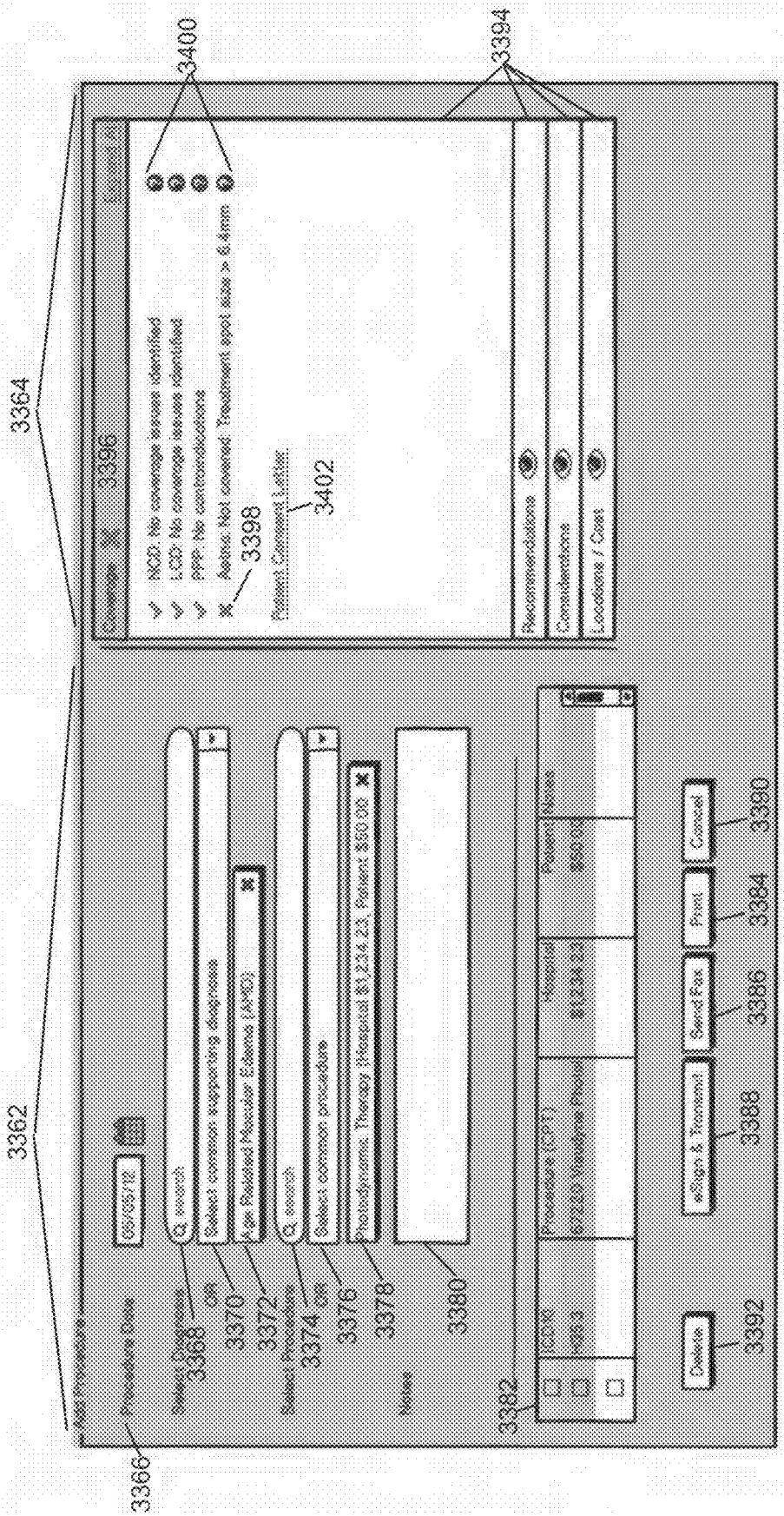

3400
3394
3364
3396
3398
3402
3362
3366
3368
3370
3372
3374
3376
3378
3380
3382
3384
3386
3388
3390
3392
3360

Figure 51

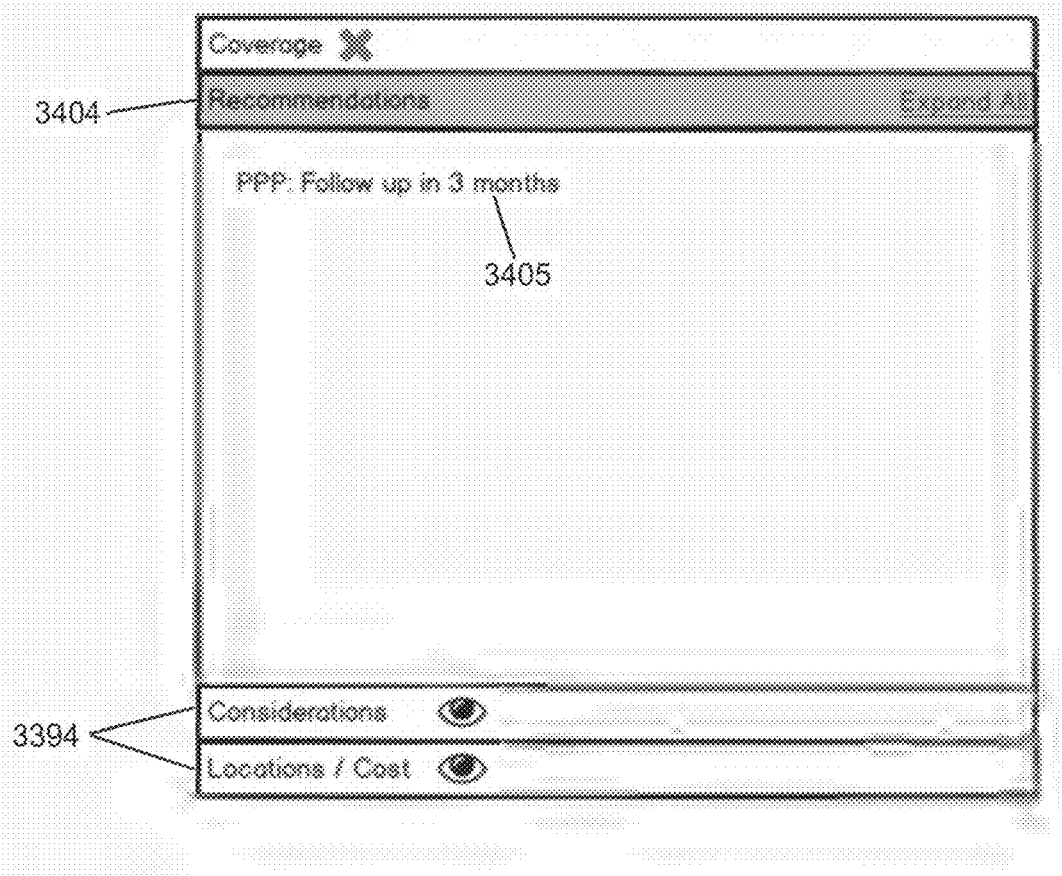

Coverage
3404
PPP: Follow up in 3 months
3405
3394
Considerations
Locations / Cost

Figure 52

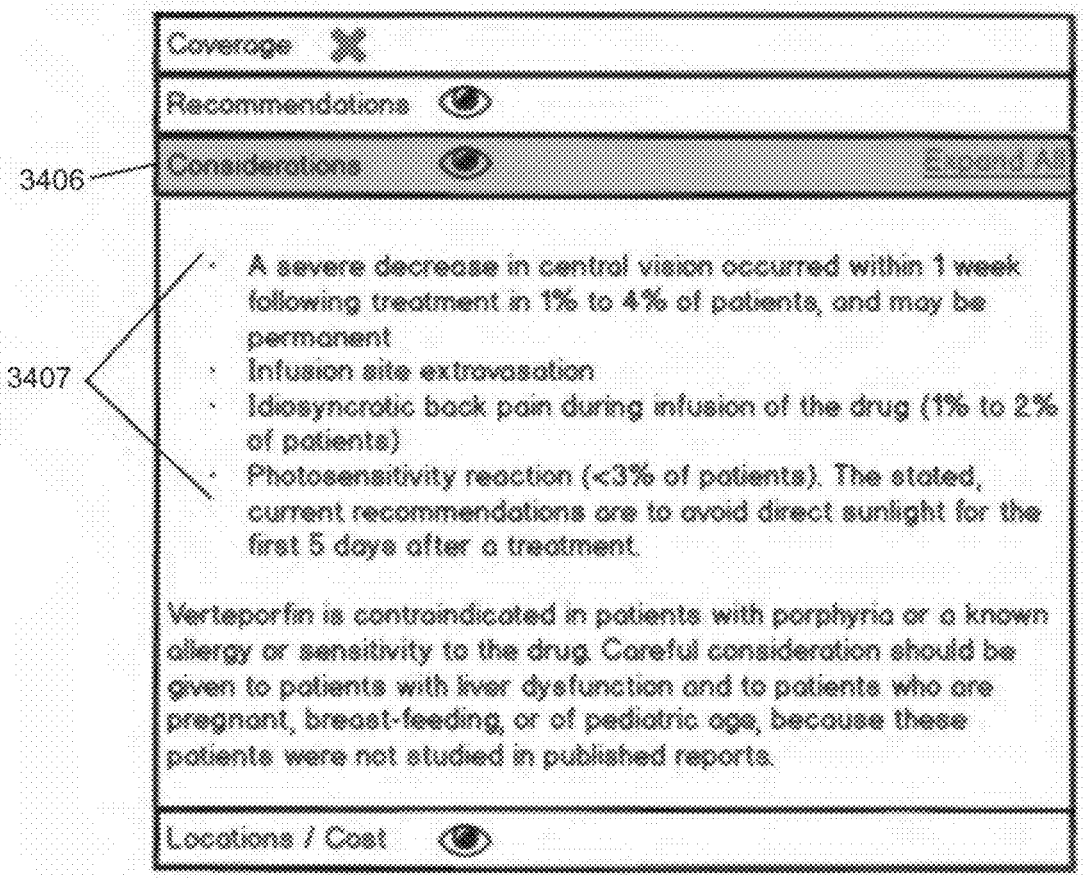

Coverage
Recommendations
Considerations
3406
3407
A severe decrease in central vision occurred within 1 week following treatment in 1% to 4% of patients, and may be permanent
Infusion site extravasation
Idiosyncratic back pain during infusion of the drug (1% to 2% of patients)
Photosensitivity reaction (<3% of patients). The stated, current recommendations are to avoid direct sunlight for the first 5 days after a treatment.
Verteporfin is contraindicated in patients with porphyria or a known allergy or sensitivity to the drug. Careful consideration should be given to patients with liver dysfunction and to patients who are pregnant, breast-feeding, or of pediatric age, because these patients were not studied in published reports.
Locations / Cost

Figure 53

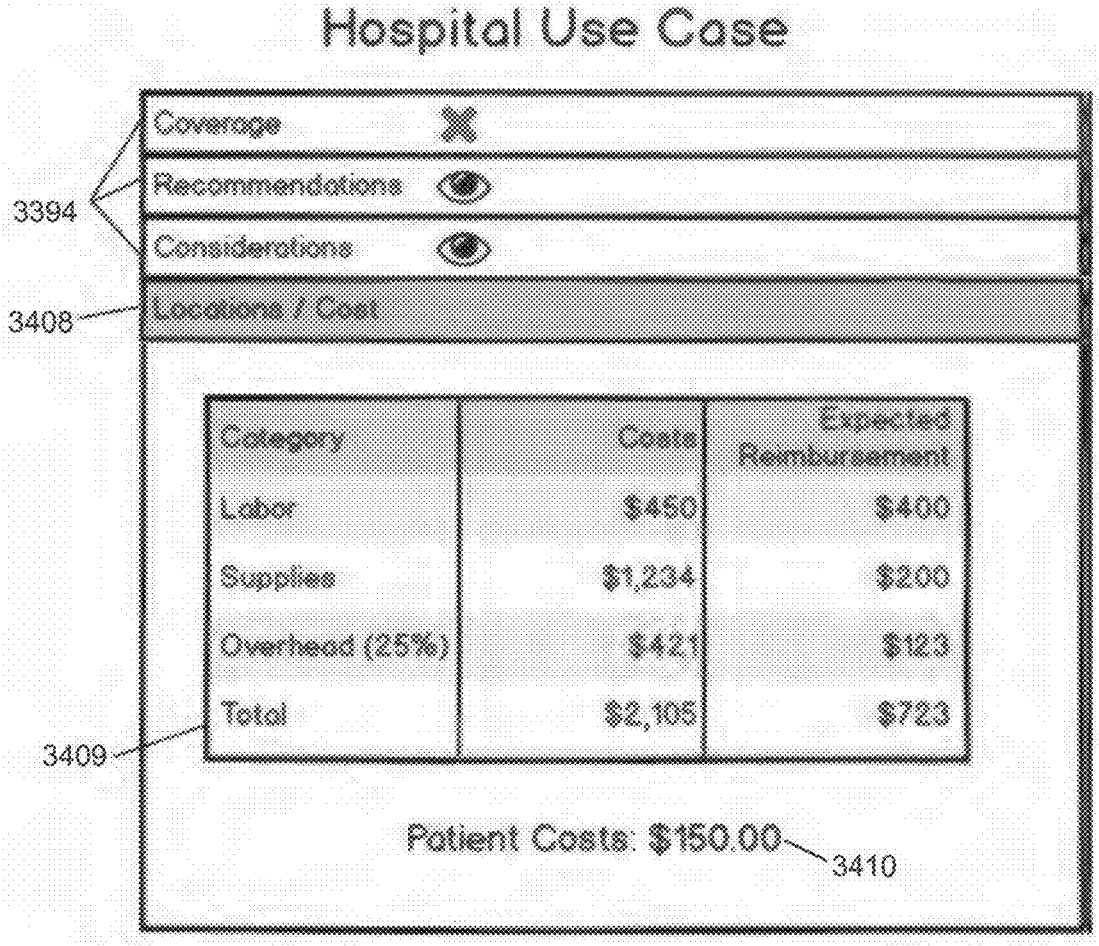

Hospital Use Case
Coverage
Recommendations
Considerations
3394
Locations / Cost
3408
Category
Costs
Expected Reimbursement
Labor
$450
$400
Supplies
$1,234
$200
Overhead (25%)
$421
$123
Total
$2,105
$723
3409
Patient Costs: $150.00
3410

Figure 54

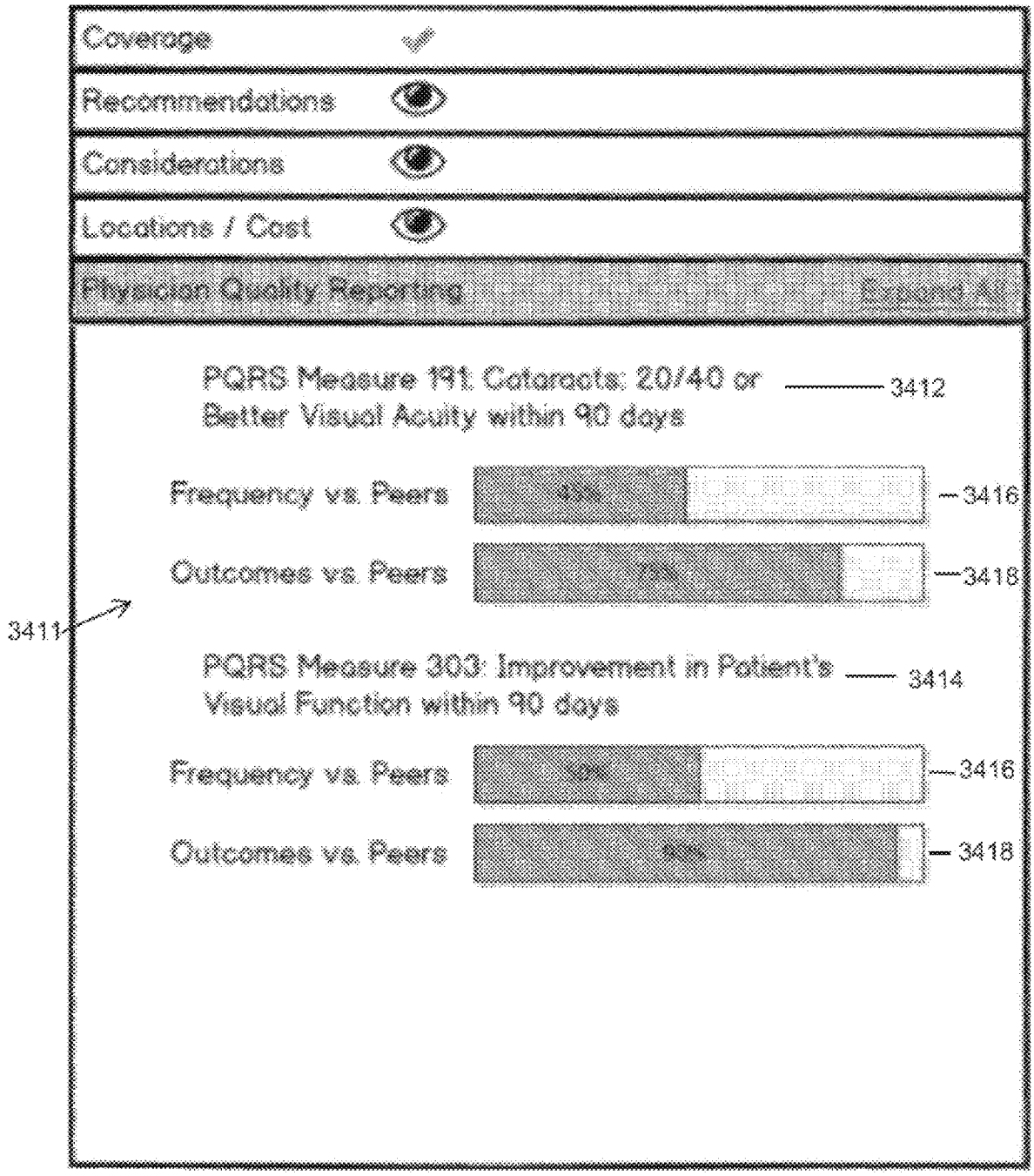

Coverage
Recommendations
Considerations
Locations / Cost
Physician Quality Reporting
PQRS Measure 191: Cataracts: 20/40 or Better Visual Acuity within 90 days
3412
Frequency vs. Peers
3416
Outcomes vs. Peers
3418
3411
PQRS Measure 303: Improvement in Patient's Visual Function within 90 days
3414
Frequency vs. Peers
3416
Outcomes vs. Peers
3418

Figure 55A

FIG. 55B

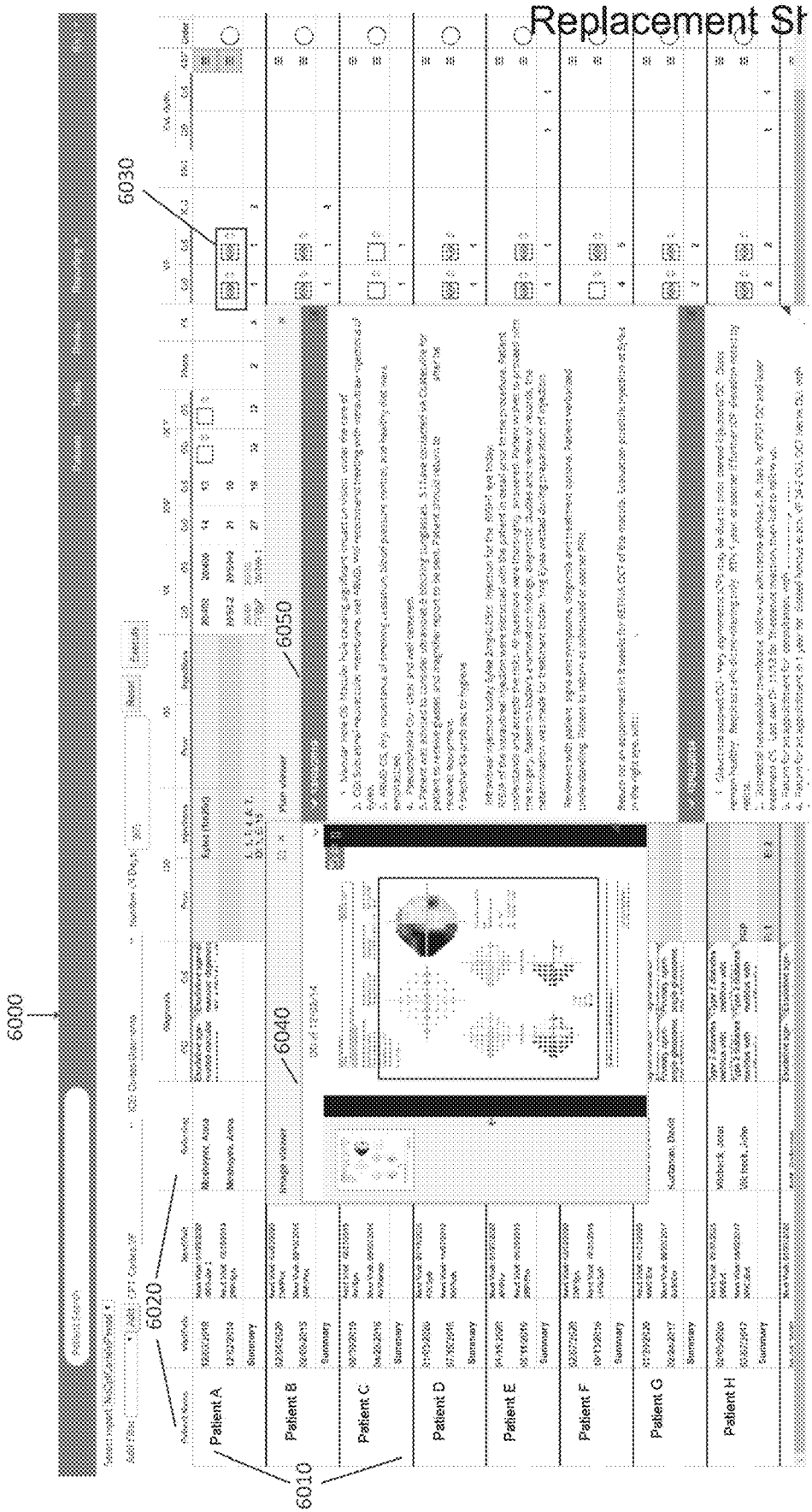

6000
6010
6020
6030
6040
6050
Patient A
Patient B
Patient C
Patient D
Patient E
Patient F
Patient G
Patient H
Image Viewer
Replacement Sh

FIG. 55C

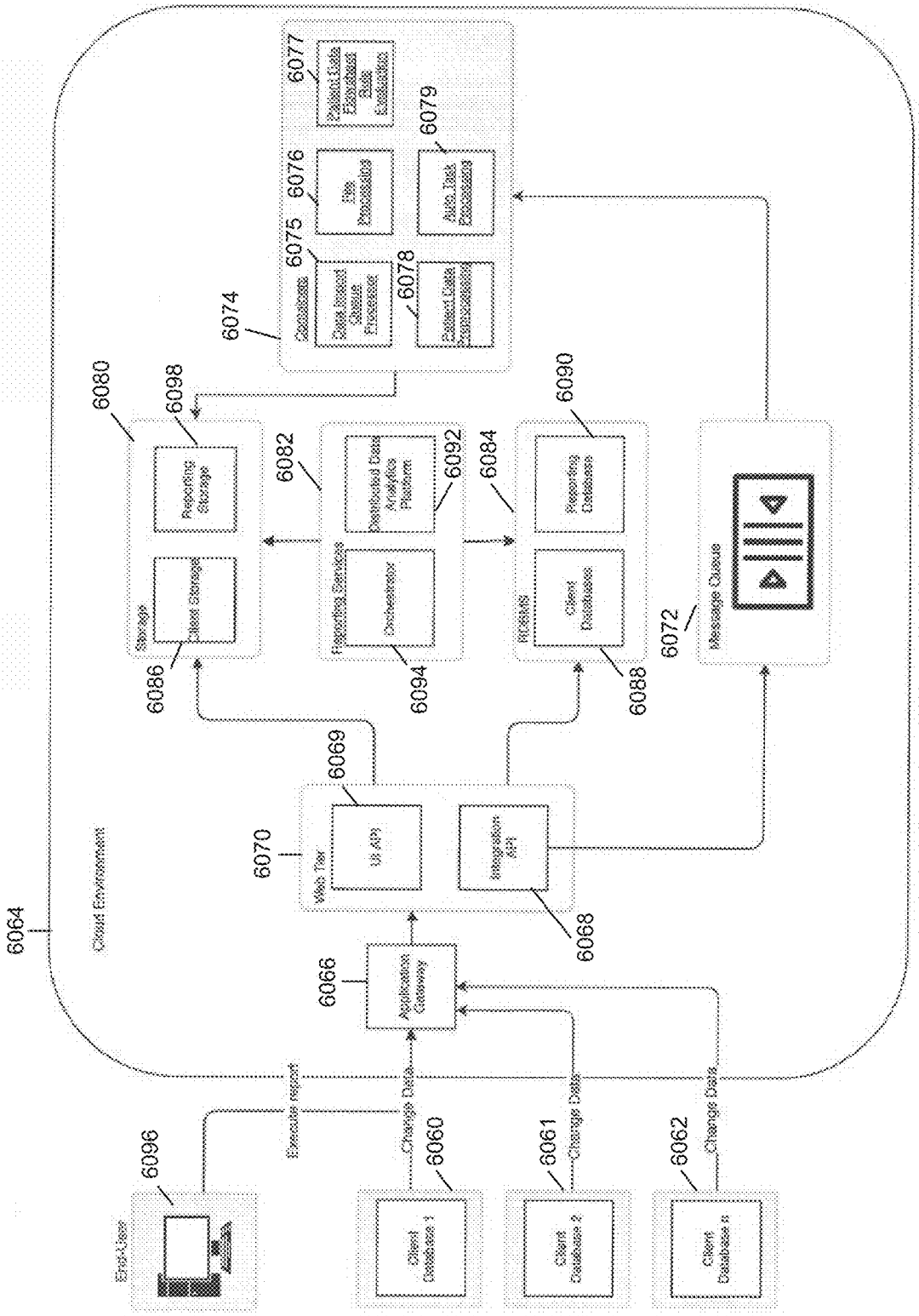
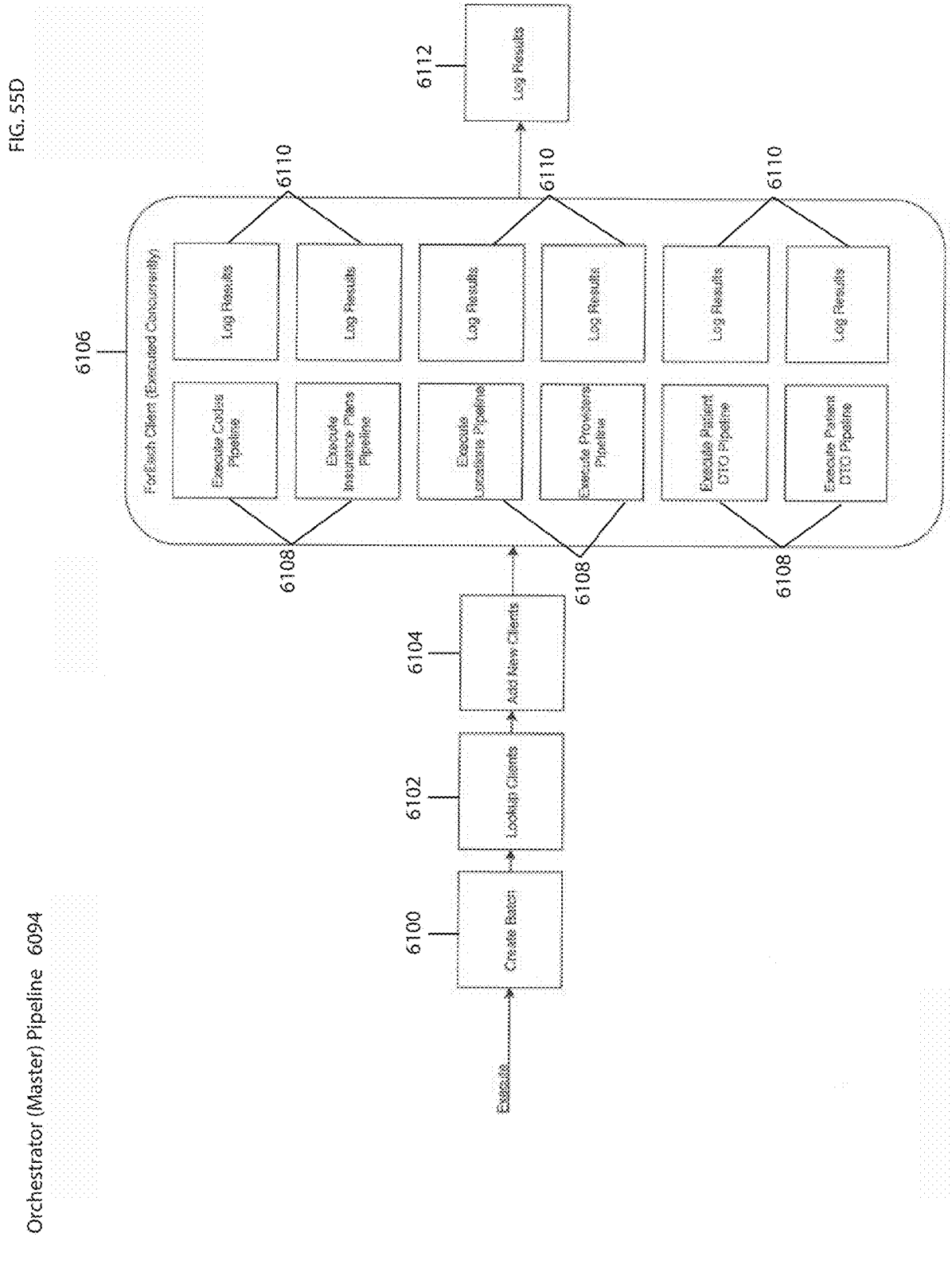

6064
Client Environment
6077
6079
6076
6075
6078
6074
6080
6098
6082
6092
6084
6090
6072
6086
6094
6088
6069
6070
6068
6066
6096
6060
6061
6062
Execute report
Change Data
Change Data
Change Data
End-User

FIG. 55D


Orchestrator (Master) Pipeline 6094
Execute
6100
Create Batch
6102
Lookup Clients
6104
Add New Clients
6106
ForEach Client (Executed Concurrently)
6108
6110
Execute Codes Pipeline
Execute Insurance Plans Pipeline
Execute Locations Pipeline
Execute Providers Pipeline
Execute Patient DTD Pipeline
Log Results
6112
Log Results

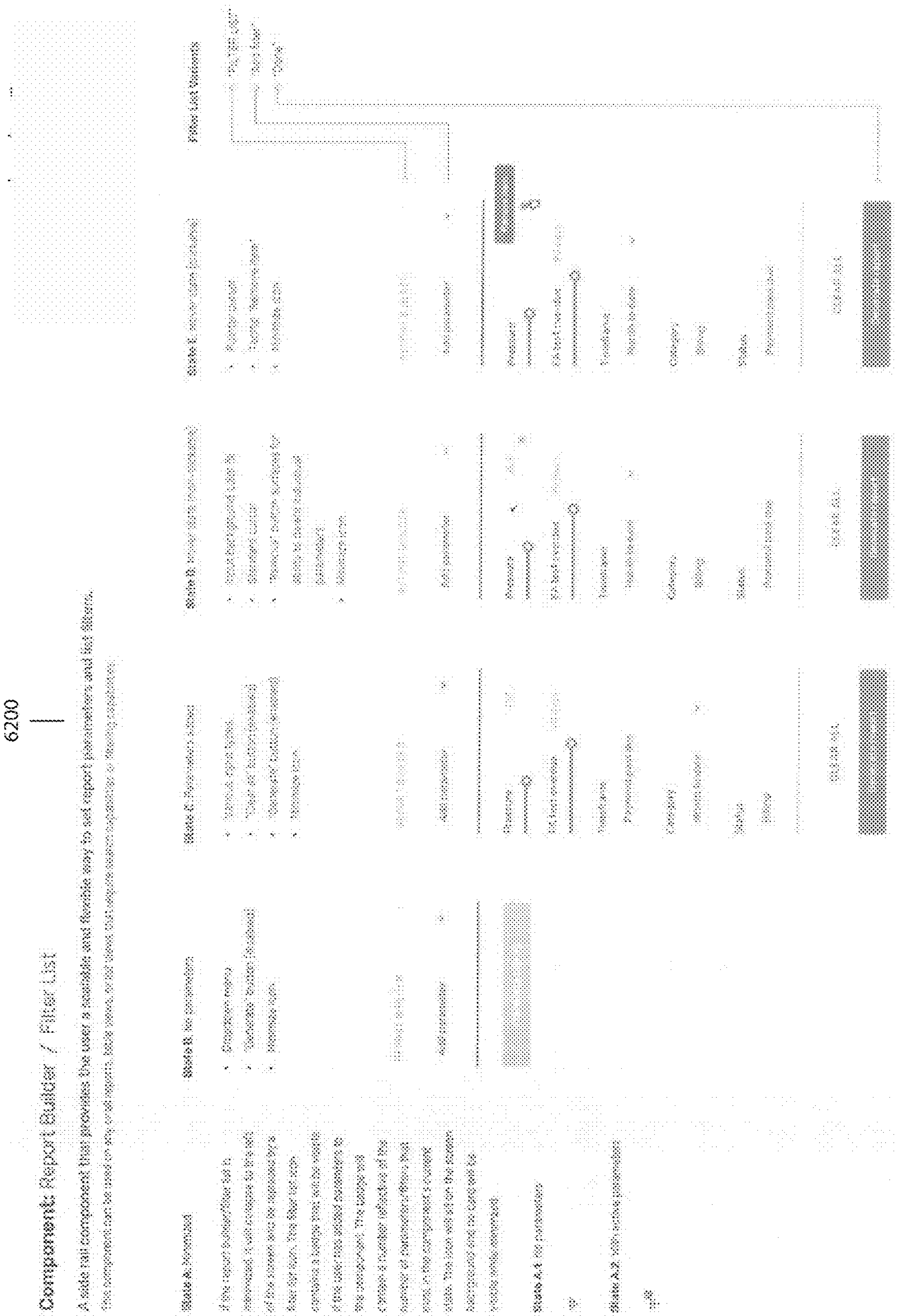
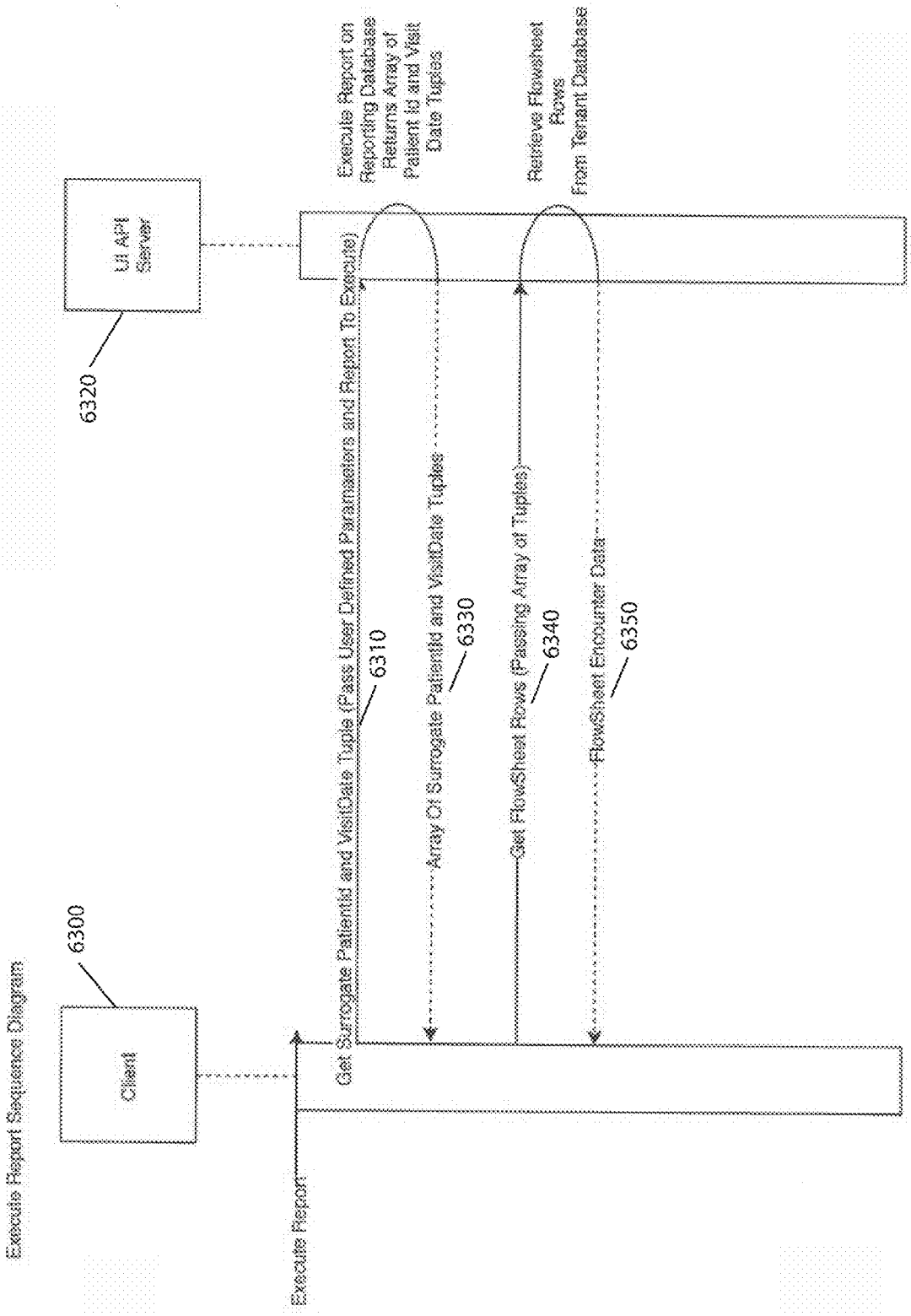

6200
Component: Report Builder / Filter List
A side rail component that provides the user a scalable and flexible way to set report parameters and list filters.

FIG. 55E

FIG. 55F


Execute Report Sequence Diagram
Client
6300
UI API Server
6320
Execute Report
Get Surrogate PatientId and VisitDate Tuple (Pass User Defined Parameters and Report To Execute)
6310
Execute Report on Reporting Database Returns Array of Patient Id and Visit Date Tuples
Array Of Surrogate PatientId and VisitDate Tuples
6330
Retrieve Flowsheet Rows From Tenant Database
Get FlowSheet Rows (Passing Array of Tuples)
6340
FlowSheet Encounter Data
6350

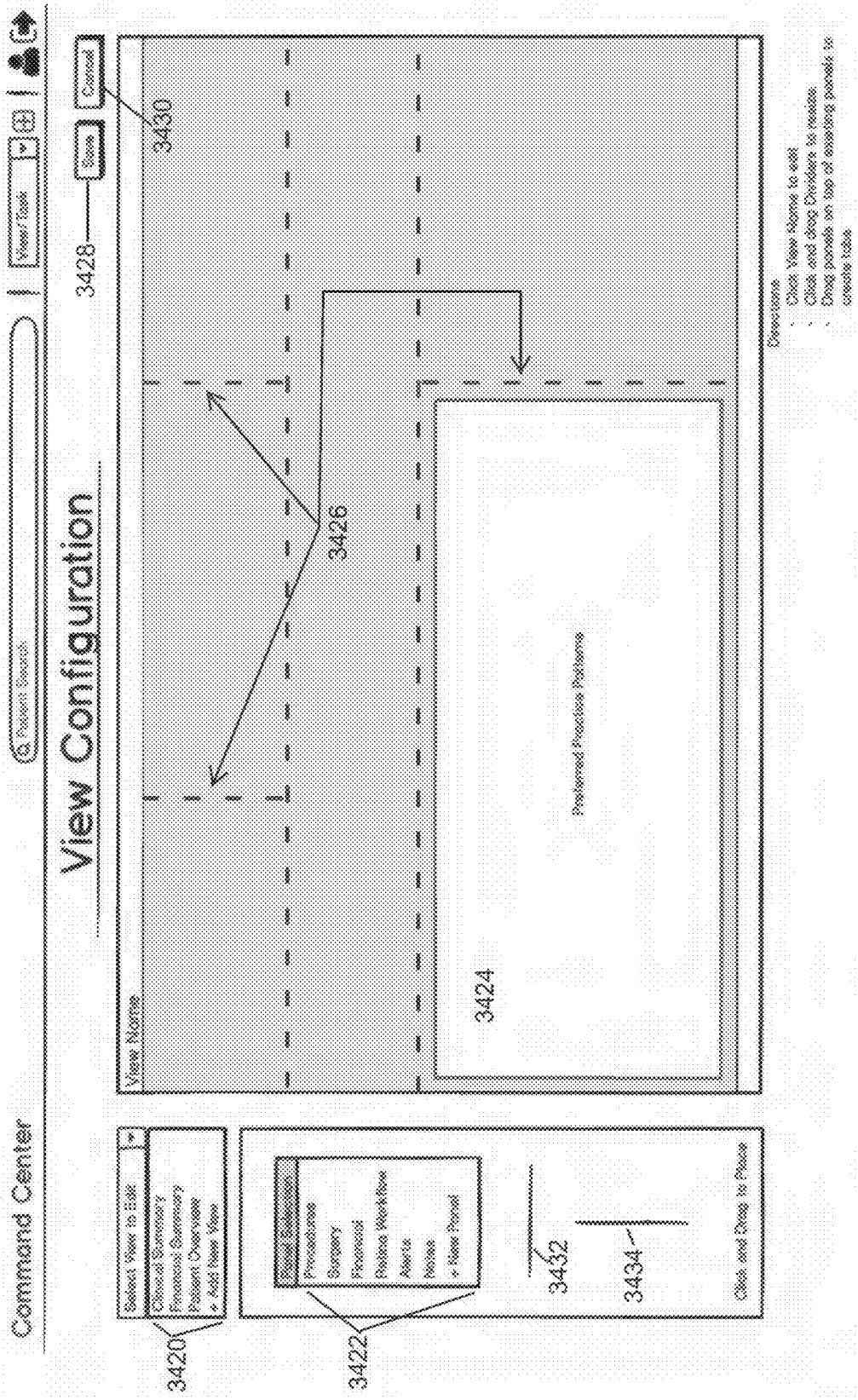

Command Center
Patient Search
Your Tasks
View Configuration
3428
Save
Cancel
3430
View Name
3426
3424
Preferred Position Patterns
Directions
Click View Name to edit
Click and drag Dividers to resize
Drag panels on top of existing panels to create tabs
Select View to Edit
Clinical Summary
Financial Summary
Patient Overview
+ Add New View
3420
Add Sections
Procedures
Surgery
Financial
Patient Workflow
Alerts
Notes
+ New Panel
3422
3432
3434
Click and Drag to Place

Figure 56A

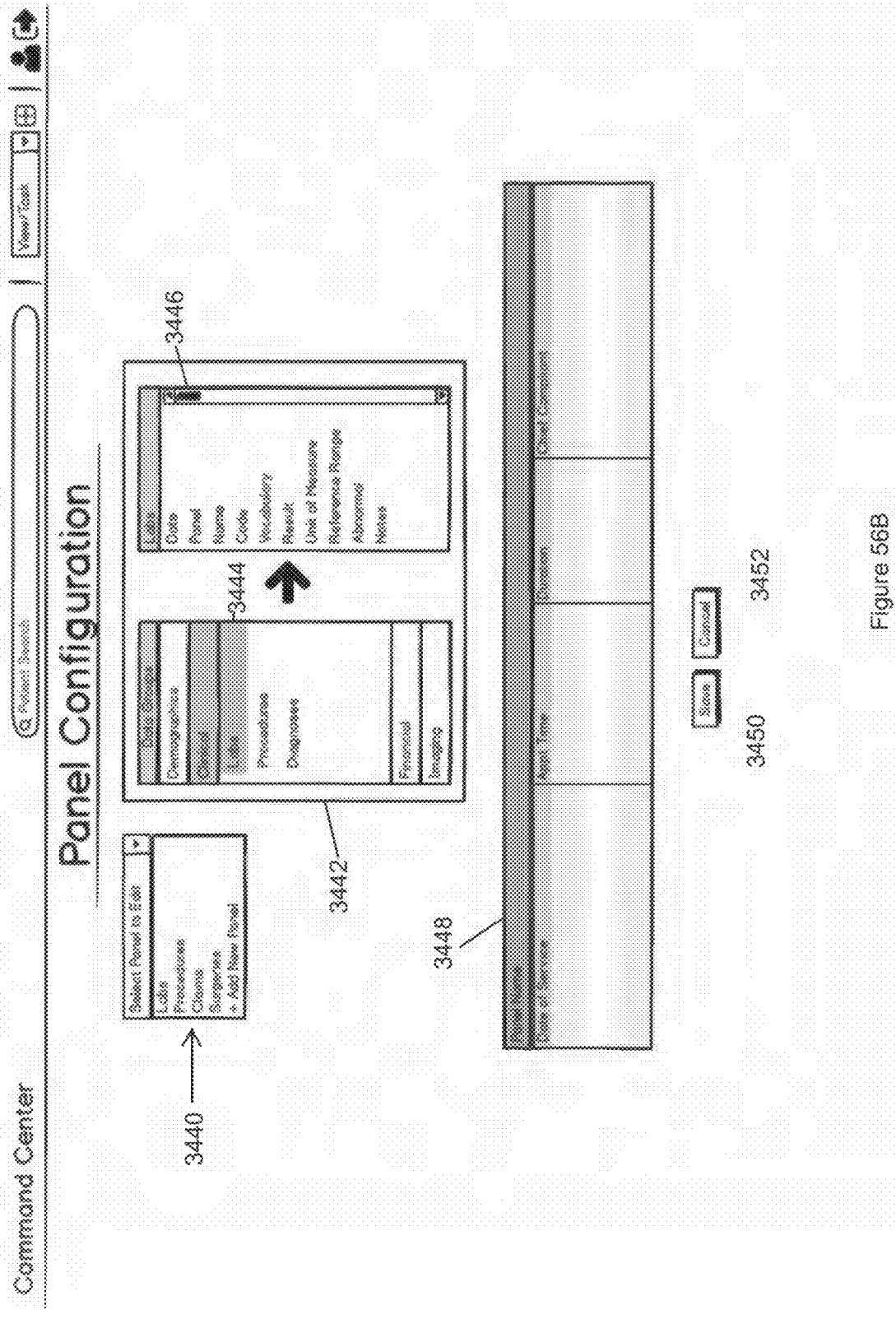

Command Center
Panel Configuration
3440
3442
3444
3446
3448
3450
3452

Figure 56B

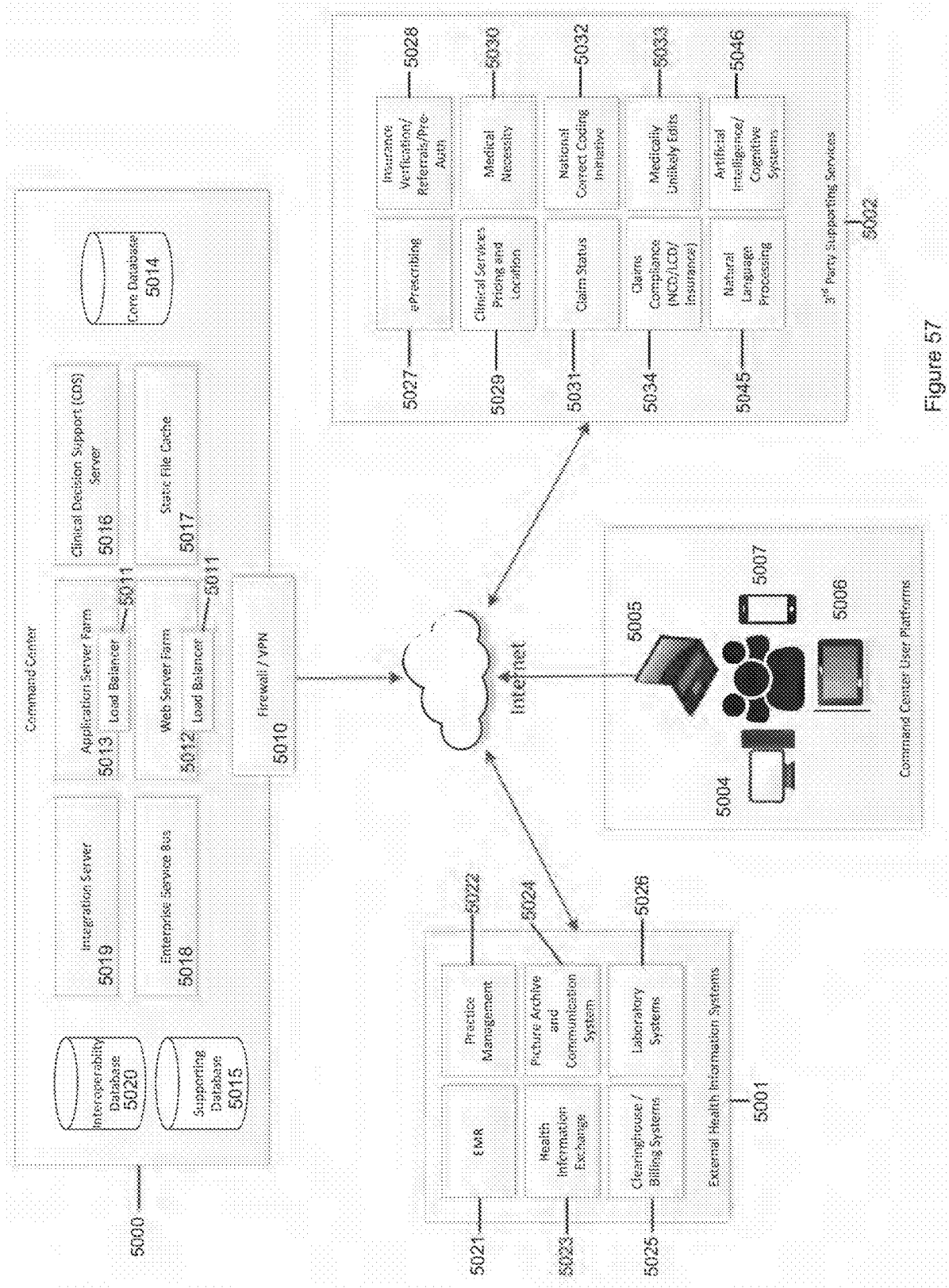

5000
Command Center
Interoperability Database 5020
Supporting Database 5015
Integration Server 5019
Enterprise Service Bus 5018
Application Server Farm 5013
Load Balancer 5011
Web Server Farm 5012
Load Balancer 5011
Firewall / VPN 5010
Clinical Decision Support (CDS) Server 5016
Static File Cache 5017
Core Database 5014
Internet
5004
5005
5006
5007
Command Center User Platforms
5001
External Health Information Systems
5021
EMR
Practice Management 5022
5023
Health Information Exchange
Picture Archive and Communication System 5024
5025
Clearinghouse / Billing Systems
Laboratory Systems 5026
3rd Party Supporting Services 5002
5027
ePrescribing
Insurance Verification/ Referrals/Pre-Auth 5028
5029
Clinical Services: Pricing and Location
Medical Necessity 5030
5031
Claim Status
National Correct Coding Initiative 5032
5034
Claims Compliance (NCD/LCD/ Insurance)
Medically Unlikely Edits 5033
5045
Natural Language Processing
Artificial Intelligence/ Cognitive Systems 5046

Figure 57

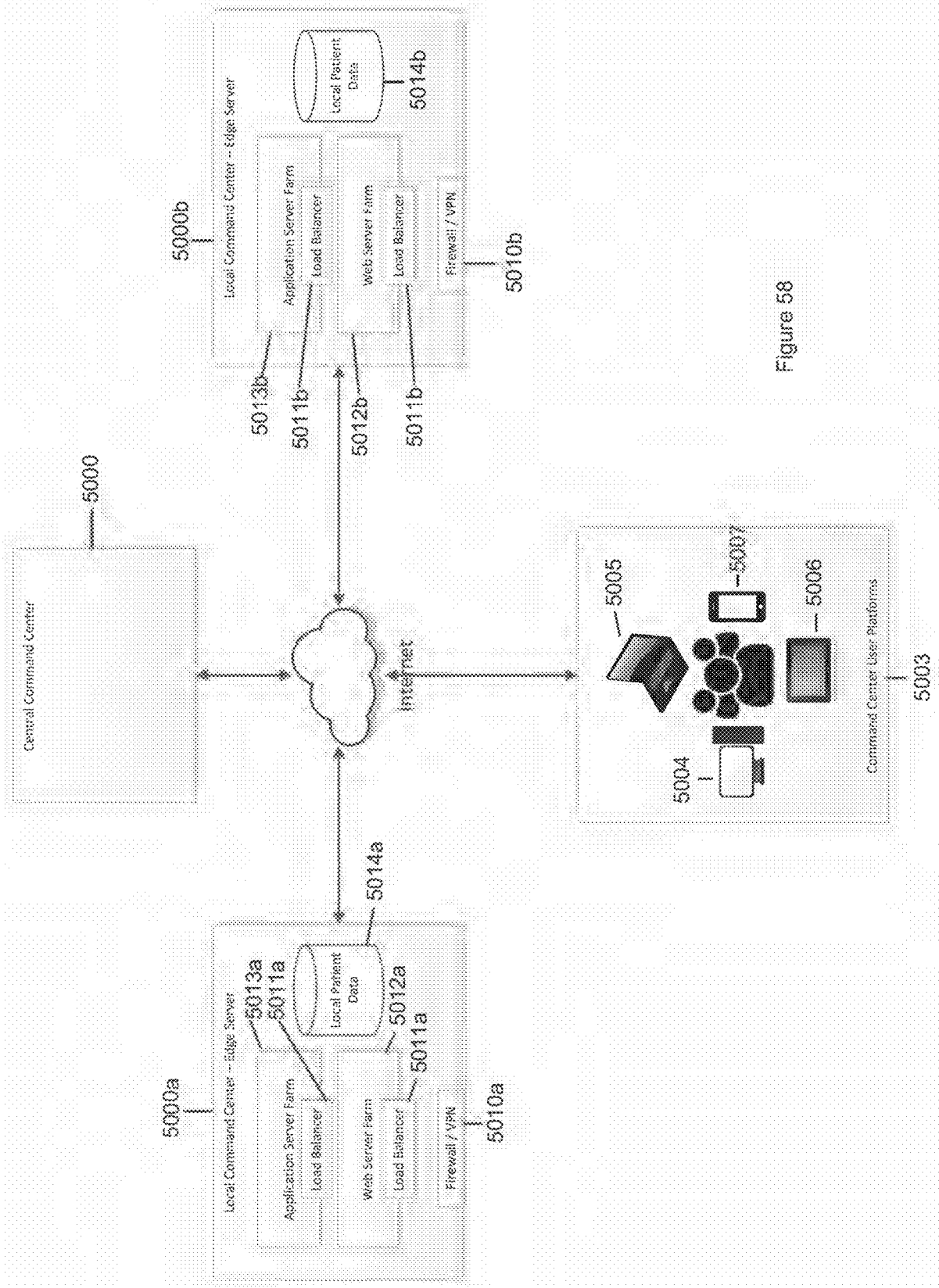

Central Command Center
5000
Internet
Local Command Center – Edge Server
5000b
Application Server Farm
Load Balancer
Web Server Farm
Load Balancer
Firewall / VPN
5010b
Local Patient Data
5014b
5013b
5011b
5012b
5011b
Local Command Center – Edge Server
5000a
Application Server Farm
Load Balancer
Web Server Farm
Load Balancer
Firewall / VPN
5010a
Local Patient Data
5014a
5013a
5011a
5012a
5011a
Command Center User Platforms
5003
5004
5005
5006
5007

Figure 58

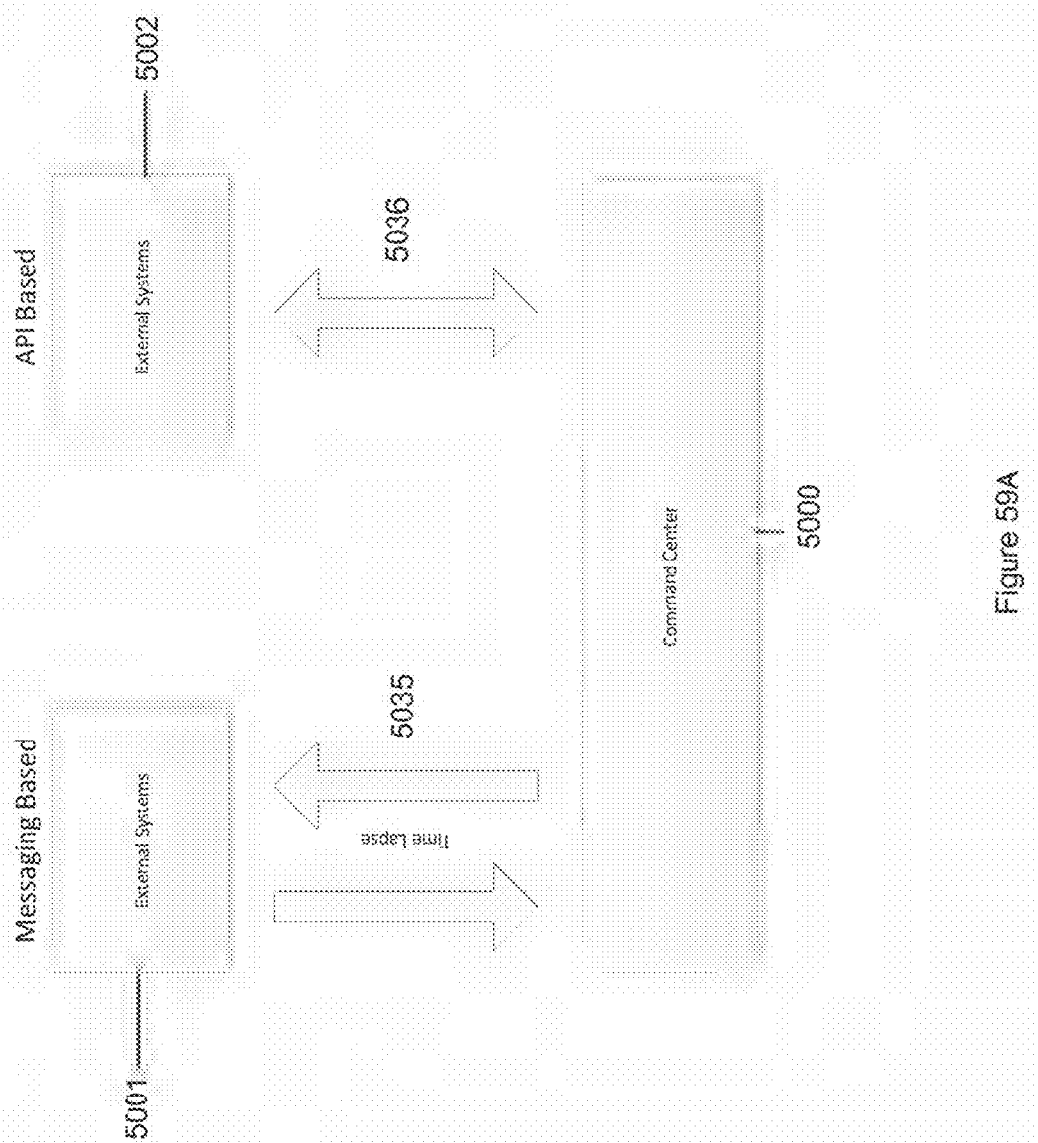

API Based
5002
External Systems
5036
Command Center
5000
Messaging Based
External Systems
5035
Time Lapse
5001

Figure 59A

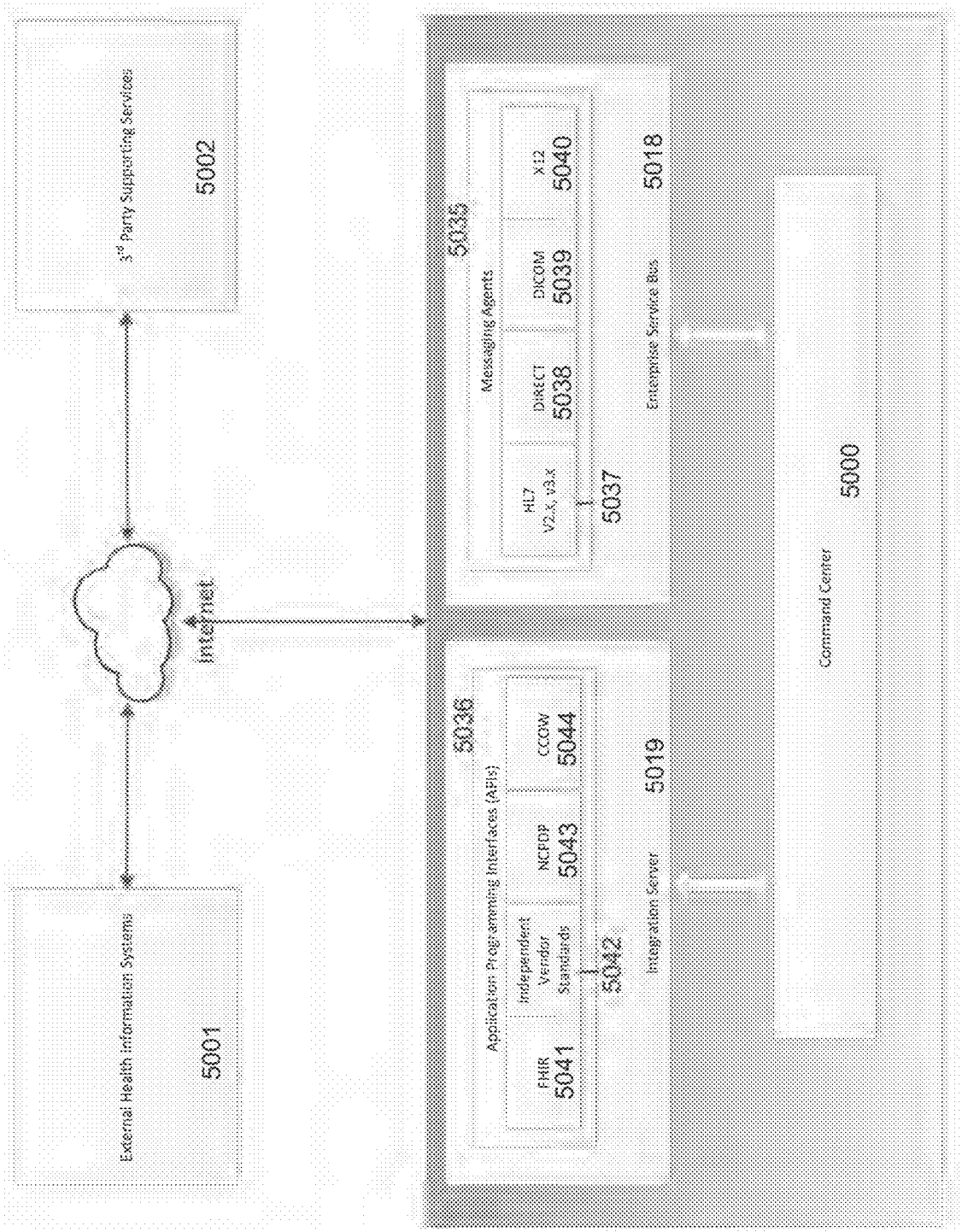

External Health Information Systems
5001
3rd Party Supporting Services
5002
Internet
Integration Server
5019
Application Programming Interfaces (APIs)
5036
FHIR
5041
Independent Vendor Standards
5042
NCPDP
5043
CCOW
5044
Enterprise Service Bus
5018
Messaging Agents
5035
HL7 V2.x, v3.x
5037
DIRECT
5038
DICOM
5039
X12
5040
Command Center
5000

Figure 59B

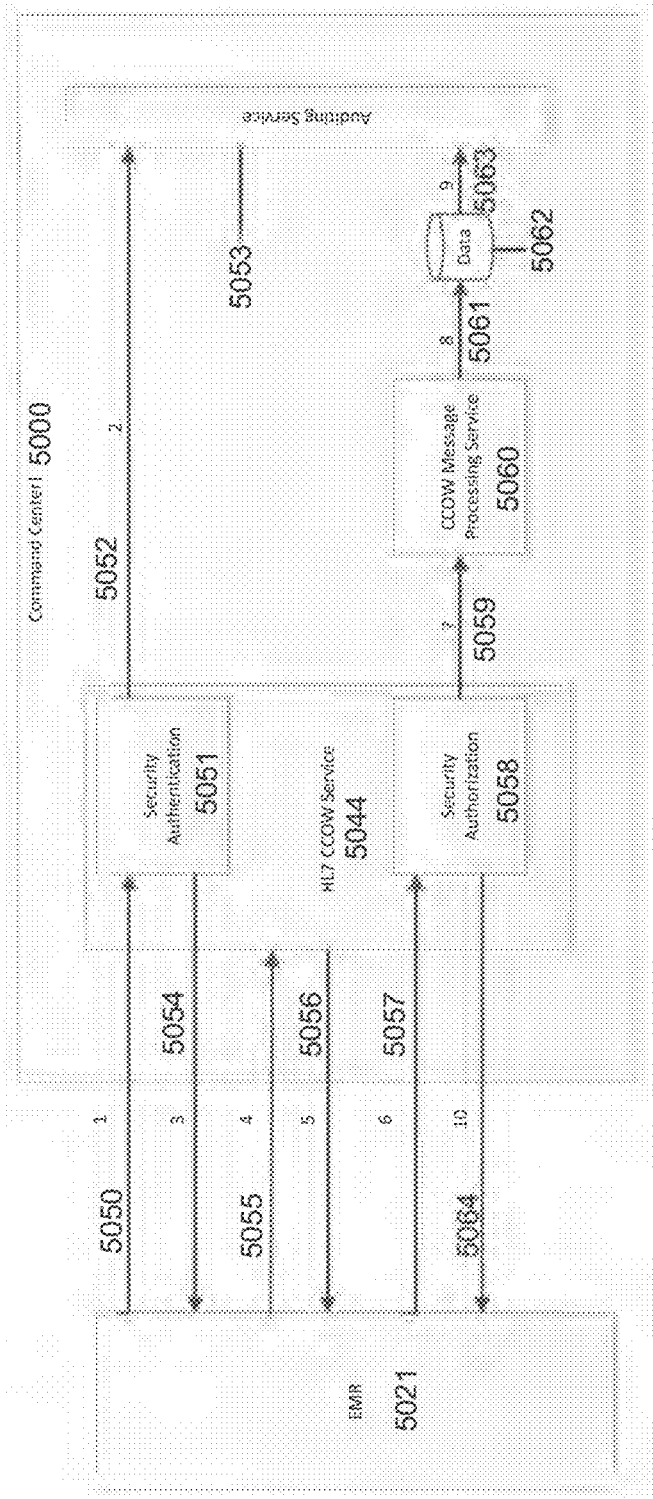

Command Center1 5000
Auditing Service
5053
5052
2
Security Authentication 5051
HL7 CCOW Service 5044
Security Authorization 5058
CCOW Message Processing Service 5060
5059
7
8
5061
9
Data
5063
5062
5050
1
5054
3
5055
4
5056
5
5057
6
5064
10
EMR
5021

Figure 60

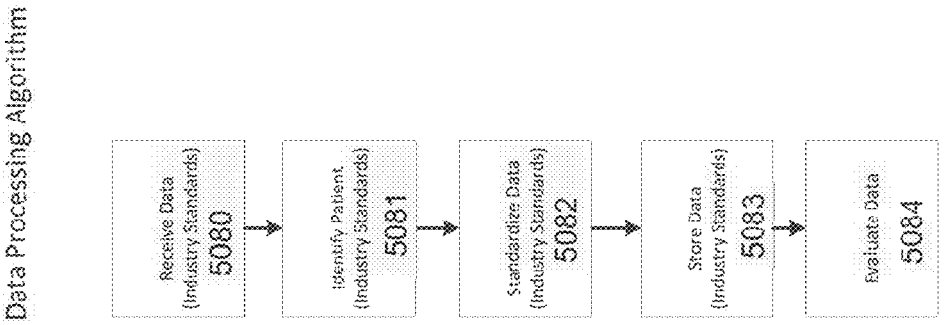

High Level Data Processing Algorithm
Receive Data (Industry Standards) 5080
Identify Patient (Industry Standards) 5081
Standardize Data (Industry Standards) 5082
Store Data (Industry Standards) 5083
Evaluate Data 5084

Figure 61

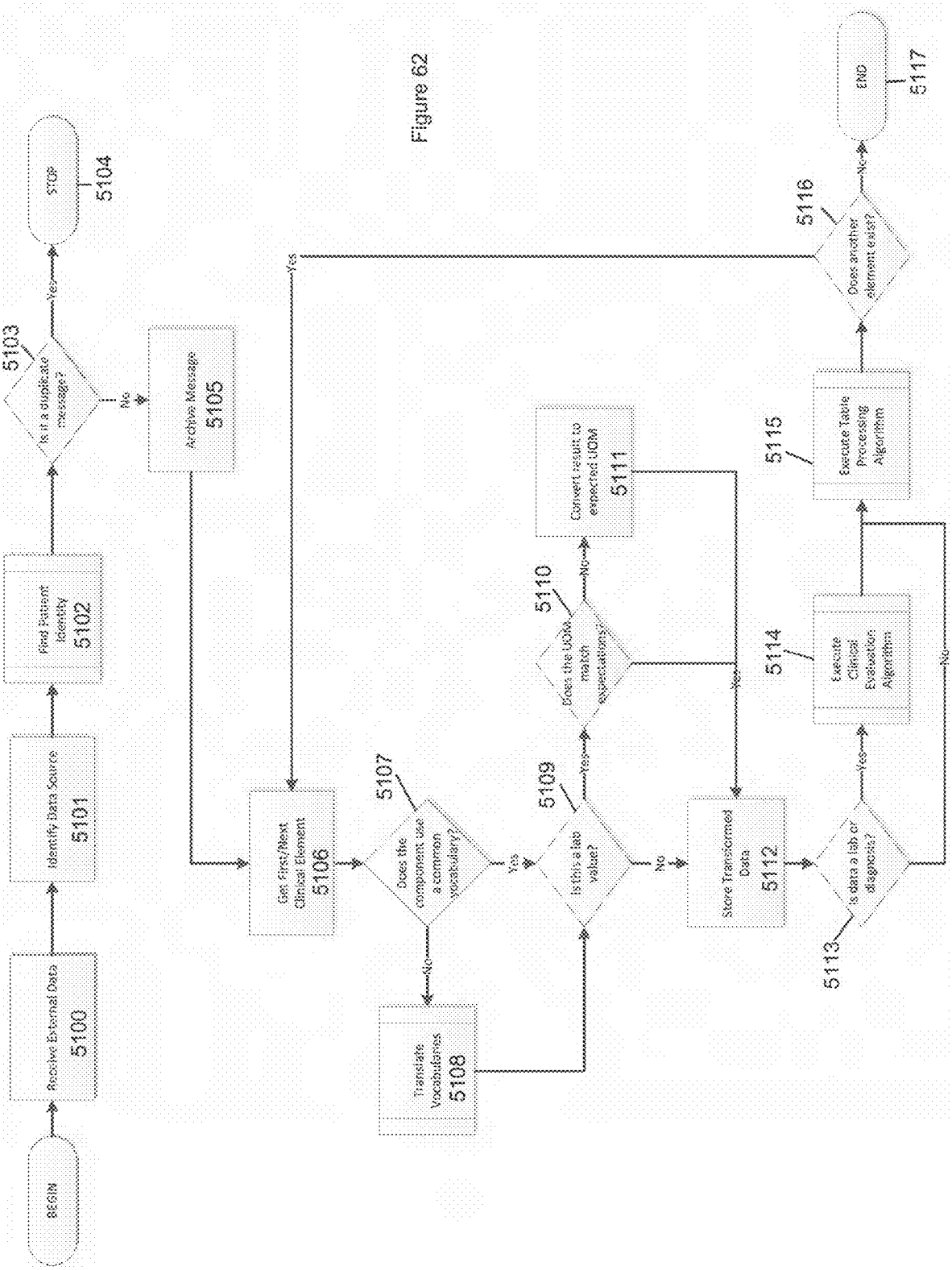

BEGIN
Receive External Data
5100
Identify Data Source
5101
Find Patient Identity
5102
Is it a duplicate message?
5103
Yes
STOP
5104
No
Archive Message
5105
Get First/Next Clinical Element
5106
Does the component use a common vocabulary?
5107
Yes
No
Translate Vocabularies
5108
Is this a lab value?
5109
Yes
No
Does the UOM match expectations?
5110
No
Convert result to expected UOM
5111
Yes
Store Transformed Data
5112
Is data a lab or diagnosis?
5113
Yes
No
Execute Clinical Evaluation Algorithm
5114
Execute Table Processing Algorithm
5115
Does another element exist?
5116
Yes
No
END
5117

Figure 62

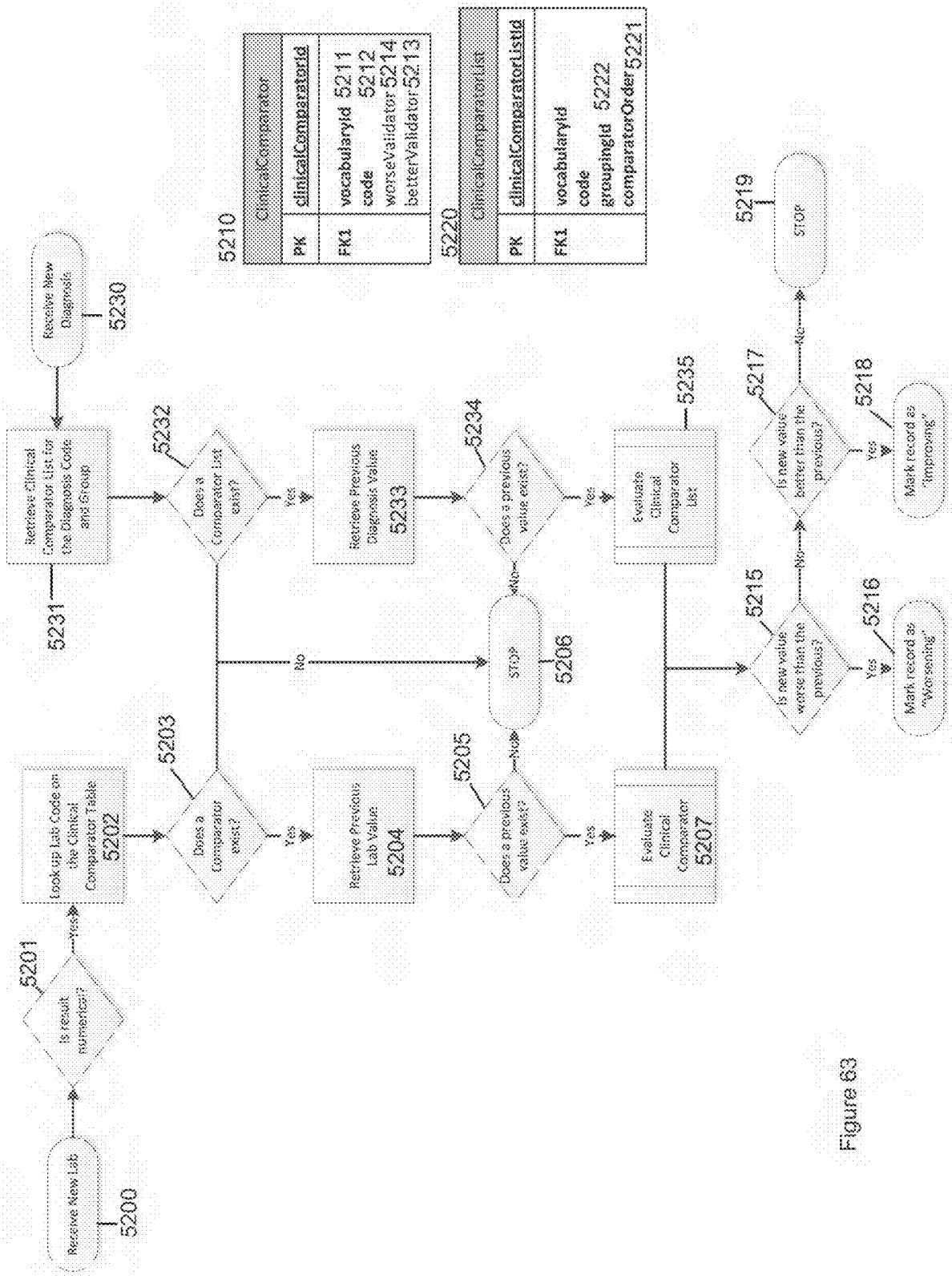

Receive New Lab
5200
Is result numerical?
5201
Yes
Look up Lab Code on the Clinical Comparator Table
5202
Does a Comparator exist?
5203
Yes
Retrieve Previous Lab Value
5204
Does a previous value exist?
5205
No
STOP
5206
Yes
Evaluate Clinical Comparator
5207
Receive New Diagnosis
5230
Retrieve Clinical Comparator List for the Diagnosis Code and Group
5231
Does a Comparator List exist?
5232
Yes
Retrieve Previous Diagnosis Value
5233
Does a previous value exist?
5234
Yes
Evaluate Clinical Comparator List
5235
Is new value worse than the previous?
5215
No
Yes
Mark record as "Worsening"
5216
Is new value better than the previous?
5217
Yes
Mark record as "Improving"
5218
No
STOP
5219
ClinicalComparator
PK clinicalComparatorId
FK1 vocabularyId 5211
code 5212
worseValidator 5214
betterValidator 5213
5210
ClinicalComparatorList
PK clinicalComparatorListId
FK1 vocabularyId
code
groupingId 5222
comparatorOrder 5221
5220

Figure 63

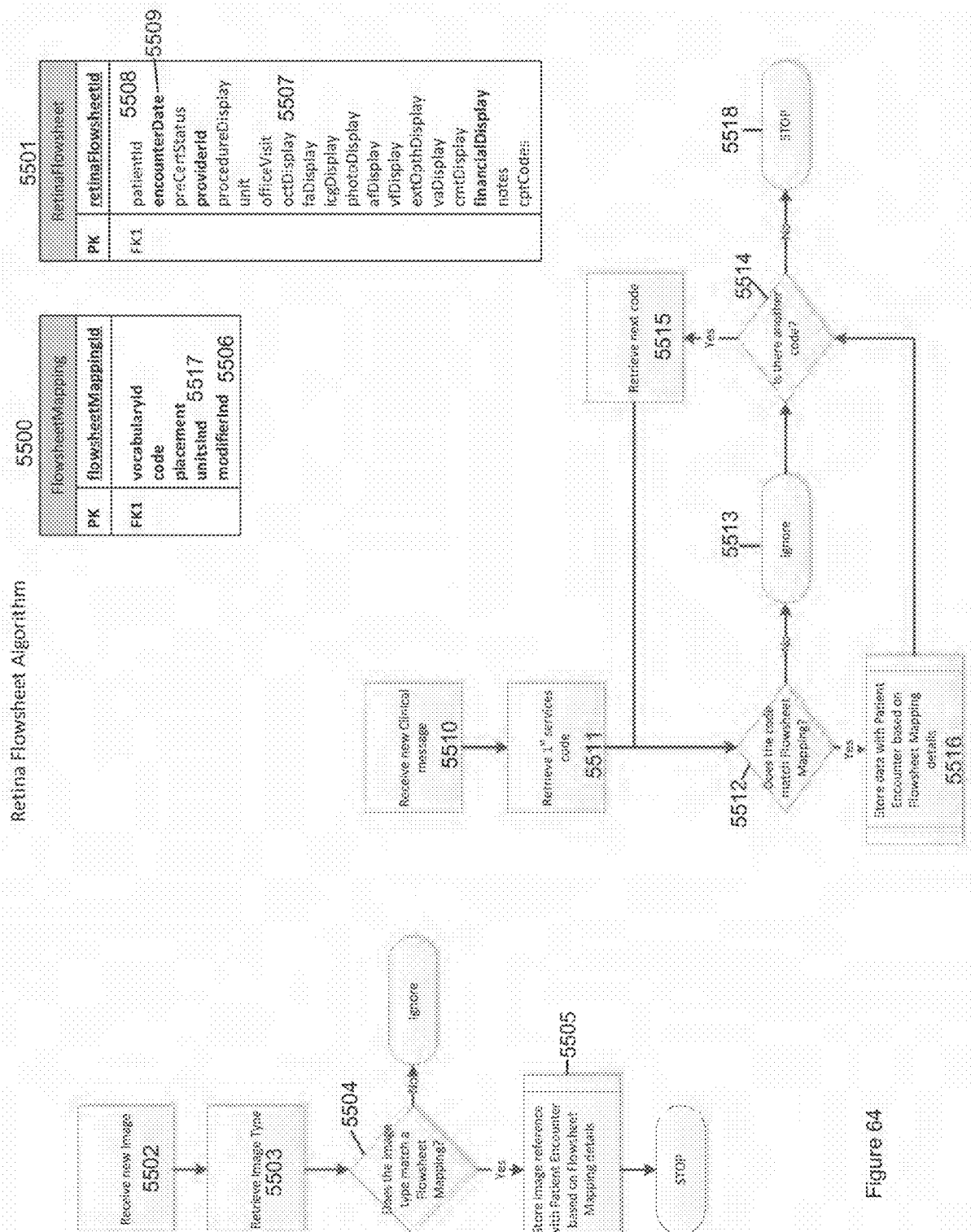

Retina Flowsheet Algorithm
5500
FlowsheetMapping
PK
flowsheetMappingId
FK1
vocabularyId
code
placement
unitsInd
modifierInd
5517
5506
5501
RetinaFlowsheet
PK
retinaFlowsheetId
FK1
patientId
encounterDate
preCertStatus
providerId
procedureDisplay
unit
officeVisit
octDisplay
faDisplay
kgDisplay
photoDisplay
afDisplay
vfDisplay
extDpthDisplay
vaDisplay
cmtDisplay
financialDisplay
notes
cptCodes
5508
5509
5507
Receive new Image
5502
Retrieve Image Type
5503
5504
Does the image type match a Flowsheet Mapping?
No
Ignore
Yes
Store image reference with Patient Encounter based on Flowsheet Mapping details
5505
STOP
Receive new Clinical message
5510
Retrieve 1st services code
5511
5512
Does the code match Flowsheet Mapping?
No
5513
Ignore
Yes
Retrieve next code
5515
Yes
5514
Is there another code?
No
5518
STOP
Store data with Patient Encounter based on Flowsheet Mapping details
5516

Figure 64

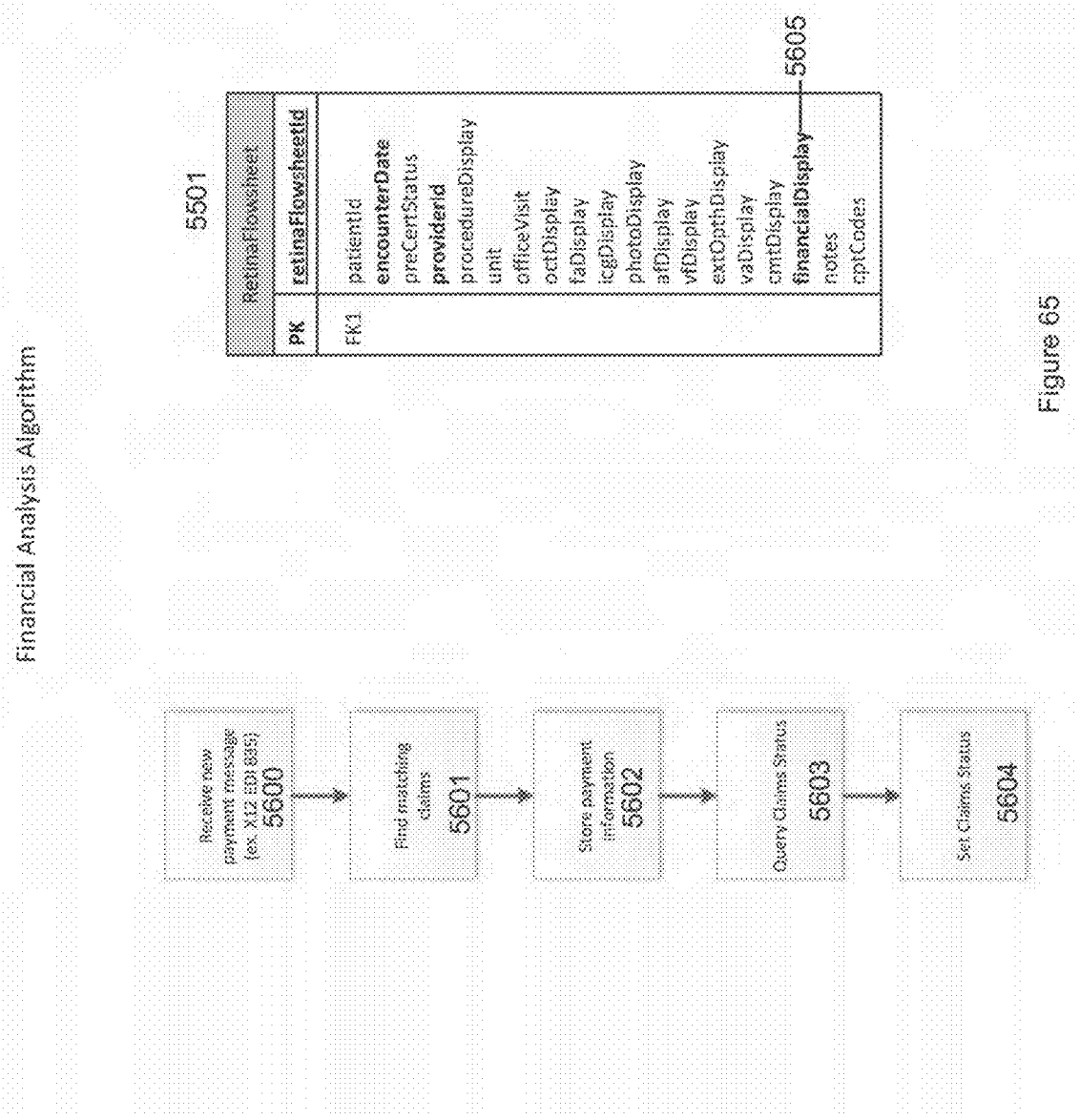

Financial Analysis Algorithm
Receive new payment message (ex. X12 EDI 835)
5600
Find matching claims
5601
Store payment information
5602
Query Claims Status
5603
Set Claims Status
5604
5501
retinaFlowsheet
PK
retinaFlowsheetId
FK1
patientId
encounterDate
preCertStatus
providerId
procedureDisplay
unit
officeVisit
octDisplay
faDisplay
icgDisplay
photoDisplay
afDisplay
vfDisplay
extOpthDisplay
vaDisplay
cmtDisplay
financialDisplay
notes
cptCodes
5605

Figure 65

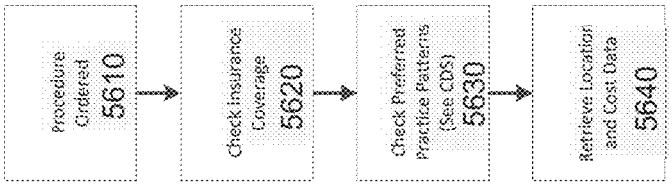

Procedure Ordered
5610
Check Insurance Coverage
5620
Check Preferred Practice Patterns (See CDS)
5630
Retrieve Location and Cost Data
5640

Figure 66A

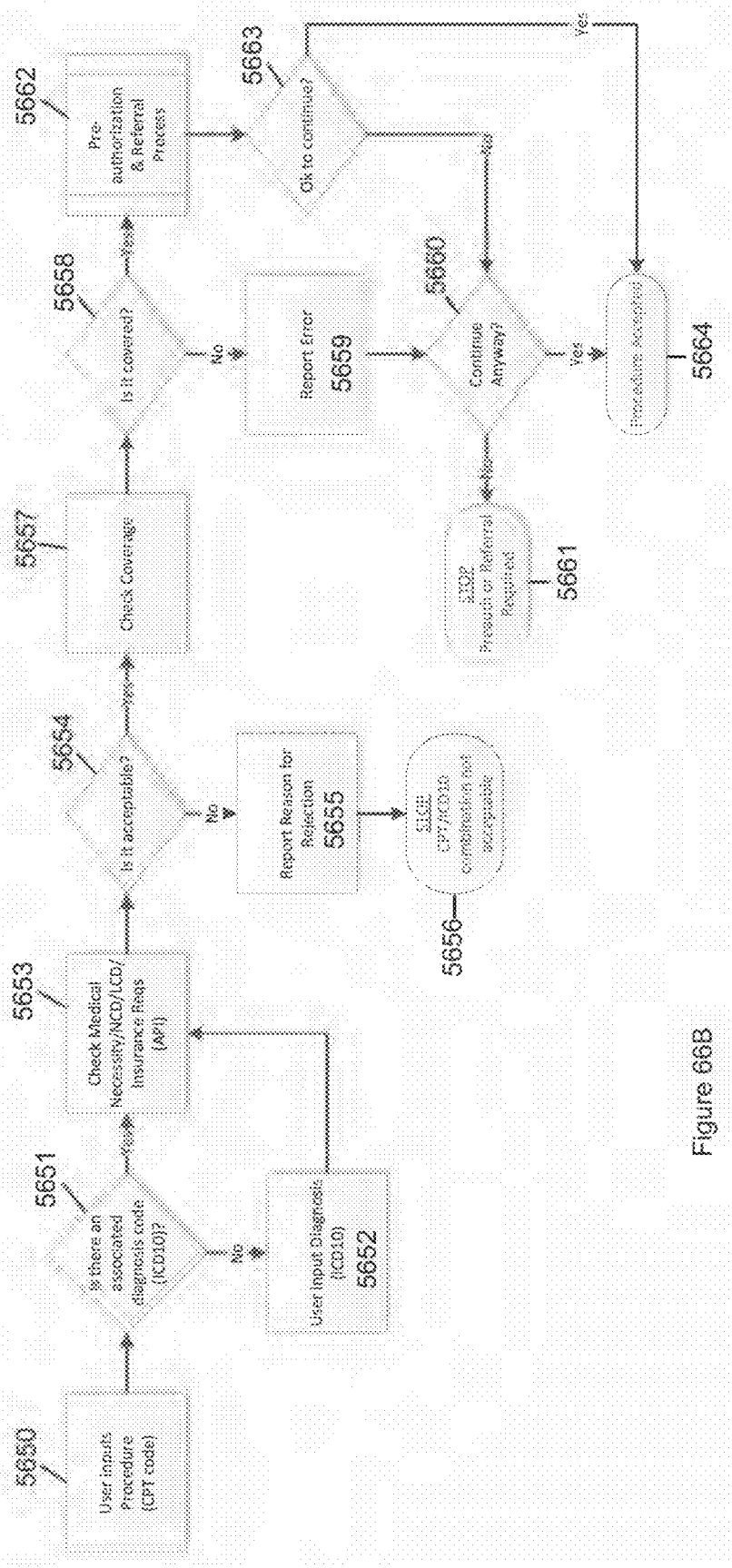

5650
User inputs Procedure (CPT code)
5651
Is there an associated diagnosis code (ICD10)?
Yes
No
User input Diagnosis (ICD10)
5652
5653
Check Medical Necessity/NCD/LCD/ Insurance Reqs (API)
5654
Is it acceptable?
Yes
No
Report Reason for Rejection
5655
5656
5657
Check Coverage
5658
Is it covered?
Yes
No
Report Error
5659
5660
Continue Anyway?
Yes
No
5661
5662
Pre-authorization & Referral Process
5663
Ok to continue?
Yes
No
Procedure Accepted
5664

Figure 66B

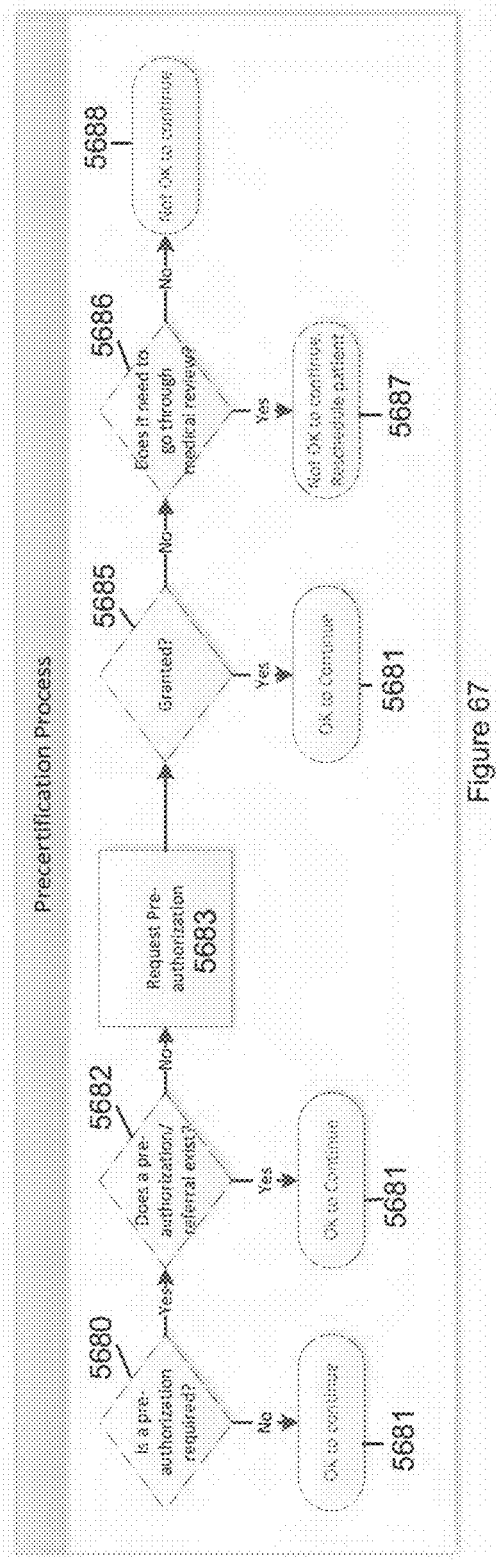


Figure 67

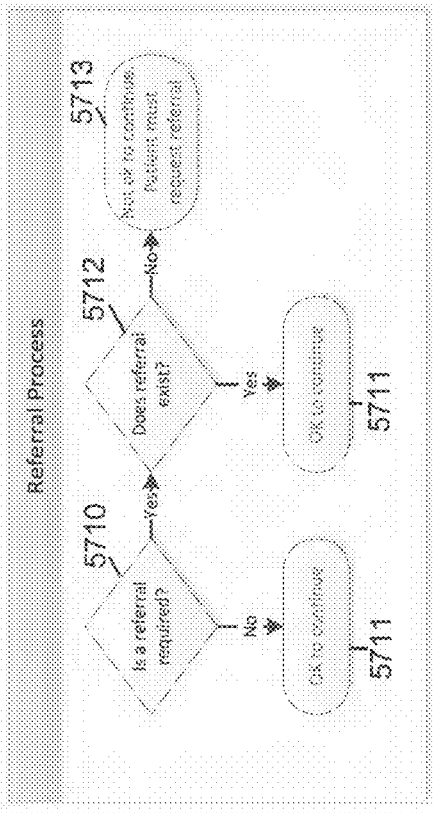


Figure 68

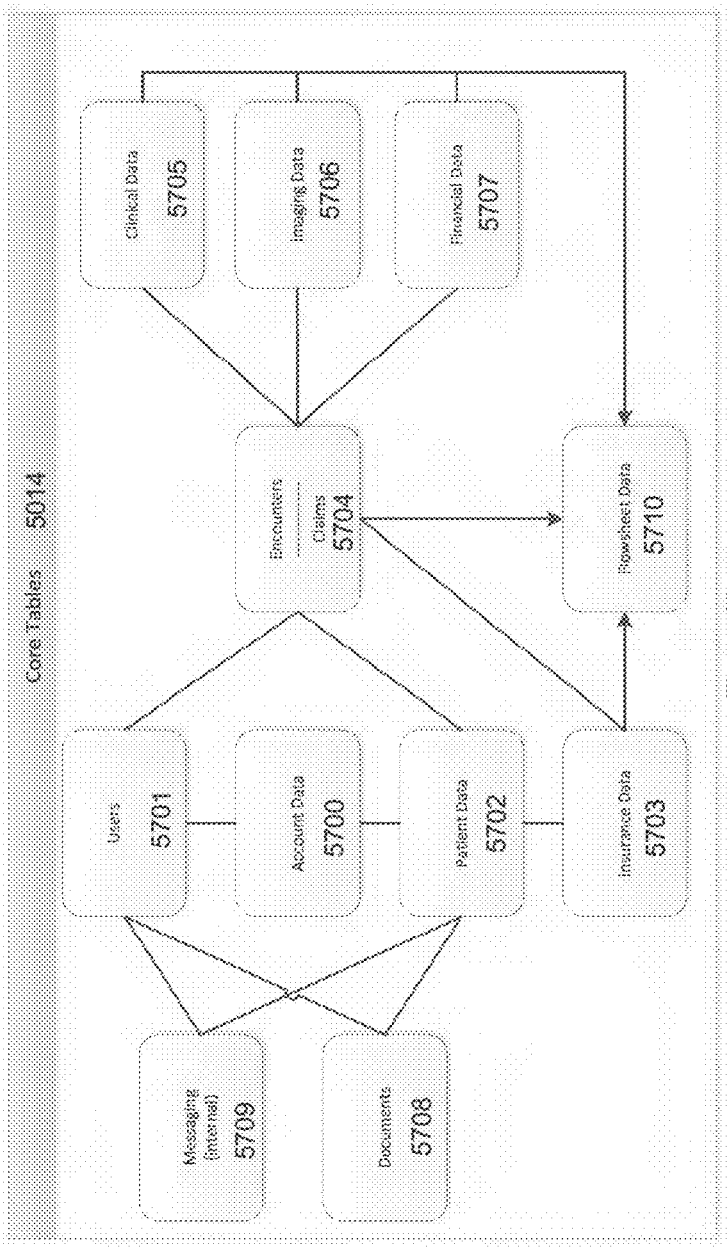


Figure 69

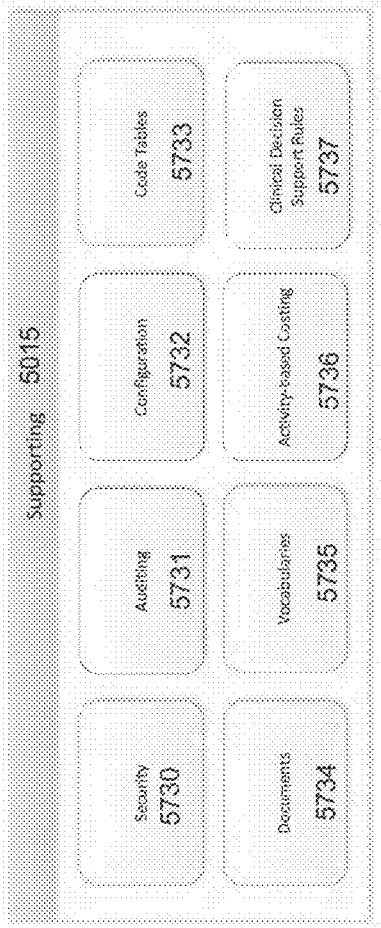


Figure 71

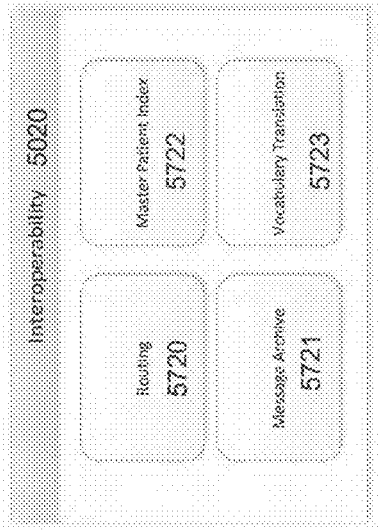


Figure 70

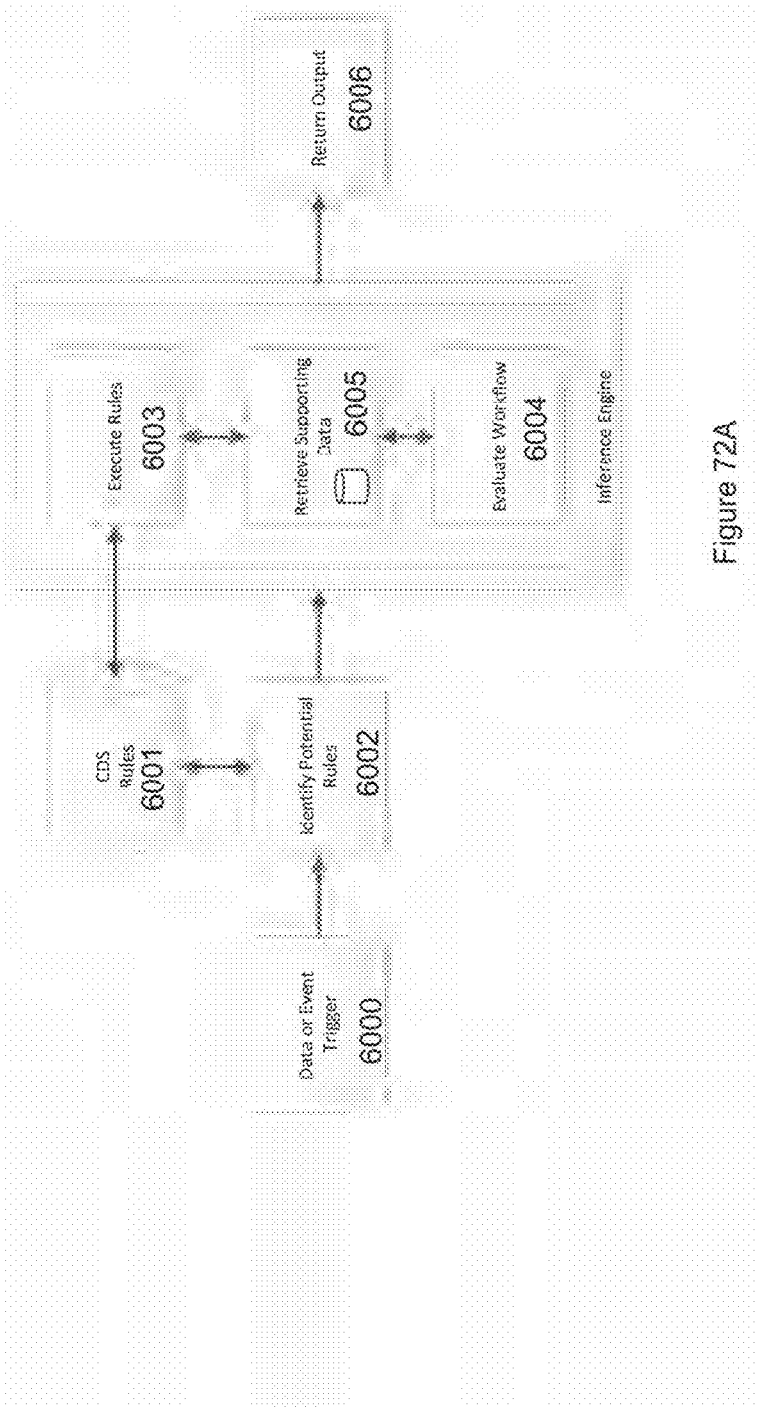

Data or Event Trigger
6000
CDS Rules
6001
Identify Potential Rules
6002
Execute Rules
6003
Retrieve Supporting Data
6005
Evaluate Workflow
6004
Inference Engine
Return Output
6006

Figure 72A

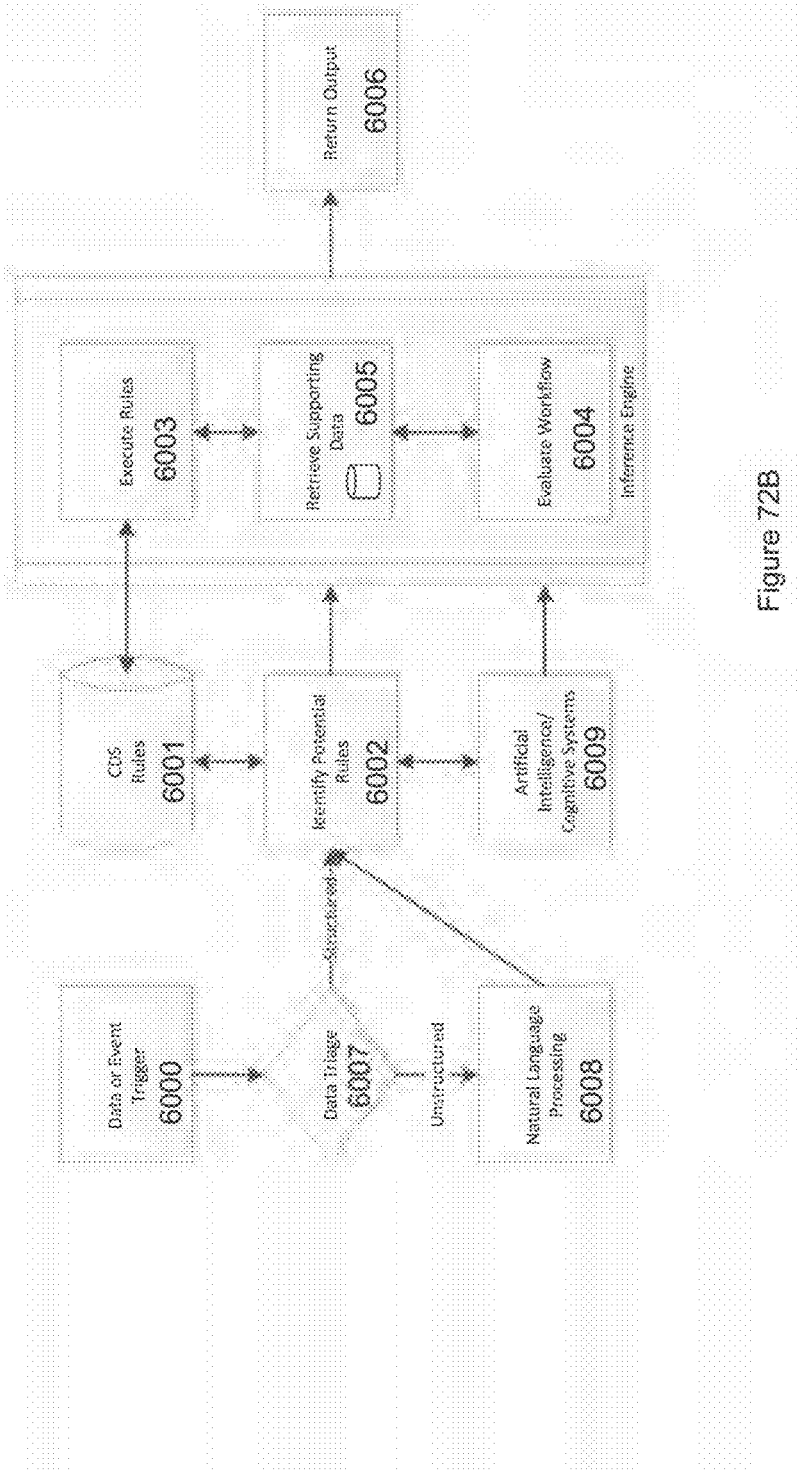

Data or Event Trigger
6000
Data Triage
6007
Unstructured
Natural Language Processing
6008
Structured
CDS Rules
6001
Identify Potential Rules
6002
Artificial Intelligence/ Cognitive Systems
6009
Execute Rules
6003
Retrieve Supporting Data
6005
Evaluate Workflow
6004
Inference Engine
Return Output
6006

Figure 72B

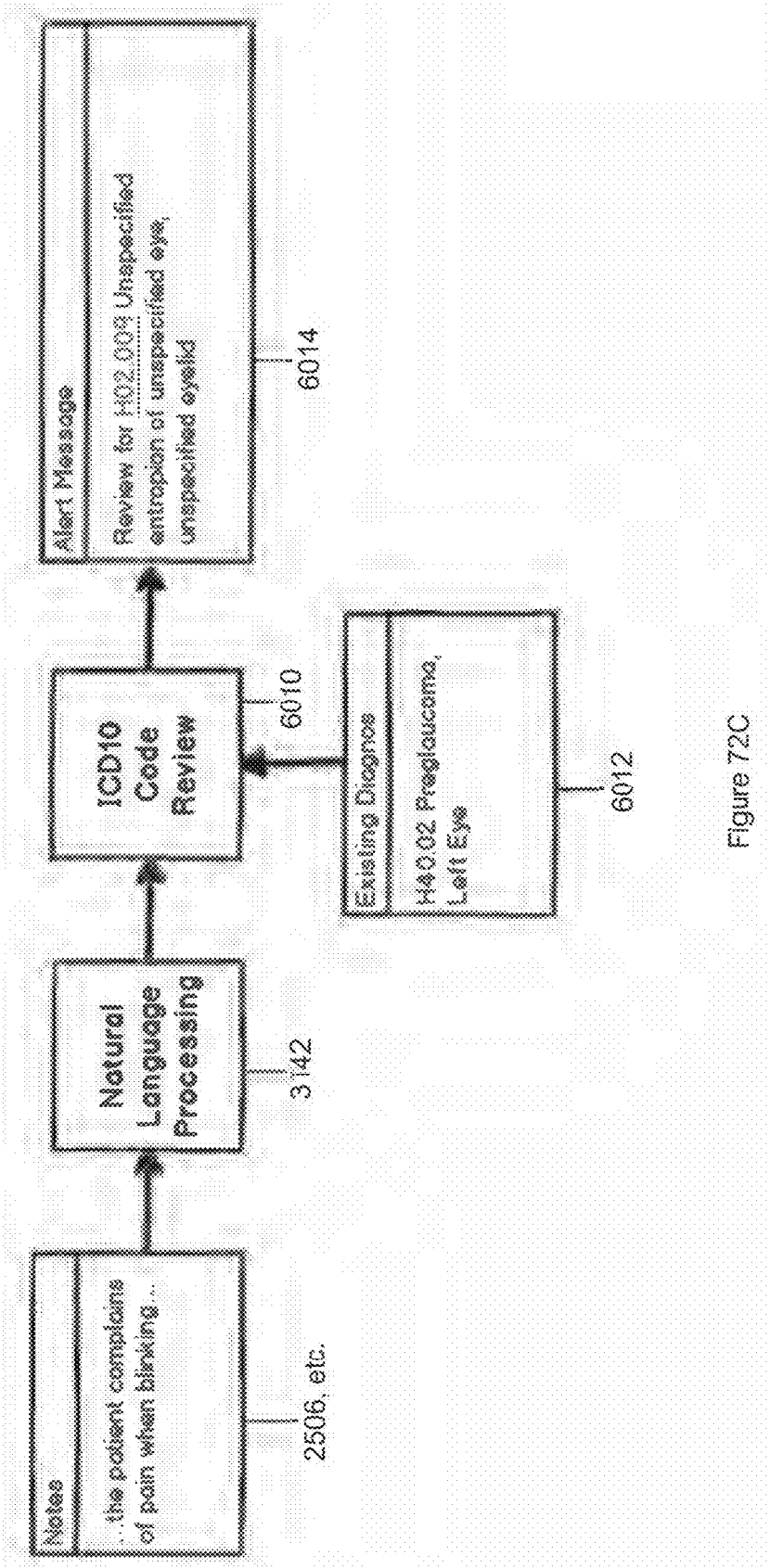

Notes
...the patient complains of pain when blinking...
2506, etc.
Natural Language Processing
3142
ICD10 Code Review
6010
Existing Diagnos
H40.02 Preglaucoma, Left Eye
6012
Alert Message
Review for H02.009 Unspecified entropion of unspecified eye, unspecified eyelid
6014

Figure 72C

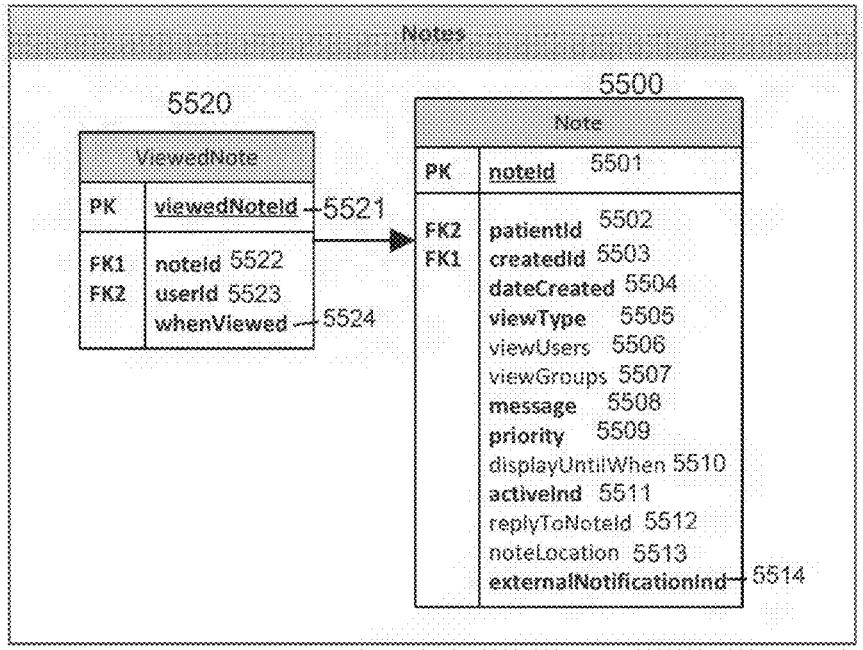


Figure 73

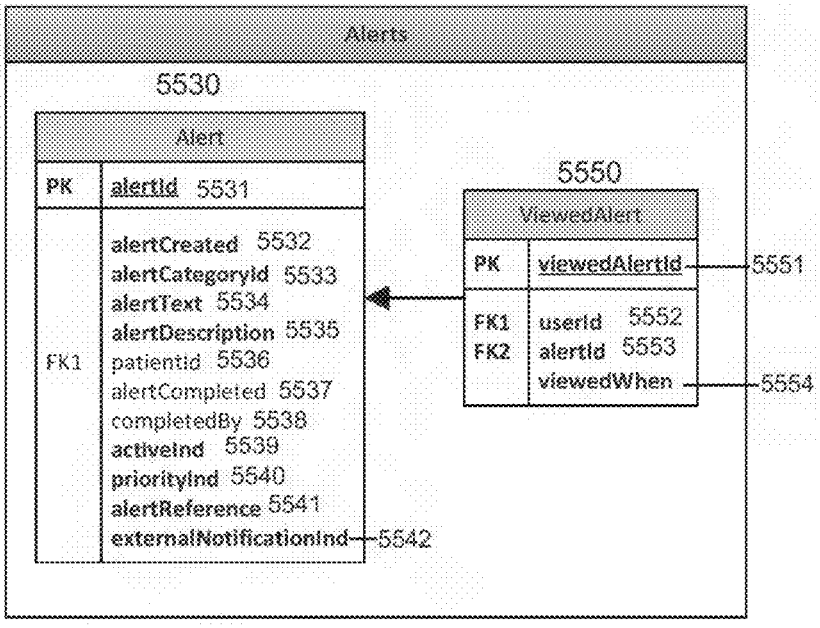


Figure 74

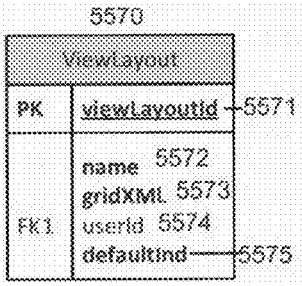


Figure 75

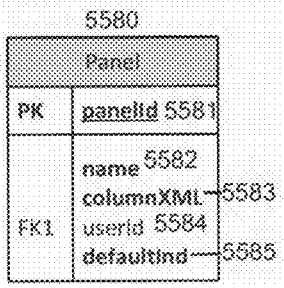


Figure 76

Figure 77

```
<view>
  <panels> 5590
    <panel>                                    5593
      <panelId></panelId>                      5594
      <position></position> <!-- Based on Flow Style: left, right, top, bottom, center -->
5595— <stacked></stacked> <!-- true,false – if true, creates tabs -- >
      <moveability></moveability> <!-- fixed, adjustable -->
    </panel>                                   5596
  </panels>
  <tabs> — 5591                                5597
    <position></position> <!-- left, right, top, bottom -->
    <tab>
      <panelId></panelId> 5598
      <order></order> 5599
    </tab>
  </tabs>
</view>
```

Figure 78

```
<panel>
  <columns> 5601
    <column>
      <name></name>5602
      <source></source> 5603
      <width></width> 5604
      <order></order> 5605
    </column>
  </columns>
</panel>
```

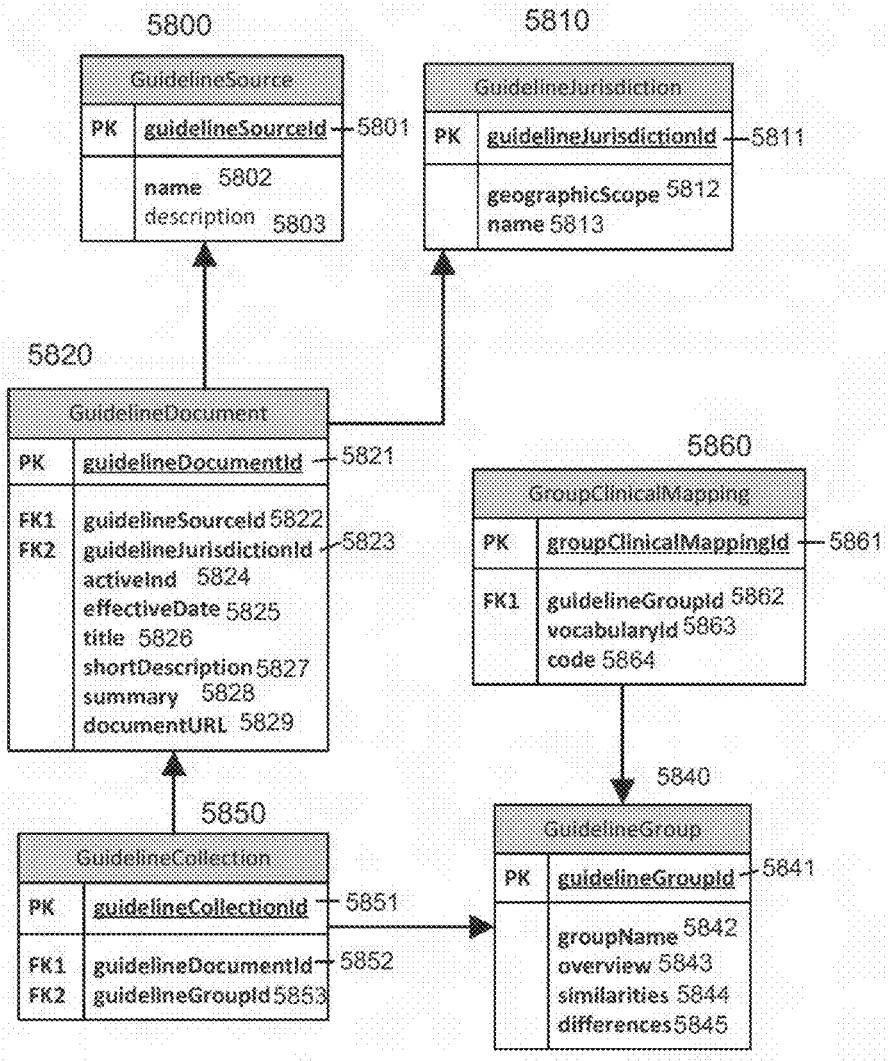

5800
GuidelineSource
PK guidelineSourceId 5801
name 5802
description 5803
5810
GuidelineJurisdiction
PK guidelineJurisdictionId 5811
geographicScope 5812
name 5813
5820
GuidelineDocument
PK guidelineDocumentId 5821
FK1 guidelineSourceId 5822
FK2 guidelineJurisdictionId 5823
activeInd 5824
effectiveDate 5825
title 5826
shortDescription 5827
summary 5828
documentURL 5829
5860
GroupClinicalMapping
PK groupClinicalMappingId 5861
FK1 guidelineGroupId 5862
vocabularyId 5863
code 5864
5840
GuidelineGroup
PK guidelineGroupId 5841
groupName 5842
overview 5843
similarities 5844
differences 5845
5850
GuidelineCollection
PK guidelineCollectionId 5851
FK1 guidelineDocumentId 5852
FK2 guidelineGroupId 5853

Figure 79

Figure 80

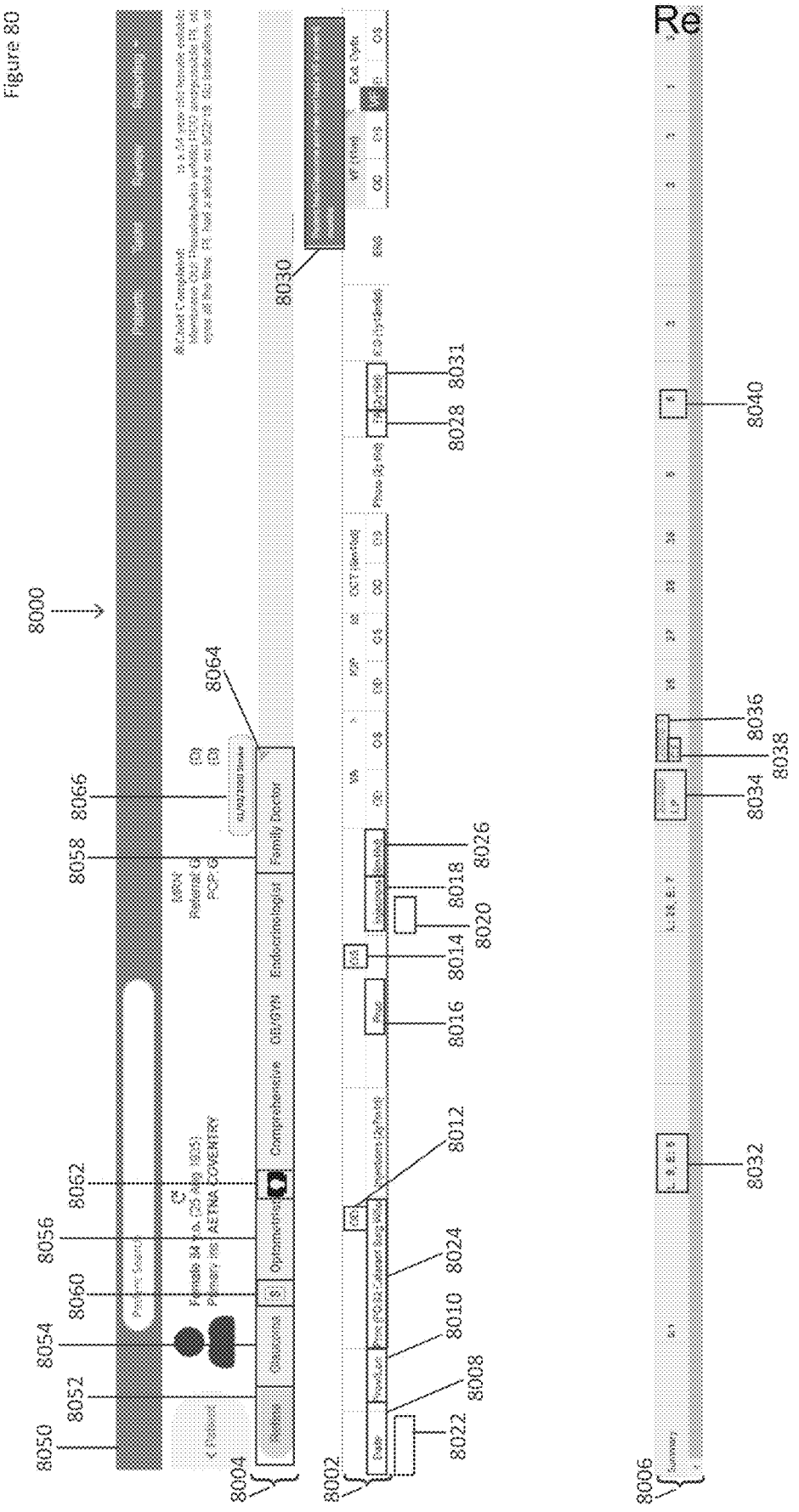
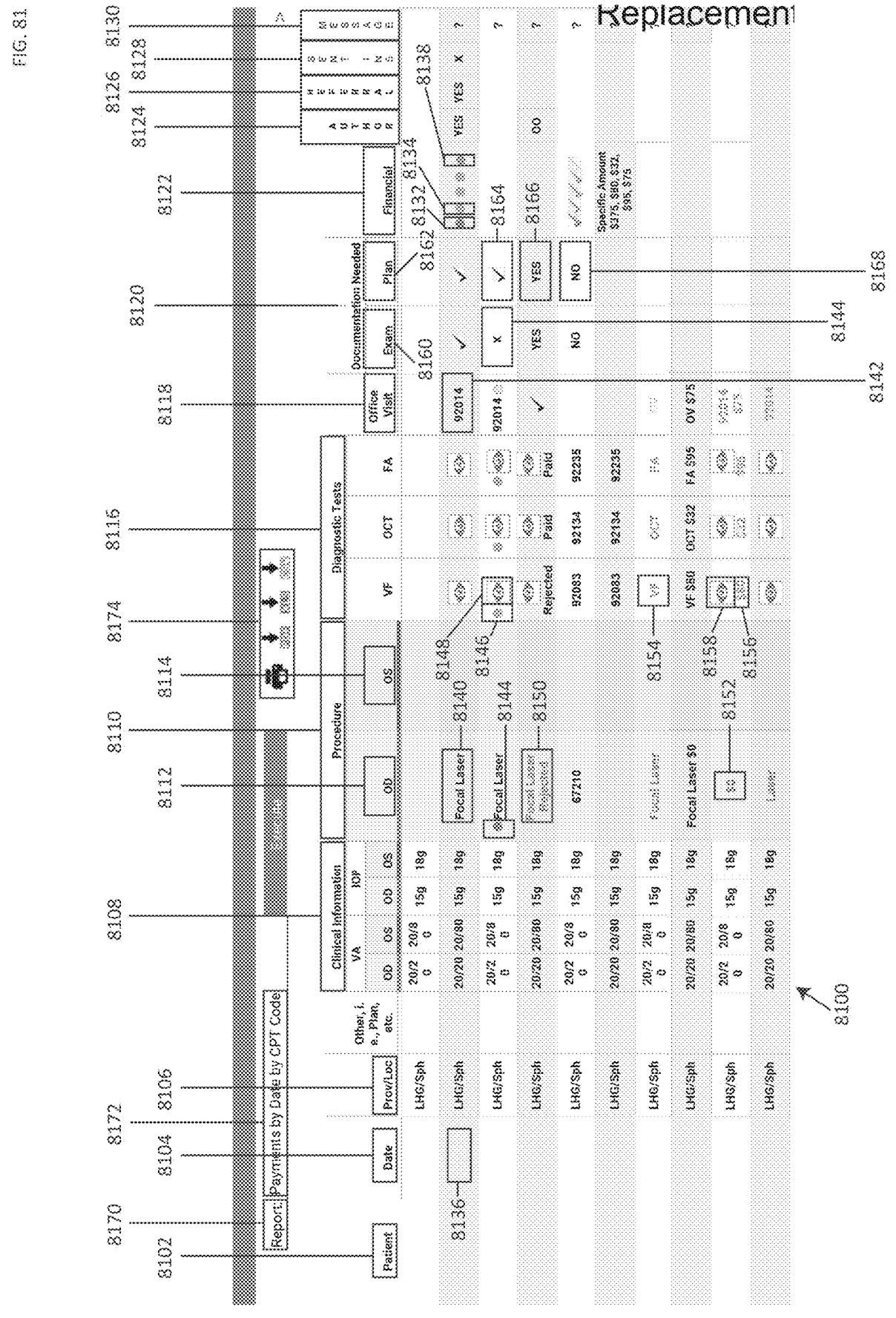

8000
8002
8004
8006
8008
8010
8012
8014
8016
8018
8020
8022
8024
8026
8028
8030
8031
8032
8034
8036
8038
8040
8050
8052
8054
8056
8058
8060
8062
8064
8066
Re

FIG. 81


Replacemen
Report: Payments by Date by CPT Code
Patient
Date
Prov/Loc
Other, i.e., Plan, etc.
Clinical Information
Procedure
Diagnostic Tests
Office Visit
Exam
Plan
Financial
Documentation Needed
Focal Laser
Specific Amount $275, $80, $32, $95, $75
8100
8102
8104
8106
8108
8110
8112
8114
8116
8118
8120
8122
8124
8126
8128
8130
8132
8134
8136
8138
8140
8142
8144
8146
8148
8150
8152
8154
8156
8158
8160
8162
8164
8166
8168
8170
8172
8174

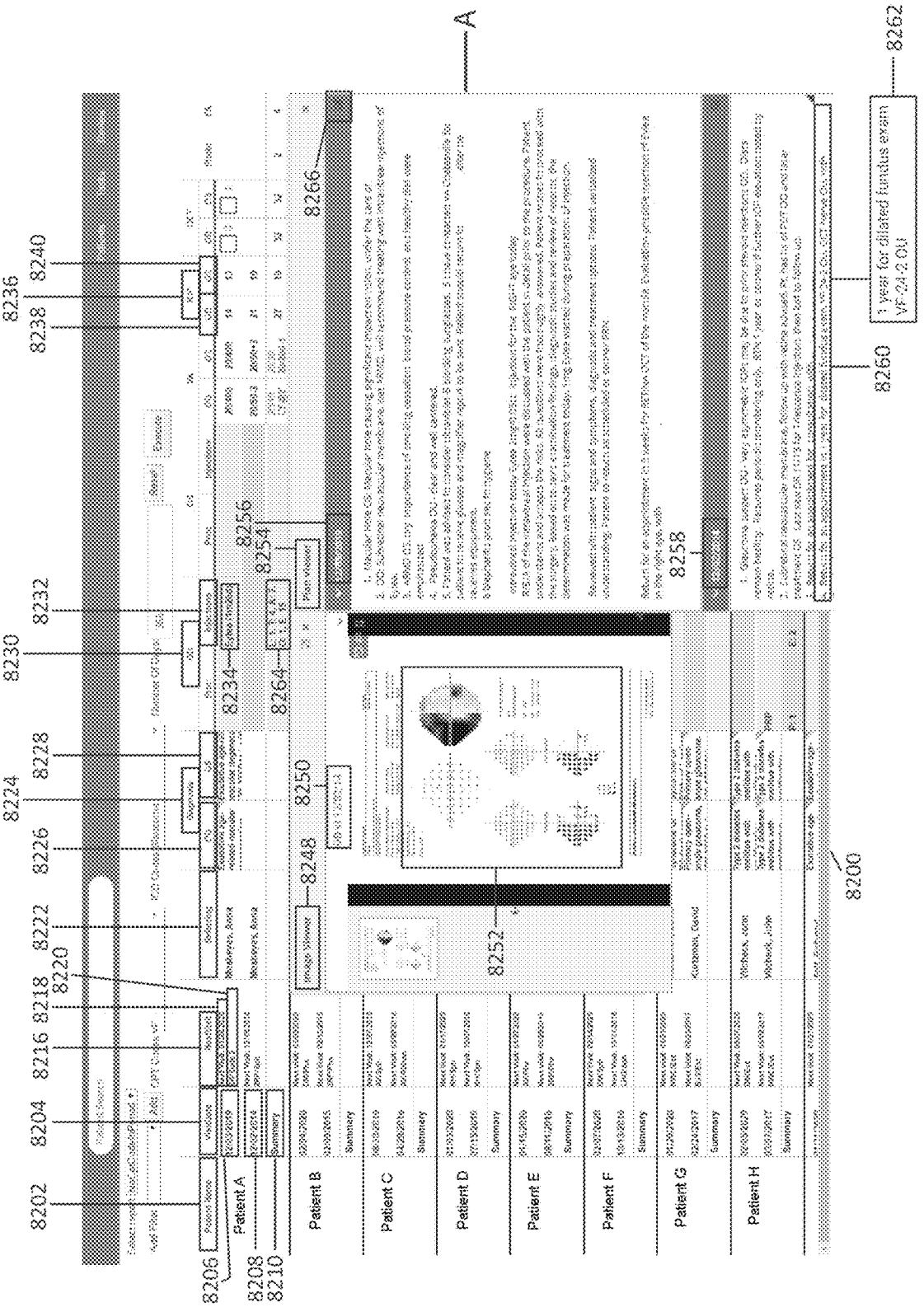

8200
8202
8204
8206
8208
8210
8216
8218
8220
8222
8224
8226
8228
8230
8232
8234
8236
8238
8240
8248
8250
8252
8254
8256
8258
8260
8262
8264
8266
A
Patient A
Patient B
Patient C
Patient D
Patient E
Patient F
Patient G
Patient H
1 year for dilated fundus exam
VF-24-2 OU

FIG. 82A

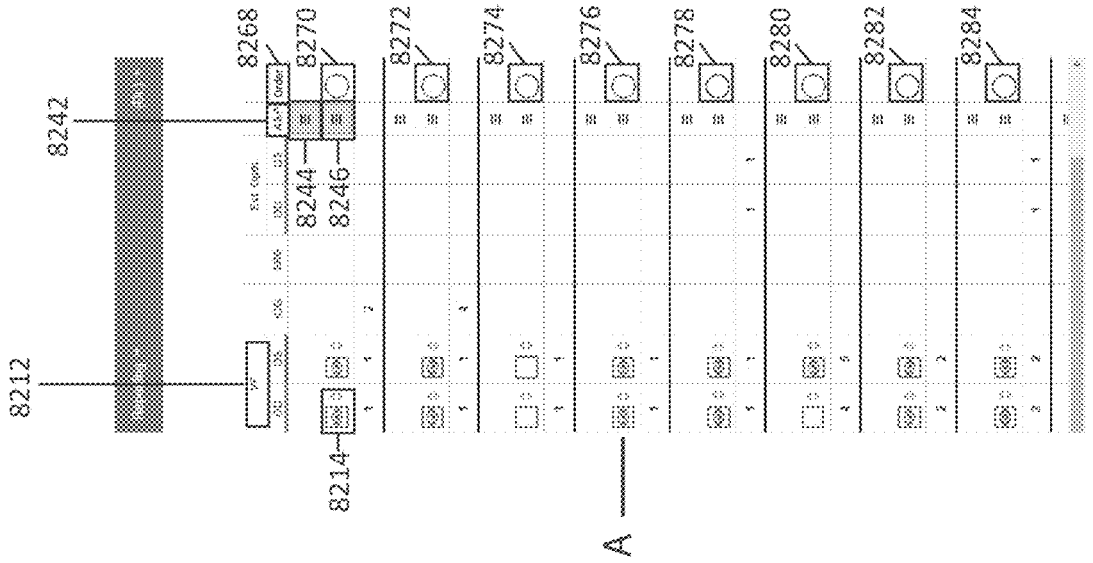
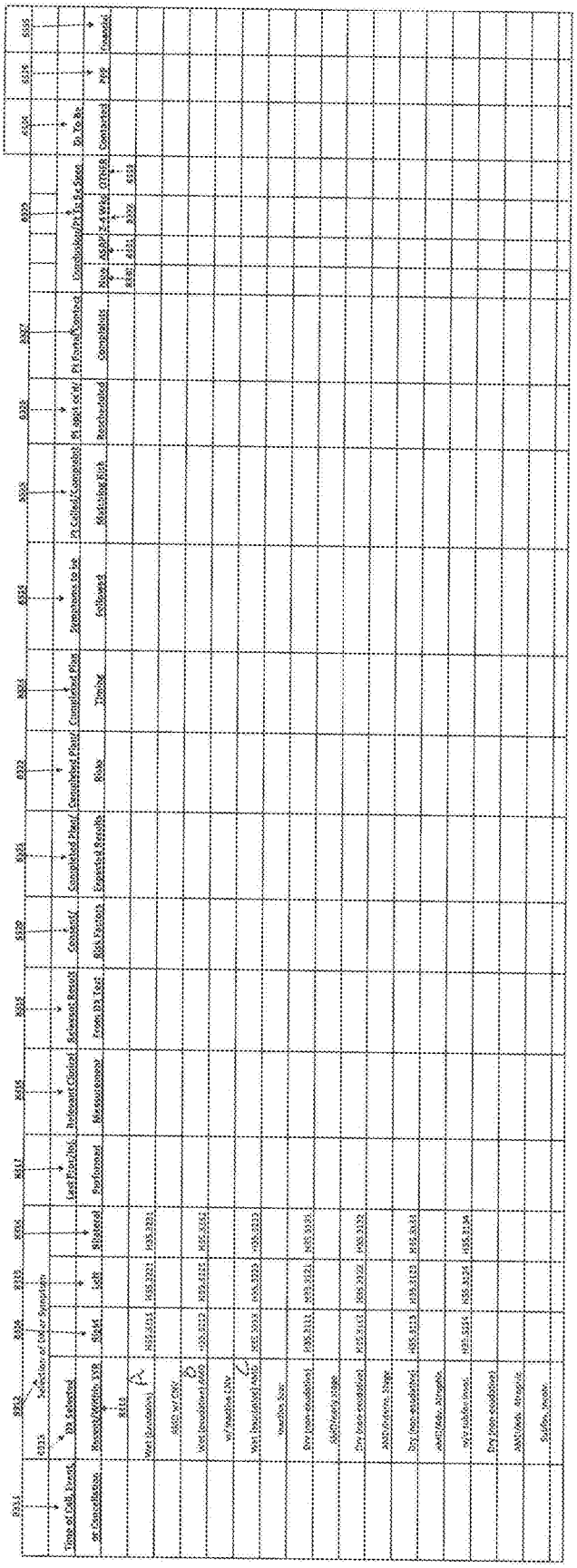
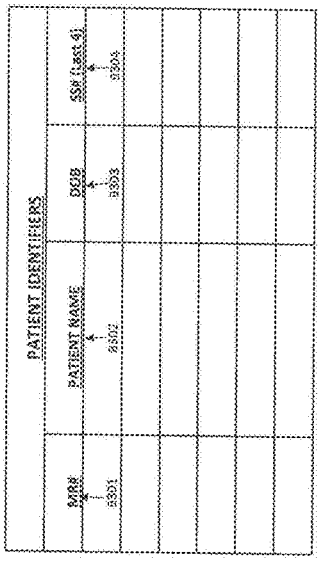

8212
8242
8268
8270
8272
8274
8276
8278
8280
8282
8284
8214
8244
8246
A

FIG. 82B

FIGURE 83 PATIENT SCHEDULER AND TRIAGE SYSTEM





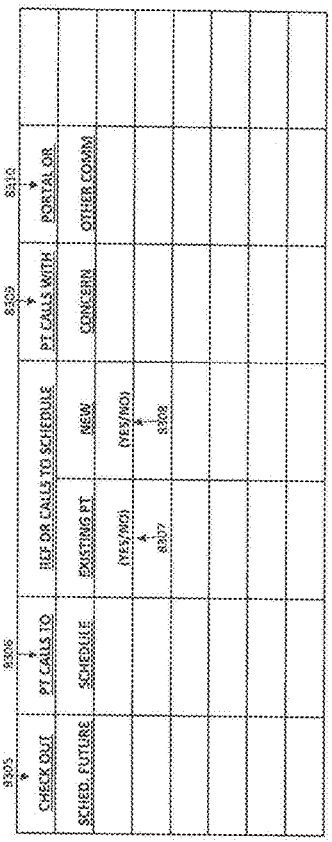


FIG. 84A

AN EXISTING PATIENT CALLS THE PRACTICE FOR APPOINTMENT

QUESTIONS TO ASK OR LOOK UP AND COMPUTER AUTOMATICALLY INPUTS THE QUESTIONS THAT ARE KNOWN

ALL ASSIGNED RISK NUMBERS BELOW AND QUESTIONS ARE EXAMPLES – A FORMULA WILL ALLOW PRACTICE TO INSERT ANY NUMBER

1. Patient had the following procedures in the last month
    a. Injection in eye (assigned urgent potential risk 10)
    b. Cataract surgery in the last month
    c. Glaucoma surgery in the last month
    d. Other _____
        i. If surgery, symptoms asked
            1. Sudden pain (urgency risk of 10)
            2. Sudden loss of vision (urgency risk of 10)
            3. Itching eye (urgency rate of 3)
2. Patient had a procedure greater than 1 month to 6 months ago
    a. Injection in eye
        i. Dx of patient auto-populated
            1. If diabetes (risk 7 assigned)
            2. If macular degeneration (risk 9)
            3. If BRVO (risk 7)
3. Patient had a follow up appointment but was not seen
    a. Within 30 days
        i. Previous appointment was < 1 month earlier
        ii. Previous appointment was 1-4 months
        iii. Previous appointment was > 120 days
    b. Within 90 days
        i. Previous appointment before that "missed appointment" was
            1. 1 month earlier
            2. 1-4 months
            3. > 120 days
4. Patient has the following diagnosis (ICD-10) with risk factors associated such that algorithm calculates the risk
    a. No diabetic retinopathy (3)
    b. Minimal diabetic retinopathy (4)
    c. Moderate diabetic retinopathy (5)
    d. Severe diabetic retinopathy (8)
    e. Proliferative diabetic macular edema (8)
    f. Macular edema (8)
    g. Advanced glaucoma (8)
    h. Ocular hypertension (3)

FIG. 84B

i. Cataracts (3)
j. Dry eyes (1)

5. Modifying factors auto-populated by computer, which calculate possible need for appointment
   a. Contact lens wearer
   b. Over age 60
   c. Age 50-60
   d. Under age 60
6. Patient has referring doctor that is an
   a. Optometrist
   b. Endocrinologist
   c. Ophthalmologist
7. Systemic disease
   a. Lupus
   b. Diabetes
   c. Hypertension
8. Patient calling because
   a. Missed a scheduled appointment
   b. Never had appointment scheduled from last visit
   c. Has new symptoms
9. If symptoms assigns a severity
   a. Loss of vision sudden in one eye or in two eyes
      i. Partial
      ii. Complete
      iii. Just blurred
      iv. Reading problems only
   b. Headache
      i. Visual complaint
      ii. Over age 50
   c. Curtain effect
   d. Floaters
      i. Few
      ii. Many
   e. Flashes of light
   f. Discharge from eye
   g. Itching
10. Which doctor patient sees auto-populated and take into consideration what type of doctor and what was done last time you saw that doctor
    a. Example of how works
       i. If practice has many specialists, some handle not the severe disease versus those of lesser how risky of a problem can be identified, i.e.,
          1. If optometrist in practice who only prescribed glasses and no ocular needs – low risk
          2. If retina doctor and any time in patient's history the patient had a laser – much higher risk

FIG. 84C

11. Does patient take any ocular medications -- each assigned a risk
    a. Tears 9risk 10)
    b. Glaucoma drop (risk 5)
    c. Antibiotic drop (risk 6 but depends on ICD-10, which could raise or lower risk)
    d. Steroid drop (risk 7)
12. Patient had diagnostic test scheduled
    a. Risk assessed but also correlated with ICD-10
        i. Fluorescein angiogram (8 risk factor)
        ii. Color photos (2 risk factor)
        iii. Visual field (5 risk factor, but if history of glaucoma -- 8 risk factor)
        iv. ERG (2)
13. Procedure had been scheduled but patient missed

Injection in eye	10 risk factor
Focal laser	7 risk factor
PRP laser	8 risk factor
Retinal tear laser	10 risk factor
Cataract surgery	5 risk factor
SLT laser	6 risk factor

FIG. 84D

EXAMPLE OF FORMULA FOR HOW URGENT APPOINTMENT NEEDED

DX OF PT	PAST PROCEDURE	WHEN	PAST DX TEST	SYMPTOMS	SCHEDULED BUT MISSED APPT	NO APPT SCHEDULED	NEED TO SEE DOCTOR
Diabetes	PRP	3 mths ago	FA	New floaters	Yes		Within one mth
Macular degeneration	Injection in eye		OCT	Pain and blurred vision	Yes		Emergency – get doctor on phone if patient can't be seen in 1 hour
Macular degeneration	Injection in the eye 4 mths ago	3 mths ago	OCT FA	None	Yes		1 month

FORMULA WITH MOST AUTO-POPULATED BY HISTORY IN COMPUTER

Patient Name	Diagnosis	Procedure in last one month	Procedure last year if any	Missed apt Yes No	Symptoms	How soon patient need to be seen
Written in by call center	Auto-populate	Auto-populate	Auto-populate	Auto-populate	Written in by person taking call	Risk = X

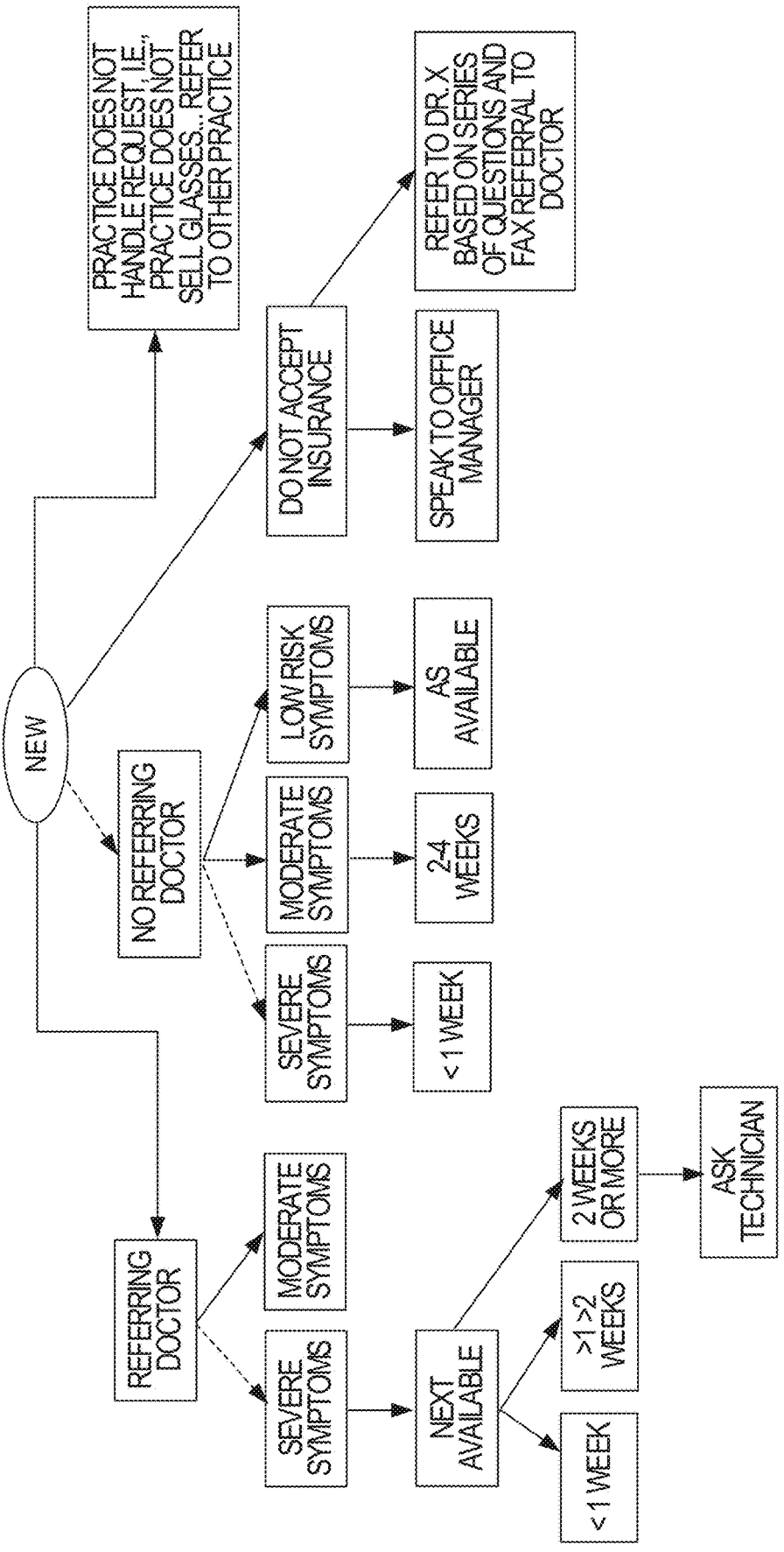

NEW
PRACTICE DOES NOT HANDLE REQUEST, I.E., PRACTICE DOES NOT SELL GLASSES...REFER TO OTHER PRACTICE
DO NOT ACCEPT INSURANCE
REFER TO DR. X BASED ON SERIES OF QUESTIONS AND FAX REFERRAL TO DOCTOR
SPEAK TO OFFICE MANAGER
NO REFERRING DOCTOR
LOW RISK SYMPTOMS
AS AVAILABLE
MODERATE SYMPTOMS
2-4 WEEKS
SEVERE SYMPTOMS
< 1 WEEK
REFERRING DOCTOR
MODERATE SYMPTOMS
SEVERE SYMPTOMS
NEXT AVAILABLE
2 WEEKS OR MORE
>1 >2 WEEKS
< 1 WEEK
ASK TECHNICIAN

FIG. 84E

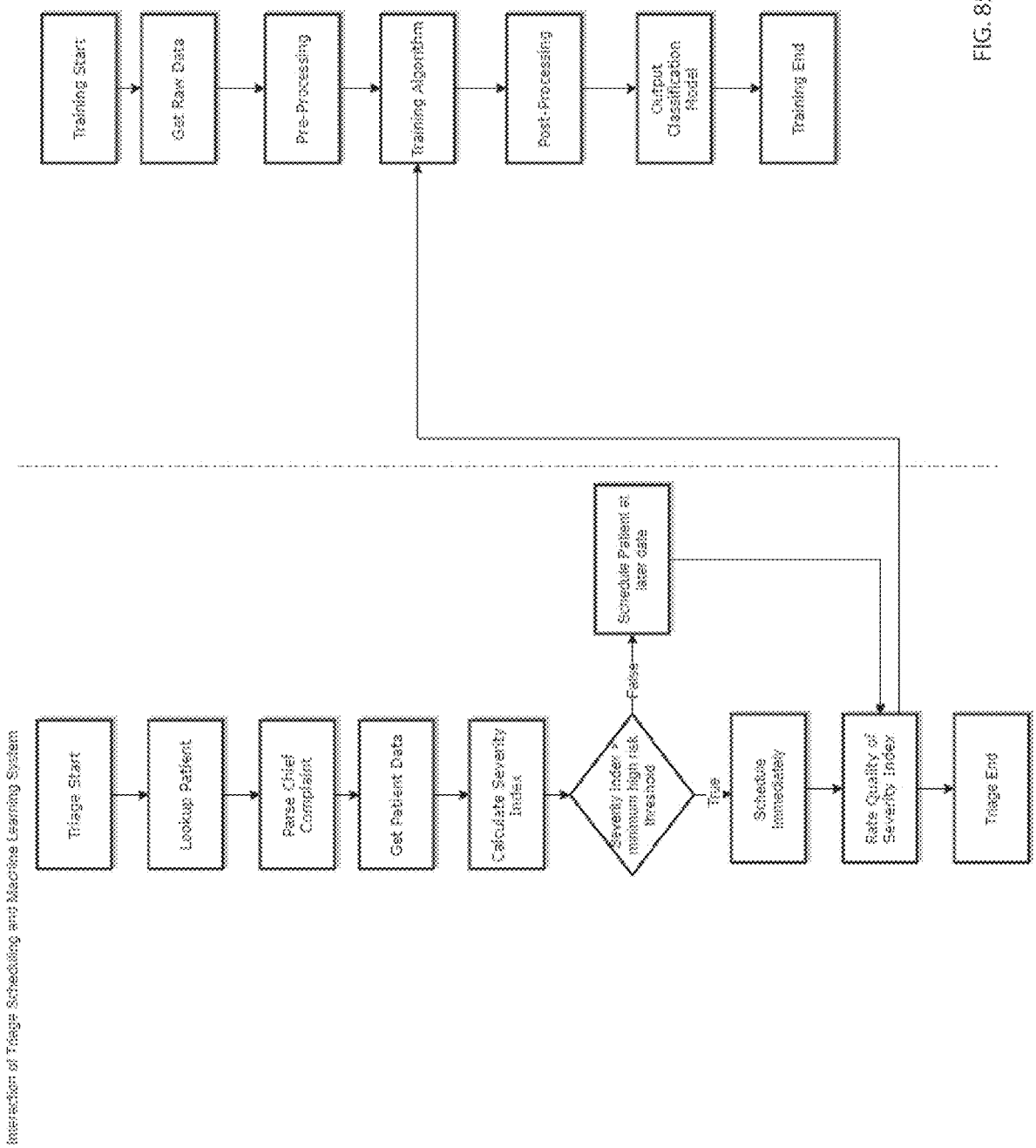

Interaction of Triage Scheduling and Machine Learning System
Triage Start
Lookup Patient
Parse Chief Complaint
Get Patient Data
Calculate Severity Index
Severity Index > minimum high risk threshold
False
True
Schedule Patient at later date
Schedule Immediately
Rate Quality of Severity Index
Triage End
Training Start
Get Raw Data
Pre-Processing
Training Algorithm
Post-Processing
Output Classification Model
Training End

FIG. 85

DATA COMMAND CENTER VISUAL DISPLAY SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part application of U.S. patent application Ser. No. 15/275,223, filed Sep. 23, 2016, which is a continuation-in-part application of U.S. patent application Ser. No. 15/204,900, filed Jul. 7, 2016, which is a continuation-in-part application of U.S. patent application Ser. No. 14/666,278, filed Mar. 23, 2015 (now U.S. Pat. No. 10,319,468), which is a non-provisional of U.S. Provisional Patent Application No. 61/968,693, filed Mar. 21, 2014. The present application is also a non-provisional of U.S. Provisional Patent Application No. 62/810,868, filed Feb. 26, 2019. The contents of these patent applications are hereby incorporated by reference in their entireties.

BACKGROUND

[0002] As technology advances, users of computer systems are asked to read and respond to an ever increasing amount of data. In complex systems, it is often difficult to present all of the data needed for decision-making in a way that facilitates quick decision-making that takes into account all of the relevant data. For example, physicians (interchangeable with "doctors" as used herein) are often called upon to make rapid life and death decisions based on a patient's conditions in the context of a medical history as presented in an Electronic Medical Record ("EMR"). However, the visual display systems for conventional EMRs are often difficult to understand and require the user to move through multiple screens, interfaces, and pop-up screens to obtain the disparate information needed to make a care decision. This is problematic when caring for multiple patients in a busy practice and is particularly problematic in a critical care setting.

[0003] Conventional EMR systems provide computerized interfaces between medical professionals and their staff and patients and are designed to facilitate and streamline the business of medical care. EMR systems allow a medical provider to track the delivery of medical care, access a patient's medical records, track billing for services provided, and follow a patient's progress. However, conventional EMR systems have mostly not met their promise because they typically include complex interfaces that require users to navigate through multiple layers, folders and/or windows to access even basic patient information. As a result, a HIMSS survey showed that 40% of physicians would not recommend their EMR to a colleague, 63.9% said note writing took longer with electronic health records, and 32% were slower to read other clinician's notes. A recent study by Medical Economics indicated that 67% of physicians are displeased with their EMR systems. Moreover, the complex interfaces are particularly problematic at the point of care as they slow physicians down and distract them from meaningful face time caring for patients. As a result, many physicians defer their interaction with the EMR systems until after the patients have been treated. A recent study reported in the Annals of Internal Medicine reported that physicians are spending almost half of their time in the office on EMR and desk work and spend just 27% on face time with patients, which is what the vast majority of physicians went into medicine to do. Once the physician gets home, they average another one to two hours completing health records. Thus, the complex interfaces of current EMR systems have led to diminished quality of the physician's practice of medicine, diminished patient quality of care, and negatively impacted physicians' job satisfaction. More user-friendly interfaces enabling physicians with ready access to the information accessible through EMR systems at the point of care would improve the physician-patient interactions and would be particularly useful in avoiding medical errors and missed diagnoses and increase compliance with insurance billing rules and regulations.

[0004] An underlying driver of physician's dissatisfaction with EMR systems is that medical knowledge is doubling every five years, diagnostic tests and procedures are exploding, and documentation requirements for payments are increasing. Physicians are becoming burdened with documentation and administrative tasks rather than spending their time as medical providers. As a result, the EMR system has created a barrier between the physician and patient, where physicians have to turn their back to the patient to input their findings, and have to navigate through multiple screens to do so rather than interact directly with the patient. The potential for medical errors, over ordering or under ordering of diagnostic tests, and other related mistakes generally, occurs because information is missed or buried in the electronic medical record and/or because information does not get transferred from the paper chart or copied from an earlier EMR entry. Important laboratory results or reports from other physicians can be lost or are difficult to access. Therefore, rather than reducing opportunities for potential medical errors, in many cases the electronic medical records systems themselves have created possibilities for error that did not exist with paper based medical files.

[0005] Communication of medical findings between physicians seeing patients treated by multiple health care providers has become more difficult. Now, rather than a phone call, simple fax or one page dictated medical summary, physicians are now sending voluminous amounts of information as the EMR gets stuffed with insurance documentation requirements and cut and paste options from "previous visits." Some medical conditions, such as diabetes, require multiple medical personnel to treat the patient. A single patient may have an eye doctor, family physician, endocrinologist, podiatrist, cardiologist, nephrologist, dietician/exercise physiologist, and diabetes education program coordinator. Primary care physicians can be audited and, if the annual report from a consultant is not in the chart, they can be financially penalized. The most important person in the team is the patient. A tool, such as the Command Center described herein, is needed that provides one summary page, with one entry per visit, that can be used by all of the care providers who can share care and see results. All can be alerted to a critical occurrence such as a hospital admission. Finally patients and their physicians can have a one page cliff note summary of the patients' visits with all of their physicians. Even a message can be sent to any or all who are sharing care. A tool is desired where physicians referring patients or sharing surgical and post-operative care (for instance a cataract surgeon co-managing with an optometrist) are able to share visits while looking at the entire patient's conditions.

[0006] A simplified method of sharing of pre-and post-operative care is desirable where a simple one page sum-

mary can be printed out and handed to the patient with future appointments on one line that can later be filled in. This will help with patient compliance and increase the likelihood that the patient will keep appointments. On this one page should include the results and the medications the patient is supposed to take, reminding a patient and the co-managing physician what was prescribed and for how long. A tool is also needed to stop duplication of diagnostic tests and to improve referring physician communication. If one physician (an optometrist, for instance) takes a photograph of an eye on a particular day and sends the patient to a physician (ophthalmologist) for a second opinion, it is desired that the exam of the referring physician be incorporated into a table whereby the consultant sees the results of the physician's (optometrist's) exam and diagnostic test (photos) on one line and does not need to repeat the photo. It is further desired that the findings of the consultant be shared with the referring physician whereby patients have one shared table for all of their physicians. This improves communication, reduces the likelihood of medical errors, and reduces the cost of healthcare, as fewer repetitive diagnostic tests are performed for physicians in different practices. Now, physicians can share information and patient histories in quick cliff note-like fashion. Through advancing technologies and telemedicine a shared diagnostic test can be looked at by multiple parties all instantly seeing previous examinations and the patient's medical history.

[0007] Another set of problems for users of EMR systems revolve around finance. Physicians are trained to treat disease and are typically not trained to manage their practices and be businesspeople. As a result, physicians increasingly rely on technicians, assistants, and other staff, often not qualified or properly trained to input information. Improper documentation or billing can occur, which the physician is held accountable for. Many current EMR systems require significant administrative overhead, and are prone to user error that can result in a discrepancy between billing, claims and payment for professional services and patient procedures. Physicians rarely know if what they had previously authorized to bill was in fact billed correctly, and rarely do physicians know if what they were paid was, in fact, correct.

[0008] In addition, there is a great demand for managing costs in the healthcare system. In recent years, health care networks have put in place systems for population health management and for revenue cycle management by providing software systems that enable healthcare providers to better track patient care and payment for healthcare services. However, it has been particularly difficult to involve the physicians directly into the revenue cycle management process. With so many priorities demanding the physicians' attention, few take the time to think about finances for an individual patient. Nine out of ten physicians cited shifting reimbursement models and the financial management of practices as their top challenges, according to a 2013 Wolters Kluwer Health Survey. Physicians typically make treatment decisions independent of cost factors and are unaware of the actual costs of the requested treatment. Providing such information to a physician at the point of care is desirable to enable the physicians to make informed decisions and is an excellent opportunity to get physicians involved on an individual patient basis in revenue cycle management. Unfortunately, providing such data to the physicians at the point of care would function to further clutter the EMR interfaces and require the physicians to spend more time interacting with the EMR system than interacting with the patient unless an efficient tool is designed.

[0009] To compound the physician's challenge, insurance companies and federal insurance programs such as Medicare and Medicaid hold physicians personally liable for what is billed, paid, and documented. Severe penalties and even criminal charges can occur when errors are made. The government has collected $2.5 billion for "wrongful under and over billing and inadequate documentation" (see https://www.justice.gov/opa/pr/departments-justice-and-health-and-human-services-announce-over-278-billion-returns-joint). Most physicians are not even aware that the government has written local coverage determinations (LCDs) (i.e. billing requirements) that are different across regions of the country and every insurance company has its own documentation frequency of tests and billing rules. Physicians, even if they are aware of the existence of LCDs, rarely have read the voluminous rules and regulations that without notice to a physician can change at any time, yet the physician is held liable. If a physician moves to another state, the rules and regulations can be entirely different. A tool is needed that at the point of care can briefly present to the physician, based on the patient's insurance, the rules and regulations for whatever a physician orders, and what needs to be documented or performed.

[0010] Overall, while EMRs were meant to reduce costs and improve quality of care, the opposite has occurred. Dr. Steven Stack, president of the American Medical Association, addressed this issue when he said: "Imagine, in a world where a 2-year-old can operate an iPhone, graduated physicians are brought to their knees by electronic health records. When you have more than a quarter million physicians being penalized by the Government by a single program, I think that most people will understand the math. It is not that 250,000 plus physicians are the problem, it is most likely the single program they are being punished by." The Government has collected substantial sums of money from physicians and hospitals annually for either under or over billing, or wrongful billing. Physicians need a tool that helps them meet all insurance regulations and make certain that charges are billed correctly.

[0011] The overarching problem is that data input and currently available user interfaces are not aligned with the way physicians practice medicine. As Gary Botstein, MD of Dekalb Medical Center in Decatur, Ga., said at a Break the Red Tape Town Hall: "It's very easy to record large amounts of data and click-off boxes. So the emphasis is really on data collection, but what physicians ought to be doing is data synthesis. They ought to be taking that data, putting it together and coming up with a differential diagnosis and then figuring out what the best diagnosis is and then the best treatment . . . EMR was in front of me, I had 280 data points . . . to complete. To do this voluminous review of systems that was irrelevant to my patient's visit, it was like looking for a needle in a haystack. Once all this data was collected, you couldn't even find it." Dr. Puppula, of Alliance Pain and Spine Centers in Atlanta stated at the same Break the Red Tape Town Hall: "Most systems today are not (designed around clinical care). They are set to comply with the federal regulations with policy makers as opposed to actual physician care, and the concern is we're basically being turned into data miners in order to spend all of our time and effort on documentation as supposed to the key issue of medical decision-making." A simple, elegant solution is needed that

helps the physician synthesize information and populate and document the chart when they see a patient on one screen, not on multiple tabs.

[0012] In current EMR systems numerous fields and data entry must occur on many different screens describing physician's findings. It takes a tremendous amount of time for data entry. A wrong click of a mouse can insert the wrong information. This is a difficult task for a busy physician and is often handed off to technicians to handle. A tool is needed that will help a physician modify and review a summary of the patient's history on one screen. Further, a tool is desired that would act like a switchboard and enable auto-population of data, where information is documented in a patient's chart when the patient is evaluated. Most EMR systems separate each patient visit by tabs representing each date of service. Critical historical information related to patient testing, diagnosis, surgical histories, and complications, are often dispersed on multiple pages, without any visual markers to identify which page houses the information that a clinician needs to review. These cumbersome formats in the EMR cause significant delay in evaluating a patient and can lead to medical mistakes, as information is lost in the confusing formatting. An improved system would provide a snapshot of the critical medical data along with the billing and clinical guidelines related to the patients' treatment, which is unique to existing EMR formats. In combining these critical data into one comprehensive format, the improved system would increase efficiency and accuracy of the patient evaluation process.

[0013] There is also a significant need for a tool that allows a physician to identify medical problems through data visualization, where data is presented and displayed in an intuitive, easy to read manner and which enables the rapid identification of billing and collections. Since physicians are typically time constrained, the tool should allow the physician to access information while examining a patient in order to quickly identify potential billing and or reimbursement problems, as well as medical problems, so that issues can be resolved with the patient in real time. The tool would thus enable the physician to be involved with revenue cycle management, while simultaneously double-checking documentation and reducing medical errors.

[0014] A tool is needed to help a physician order diagnostic tests, procedures and medications while seeing on one screen all of the patient medical situation and having a bird's eye overview of what has been ordered/performed in the past and the results and costs. Physicians can get distracted as they are forced to multi-task. A tool is needed that puts the pertinent information at the fingertips of the physician and that can be ordered directly from the screen including the patient's medical information. Yet, physicians often are blindfolded when it comes to knowing requirements of a particular patient's insurance that may require a patient to go to a particular location to obtain a diagnostic test or the cost of that test for the hospital, practice or patient. The same holds true in regards to ordering medication or a procedure. A tool is desired that will enable physicians to discuss options with the patient at the point of care and alter the plan if necessary.

[0015] Physicians also need a tool that will enable them to collect and evaluate their own clinical outcomes. This is important because pay for performance models are increasingly being implemented and compensation will be based on clinical and cost savings outcomes, rather than for services and procedures provided. At the heart of all pay for performance models is data analysis. Tinsley suggests "that tracking clinical data is essential in preparing for pay for performance models. Even if a small practice can participate in large scale, value-based model, it can surely implement measures that track and reward quality patient management. There is always more money behind knowing the clinical outcomes and data behind physicians' requests. A lot of physicians are saving payers money and not getting a piece of the pie." A tool is needed that can provide the physician with a summary of results of their medical care. This will then enable them to improve care and to negotiate rates with insurance carriers, and will help them in establishing cost saving methods for delivering care and determining if the care they provide meets set standards.

[0016] A tool is needed to help physicians document better and more quickly, identify errors and make suggestions by incorporating artificial intelligence and adaptive learning engine techniques into patient care to, for example, find discrepancies in payments, to alert physicians about inconsistent medical documentation or improper orders, to speed up the process of complying with regulations, or to alert the physician that a plan or order is inconsistent with a preferred practice plan for a patient.

[0017] A tool is also needed to alert the physician of important messages, letters and laboratory results that are not readily accessible in current EMRs, so they do not miss important findings and so that the physician may learn about important reports while they are examining a patient. In many cases, these reports may just have been received in the mail or by fax and a clerk just scans it and it becomes buried within the EMR without alerting the physician. Physicians rely on surrogates, like technicians or receptionists to document information on each visit such as a chief complaint. Important alerts that the staff wishes to send to a physician on the day the physician is examining the patient should be communicated on the same page so that everything relating to a patient can be seen at once and nothing important missed. Further, in some cases such alerts should be removed at the end of the day, because they are no longer relevant, thus reducing information clutter allowing the physician to focus on what is important and relevant.

[0018] A tool is further needed that allows a physician to make important notations, or that reminds the physician of changes or allows the physician to make a brief note that the physician understands and to help the physician rapidly guide decision making to care for the patient that is not just for chart documentation alone. The note should be able to be changed at any time if it is just for the physician to remind themselves of how to care for the patient. Insurance companies want complete, accurate and understandable notes to justify payment. Physicians are often forced to do meaningless documentation. A tool is needed just for the physician that allows shorthand reminders for the physician to best care for the patient without regard to what "the insurance company will police."

[0019] Most EMR systems are highly proprietary and do not communicate well with each other. This lack of interoperability presents a barrier to the transparent communication of health information. A tool is needed that can grab and summarize data from multiple sources and EMR systems. In particular, a tool is needed that will conform to new interoperability standards proposed and allow for a complete patient history, no matter what EMR system is used. The

interface should also be flexible so that the information presented may be customized to the needs of the user.

[0020] Thus, there is a significant need for a data presentation tool that allows for the capture and presentation of large amounts of disparate data to a user such as a physician in a way that facilitates informed efficient decision-making. In the case of an EMR interface, the tool should allow physicians to rapidly detect potential problems, inconsistencies, medical changes, potential billing errors, review diagnostic tests and navigate through the entire patient chart history, and document within the chart with minimal navigation so that the data may be readily accessed at the point of patient care with minimal distraction from caring for the patient. The data command center described herein, is designed to address these and other needs in the art.

SUMMARY

[0021] The above and other needs in the art are addressed by a data command center visual display system and associated methods for displaying data on a display screen from multiple data sources and allowing navigation amongst the data without leaving the display screen of the visual display system. Numerous technical issues rooted in computer technology must be solved for the data to be presented to the visual display system so that the data may be displayed in the command center without leaving the display screen. For example, the visual display system must provide access to the requisite health information systems and third-party support services whereby the data may be accessed, processed, and presented without unacceptable delay. Also, the display data must be collected and ordered to facilitate the various combinations of the data into respective display panels that may be navigated on the display screen. For example, it is desirable for the data to be configured in a task-based or specialty-specific display configuration for use by physicians, for example. To do this, various features in prior art systems needed to be acquired and combined in a new way to facilitate access to the features without having to navigate away from the display screen. For example, conventional EMR systems provide interfaces to third party prescription ordering systems but require the user the navigate to another system and away from the EMR interface. Accessing ordering screens without leaving the display screen becomes particularly difficult where the display screen space is limited as is the case for many physicians who use portable display devices such a iPads™ and other mobile computers. The structural embodiments described herein address these technical issues to generate the command center visual display system embodiments described herein.

[0022] In exemplary embodiments, such a data command center visual display system includes a patient database that stores patient identification information, patient insurance information, patient medical history information, a computer readable storage medium having stored thereon instructions thereon, and a processor that executes the instructions to perform operations including creating a plurality of adjustable display panels configured to display predetermined combinations of the patient identification information, patient insurance information, patient medical history information, and creating a patient flowsheet that integrates the patient medical history information into a table that presents the patient's medical history by visit to at least one physician with respective procedures or actions performed during each visit represented as first icons identifying the procedure or action performed and second icons enabling selection of anew procedure or action, where the first and second icons provide links to associated patient medical information and ordering display panels that may be accessed without leaving the display screen. In response to selection of the second icon by a user of the visual display system, an ordering display panel is presented to the display screen in addition to the adjustable display panels and patient flowsheet. The desired procedures or actions may be ordered from the ordering display panels while relevant portions of the patient's medical history are still visible on the display screen. The scope of the claims also contemplates corresponding methods performed by the visual display system and users thereof.

[0023] In exemplary embodiments, the ordering display panel compromises an ePrescribing panel for ordering medication or a medical procedure ordering panel for ordering a medical procedure. By way of example, the medical procedure ordering panel for ordering a medical procedure may further provide a link to the quality reporting panel that displays quality reporting metrics and/or peer data related to the procedure that is being ordered. All of such ordering display panels are configured in the context of the screen display to save real estate so that the ordering display screen may be displayed while still being able to view the medical history data, for example.

[0024] In other exemplary embodiments, the ordering display panel comprises an imaging order panel for ordering a medical image of the patient or a lab order panel for ordering a lab test of the patient. In still other embodiments, instructions are provided that when executed create an image icon in an adjustable display panel and/or the patient flowsheet that, when selected by the user of the visual data system, opens a display window for viewing of one or more images without leaving the display screen.

[0025] In other exemplary embodiments, the visual display system incorporates financial data with the patient medical history data into the display panels. Such a visual display system includes a patient database that stores patient identification information, patient insurance information, patient medical history information, and patient payment information, a computer readable storage medium having stores thereon instructions thereon, and a processor that executes the instructions to perform operations including creating a plurality of adjustable display panels configured to display predetermined combinations of the patient identification information, patient insurance information, patient medical history information, and patient payment information, and creating a patient flowsheet that integrates the patient medical history information and patient payment information into a table that presents the patient's medical history by visit to at least one physician with respective procedures or actions performed during each visit represented as first icons identifying the procedure or action performed and second icons indicating whether the procedure or action has been paid for in part or in full, the first and second icons providing links to associated patient medical history information and/or patient payment information. In response to selection by a user of the visual display system, the adjustable display panels and patient flowsheet are moved into a task-based or specialty-specific display configuration such that the patient identification information, patient insurance information, patient medical history infor-

mation, and patient payment information may be accessed without leaving the display screen. The task-based or specialty-specific display configuration is then presented to the display screen. In exemplary embodiments, selection of the first icons or second icons open display windows to associated medical history data and/or financial data and overlay a portion of the display screen with the display windows whereby the associated medical history data and/or financial data may be viewed by the user of the visual display system while the adjustable display panels and the patient flowsheet are displayed in a background on the display screen. Throughout this description, it will be appreciated that all financial data in the system, including costs to patient, is compartmentalized such that no user may see financial details for users or organizations not authorized in accordance with applicable policies and law. Also, the scope of the claims also contemplates corresponding methods performed by the visual display system and users thereof.

[0026] The visual display system includes a number of features that enable accessing information on the display screen. For example, third icons are provided in the patient flowsheet or display panels that include links to compliance information about compliance with insurance guidelines and/or good clinical practice guidelines for a procedure or action associated with each third icon. In exemplary embodiments, the compliance information includes aggregated medical treatment guidelines and an overview outlining similarities and differences amongst different medical treatment guidelines making up the aggregated medical treatment guidelines. The aggregated medical treatment guidelines may include information related to recommended follow-up with the patient, information related to procedures permitted or prevented by the patient's insurance or contraindications, and information relating to proper billing for the procedure or action associated with a third icon selected from the patient flowsheet or display panels. In exemplary embodiments, the visual display system provides access to a clinical decision support system that uses a rules engine and/or natural language processing to aggregate the medical treatment guidelines and to generate the overview outlining similarities and differences amongst different medical treatment guidelines making up the aggregated medical treatment guidelines. The clinical decision support system and/or natural language processing system may further compare medical data to notice patterns, errors and anomalies in different entries or notes, find discrepancies in payments, alert the user of the visual display system about inconsistent medical documentation or improper orders, speed up the process of complying with regulations, alert the user of the visual display system that a plan or order is inconsistent with a preferred practice plan for a patient, or warn the user of the visual display system that billing certain procedures might not be covered. The natural language processing system may also be accessed parse notes in the patient flowsheet or display panels for potential ICD10 codes or alternative diagnosis.

[0027] The visual display system also includes a display configuration that enables users of the visual display system to order medications, diagnostic tests, images, procedures, and the like directly from the patient flowsheet or display panel. For example, an icon or link in the patient flowsheet or display panel may include an ePrescribing panel for ordering medication or a medical procedure ordering panel for ordering a medical procedure. The medical procedure ordering panel may further include a link to a quality reporting panel that displays quality reporting metrics and/or peer data related to the procedure that is being ordered. In other embodiments, an icon or link in the patient flowsheet or display panel may include an imaging order panel for ordering a medical image of the patient or a lab order panel for ordering a lab test of the patient. In still other embodiments, an image icon is provided in an adjustable display panel and/or the patient flowsheet that, when selected by the user of the visual data system, opens a display window for viewing of one or more images without leaving the display screen. In other embodiments, an alert icon is provided in an adjustable display panel and/or the patient flowsheet that, when selected by the user of the visual data system, opens an alert message without leaving the display screen. In still other embodiments, one of the display panels may be configured to accept today's visit notes from the user of the visual display system in connection with a patient visit for storage for access with other data of the one display panel.

[0028] Other novel features in exemplary embodiments include a moveable note icon for association with context information in a corresponding one of the adjustable display panels and/or the patient flowsheet. The note icon moves with the context information as the context information is moved on the display screen. When the note icon is selected, the user of the visual display system may enter a note relating to the context information.

[0029] In still other embodiments, data input by the user of the visual display system may trigger auto-population of information in the adjustable display panels and patient flowsheet and auto-population of the patient's medical record in an electronic medical record system. In the exemplary embodiments, the auto-population occurs without the user of the video display system leaving the display screen.

[0030] In other embodiments, new clinical information for the patient is provided to a diagnosis evaluation algorithm for comparison of the new clinical information with previous corresponding clinical information for the patient to determine whether the new clinical information is indicative of an improvement or worsening of the patient's medical condition. The visual display system further generates diagnosis indicators providing a visual representation of an improvement of a medical problem, disease, or symptom, or a worsening of a medical problem, disease, or symptom as a result of taking a particular medication or undergoing a particular medical procedure and displays the diagnosis indicators in the adjustable display panels and/or the patient flowsheet.

[0031] Other embodiments of the visual display system allow for increased speed of data presentation by a local database that stores a subset of patient identification information, patient insurance information, patient medical history information, and patient payment information, where the subset includes the patient identification information, patient insurance information, patient medical history information, and patient payment information for patients having an appointment within a predetermined time window.

[0032] The visual display system in exemplary embodiments includes interfaces to an external health information system and third party service systems. In exemplary embodiments, the external health information system includes at least one of an electronic medical records system, a practice management system, a health information exchange, a picture archive and communications system, a

clearing house/billing system, and a laboratory system. On the other hand, the third party service systems may include one or more of an ePrescribing system, an insurance verification/referral/pre-authorization system, a system for establishing medical necessity by verifying that a procedure or medication is associated with a correct ICD10 code supporting its use, a clinical services pricing and location system, a claim status checking system, services in support of the National Correct Coding Initiative, services to proactively ensure claims are coded correctly to prevent issues in billing, claims compliance services that evaluate claims against National Coverage Determination (NCD) and Local Coverage Determination (LCD) guidelines as well as local insurance regulations to establish and document medical necessity, a natural language processing system, and artificial intelligence/cognitive systems that provide clinical decision support.

[0033] In exemplary embodiments, the patient identification information, patient insurance information, patient medical history information, and patient payment information is stored in the patient database in transactional tables that capture clinical and billing data and reporting tables where data is aggregated for a particular physician, practice, health system or other entity. Each table uses a surrogate primary key that is a unique value within the table used to identify a row that is not directly tied to data in that row. In the exemplary embodiments, XML code moves and stores different display panel and flowsheet views. The XML code further identifies a collection of panels and tabs, wherein within each panel is a panel ID that links the panel to a tab, the panel's position, and whether or not the panel is stacked with another panel. The XML code may also set up the display panels and patient flowsheet on the display screen by, for example, identifying a collection of columns and, for each column, a name of the column along with a data source. The display panels so configured are presented to the display screen for selection and display panel frames on the display screen are manipulated for receiving selected display panels.

[0034] In other exemplary embodiments, the patient flowsheet is organized around patient medical information corresponding to a particular disease state and/or procedures and/or insurance coverage and/or actions for treating the particular disease state.

[0035] The patient database may also be adapted to include patient medical history information from a plurality of medical providers whereby the patient flowsheet may be adapted to include medical history information from more than one medical provider in order to provide shared treatment of the patient in the patient flowsheet. In other embodiments, a summary table may be provided that illustrates everything the user of the visual display system has done for each patient in a particular time frame or for each patient having a particular disease state in a particular time frame. The summary table may also include information from other medical providers who are providing shared treatment of the patient. If financial data, cost, charge, payment is on the summary table with the medical data, this data is compartmentalized such that no user may see financial details for users or organizations not authorized in accordance with applicable policies and law.

[0036] In yet other embodiments, a data command center visual display system is provided that presents dynamic data to a display screen. The command center visual display system includes a plurality of adjustable display panels configured to display predetermined combinations of patient identification information and patient medical information. A patient flowsheet is created that includes a table that presents the patient's medical information by medical service, medical procedure, diagnostic test, medication, and diagnosis that is prescribed, ordered, performed, or selected during respective encounters with at least one medical provider. In response to selection by a user, at least two adjustable display panels containing medical information relating to one or more patients in the patient flowsheet are presented to the display in a single view. The user may edit or move the medical information or the patient identification information within the display panels while the display panels are simultaneously open.

DESCRIPTION OF THE DRAWINGS

[0037] FIG. **1** illustrates an exemplary embodiment of a Data Command Center for use with art EMR system customized for a Retina Ophthalmology practice in accordance with a first embodiment.

[0038] FIG. **2** illustrates a medical record window of the medical record system of FIG. **1** that is useful for deploying or launching embodiments in accordance with the first embodiment.

[0039] FIG. **3** illustrates a medical record dashboard selection window useful for selecting and launching embodiments in accordance with the first embodiment.

[0040] FIG. **4**A illustrates a medical record dashboard in accordance with the first embodiment.

[0041] FIG. **4**B illustrates a portion of the medical record dashboard of FIG. **4**A in accordance with the first embodiment.

[0042] FIG. **4**C illustrates a portion of the medical record dashboard of FIG. **4**A in accordance with the first embodiment.

[0043] FIG. **4**D illustrates a portion of the medical record dashboard of FIG. **4**A in accordance with the first embodiment.

[0044] FIG. **5**A depicts a medical summary update process in accordance with the first embodiment.

[0045] FIG. **5**B illustrates a notes update process in accordance with the first embodiment.

[0046] FIG. **6** illustrates a user action record access process in accordance with the first embodiment.

[0047] FIG. **7** illustrates a medical records access window in accordance with the first embodiment.

[0048] FIG. **8** illustrates a medical record and diagnosis update process in accordance with the first embodiment.

[0049] FIG. **9** illustrates a medical record update marker process in accordance with the first embodiment.

[0050] FIG. **10**A illustrates a medical record update marker process in accordance with the first embodiment.

[0051] FIG. **10**B illustrates a medical record update marker process in accordance with the first embodiment.

[0052] FIG. **11** illustrates a portion of the medical record dashboard of FIG. **4**A including a scrolled display in accordance with the first embodiment.

[0053] FIG. **12**A illustrates a portion of the medical record dashboard for a glaucoma practice in accordance with the first embodiment.

[0054] FIG. **12**B illustrates a portion of the medical record dashboard of FIG. **12**A in accordance with the first embodiment.

[0055] FIG. **12**C illustrates a portion of the medical record dashboard of FIG. **12**A in accordance with the first embodiment.

[0056] FIG. **12**D illustrates a portion of a medical record dashboard for display as a function of patients seen by a gastrointestinal physician during a certain period of time with CPT codes performed on patients on a particular day in accordance with the first embodiment.

[0057] FIG. **12**E illustrates a portion of a medical record dashboard for display as a function of patients with a specific disease ICD in accordance with the first embodiment such that many patients may be compared at the same time, which can be useful for clinical research or for tracking clinical outcomes.

[0058] FIG. **13**A illustrates a medical record dashboard in accordance with the first embodiment.

[0059] FIG. I3B illustrates a ledger window accessible from the medical record dashboard of FIG. **13**A in accordance with the first embodiment.

[0060] FIG. **14** illustrates a computer server system configured for operating and processing components of the command center visual display system and method in accordance with the first embodiment.

[0061] FIG. **15** illustrates an exemplary embodiment of a Data Command Center for use with an EMR system customized for an Ophthalmology Retina practice in accordance with a second embodiment.

[0062] FIG. **16** illustrates the search results of a patient search input into the patient search field in accordance with the second embodiment.

[0063] FIG. **17** illustrates a user control panel that displays views for selection by the user in accordance with the second embodiment.

[0064] FIG. **18** is an example of a new view created by the user for their personal use in accordance with the second embodiment.

[0065] FIG. **19** illustrates the panel presented when the add sticky notes icon in FIG. **15** is selected.

[0066] FIG. **20** illustrates the Patient Information panel for displaying high level information about the patient in accordance with the second embodiment.

[0067] FIG. **21** illustrates the Patient Insurance panel for displaying the patient's insurance information in accordance with the second embodiment.

[0068] FIG. **22** illustrates Today's Visit Notes tab containing elements related to capturing information about notes specific to today's visit in accordance with the second embodiment.

[0069] FIG. **23** illustrates the Problems tab displaying a patient's problem list as imported from the EMR in accordance with the second embodiment.

[0070] FIG. **24** illustrates the Checkout tab that is used to determine when a patient should return to the practice in accordance with the second embodiment.

[0071] FIG. **25** illustrates the Surgeries tab that displays information about the patient's surgeries in accordance with the second embodiment.

[0072] FIG. **25**A illustrates an exemplary embodiment of a Data Command Center for use with an EMR system customized for shared care between an optometrist and an ophthalmologist.

[0073] FIG. **25**B illustrates a summary of symptoms selected from the Data Command Center of FIG. **25**A.

[0074] FIG. **25**C illustrates a summary of exam findings selected from the Data Command Center of FIG. **25**A.

[0075] FIG. **25**D illustrates the billing summaries selected from the Data Command Center of FIG. **25**A.

[0076] FIG. **26** illustrates the Allergies tab that displays a patient's allergy information in accordance with the second embodiment.

[0077] FIG. **27** illustrates the Medications tab that displays medication information in accordance with the second embodiment.

[0078] FIG. **28** illustrates the Labs tab that displays lab information in accordance with the second embodiment.

[0079] FIG. **29**A illustrates the Physician tab that displays information about the patient's other physicians and provides a listing of letters sent to the patient's other physicians in accordance with the second embodiment.

[0080] FIG. **29**B illustrates the New Letter Popup when the letter link in FIG. **29**A is selected in accordance with the second embodiment.

[0081] FIG. **30** illustrates the Letters/Document tab that displays letters and documents transferred from the EMR system in accordance with the second embodiment.

[0082] FIG. **31** illustrates the Summary panel that is a permanent note feature allowing the user to save and change the same note that is always visible when viewing the patient in accordance with the second embodiment.

[0083] FIG. **32**A illustrates an exemplary embodiment of the Retina Flowsheet illustrated in FIG. **15** in accordance with the second embodiment.

[0084] FIG. **32**B illustrates the medical treatment information of the Retina Flowsheet of FIG. **32**A in more detail.

[0085] FIG. **33**A illustrates a modified Command Center in which the display panels are replaced by panels for ordering clinical tests and procedures, diagnostic images, and medications in accordance with the second embodiment.

[0086] FIG. **33**B illustrates an example popup display window illustrating abnormal test results over time.

[0087] FIG. **34**A illustrates the Place FA order dialog box that pops up when the user clicks the column header for the FA exam in accordance with the second embodiment.

[0088] FIG. **34**B illustrates another example of in situ ordering for the Procedure columns OD and OS in accordance with the second embodiment.

[0089] FIG. **35** illustrates a possible flowsheet for glaucoma in accordance with the second embodiment, which is similar to that presented above in FIG. **12**A with respect to the first embodiment.

[0090] FIG. **36** presents a flowsheet for diabetes in accordance with the second embodiment.

[0091] FIG. **37** illustrates an exemplary Financial Flowsheet in accordance with the second embodiment.

[0092] FIG. **38** illustrates a view of the Notes tab in accordance with the second embodiment.

[0093] FIG. **39** illustrates how the Command Center enables the user to add notes in accordance with the second embodiment.

[0094] FIG. **40** illustrates a view of the Alerts tab notes in accordance with the second embodiment.

[0095] FIG. **41**A illustrates a view of the Image tab in accordance with the second embodiment.

[0096] FIG. **41**B illustrates an alternative presentation of the Image tab in accordance with the second embodiment.

[0097] FIG. **42**A illustrates a view of the Guidelines Summary tab in accordance to second embodiment.

[0098] FIG. **42**B illustrates an exemplary cognitive system enhanced clinical decision support system for providing cognitive enhanced guidance analysis and summary.

[0099] FIG. **43** illustrates a view of the Published Guidelines in accordance with the second embodiment.

[0100] FIG. **44** illustrates a view of the Medication Order panel in accordance with the second embodiment.

[0101] FIG. **45** illustrates the Medication Alternatives (Suggested) sub panel of the six sub panels illustrated in FIG. **44**.

[0102] FIG. **46** illustrates a view of the Lab Order panel in accordance with the second embodiment.

[0103] FIG. **47** illustrates the Locations/Costs sub panel of the sub panels of FIG. **46**.

[0104] FIG. **48** illustrates a view of the Imaging Order panel in accordance with the second embodiment.

[0105] FIG. **49** illustrates the Locations/Cost sub panel of the sub panels illustrated in FIG. **48**.

[0106] FIG. **50** illustrates the Recommendations sub panel of the sub panels illustrated in FIG. **48**.

[0107] FIG. **51** illustrates a view of the Procedure panel in accordance with the second embodiment.

[0108] FIG. **52** illustrates the Recommendations sub panel of the sub panels illustrated in FIG. **51**.

[0109] FIG. **53** illustrates the Considerations sub panel of the sub panels illustrated in FIG. **51**.

[0110] FIG. **54** illustrates the Locations/Costs sub panel of the sub panels illustrated in FIG. **51**.

[0111] FIG. **55**A illustrates a Physician Quality Reporting panel within the Smart Evaluation control panel.

[0112] FIG. **55**B illustrates an Evaluative Clinical Reporting (ECR) interface that provides an organized view derived from disparate data sources in accordance with user-defined parameters, of a specific report type, executable on a single or group of patients.

[0113] FIG. **55**C illustrates a reporting architecture in a sample embodiment.

[0114] FIG. **55**D illustrates the Orchestrator Master Pipeline of FIG. **55**C in a sample embodiment.

[0115] FIG. **55**E illustrates the report builder parameter selection interface in a sample embodiment.

[0116] FIG. **55**F illustrates a sequence diagram for executing a report in a sample embodiment.

[0117] FIG. **56**A illustrates the View Configuration page that provides the user a mechanism to create or modify dynamic dashboards to accommodate their unique requirements in accordance with the second embodiment.

[0118] FIG. **56**B illustrates the Panel Configuration page that provides the user a mechanism to create or modify display panels to use when populating the dynamic dashboards as described in FIG. **56**A.

[0119] FIG. **57** illustrates the Command Center architecture and connectivity to external Health Information Technology systems and third party services in accordance with the tool described herein.

[0120] FIG. **58** illustrates the architecture of a central controlling server platform and multiple geographically distributed edge server platforms.

[0121] FIG. **59**A illustrates integration of the Command Center with the user's existing Health Information Technology (HIT) and third party services using either industry standard message-based protocols or API-based methods in accordance with the tool described herein.

[0122] FIG. **59**B illustrates systems integration standards used to communicate between the Command Center and external Systems in accordance with the tool described herein.

[0123] FIG. **60** illustrates an overview of the industry standard CCOW workflow and the various components involved in several transactions in accordance with the tool described herein.

[0124] FIG. **61** illustrates a standard workflow when data is received from an external system through any of the messaging standards or API methods in accordance with the tool described herein.

[0125] FIG. **62** illustrates a detailed flowchart of the data import process in accordance with the tool described herein.

[0126] FIG. **63** illustrates a flowchart of the Clinical Evaluation Algorithm in accordance with the tool described herein.

[0127] FIG. **64** provides a diagram of the tables used to determine if imported data is relevant to the Flowsheet Mapping table and to store data for display on the in the flowsheet database fields in accordance with the tool described herein.

[0128] FIG. **65** illustrates a Financial Analysis Algorithm for processing financial payment information in accordance with the tool described herein.

[0129] FIG. **66**A illustrates generally the process for ordering a procedure in accordance with the tool described herein.

[0130] FIG. **66**B illustrates the logic used to check for pre-authorization and/or a referral in accordance with the tool described herein.

[0131] FIG. **67** illustrates the precertification process that is invoked by presentation of a CPT Procedure code and an ICD10 Diagnosis code in accordance with the tool described herein.

[0132] FIG. **68** illustrates the referral process that is invoked by presentation of a CPT Procedure code and an ICD10 Diagnosis code in accordance with the tool described herein.

[0133] FIG. **69** illustrates the classes of data that are stored as part of the core tables in accordance with the tool described herein.

[0134] FIG. **70** illustrates the interoperability tables that are used to handle receiving and sending of data between systems in accordance with the tool described herein.

[0135] FIG. **71** illustrates the supporting tables that include tables for handling behind the scenes processing in accordance with the tool described herein.

[0136] FIG. **72**A illustrates an exemplary clinical decision support system in accordance with the tool described herein.

[0137] FIG. **72**B illustrates an exemplary cognitive system enhanced clinical decision support system for providing cognitive enhanced guidance.

[0138] FIG. **72**C illustrates an exemplary cognitive system enhanced clinical decision support system for alternative diagnosis identification.

[0139] FIG. **73** illustrates a diagram of the tables used to display data on the Note tab (FIG. **39**) in accordance with the tool described herein.

[0140] FIG. **74** illustrates a diagram of the tables used to display Alerts that are generated for a patient in accordance with the tool described herein.

[0141] FIG. **75** illustrates the ViewLayout table that stores the panels and tabs that make up the view and how they are positioned in accordance with the tool described herein.

[0142] FIG. **76** illustrates the Panel table that stores references to the data displayed panel in accordance with the tool described herein.

[0143] FIG. **77** illustrates the view XML that provides means for moving and storing the different display panel and flowsheet views in exemplary embodiments.

[0144] FIG. **78** illustrates the panel XML that provides means for setting up the display panels and flowsheets in exemplary embodiments.

[0145] FIG. **79** illustrates the guideline tables that are used to store individual guidelines, groups of guidelines in order to store common information about the group, and associations of those groups with clinical codes (such as ICD10, CPT, RxNorm) in sample embodiments.

[0146] FIG. **80** illustrates how three rows in the user interface may convey much information for a healthcare professional in sample embodiments.

[0147] FIG. **81** demonstrates a display that enables a healthcare provider while delivering medical care to a patient to participate in revenue cycle management.

[0148] FIGS. **82**A-**82**B together illustrate a display of a report that can be run by user of the tool described herein in sample embodiments.

[0149] FIG. **83** illustrates an embodiment of a patient scheduler and triage system implemented in a flowsheet table.

[0150] FIGS. **84**A-**84**C illustrate sample questions for a patient in a patient triage scheduler in a sample embodiment.

[0151] FIG. **84**D illustrates sample formulas for urgency of appointments.

[0152] FIG. **84**E illustrates a flow for handling patient calls for an appointment.

[0153] FIG. **85** illustrates the interaction of triage scheduling with a machine learning system.

DETAILED DESCRIPTION

[0154] Exemplary embodiments of a Data Command Center are described below with respect to FIGS. **1-85**. Those skilled in the art will appreciate that the illustrated embodiments described are for exemplary purposes only and are not limited to the specific process and interfaces described.

[0155] Before any embodiments are explained in detail, it is to be understood that the tool is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The tool is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "connected," "supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

[0156] As used herein, a "healthcare provider" may be any clinical professional such as a doctor, physician, podiatrist, chiropractor, dentist, veterinarian, ancillary staff, nurses, physician's assistant, medical provider, physical therapist, all allied health professionals, or hospital staff member. All such "healthcare providers" may use the tool as interchangeable users. Healthcare provider, doctor, and physician are used interchangeable herein.

[0157] A row, column, or line (even a diagonal line) may represent may provide sequencing or evaluation in either direction. Also, the time, date, date of service, visit and encounter are also interchangeable in this document. Similarly, "Electronic medical record (EMR)" is interchangeable with "Electronic Health Record (EHR)."

[0158] Practice management systems (PMs) are programs that perform the billing collection and reconciliation of payments as well as scheduling patients. This can also be termed Revenue Cycle Management (RCM) and associated with this are billing companies that use software to help practices and hospitals get the bills out and collect money from insurance companies. Also, all of these entities integrate with and work through clearing houses.

[0159] A screen, scrolling screen, view, or snapshot is interchangeable in some embodiments, but it is recognized that the doctor could grab different panels from a scrolling screen and converge them all into one view or snapshot. Some embodiments do have a scrolling screen which then could be made into a single view (snapshot) by the user or a combination of a scrolling screen with a single view overlaid so that different portions from the scrolling screen of other views could all be combined into one view that is always displayed on top of the scrolling screen. In other words, the tool allows the ability to look at the entire scrolling screen of information and to grab a panel from one screen and then move it to an overlaid single snapshot screen, thereby producing exactly what the doctor wants to see at any one point in time for that patient in one view—but with the doctor able to navigate to other portions of the EMR (could even be going into other tabs and not a scrolling screen) so that simultaneously the doctor can grab more information to create a personalized snapshot for that patient.

[0160] Medical tests as described herein is interchangeable and inclusive of image or imaging, diagnostic tests, radiological tests or procedures, laboratories, chemistry and hematological tests, photography, genetic testing, nuclear scans, ultrasounds, x-rays, optical coherent tomography photographs and angiographies and any medical testing or medical services that tests or screens patients for a medical condition. In addition, it is understood that terms like diagnosis can be reflected by ICD 9 or 10 or similar identifying factors, and medications may be interchangeable.

[0161] As used herein, an icon, symbol, or indicator are all interchangeable and are not just a means and conveyors of the ability to click what is underlying or a simple yes or no, but also such elements have the ability to convey much additional information. These elements enable an interaction to occur and even on a word or numbers can also have some interaction to convey and compress information such as blinking, flashing color change, italics, underline or any method that catches the attention of the user. When in a dashboard, the entire cell can have one color and the icon itself another or both can independently represent any of the intentions described, i.e. blinking.

[0162] As described herein, the "tool" may be referenced to herein alternatively as a "Data Command Center," a "Command Center," an "EHR Command Center," an "actionable Dashboard," "Dashboard," "table," "Visual Display System," "Flowsheet" and/or "Flowchart."

[0163] The following discussion is presented to enable a person skilled in the art to make and use embodiments. Various modifications to the illustrated embodiments will be readily apparent to those skilled in the art, and the generic principles herein can be applied to other embodiments and applications without departing from embodiments of the tool. For example, though the tool is described for use with an EMR system in an exemplary embodiment, those skilled in the art will appreciate that the systems and methods described herein may be used for numerous other applications where much data is presented to the viewer, including, for example, interfaces to stock tracking and purchasing software, industrial monitoring systems, and the like. Thus, embodiments are not intended to be limited to embodiments shown, but are to be accorded the widest scope consistent with the principles and features disclosed herein. The following detailed description is to be read with reference to the figures, in which like elements in different figures have like reference numerals. The figures, which are not necessarily to scale, depict selected embodiments and are not intended to limit the scope of embodiments. Skilled artisans will recognize the examples provided herein have many useful alternatives that fall within the scope of embodiments.

[0164] Some embodiments herein provide one or more technological solutions in the realm of one or more of data assimilation and recordation with real-time communications across a network, computers, or the Internet to improve the performance of, and technology of, data assimilation and recordation, communication and messaging software, systems and servers by providing automated functionality that effectively and more efficiently manages data assimilation and recordation and related automatic triggering of new computing events in the network based on the data gathered during an actual event in ways that cannot effectively be done, or done at all, manually. For example, some embodiments herein provide one or more technological solutions to processing a user interface including a single page quick review "summary sheet" that is rendered by pulling key data points from EMR interactive notes allowing a physician to provide the best possible care. Further, the improved assimilation and recordation, communication and messaging software, and systems and servers enable centralized collection and review of information and two-way auto-population of the user interface from billing or other parts of local and remote electronic medical record systems that can reduce human error, and can cut down on medical errors. This technology can allow a physician or other healthcare worker to quickly access and review critical medical and procedure data using consistent data visualization field formats. This technology can automatically summarize each patient visit on one line on one page that can be seen and through pattern recognition, and rapidly visualized. This technology can allow a physician to instantly evaluate a patient's situation, and catch potential billing errors.

[0165] Some embodiments herein provide one or more technological solutions to providing a user interface that functions as a "command center" for the physician's decision-making. Using data collection, assimilation and recordation with real-time communications across a network, computers, or the Internet, some embodiments described herein provide an information hub where the lifetime of a patient's medical and surgical history, diagnostic tests results, and prescribed medications can be accessed. Further, the user interface can provide alerts regarding the reasons for the patient's visit, and can include messages from staff that can be programmed to self-delete and not be viewable after it has been removed.

[0166] Some embodiments provide a user interface that can function as an epicenter for physician care allowing medical synthesis of the problems confronting the patient. To make the best decisions, the physician needs to understand the entire picture of a patient's life, while being able to home in on any detail. Some embodiments can function as an EMR similar to how a ganglion cell is to the brain or the spinal cord to the body. Some embodiments provide the ability for the findings of a physician during "today's visit" to be rapidly entered into the relevant fields/tabs/screens within an EMR, streamlining data entry required for documentation and interpretation. Some embodiments can provide a starting point for caring for a patient, where new orders can be placed or messages can be sent. Using a summary review table, the physician can navigate and interact with the entire EMR for the patient without the need to access multiple screens, and can be interoperable to enable extraction of pertinent information from other sources.

[0167] Medical sub-specialization, information overload, and increased complexity of reimbursements for service all conspire to remove the physician from caring for a patient. Some embodiments can save the physician time that can be used for time with the patient rather than time used with a computer screen and a mouse. Finally, presented here is the new tool that makes the computer age successfully replace the paper age in properly caring for patients. Some embodiments can allow the physician and hospitals to comply with insurance companies and the government which demand that they comply and be responsible for their billing. Some embodiments can help transform the mindset of a physician from being a medical provider without any knowledge of business or finance, to a physician able to participate in revenue cycle management. Some embodiments can, therefore, insert the physician back into being the quarterback of the healthcare system. Some embodiments can give the physician the time to be a healer while at the same time rapidly synthesizing information that can cut costs and improve outcome quality. In an ever-expanding interoperable complex world, some embodiments can function as a physician's genie and magic carpet that seamlessly transports the physician though the maze of data entry and provides the overview needed for medical synthesis.

[0168] Some computerized or electronic medical record ("EMR") systems provide computerized interfaces between medical professionals and staff and one or more medical records databases. Some embodiments disclosed herein include a command center visual display system and method that can be linked to or otherwise accessed from a conventional EMR system. In some other embodiments, any conventional EMR system can be coupled or linked with the command center visual display system and method described herein.

[0169] Some embodiments of the command center visual display system and method can be interfaced with a variety of systems including but not limited to EMRs, Health

Information Exchanges (HIEs), Billing Clearinghouses, Insurance Companies, Picture Archiving and Communication Systems (PACS) as well as third party services to provide information and services used in data presentation.

[0170] Some embodiments include a command center visual display system and method that can be included as an add-on software package to a conventional medical record system. In some embodiments, tasks associated with an add-on software program can be seamlessly linked and/or incorporated into one or more core software tasks or modules of the conventional medical record system. In some embodiments, a message-based interface can be used to connect and transmit data between one or more software modules of the command center visual display system and method, and one or more conventional medical records systems and/or one or more patient records and/or databases comprising patient records. In some embodiments, application programming interfaces (hereinafter "APIs") can be used to connect and transmit data between one or more software modules of the command center visual display system and method, and one or more conventional medical records systems and/or one or more patient records and/or databases comprising patient records. For example, in some embodiments, the command center visual display system and method can be configured to receive patient data from a health information exchange or a medical provider. In some further embodiments, the command center visual display system and method can auto-populate various data fields (including information fields, tables, or windows) from a variety of sources. The sources can include electronic, physical (paper records), and human input. In some embodiments, an electronic dataflow can be established between the command center visual display system and method and one or more computer systems of servers that comprise patient information (e.g., electronic medical records). In some embodiments, the dataflow comprises a one-way flow from the source to the command center visual display system and method. In some other embodiments, the dataflow comprises a two-way flow from the source to the command center visual display system and method, and from the command center visual display system and method to the source. This information can be any medical diagnosis information prepared by a medical practitioner, any medical procedures or services provided to the patient, including procedures or services by claims made, or billings or payments including billing signed off by a physician as detailed above, billings, payments, or other information from anywhere in the EMR chart not limited to treatment summaries, and/or diagnosis summaries, and/or patient feedback summaries, and/or other physician summaries, patient outcome summaries, and so on. For example, in some embodiments, the command center visual display system and method discussed below can display and/or auto-populate with at least one of a patient's prior medical procedures, diagnostic tests, surgeries, current medications, current illnesses, treated illnesses, and so on.

[0171] In some further embodiments, new software features of the command center visual display system and method can be added to an existing application without modifying the existing code of the existing application. In some other embodiments, the command center visual display system and method can function as an independent application, not linked, overlaid, or otherwise interfaced with any conventional medical record system.

First Embodiment of Data Command Center

[0172] FIG. **1** illustrates an embodiment of a Data Command Center (CC) implemented as a data interface to a medical record system **100** in accordance with a first set of embodiments. In accordance with the first set of embodiments, a user, such a medical practitioner, can utilize a conventional medical record system to launch or enter a medical services tracking system that can display information dashboards, tables, charts, windows, as tailored by a user. FIG. **2** illustrates a medical record window **200** of the medical record system **100** in accordance with a first set embodiments described herein. In some embodiments, the medical record window **200** of a conventional medical record system can include a medical tracking system launch icon **250** to facilitate access to and/or launch of one or more embodiments of the medical service tracking system and method. It will be appreciated that the "icons" used herein are graphical elements with links to associated dynamic or static data in the same system or a remote system. Of course, the icons may simply be links. For the ease of description, whenever the text refers to "icons" such "icons" may be graphical elements with links or simply links to associated dynamic or static data.

[0173] In some embodiments, a user can use the command center visual display system launch icon **250** or other displayed icon or display element to access or launch the command center visual display system and method described herein. In some further embodiments, the launch icon **250** can be used to temporarily halt the medical record system **100** and access or launch the command center visual display system and method. In some other embodiments, the launch icon **250** can be used to access or launch the command center visual display system and method while the medical record system **100** continues to run in parallel, continues to run in a background mode, and/or is switched to an idle mode.

[0174] Referring to FIG. **3**, illustrating a medical record dashboard selection window useful for selecting and launching embodiments described herein. In some embodiments, after a user selects or clicks the launch icon **250**, a medical record dashboard selection window **300** can be displayed. The medical record dashboard selection window **300** can include one or more selectable medical record dashboards from which a user can select to access at least one medical record dashboard. For example, in one non-limiting example embodiment, the user can select "Retina Flowsheet" **305** to access and/or launch a medical record dashboard including a retina flowsheet. In some further embodiments, the at least one medical record dashboard can include any number of selectable medical records for any medical condition, and/or any medical diagnosis, and/or any medical treatment.

[0175] Some embodiments comprise one or more displayed tables and/or dashboards that function as a Data Command Center. The Data Command Center can enable a user to work with a single display that can be configured as a central medical record entry, access, update, recording, and archival site. For example, FIG. **4**A illustrates a medical record dashboard **400** in accordance with a first embodiment. In some embodiments, the medical record dashboard **400** can be displayed by the user following the user's selection of at least one medical record dashboard from the medical record dashboard selection window **300**. In some embodiments, the medical record dashboard **400** can display data from one or more medical records, and/or track medical

procedures and services based on claims made or billing signed off by a physician for one or more delivered medical procedures or services. Some embodiments include a command center visual display system and method that can dynamically link to various external databases comprising patient information that can be displayed in the medical record dashboard **400**. For example, in some embodiments, the command center visual display system and method can function as a portal to patient information prepared by the user or patient information from other sources. Further, in some embodiments, the medical record dashboard **400** can be auto-populated as a function of claims made or billing signed off by a physician. In this instance, any data displayed within the medical record dashboard **400** is derived from one or more claim records that have been billed for one or more procedures or services have previously been provided to the patient. In some other embodiments, auto-population can be enabled in both directions interacting as a switchboard between the entire EMR and the medical record dashboard **400** along with what is added to any window, sub-window, column or entry in the medical record dashboard **400** being automatically added to the appropriate part of the chart for documentation before finalizing the encounter.

[0176] In some embodiments, the medical record dashboard **400** can display information related to any medical procedures or services in relation to care of a patient. For example, in some embodiments, the medical record dashboard **400** can display information related to medical procedures or services in relation to retinal eye medical care of a patient. In some embodiments, the medical record dashboard **400** can display information including components where there is a summary of the patient's problem list that a user can input patient information and constantly update and change. Further, this information can be auto-populated with the touch of a button into a designated location such as the current plan documenting the patient's current visit (thus aiding documentation for the current visit). Further, whatever is important for a user to input into the day's visits for documentation can be initially inputted in the table, and then permanently into the day's patient visits. Further, the summary section of the medical record dashboard **400** can be constantly fluid, and can be changed at every visit rather than being written to an unchangeable document or file (e.g., such as a PDF). Further, any patient data that is inputted, received, analyzed, or created can be auto-populated into any portion of the dashboard **400**, and/or can form a dataflow out of the medical record dashboard **400** to another electronic system or server, or another user, observer, or other 3rd party.

[0177] In some embodiments, the medical record dashboard **400** can display various windows and sub-windows based on a user preference and/or current or previous user interaction with the medical record dashboard **400**. For example, in some embodiments, the medical record dashboard **400** can display a problems window **425** and/or a surgeries window **450** where information related to a patient's medical problems and surgeries can be displayed in information columns **600**, **700** respectively. Further, in some embodiments, patient information related to allergies and drugs can be displayed within the allergies/drug section **460**. This information can be auto-populated from a variety of sources, or inputted by a user.

[0178] In some embodiments, the medical record dashboard **400** can include a summary window **475** enabling a user to view and edit summary information related to the patient, any details of care provided to the patient, and/or and any medical diagnosis information prepared by a medical practitioner. Further, in some embodiments, the medical record dashboard **400** can also display detailed information related to any medical procedures or services provided to the patient, including procedures or services that are auto-populated by claims made, or billings or payments including billing signed off by a physician as detailed above. For example, in some embodiments, the medical record dashboard **400** can display a command center visual display window **500** including information columns **800** that can be auto-populated by claims made or billings signed off by a physician. The auto-population can include billings, payments, or other information from anywhere in the EMR chart. For example in some embodiments, the information that is auto-populated can include treatment summaries, and/or diagnosis summaries, and/or patient feedback summaries, and/or other physician summaries, and so on. For example, in some embodiments, the command center visual display system and method can display and/or auto-populate at least one field, table, or window with at least one of a patient's prior medical procedures, diagnostic tests, surgeries, current medications, current illnesses, treated illnesses, and so on. The command center visual display system and method can auto-populate various data fields via an electronic dataflow established between the command center visual display system and method and one or more computer systems of servers that comprise patient information (e.g., such as electronic medical records). The dataflow can comprise a two-way flow from the source of patient data to the command center visual display system and method, and from the command center visual display system and method to the source. In some embodiments, this information can be any medical diagnosis information, any medical procedures or services provided to the patient, procedures or services by claims made, or billings or payments including billing signed off by a physician as detailed earlier, any information from anywhere in the EMR chart including treatment summaries, and/or diagnosis summaries, the patient's prior medical procedures, diagnostic tests, surgeries, current medications, current illnesses, treated illnesses, and/or patient feedback summaries, and/or other physician summaries, patient outcome summaries, treatment summaries, and/or diagnosis summaries, and/or patient feedback summaries, and/or other physician summaries or treatments. Further, in some embodiments, the information that is auto-populated can include patient outcome summaries. For example, in some embodiments, the command center visual display system and method process a plurality of patient outcomes and display an analysis of patient outcomes based at least in part on patient information from treatment summaries, and/or diagnosis summaries, and/or patient feedback summaries, and/or other physician summaries or treatments. In some embodiments, the patient outcomes can include or comprise physician quality reporting system (PQRS) quality measures. In some embodiments, calculated or reported patient outcomes can include or comprise at least one PQRS measures code.

[0179] The medical record dashboard **400** can include miscellaneous information identifying the patient, information related to the patient's insurance plan, physicians and referring physicians, and the patient's current balance. Other information can relate to the patient's prior visit, prior

diagnosis or procedure and any important information relevant to the next visit. Additional information can relate to the current visit, including history of illness and chief or current medical complaint, billing information, and retrievable medical information including pharmacy information. For example, in some embodiments, the medical record dashboard **400** can include a patient insurance entry **401**, referring physician entry **402**, and primary care physician entry **403**. The medical record dashboard **400** can also include patient balance entry **404**, and a high deductible plan entry **405**. Important patient information related to a pending or current visit can include a "days left post op period" entry **406** and/or an information alert **465**. In some embodiments, the information alert **465** can be auto-populated based on other information or entries in the medical record dashboard **400**. In other embodiments, the information alert **465** can be set by any user to alert the user or other user of information relevant to the patient. In some embodiments, the information alert **465** can comprise a daily technician update, including information to medical information such as blood pressure, or whether the patient is pregnant, or any other urgent information with which a member of a health care team can alert another member. Further, this information can become permanent or can be deleted from the dashboard **400**, and from any record or table accessible from the dashboard **400**, including any medical record. Further, this information can serve as or be configured as a "sticky note" that can be removed from any of the above-mentioned records. For example, the "sticky note" can be an electronic sticky note riding on the dashboard or any record accessible from the dashboard. Further, the dashboard **400** can provide improvement as described where test interpretations and evaluation of patients, once documented and billed, usually become date stamped, and cannot be easily amended without applying a new date of amendment. In some embodiments, the command center visual display system and method can improve and follow care that not necessarily be used as part of a particular day's medical record. Therefore, months or years apart, physicians can add notes into the table when new findings, discoveries, or realizations warrant it without feeling encumbered that they are "changing past medical record" and a disclosure of such can be at the bottom of the dashboard **400**. Allowing physicians and technicians to add and change notes within this dashboard **400** (rather than changing the patients EMR chart) can enable them to summarize critically important health/history/treatment data, which can then be used as a faster point of reference while examining the patient. Notes that sit on the table can flag or alert the physician to an important medical change, and can be used as an additional form of communication to strengthen lines of communication between technicians/clinic staff and physicians to better ensure that the physician is quickly directed to important medical information.

[0180] In some other embodiments, a daily technician update can be accessed or otherwise made visible to the user in at least one other portion of the dashboard **400**. In some embodiments, the information alert **465** can be displayed in a specific color and/or with a specific graphic and/or animation. For example, in some embodiments, the information alert **465** can comprise a flashing red animation. To protect the physician during an audit, a statement on the dashboard **400** can be added that "notes on this table" are not necessarily added at the time listed as the date and not for documentation in a medical record, but as a rapid reminder medical decision making and cliff note reference tool. As another example, if this patient's records were ever sent to another physician or insurance company or were audited, this is critical information a physician is often not privy to and an icon on the table will alert the physician of this fact. By selecting this or another icon, the history of this audit or records release request or other occurrence can be seen. So, if an insurance company is requesting a medical necessity report or other information that is needed by a billing office or anyone else, the physician will be informed on the table so that the physician can instantly decide what is needed. A report can be dictated or chart information transmitted within or outside the practice in an expedited manner. Often just an office worker decides what to send in reply to an outside entity request. By using this tool at the point of care when a patient is being examined, the patient may be consulted by the physician to correct any information that needs clarification, and decisions and reports can most accurately be made. Additionally, physicians remotely can be alerted about requests and one summary table rapidly allows for more rapid and accurate communication.

[0181] Some embodiments include an alert or access to one or more letters or results from outside (icon **407**) systems or third parties. Some further embodiments include an alert or access to letters sent **408**. The letters can be written, typed, and/or one or more dictated letters from the user and/or another medical provider. Some embodiments include an entry or access to the current day's history, the current day's plan, and/or to the current day's billing. For example, some embodiments include a "Today's history" button or icon **409**, a "Today's plan" button or icon **411**, and a "Todays billing" button or icon **413**. In some further embodiments, a correspondence button or icon **436** can be used to view, access, enter, and/or auto-populate correspondence related to a patient's care. This can include any medical record and/or any correspondence generated while the patient is under care by the user and/or any other physician or medical practitioner, medical services provider, and/or medical insurance company.

[0182] In some embodiments, the medical record dashboard **400** can display a summary of the patient's problem list that a user can input patient information and constantly update and change. For example, some embodiments include the ability to enter or access current complaints of the patient (button **430**). In some embodiments, a user can add or update one or more entries of the patient's chief or current complaints, and/or a user can view one or more entries of the patient's chief or current complaints using the button **430**. In some embodiments, if a user activates (e.g., by clicking using a cursor) the button **430**, information related to the patient's current medical problems or complaints can be shown and/or displayed and/or updated by any user or user's assistant. In some embodiments, the information can be auto-populated into the medical record dashboard **400** and/or to any other accessible window displayed by the command center visual display system and method.

[0183] In some embodiments, the medical record dashboard **400** can display a today's examination access button **432** that a user can use to view and/or input patient information, patient examination results, tests, notes, or any information relevant to the medical care of the patient. In some embodiments, a user can add or update one or more entries of the today's examination, and/or a user can view

one or more entries of the examination. In some embodiments, if a user activates (e.g., by clicking using a cursor) the button **432**, information related to the patient's examination including medical problems or complaints patient information, patient examination results, tests, notes, etc., can be shown and/or displayed and/or updated by any user or user's assistant. In some embodiments, the information can be auto-populated into the medical record dashboard **400** and/or to any other accessible window displayed by the command center visual display system and method. In some embodiments, any stored or displayed patient's examination can be cleared from the medical record dashboard **400** following some time period once the patient visit is complete. In some embodiments, the medical record dashboard **400** can remove display or access to a previous patient's examination details once the patient visit has ended. In some other embodiments, the medical record dashboard **400** can remove display or access to a previous patient's examination details later in the day of the patient's visit, or before the following day, or at any time selectable by the user or user's assistant. In some embodiments, the information can be auto-populated into the medical record dashboard **400** and/or to any other accessible window displayed by the command center visual display system and method. In some embodiments, the information can be auto-populated into any EMR system for recordation into one or more EMR's of the patient. In some embodiments, for any auto-populated information that includes technical information without any associated professional interpretation, the command center visual display system and method can provide a visual and/or audible alert to enable a user to provide an update for auto-population to an EMR system.

[0184] In some embodiments, the medical record dashboard **400** can also include at least one link to information from external databases, providers, hospitals (e.g., such as a discharge summary), clinics and/or testing laboratories, etc., (e.g., where the information can include the overall diagnostic imaging center of the practice for certain pieces of equipment and into the machine to actually see all of the study). In the latter example, the medical record dashboard **400** can receive information from at least one database and/or server and/or controller coupled to receive data from the diagnostic equipment. Further, some embodiments may include an entry or access to the National Patient Registry or other kind of registry (link **415**), hospital EMR (link **417**), imaging center **419** (including accessing software imaging and diagnostic management systems to handle many diagnostic images and studies or specific diagnostic equipment), and ePrescribe link **421**.

[0185] In some embodiments, the user can access at least one ePrescribe database, server, and/or website directly from the dashboard **400** using the ePrescribe link **421**. Further, in some embodiments, orders can be auto-populated into the plan or order screen of EMR ("Orders" link **423**). For example, in some embodiments, during or after completion of a patient examination, any medical service, medical test or diagnostic, or other medical service can be auto-populated into an order section of the chart. In some embodiments, any recommendation for a return visit can be viewed, accessed, and/or auto-populated using the return visit button or icon **434**. For example, in some embodiments, the recommendations can be any advised next steps in the patient's care, any diagnosis, prescriptions, tests, etc. In some embodiments, the aforementioned "Today's plan" button or icon **411** can be used to view, access, and/or auto-populate details and systems including for a day's activities for the patient examination.

[0186] In some embodiments, a single button or icon entitled "Imaging Center" (button **424***a*) can take a user (e.g., a physician) instantly or immediately to the piece or pieces of diagnostic equipment that were used that or another day for testing so the physician can now measure and enter the findings. This can be internal in the user's practice so that any diagnostic equipment can be accessed. In some embodiments, the same or another button can provide a link in the major table to an image or diagnostic management software system. In this way, some embodiments can handle the tremendous amount of diagnostic equipment and images, and unlike prior art tables that just provide access to a PDF, these embodiments provide access to not just one single piece of diagnostic equipment but all of them and the complete study, not just a "slice", can be evaluated and comparison of changes over time made.

[0187] Once entered, the data can be auto-populated into the dashboard **400** (e.g., such as a retina flowsheet) under other column **1200** (FIG. **4**C), where each clinical research study would have other factors followed such as central macular thickness ("CMT"), or ischemic index ("ISI"). Further, the second button (button **424***b*) can take the user to either the company sponsoring the clinical research website (sometimes a pharmaceutical company and other times a company that invented a device). The clinical researcher could immediately go to this website and input any data that was obtained from that visit from the diagnostic equipment button **424***a*, and/or to a research spreadsheet where the user (e.g., a clinical researcher in this example embodiments) can input the data, or where the data can be auto-populated (e.g., from the other column **1200** or into the other column **1200**).

[0188] Further details of the problems window **425**, surgeries window **450**, and command center visual display window **500** and are provided in FIGS. **4**B-**4**D illustrating enlarged views of portions of the medical record dashboard **400**. For example, FIG. **4**B illustrates a portion of the medical record dashboard of FIG. **4**A in accordance with some embodiments. As illustrated, in some embodiments, the information columns **600** of the problems window **425** can include a date and time information in entered date column **610**, a timeline column **620**, an "ICD" column **630** for international classification of disease codes including international classification of disease codes version 9 or version 10 (hereinafter collectively referred to as "ICD code") information, location of the problem or disorder (shown as "OD", "OS", "OU" identifying right eye, left eye, both eyes), or from any part of the body, and a diagnosis column **650** for detailing information related to an initial diagnosis or final diagnosis of a patients problem or disorder that can be auto-populated or inputted. Further, in some embodiments, the information columns **700** of the surgeries window **450** can include information related to services or procedures that were provided to the patient (procedure columns **720**), a description of the services or procedures performed (description columns **730**), and when the services or procedures were provided (timeline columns **710**). Referring to FIG. **4**C, in some embodiments, the surgeries window **450** can include location information **740**, surgeon or physician information **750**, and a comments section **760**.

[0189] Referring to the command center visual display window **500**, the information columns **800** can include a

date column **805**, and a procedure column **810** illustrating or providing access to information detailing one or more procedures performed on the patient. Further, the procedure column **810** can include an "OD" column **815**, and "OS" column **820** providing right and left eye procedure information, or could be a body part (i.e., orthopedic surgery limb versus spine). In some embodiments, information related to the medical provider, the location where the procedure was performed, and office visit information can be provided to the user in the provider column **830**, and unit column **840**, and office visit column **845**.

[0190] In some embodiments, the user can view information related to tests and procedures performed on the patient. For example, in some embodiments, these can include information related to one or more medical imaging procedures such as an optical coherence tomography ("OCT"), or fluorescein angiography ("FA"), and/or indocyanine green chorioangiography ("ICG"), or any current procedural terminology code (hereinafter "CPT code"), including any CPT code found in the American Medical Association CPT 2015 professional edition or other edition, the entire contents of which is incorporated by reference. Moreover, the user can view information related to tests and procedures performed on the patient based on an ICD code. Other clinical vocabularies such as Systematized Nomenclature of Medicine (hereinafter "SNOMED codes") can be used in other embodiments as the system is not limited.

[0191] In some embodiments, the user can compare patient clinical information, such as labs and vitals, before and after a selected medication has been prescribed or a procedure has been performed to better understand the effect of the medication or procedure on the patient. Similarly in other embodiments, the user can examine how the current patient compares against other patients in the practice and population in general to better understand outcomes.

[0192] In some embodiments, medical procedures performed (including any of the aforementioned medical imaging procedures) that have been billed and claimed can be viewed or accessed by a user within any of the "OCT" column **850** (split as an "OD" column **855** and "OS" column **860**), an "FA" column **870** (split as an "OD" column **872** and "OS" column **874**), and/or "ICG" column **880** (split as "OD" column **882** and "OS" column **884**).

[0193] Referring to FIG. **4**C, illustrating a portion of the medical record dashboard of FIG. **4**A in accordance with some embodiments, the information columns **800** can include a photo column **890** configured to enable a user to access any photographic images of the patients eyes including optical and auto-fluorescent images of the eyes ("OU" column **892** and "AF" column **894**). In some embodiments, if visual function tests were performed, information can be viewed or accessed in the visual field "VF" column **900** (including an "OD" column **910**, "OS" column **920**, and/or "OU" column **930**). Some embodiments also include an extended ophthalmology column **1000** (including "OD" column **1050** and "OS" column **1070**), and a visual acuity column ("VA" column **1100**, including "OD" column **1150**, and "OS" column **1170**). In some embodiments, as described earlier, other details of various tests, procedures or services can be viewed or accessed in the other column **1200**. Further, information associated with any of the user-accessible tests, procedures or services or other notes provided by the user and/or medical provider can be viewed or accessed in the notes column **1300** using one or more notes access icon **1350** and/or by viewing a note entry **1375** (e.g., and/or any note entered using the note entry window **1305**). The information can also be auto-populated into the EMR plan pages. The command center visual display system and method can auto-populate various data fields of the medical record dashboard of FIG. **4**A via an electronic dataflow established between the command center visual display system and method and one or more computer systems of servers that comprise patient information (e.g., such as electronic medical records). The dataflow to and from the medical record dashboard of FIG. **4**A can comprise a two-way flow from the source of patient data to the command center visual display system and method, and from the command center visual display system and method to the source.

[0194] Some embodiments include visual cues, icons, or markers representing and/or enabling access to detailed information related to medical services, procedures or tests provided to the patient. Further, by employing data visualization techniques to train the user's eye to quickly identify these icons or markers can increase the efficiency of user accessing key medical indicators such as test results and surgical histories. For example, in some embodiments, medical services, procedures or tests performed or provided can be assigned a visual code, icon, or graphical marker. For example, FIG. **4**B at least shows visual cues, icons, or markers **885** representing medical services, procedures or tests performed or provided to the patient. In some embodiments, the information columns **800** within the command center visual display window **500** can include at least one "test done, no image attached" icon **885***a*, one or more "see image in order viewer" icon **885***b*, at least one "view order interpretation" icon **885***c*, and/or at least one "procedure billed or claims made" icon **885***d*, where an appearance in the medical record dashboard **400** represents a claim was made, and a change in color or other method (italics, bold, etc. can represent whether the bill was paid. Further, FIG. **4**D illustrates another portion of the medical record dashboard **400** of FIG. **4**A in accordance with some embodiments and shows example of "test done, no image attached" icon **885***a*, "see image in order viewer" icon **885***b*, "view order interpretation" icon **885***c*, and "procedure billed or claims made" icon **885***d*, where an appearance in the medical record dashboard **400** represents a claim was made, and a change in color or other notification method can represent whether the bill was paid. Data visualization icons and markers housed in the table can be used to quickly identify billing or coding errors, and thus can empower the physician to be proactive and thorough in areas of compliance with insurance guidelines. The use of these icons to identify potential errors in coding can provide an additional level of protection and proofing to reduce and prevent potential billing and/or malpractice errors.

[0195] In some embodiments, the medical record dashboard **400** can provide a text summary of any aspect of the medical record dashboard **400**. As described earlier, the summary window **475** can enable a user to view and edit summary information related to the patient, any details of care provided to the patient, and/or and any medical diagnosis information prepared by a medical practitioner. In some embodiments, the user can add and/or edit the summary information. For example, FIG. **5**A depicts a medical summary update process in accordance with some embodiments. In some embodiments, the medical record dashboard **400** including the problems window **425**, surgeries window

450, summary window **475**, and command center visual display window **500** can include summary comments **482** that can be entered, updated, expanded using the summary input window **484**. In some embodiments, a user can enter information within the summary input window **484** for entry into the summary window **475**.

[0196] In some embodiments, the user can add or update information associated with any of the user-accessible tests, procedures or services or other notes provided by the user and/or medical provider in the notes column **1300**. For example, FIG. **5**B illustrates a notes update process in accordance with some embodiments. In some embodiments, the medical record dashboard **400** comprising the problems window **425**, surgeries window **450**, summary window **475**, and the command center visual display window **500** with notes column **1300** can be updated with one or more notes using the note entry window **1305**. In some embodiments, placement or viewing functions can be toggled using a left or right mouse click function. For example, in some embodiments, following an initial impression or diagnosis, a right click can be updated or shown in a note (e.g., through note entry window **1305**), and/or a left click can show in the summary (e.g., summary window **475** as summary comments **482**). Further, a right-click for instance or other method can insert what is typed in the table into the corresponding area of the medical chart (e.g., the plan), whereas a left click would insert only into the table and not any other location within the EMR.

[0197] Regarding the visual cues, icons, or markers **885** (referred to above and shown at least in FIG. **4**B), in some embodiments, a user can access underlying information linked to the visual cues, icons, or markers **885**. For example, using a single click or mouse-over, a user can use the command center visual display window **500** of the medical record dashboard **400** to access and view any information auto-populated within the command center visual display window **500** and/or other windows or sub-windows of the medical record dashboard **400**. For example, FIG. **6** illustrates a user action record access process in accordance with some embodiments. In some embodiments, a user action **887** (depicting a user click or mouse-over of a cursor) can enable a user to access and view information (in this example, information lined to "see image in order viewer" icon **885***b*). In some further embodiments, a user can use a single click or mouse-over to user can access and view any information within any portion of the medical record dashboard **400**. Further, in some embodiments, a user can use left and right mouse clicks to navigate from one portion of the medical record dashboard **400** to another. Furthermore, in some embodiments, a right-click mouse function update the user and/or display any important information in the medical record dashboard **400**, and a left-click can bring the user back to another portion of the medical record dashboard **400**.

[0198] As an example embodiment, the command center visual display system and method can display at least one medical record as a result of the user action **887**. For example, FIG. **7** illustrates a medical records access window **1400** in accordance with some embodiments. In some embodiments, the user's action (represented by user action **887**) can direct the command center visual display system and method to display the medical record access window **1400** including a medical record display **1410**. Further, in some embodiments, at least one medical record **1430** can be selected from the medical record list **1420** for viewing in the medical record display **1410**. As illustrated in FIG. **7**, in some embodiments, the at least one medical record **1430** can include an image or photograph such as an optical and/or fluorescein angiogram image. In other embodiments, the at least one medical record **1430** can comprise an X-ray image. In some further embodiments, the at least one medical record **1430** can include an MRI scan or any report or anything ordered or performed by the physicians. In some embodiments, the at least one medical record **1430** can comprise one or more dictated letters from the user or another medical provider. Further, in some embodiments, the at least one medical record **1430** can comprise a record or any portion of a correspondence from another medical provider.

[0199] In some embodiments, the command center visual display system and method can enable a user to access underlying information linked or related to diagnostic codes. In some other embodiments, the command center visual display system and method can enable a user to access underlying information linked or related billing codes. For example, in some embodiments, using a single click or mouse-over, a user can use the command center visual display window **500** of the medical record dashboard **400** to access and view any information related to diagnostic and/or billing codes. In some embodiments, the diagnostic and/or billing code information and payment history can be displayed in a separate document or window. In some other embodiments, diagnostic and/or billing code information can be display overlaid onto the medical record dashboard **400** (e.g., as a pop-up window or transient text and/or graphics).

[0200] In some embodiments, at least one medical record **1430** can comprise a transition of care document (hereinafter "CCD"). In some embodiments, the command center visual display system and method can be configured to receive one or more CCDs from one or more medical providers for display to the user. In some embodiments, command center visual display system and method can be configured to extract information from the CCD for display to the user. For example, in some embodiments, information from a received CCD can be extracted and used to populate one or more data columns or fields of the medical record dashboard **400** and/or one or more linked data columns or fields of the medical record dashboard **400**. In some other embodiments, the command center visual display system and method, enabled by the system **30**, can be configured to receive direct messaging information. The command center visual display system and method can be configured with standards and profiles required for interoperability and document-based health information exchange with other healthcare organizations. These can include IHE profiles, CDA and CCD, NwHIN Direct, HL7v2, HL7v3, DICOM, X12, ITK (UK), DMP (France), and NEHTA (Australia), etc. For example, in some embodiments, the system **30** can include an HL7 message router and schemas for exchange of direct messages including a graphical editor for transforming messages and data.

[0201] In some embodiments, the user can retrieve and/or update information related to a medical diagnosis. For example, FIG. **8** illustrates a medical record and diagnosis update process in accordance with some embodiments. In some embodiments, the medical record dashboard **400** including problems window **425**, surgeries window **450**,

summary window **475**, and command center visual display window **500** can include an option to enable a user to update or enter at least one medical diagnosis using a medical record/diagnosis window **1450**. In some embodiments, multiple medical diagnoses can be provided or updated by a user. In some embodiments, the user providing the medical diagnosis can be any medical practitioner providing the service or procedure to the patient. In some other embodiments, the medical record/diagnosis window **1450** can be updated by a user other than the medical practitioner providing the service or procedure to the patient.

[0202] Further, in some embodiments, information can also be auto-populated into the EMR plan pages. The command center visual display system and method can auto-populate various data fields related to information in any one of the problems window **425**, surgeries window **450**, summary window **475**, and record/diagnosis window **1450** via an electronic dataflow established between the command center visual display system and method and one or more computer systems of servers that comprise patient information (e.g., such as electronic medical records). The dataflow can comprise a two-way flow from the source of patient data to the command center visual display system and method, and from the command center visual display system and method to the source.

[0203] In some embodiments, the command center visual display system and method can enable a user to update information displayed in the command center visual display window **500**. For example, in some embodiments, a user can update information related to a medical diagnosis and/or information related to a medical test or other service or procedure. For example, FIG. **9** illustrates a medical record update marker process in accordance with some embodiments. The medical record dashboard **400**, including problems window **425**, surgeries window **450**, and summary window **475** is shown with a record update marker **1500** being accessed by a user and displaying a update marker selection tab **1550**. In some embodiments, the update marker selection tab **1550** can include a user-selectable marker or icon. For example, in some embodiments, update marker selection tab **1550** can include a selectable diagnosis indicator **1552**, a selectable diagnosis indicator **1554**, and/or a selectable diagnosis indicator **1556**. In some embodiments, the selectable diagnosis indicators **1552**, **1554**, **1556** can provide a graphical representation of a medical diagnosis, outcome, or test. For example, in some embodiments, the diagnosis indicators **1552**, **1554**, **1556** can provide a visual representation of an improvement of a medical problem, disease, or symptom, or a worsening of a medical problem, disease, or symptom. Further, in some embodiments, the diagnosis indicators **1552**, **1554**, **1556** can provide a visual representation of a medical problem, disease, or symptom that is stable or substantially unchanged. In some embodiments, the diagnosis indicators **1552**, **1554**, **1556** can provide a visual representation directly related to one or more variables of a physical test. For example, in the field of ophthalmology, some imaging tests can provide an analysis of the thickness of the retina related to an eye disease such as macular degeneration. In some embodiments, an increase in thickness can represent a worsening of the condition, whereas a decrease in thickness can represent an improvement. A stable or unchanged thickness can indicate the disease is responding to treatment or is in remission. Further, by using data visualization techniques such as by using a color change or other method (e.g., such as using italics, bold text, and/or underlined text), a particular important change in a test can be marked for internal reference alerting a physician to the tests or procedures that are important and to take note for future reference. Further, in some embodiments, the diagnosis indicators **1552**, **1554**, **1556** can comprise a color and/or graphical change providing a visual representation of items billed, items not billed, or tests needing reports or interpretations are required. A color change or data visualization method (e.g., such as using italics, bold text, and/or underlined text) can also tell a physician if a test or procedure was billed, rejected, or if an interpretation needs to be made.

[0204] As an example embodiment, the diagnosis indicators **1552**, **1554**, **1556** can provide a visual representation of the status of a patient with an eye disease such as macular degeneration. For example, in some embodiments, the diagnosis indicators **1552**, **1554**, **1556** can be selected from the update marker selection tab **1550** when the user intends to indicate a worsening of the condition (e.g., where the thickness of the retina is increasing). In some embodiments, any of the diagnosis indicators **1552**, **1554**, **1556** can be color-coded to represent a status or provide a visual indicator of a medical condition, test, or diagnosis linked to the diagnosis indicators **1550**. For example, in some embodiments, the diagnosis indicator **1552** can be color coded red and the diagnosis indicator **1556** can be color-coded green. Further, the diagnosis indicator **1554** can be color-coded blue or black. In some other embodiments, the diagnosis indicator **1552** can be color coded green and the diagnosis indicator **1556** can be color-coded red. In other embodiments, other graphical markers or icons can be used, and/or other colors can be used to differentiate the diagnosis indicators **1552**, **1554**, **1556**. Further, in some embodiments, in addition to or in place of using a color differentiation between the diagnosis indicators **1552**, **1554**, **1556**, one or more of the diagnosis indicators **1552**, **1554**, **1556** can flash or pulsate.

[0205] In some embodiments, the command center visual display system and method can enable a user to provide a plurality of updates to information displayed in the command center visual display window **500**. For example, in some embodiments, a user can update information related to a medical diagnosis and/or information related to a medical test or other service or procedure, and subsequently provide further updates to the same information or to other information. For example, FIG. **10**A illustrates a medical record update marker process in accordance with some embodiments including medical record dashboard **400**, with problems window **425**, surgeries window **450**, summary window **475**, and command center visual display window **500**. The command center visual display window **500** depicts diagnosis indicator **1552***a* representing previously updated information. The command center visual display window **500** also illustrates a user updating information with a process described above using the update marker selection tab **1550** comprising a selection of diagnosis indicator **1552**, diagnosis indicator **1554**, or diagnosis indicator **1556**.

[0206] Further, FIG. **10**B illustrates a medical record update marker process in accordance with some embodiments. Following the medical record update marker process shown in FIG. **10**A, in some embodiments, the medical record dashboard **400** including medical record dashboard **400**, with problems window **425**, surgeries window **450**,

summary window **475**, and command center visual display window **500** can display diagnosis indicator **1552***a* and diagnosis indicator **1556***a* indicative of updated information or status of a patient and/or a patient's disease, test, or medical condition. Further, any ICD, SNOMED or similar code can be inserted.

[0207] FIG. **11** illustrates a portion of the medical record dashboard **400** of FIG. **4**A including a scrolled display in accordance with some embodiments. In some embodiments, the medical record dashboard **400** including problems window **425**, surgeries window **450**, summary window **475** can include a command center visual display window **500** that comprises a scroll display **505**. In some embodiments, any information displayed in the command center visual display window **500** can be scrolled by the user to bring non-visible portions of the command center visual display window **500** into view. This procedure can enable the user to view the entire history of the patient independent of the number of years of history that is on record.

[0208] FIG. **12**A illustrates a portion of the medical record dashboard **1600** in accordance with another embodiment. In some embodiments, the medical record dashboard **1600** can display data from one or more medical records, and/or track medical procedures and services based on claims made or billing signed off by a physician for one or more delivered medical procedures or services. Further, in some embodiments, the medical record dashboard **1600** can be auto-populated as a function of claims made or billing signed off by a physician, auto-populated from any portion of a selected chart. In this instance, any data displayed within the medical record dashboard **1600** can be derived from one or more claim records that have been billed for one or more procedures or services have previously been provided to the patient. In reference to the medical record dashboard **1600** and/or the previously described medical record dashboard **400**, in some embodiments, auto-populating visits by actual claims made or billings signed off by a physician, by definition occurs after the visit with the patient. In some embodiments, the command center visual display system and method can auto-populate the some information at the time the patient is seen, or shortly thereafter, or even before in preparation for a visit (i.e., lab results), so that even if a patient is not seen on a particular day, the user (e.g., medical provider) can view the displayed information in the table for information. For example, in some embodiments, information related to vision can be made with the current date at the time patient is seen. In some embodiments, a user or user's assistant can update the command center visual display system and method with medical tests or test results (e.g., a vision test) as they are performed or shortly thereafter (i.e., on the same day). In this example, this information can immediately trigger the current date and auto-populate the vision column. This information can then be immediately viewed by a user and/or medical provider, and can be updated with notes or comments or other information as the user and/or medical provider is attending to the patient. Further, after the claim has been made for any diagnostic tests or examinations or procedures that have not yet been billed, the date will then auto-populate in the future with the other related columns. In some embodiments, while examining a patient, important information and/or certain parameters that are critical to follow can be immediately updated to the command center visual display system and method. Using these procedures, the command center visual display system and method can enable the medical provider to review the patient's medical history, treatment history, and instantly see items of importance on the day they're examining a patient. For example, the user and/or medical provider can be enabled by the command center visual display system and method, on the day the patient is examined, to review information such as a vision or glaucoma table, intraocular pressure, blood pressure, blood sugar, etc. When billing claims are made, further information is filled to complete the billed claims record. As a further example, a patient may be seen a few days apart and the diagnostic tests etc. and claims have not yet been made, however the command center visual display system and method can be configured to show that the patient was seen that day (e.g., with a vision, pressure test, etc.), and the command center visual display system and method can enable a user (such as a physician) to interpret and/or add special notes on the day they see a patient or before they see the patient rather than waiting to make some notes when a claim is actually generated.

[0209] In some embodiments, a medical office wishes to communicate results or a test (e.g., a pathology result or test) a blinking cursor can appear to alert a lab physician to confirm done or other correspondence can be auto-populated into other portions of the EMR. Also any written or type correspondence or any links to dictated information using voice recognition coupled to or integrated with the command center visual display system and method. The display can include information including components where there is a summary of the patient's problem list that a user can input patient information and constantly update and change. Further, this information can be auto-populated with the touch of a button into a designated location such as the current plan documenting the patient's current visit (thus aiding documentation for the current visit). Further, whatever is important for a user to input into the day's visits for documentation can be initially inputted in the table, and then permanently into the day's patient visits. Further, the summary section of the medical record dashboard **2100** (FIG. **13**A) can be constantly fluid, and can be changed at every visit rather than being written to an unchangeable document or file (e.g., such as a PDF). Any patient data that is inputted, received, analyzed, or created can be auto-populated into any portion of the dashboard **2100**. The command center visual display system and method can auto-populate in a one-way or two-way direction in various data. fields related to information in any patient information via an electronic dataflow established between the command center visual display system and method and one or more computer systems of servers that comprise patient information (e.g., such as electronic medical records). The dataflow can comprise a two-way flow from the source of patient data to the command center visual display system and method, and from the command center visual display system and method to the source including another electronic system or server, or another user, observer, or other 3rd party.

[0210] By following a patient on the day of delivery (e.g., for a vision intraocular pressure or anything else) The Data Command Center Visual Display system and method can enable the user and/or medical provider to see the diagnostic test on same day even though it has not been billed. Further, this procedure can enable the medical provider to optionally add a note (as described earlier) and allow free hand typing at the end of the line.

[0211] In some embodiments, medical information populated within the command center visual display system and method (e.g., shown as visual cues, icons, or markers **885** representing medical services, procedures or tests performed or provided to the patient) can include a visual marker such as a red dot. In some embodiments, the command center visual display system and method can display the red dot until a claim is actually made at which time the command center visual display system and method can display a green dot (i.e., the command center visual display system and method can convert the red dot to a green dot). In some embodiments, by clicking on the dot, the user can toggle between the payment screen and the command center visual display window **500**, **1700**. This can allow medical providers to improve patient care, to review the actual picture of a diagnostic test that is displayed within the command center visual display window **500**, **1700**, to review other diagnostic tests results, and to compare to what happened on other days. In some embodiments, at any time, a medical provider can click on the dot to access a display where the claim is billed, and any payment that was made can be displayed. This process can help to reduce medical errors enabling medical providers to quickly review the billings and claims made or billings signed off by a physician and payment portions of the command center visual display system and method. Further, this procedure serves as an additional tool to minimize coding, compliance with insurance guidelines, and medical treatment errors, as the command center visual display system can provide a quick reference tool that can pull all critical medical and procedure data from the patients EMR chart into a concise and clear table.

[0212] In some embodiments, the medical record dashboard **1600** can display information related to medical procedures or services in relation to care of a patient with glaucoma. In some embodiments, the medical record dashboard **1600** can display various windows and sub-windows based on a user preference and/or current or previous user interaction with the medical record dashboard **1600**. Some embodiments include a medical record dashboard **1600** that comprises information columns **1640** including a problems window **1650** and/or a surgeries window **1660** where information related to a patient's medical problems and surgeries can be displayed. In some embodiments, the medical record dashboard **1600** can include a summary window **1670** enabling a user to view and edit summary information related to the patient, any details of care provided to the patient, and/or and any medical diagnosis information prepared by a medical practitioner. Further, the medical record dashboard **1600** can also display detailed information related to any medical procedures or services provided to the patient, including procedures or services that are auto-populated by claims made or billing signed off by a physician as detailed above or other method. For example, in some embodiments, the medical record dashboard **1600** can display a command center visual display window **1700** including a plurality of information columns **1705**. In some embodiments, the command center visual display window **1700** can be scrolled by the user to display other portions of the command center visual display window **500**.

[0213] In some embodiments, the medical record dashboards **400**, **1600** can also display detailed information related to notification of payment of any medical procedures or services provided to the patient, including procedures or services that are auto-populated by claims made or billing signed off by a physician as detailed above or other method. Moreover, the medical record dashboards **400**, **1600** can enable a user to access and/or track the status of the billing and payment process at any point in time. For example, in some embodiments, the medical record dashboards **400**, **1600** can access and view any patient encounter form (i.e. a superbill), any claims made to a clearing house, any updates on accepted or rejected bills from the clearing house, any claims made to an insurance company, and/or any payments received for any claims made.

[0214] FIG. **12**B illustrates a portion of the medical record dashboard **1600** of FIG. **12**A in accordance with some embodiments. As shown, the problems window **1650** can include a date and time information in entered date column **1710**, a timeline column **1720**, an "ICD" column **1730** for ICD code information, location of the problem or disorder (shown as "OD", "OS", "OU" identifying right eye, left eye, both eyes) (column **1740**), and a diagnosis column **1750** for detailing information related to an initial diagnosis or final diagnosis of a patients problem or disorder. Further, the surgeries window **1660** can include information related to services or procedures were provided to the patient (procedure columns **1662**), a description of the services or procedures performed (description columns **1664**), and when the services or procedures were provided to the patient (shown as timeline columns **1666**), and can include a surgical report that can be brought up and viewed by the user.

[0215] Referring to the command center visual display window **1700** of dashboard **1600**, the information columns **1705** can include a date column **1710**, and a procedure column **1720** illustrating or providing access to information detailing one or more procedures performed on the patient. Further, the procedure column **1720** can include an "OD" column **1722**, and "OS" column **1724** providing right and left eye procedure information. In some embodiments, information related to the medical provider, location where the procedure was performed, and office visit information can be provided to the user in the provider column **1730**, and unit column **1740**, and office visit column **1750**.

[0216] In some embodiments, the command center visual display window **1700** can enable a user to view information related to tests and procedures performed on the patient including, but not limited to one or more medical imaging procedures such as an optical coherence tomography ("OCT"), or fluorescein angiography ("FA"), and/or indocyanine green chorioangiography ("ICG"). In some embodiments, medical procedures performed (including any of the aforementioned medical imaging procedures) that have been billed and claimed can be viewed or accessed by a user within any of the "OCT" column **1760** (shown split as an "OD" column **1762** and "OS" column **1764**), an "Ant Seg OCT" column **1770** (split as an "OD" column **1772** and "OS" column **1774**).

[0217] In some embodiments, if visual function tests were performed, information can be viewed or accessed in the "VF" column **1780** (including an "OD" column **1782**, and/or an "OS" column **1784**. Some embodiments include a photo column **1790** configured to enable a user to access any photographic images of the patient's eyes including optical and/or auto-fluorescent images of the eyes ("OD" column **1792** and "OS" column **1794**). Further, some embodiments include a Gonio column **1796** providing access to gonioscopy data and/or information related to a dilated fundus examination ("DFE" column **1798**). In some embodiments,

the surgeries window **1660**, can include location column **1642**, surgeon column **1644**, and a comments column **1646** (shown in FIG. **12**C).

[0218] In some embodiments, the command center visual display window **1600** can enable a user to view information related to tests and procedures performed on the patient including a cup-to-disc ratio ("C/D") to assess the progression of glaucoma, Pachymetry data ("Pachy"), refraction test information such as best-corrected visual acuity ("BCVA"), and/or intraocular pressure (IOP) data. For example, FIG. **12**C illustrates a portion of the medical record dashboard of FIG. **12**A in accordance with some embodiments and shows method column **1820**, "C/D ratio" column **1830**, "Pachy" columns **1860**, "BcVA" columns **1870**, and "IOP" columns **1880**. In some embodiments, the "C/D ratio" column **1830** includes "V" column **1835**, "H" column **1840**, "V" column **1850**, and "H" column **1850**. Further, in some embodiments, the "Pachy" columns **1860** includes "OD" column **1862**, and "OS" column **1864**. In some embodiments, the "BcVA" columns **1870** includes "OD" columns **1872**, and "OS" columns **1874**. Some embodiments include "IOP" columns **1880** including "OD" columns **1882**, and "OS" columns **1884**. In some embodiments, other columns **1890** can be used to add additional test information. Further, the command center visual display window **1700** can also include a notes column **1895** for accessing and updating notes related to tests and medical diagnosis. In some embodiments, the tracking display window **1700** can be updated with comments and notes as described earlier with respect to tracking display window **400**.

[0219] In some embodiments, the command center visual display system and method can display and auto-populate the medical record dashboard **400** and/or the medical record dashboard **1600** with more than one patient information. For example, in some embodiments, any windows, sections, or columns of the medical record dashboard **400**, **1600** can display information related to a plurality of patients. Any patient data. that is inputted, received, analyzed, or created can be auto-populated into any portion of the dashboard **400**, **1600**, where the command center visual display system and method can auto-populate in either a one-way or a two-way direction. Thus, data fields related to information in any patient information can be communicated via an electronic dataflow established between the command center visual display system and method and one or more computer systems of servers comprising patient information (e.g., such as electronic medical records).

[0220] Further, in some embodiments, any information displayed by the command center visual display system and method can display and auto-populate the medical record dashboard **400** and/or the medical record dashboard **1600** as a function of patients seen during a specified time period. In some other embodiments, the command center visual display system and method can display and auto-populate the medical record dashboard **400** and/or the medical record dashboard **1600** as a function of a specified disease and/or diagnosis. For example, in some embodiments, the command center visual display system and method can display and auto-populate the medical record dashboard **400** and/or the medical record dashboard **1600** as a function of a diagnosis or procedure or prescribed medication or lab or imaging test from input received from a physician or other medical practitioner or provider. For instance, every patient who has the diagnosis of diabetes with their name and the date last scene is auto-populated. Certain parameters that may need to be followed by the user from all of their patients with this condition can be auto-populated. For example, in the case of patients with diabetes, parameters can include how often they've missed appointments, blood sugar, hemoglobin A1C, medications, major new medical complications such as heart attack, stroke, amputations, blindness, each of which can be auto-populated and followed to enable the user to see how all their patients are doing. In some embodiments, input and the ability to display data can be based on single values or on complex multi-variate input (i.e. patients with diabetes, taking metformin and seen by the practice in the last 30 days).

[0221] In some embodiments, the user can receive a daily report on all the patients they have seen, what the diagnosis codes are and what CPT, ICD, or office visit billing codes were done whether they have been billed or not. In some embodiments, the user can view a report of patients for a specific day or week based on appointments or other data such as referrals. With this functionality, at the end of the day physicians can see all of their activity or the practice's activity and using data visualization techniques can realize what activity still needs to be completed or was not entered properly. The user can then review the same information in a few days' time and weeks or months later to ensure that the proper billing and collections has occurred. In some embodiments, any report or diagnostic test can be sent to a patient portal, to an email server, and/or as a fax. Further, the user can be alerted when the claims go out and when they are actually paid. For example, in some embodiments, the above described methods of display can provide a mechanism for determining payments to the user, and if claims are being made for each patient seen in any particular day, week or month.

[0222] In some embodiments, any report, note, letter, referral or diagnostic test can be sent to an EMR, patient portal, a messaging platform to an email server, and/or as a fax. Messages can be transmitted to a patient or another practice focused on appointment reminders, medication prescriptions and/or refills, and good care management guidelines. It should be recognized the data interoperability and messaging are not limited to the examples provided but apply to any information within the Command Center.

[0223] Examples of the aforementioned examples of displayed data sorted and viewable by patient, disease time period, physician, etc., are shown in FIGS. **12**D and **12**E. For example, FIG. **12**D illustrates a portion of a medical record dashboard **1900** for display as a function of disease or patient in accordance with some embodiments. Further, FIG. **12**E illustrates a portion of a medical record dashboard **2000** for display as a function of patients or physician or disease state in accordance with some embodiments. In some embodiments, the medical record dashboards **1900**, **2000** can be displayed overlaid on a previously viewed dashboard such as medical record dashboard **400**, **1600**. For example, in some embodiments, the medical record dashboards **1900**, **2000** can be displayed in the command center visual display window **500**. In other embodiments, the medical record dashboards **1900**, **2000** can be displayed independently from the medical record dashboard **400**, **1600**, and the user can toggle a display of any of the medical record dashboards **400**, **1600**, **1900**, **2000**.

[0224] Referring to FIG. **12**D, including providing a list of patients **1905**, within column **1910**, an entire day of patients

listed by date or by insurance coverage can be provided or the list can comprise a single patient with multiple visits. For example, in some embodiments, within column **1920**, an office visit and any items billed for a routine examination day and any other CPT codes billed that day can be displayed. Some specialties will have many CPT codes during an office visit (e.g. Ophthalmologists, whereas others (e.g., Gastroenterologists) may have four during an office visit. In some embodiments, column **1930** can include the procedures that a physician may perform, and are usually not on the same day as the exam (these are GI physicians examples). In some further embodiments, the column **1940** can include various important parameters that can be followed for a specific patient. Some embodiments include column **1950** that includes where a physician writes notes about patient care issues. In some embodiments, column **1960** can takes the user to that patient's personal EMR or review table and can also send a message to the patient. In some embodiments, the column **1970** can takes the physician to the charge payment history of the patient, and also a message can be sent to the billing department from this table. Columns can be reconfigured such that all patients with a particular insurance company that have a particular diagnosis on any given date or over a prolonged period of time can have tests and procedure results, as well as payments compared, allowing on one screen anyone to rapidly move through this visual display system to empower rapid comparison of results and potential payment anomalies for the same insurance company for the same CPT codes but perhaps different ICD9 or 10 diagnosis and to see if there is a mismatch (e.g., through the use of artificial intelligence systems discovering insurance payment irregularities). In some embodiments, columns **1920**, **1930** can be colored 'black' when a claim is made, and can be colored 'green' if paid, and can be colored 'yellow' if a payment is pending, and can be colored 'red' if payment denied by one rendition, e.g., physician reconciliation report of messages sent individuals for follow up, and/or a report of all the message activity from any given day.

[0225] Referring to FIG. **12**E, including example embodiments related to patients with diabetes, the display for patients **2010** can include a variety of medical, billing, and insurance related information. FIG. **12**E illustrates a portion of a medical record dashboard for display as a function of patients with a specific disease ICD, such that many patients may be compared at the same time, which can be useful for clinical research or for tracking clinical outcomes. This embodiment tracks all patients in a practice or a subset of patients and can compare, for example, particular diagnostic test results in patients with a particular condition, the results of a particular medication, how all the patients did who received a particular intraocular lens into the eye, etc. The information is put into each individual patients table, but all patients with that issue can also be called up on a single table such at that illustrated in FIG. **12**E. This feature can compile and compare all patients with a particular insurance company that have a particular diagnosis and compare tests and procedure results, as well as payments, allowing a doctor on one screen to rapidly see results, changes, patterns and payment anomalies. This feature also allows the extraction of patients with similar conditions for referrals and clinical research, batch generation for cross-referrals (e.g. optometry for an ophthalmologist), etc. This medical record dashboard **2000** can be displayed as shown, or can be sorted based on any of the data columns. For example, the patients **2010** can be shown including information displaying insurance coverage **2020**, date of diagnosis of diabetes **2030**, the patient's age **2040**, the patient's weight **2050**, the patient's height **2060**, their body mass index **2070**, their initial presenting HbgA1C **2080**, their most recent HbgA1C **2090**, their hypertension status **2092**, their recent blood pressure **2094**, their All ICD diagnosis **2096** and their current or past medications **2098**. In some embodiments, the medical record dashboard **2000** can be reconfigured to shown patients **2010** sorted by any of the columns **2020**, **2030**, **2040**, **2050**, **2060**, **2070**, **2080**, **2090**, **2092**, **2094**, **2096**, **2098**.

[0226] Those skilled in the art will appreciate that a summary table of the type illustrated in FIG. **12**E enables the physician to put into one dashboard **2000** everything the physician has done in a particular time frame, such as a day. For instance, a line of information for the information entered into the chart for every patient for today's visit, may be presented in the dashboard **2000**. Whatever the technician records like the patient's vision and any diagnostic tests or laser procedures or injections in the eyes that were actually done that day, come up on the dashboard **2000** for interpretation. Dashboard **2000** thus shows on one page literally everything a physician will have done from laser surgeries to injections to photos is all summarized for inspection and confirmation. The physician may also refer to the notes section, such that physicians can write notes reminding themselves to do something like call the patient's family at night, check laboratories results, or remind doctors of items to do. Those type of messages can remain permanent or disappear if the physician chooses. The dashboard **2000** also serves as a double-check enabling the physician to check again (e.g. 48 hours later) when everything for that day should have already been billed or 60 days later when everything is paid and all dates queried can be compared. Also, the physician may call up all patient having a common insurance carrier to facilitate satisfaction payments from the insurance.

[0227] In some embodiments, the command center visual display system and method can enable a user to update a medical record dashboard **400** and/or the medical record dashboard **1600** to be mark personalized to the next treating physician or patient to follow progression changed outcomes. This will be used to access quality of care and prove effectiveness and results resolution, and can be used for negotiating with insurance carriers or for performance research. For example, anything can be tracked or personalized to the needs of the treating physician or patient to follow progression, changes, and outcomes. This can be used to assess quality of care and prove effectiveness and results of treatment. Quality outcome measures are important for all practices to start to follow as this improves patient care, and in the future, a physician's financial compensation from insurance companies, or any penalization will be determined based on the quality of care metric. Further, physicians who participate in clinical research must follow defined parameters over time as they learn whether a particular drug, or device, or other item being investigated actually improve changes or worsens particular parameters. As described earlier, in some embodiments, the information that is auto-populated can include patient outcome summaries. In some embodiments, the command center visual display system and method can process patient outcomes and display an analysis of patient outcomes based on patient

information from treatment summaries, and/or diagnosis summaries, and/or patient feedback summaries, and/or other physician summaries or treatments. The patient outcomes can include or comprise physician quality reporting system (PQRS) quality measures, and calculated or reported patient outcomes can include or comprise PQRS measures codes.

[0228] By way of example in FIG. **4**C, vision is followed in column **1100**, and in the other column **1200**, many different parameters that may change over time can be added. For example, as described earlier with respect to participation in clinical research studies, other factors followed such as central macular thickness ("CMT"), or ischemic index ("ISI") (% and a scan in millimeters) can be followed. Therefore, every time the patient comes in to be examined, the table can serve the multi-purpose of treating the patient, and for inputting research data from the office visit right into the table. This can then auto-populate into another portion of the EMR or derive these numerical values and place them into the research Excel spreadsheet. Also, it could go the other way, where if the Excel research spreadsheet can also have the data inputted into the review table.

[0229] In some embodiments, the command center visual display system and method can enable a date alert or self-destruction of any information or data entered or auto-populated in the medical record dashboard **400** and/or the medical record dashboard **1600**. For example, in some embodiments, any message, or note, or summary, or any medical data can include a date alert and/or a self-destruct function that can instruct the command center visual display system and method to remove and/or delete information from the medical record dashboard **400** and/or the medical record dashboard **1600**. In other embodiments, the historical date and/or an alert or warning can be provided with any auto-populated or user-summoned information to assist the user with an assignment of relevancy to any data being reviewed prior to, during, or after a patient visit or examination. In some embodiments, this feature can optimize the standard of care being delivered by the user. For instance, this feature can help monitor preferred practice patterns or serve as a reminder on information needed for clinical review.

[0230] Within the rows and columns of data displayed, the flowsheet view prioritizes relevant data, while masking less important values. This functionality allows the physician to focus on the most important data pertinent to the current use case, e.g., with a patient that has a certain diagnosis, several preferred diagnostic test results and data are germane. The display is also inclusive of data that originates from additional physicians/EHR visits deemed important which is rendered in chronological order. Utilizing Artificial Intelligence (AI), Natural Language Processing (NLP), and/or conventional business logic, the tool programmatically filters out unnecessary information and queries for display additional information which may consist of additional rows displaying external physician encounters, diagnostic test results, etc.

[0231] Flowsheet Configuration may be defined based on key events, results, date/time, and/or logical parameters which can include, but are not limited to:

[0232] Diagnoses

[0233] Medication Start/End Dates

[0234] Allergy Start/End Dates

[0235] Billing History

[0236] Demographic Data

[0237] Observations/Plans

[0238] Life Events

Format and display of rendered data will make maximum usage of space by shrinking less relevant rows, auto-sizing of columns, and automatically collapsing less relevant data. The intention of this functionality is to provide the most efficient view of relevant data, while not overloading the provider with information not germane to the current Flowsheet Configuration. An example would be if a patient has glaucoma there are specific columns that are highly important to monitoring the chronic condition but some which have no relevance. In this example, the patient that has a diagnosis of glaucoma will have Intra-Ocular Pressure (IOP), Glaucoma medications, etc. displayed prominently while the other less relevant columns are masked. It is important to note that the masked columns can be expanded so that, in edge cases, the doctor may still want to view those data.

[0239] Involving several layers of business logic, correlated to predefined parameters, all data is parsed for relevance. Rules and logic compile a final dataset for the interface, while system or user-defined flow/sheet templates determine actual rows and columns for display. A Flowsheet Configuration Object is used to store configuration settings. The Flowsheet Configuration Object is a JSON object containing definitions and constraints outlining what parts of dataset should render on-screen. All configurations are then outputted to the Flowsheet Configuration Object.

[0240] The Flowsheet Editor Interface provides a method by which a provider can configure the formatting and display of Flowsheet data. This simplified interface editor embodies "What You See Is What You Get" (WYSIWYG) methodology, with drag and drop of Flowsheet elements. Upon completion of a Flowsheet Template, associated parameters must be defined. The Flowsheet Editor allows the user to define how columns and rows will display. While providers have the ability to only view predefined data, filtered data may trigger a rule to display in lieu of predefined filters. Preconditioned upon required contract/agreement between providers, data may display from multiple, disparate sources to display continuity of care.

[0241] The Flowsheet Editor Interface also allows the end-user to configure the way that summary rows are presented within the flowsheet. A provider may choose to discard certain edge-cases from the summary calculation, take the highest and lowest values, take an average, or some other logical calculation to determine how the individual columns summary row data presents itself.

[0242] In addition to allowing changes which reflect the display of the data, it is possible for the end-user to program the alerts and auto-tasks which are sent as a result of the rule threshold being exceeded. For example, if a provider determines that a new alert rule must be created, they are able to select the column, or columns, apply logical rules to the column or columns being analyzed, and set the task associated with rule which will be sent to the user-defined staff member or groups of staff members. As another example, a provider may choose to add a new alert for those patients which have a diagnosis of Glaucoma and have not had a required diagnostic test, a Visual Field, in 365 days. The provider is then able to set a task that will be sent to front-desk staff to schedule the diagnostic test will automatically be sent when the Auto Task Container processes both the system and user-defined auto task and alerts. The editor

interface also allows for the end-user to configure the way the alert displays in the flowsheet. For example, the end-user can set the display of the alert to any of the following, but not limited to, headers, within the rows and columns of the flowsheet, on the patient demographic panel, etc.

[0243] Pre-defined display rules may override a user-defined flowsheet configuration when the rule is prioritized for patient safety reasons. These overrides will display the visit in question in a prominent color. An example of this would be if a patient had recently found out that she was pregnant, it becomes very important that she does not have certain diagnostic tests as they can endanger the viability/health of the fetus. For example, a Fluorescein Angiogram should not be performed on a patient to monitor the progress of a patient if she is pregnant. Due to the potential life altering consequences, the system, through the use of AI, is smart enough to override the flowsheet template, and display the visit from the OBGYN, where the patient was confirmed to be pregnant.

[0244] With regard to Co-Management and/or Multi-Specialty Practices, external provider data may be included subject to necessary contracts/agreements. When this is the case, external provider rows may be collapsed, truncated, or expanded dependent upon system or user preference. The data will only be available in the case of explicit acceptance of liability for viewing patient health information.

[0245] In some embodiments of the inventor, the command center visual display system and method also can enable a user to access a detailed ledger comprising financial information related to one or more procedures. In some embodiments, the ledger can be accessed from a medical record dashboard. Further, in some embodiments, the dashboard can include at least one visual indication of a payment for services provided, where detailed information of the charges, payments, write-offs, adjustments, and balances can be accessed and displayed. For example, FIG. **13**A illustrates a medical record dashboard **2100** in accordance with some embodiments. In some embodiments, the medical record dashboard **400** illustrated in FIG. **4**A can comprise, include, or be replaced by the medical record dashboard **2100**. In some embodiments, the medical record dashboard **2100** can be accessed as described for the medical record dashboard selection window of FIG. **3**. In some embodiments, the medical record dashboard **400** can be displayed by the user following the user's selection of at least one medical record dashboard from the medical record dashboard selection window **300**. For example, in some embodiments, the user can select "Retina Flowsheet" **305** to access and/or launch the medical record dashboard **2100**.

[0246] In some embodiments, the command center visual display system and method display a medical record dashboard **2100** including a display of data from one or more medical records, and/or track medical procedures and services based on claims made or billing signed off by a physician for one or more delivered medical procedures or services. Some embodiments include a command center visual display system and method that can dynamically link to various external databases comprising patient information that can be displayed in the medical record dashboard **2100**. For example, in some embodiments, the command center visual display system and method can function as a portal to patient information prepared by the user or patient information from other sources. Further, in some embodiments, the medical record dashboard **2100** can be auto-populated as a function of claims made or billing signed off by a physician. In this instance, any data. displayed within the medical record dashboard **2100** is derived from one or more claim records that have been billed for one or more procedures or services have previously been provided to the patient. In some other embodiments, auto-population can be enabled in both directions interacting as a switchboard between the entire EMR and the medical record dashboard **2100** along with what is added to any window, sub-window, column or entry in the medical record dashboard **2100** being automatically added to the appropriate part of the chart for documentation. In some embodiments, the medical record dashboard **2100** can display information related to medical procedures or services in relation to retinal eye care of a patient. In other embodiments, the medical record dashboard **400** can display information related to medical procedures or services in relation to any kind of medical care of a patient.

[0247] In some embodiments, the medical record dashboard **2100** can display various windows and sub-windows based on a user preference and/or current or previous user interaction with the medical record dashboard **2100**. For example, in some embodiments, the medical record dashboard **2100** can display a problems window **2125** and/or a surgeries window **2150** where information related to a patient's medical problems and surgeries can be displayed.

[0248] In some embodiments, the medical record dashboard **2100** can display information including components where there is a summary of the patient's problem list that a user can input patient information and constantly update and change. Further, this information can be auto-populated with the touch of a button into a designated location such as the current plan documenting the patient's current visit (thus aiding documentation for the current visit). Further, whatever is important for a user to input into the day's visits for documentation can be initially inputted in the table, and then permanently into the day's patient visits. Further, the summary section of the medical record dashboard **2100** can be constantly fluid, and can be changed at every visit rather than being written to an unchangeable document or file (e.g., such as a PDF). For example, in some further embodiments, the medical record dashboard **2100** can include a summary window **1670** enabling a user to view and edit summary information related to the patient, any details of care provided to the patient, and/or and any medical diagnosis information prepared by a medical practitioner. Further, the medical record dashboard **2100** can also display detailed information related to any medical procedures or services provided to the patient, including procedures or services that are auto-populated by claims made, or billings or payments including billing signed off by a physician as detailed above. All of the features of the medical record dashboard **400** as described earlier can be provided in the medical record dashboard **2100**.

[0249] Some additional features include the dashboard **2100** displaying at least one visual indication of a payment for services provided on the dashboard **2100**. Further, the user can be provided with access to a detailed ledger comprising financial information related to one or more procedures. For example, in some embodiments, the dashboard can comprise a payment indicator column **2200** including one or more indicator and/or access icons. For example, in some embodiments, the payment indicator column **2200** can comprise a column **2205***a* that can be populated with one or more indicator icons. In other embodi-

ments, the column **2205***b* can be provided with one or more indicator or access icons. In some embodiments, the one or more indicator or access icons can comprise icons of color such as yellow or green.

[0250] The payment indicator column **2200** can be positioned anywhere on the dashboard **2100**. In the example embodiments of FIG. **13**A, the payment indicator column **2200** can be positioned between the procedure column **2110** illustrating or providing access to information detailing one or more procedures performed on the patient, and information related to the medical provider, provider column **2130**, that can display the location where the procedure was performed, and office visit information.

[0251] In some embodiments, one or more of the icons of the payment indicator column **2200** can be accessed by the user to initiate the command center visual display system and method displaying more detailed financial information. An example embodiments is illustrated in FIG. **13**B illustrating a ledger window **2300** accessible from the medical record dashboard **2100** of FIG. **13**A. In some embodiments, the command center visual display system and method can display the ledger window **2300** overlaid onto the medical record dashboard **2100**. In other embodiments, the ledger window **2300** can be displayed in place of the medical record dashboard **2100**. In other embodiments, the ledger window **2300** can be displayed with the medical record dashboard **2100**.

[0252] In some embodiments, the ledger window **2300** can include information processed by the command center visual display system and method including information related to the date of procedure, description of the procedure, dates entered, a charge type, etc. For example, in some embodiments, ledger window **2300** can include the service to column **2310**, entered column **2320**, line column **2330**, type column **2340**, and description column **2350**. Further, in some embodiments, the ledger window **2300** can include information related to payments and billing. For example, in some embodiments, the ledger window **2300** can include a display of a charge column **2360**, payment column **2370**, write-off column **2380**, adjustment column **2390**, and a balance column **2400**. In some embodiments, the user can close the ledger window **2300** and return to the medical record dashboard **2100** at any time. In other embodiments, more than one ledger window **2300** can be displayed based on selections made by the user in the medical record dashboard **2100**.

[0253] FIG. **14** illustrates a computer system **30** configured for operating and processing components of the command center visual display system and method in accordance with some embodiments. In some embodiments, the computer system **30** can process one or more software modules of the aforementioned command center visual display system and method and display information related to medical services within at least one graphical user interface. Further, in some embodiments, using the computer system **30**, the command center visual display system and method can manage the organization of data and data flow between the various components of the command center visual display system and method. For example, in some embodiments, the computer system **30** can be configured to process and display the medical record dashboard **400** and/or the medical record dashboard **1600**. Further, in some embodiments, the computer system **30** can be configured to process and display auto-populated data within any portion of the medical record dashboards **400**, **1600**, including, but not limited to the command center visual display window **500** and/or the command center visual display window **1700**.

[0254] In some embodiments, the system **30** can include at least one computing device, including one or more processors **32**. Some processors **32** can include processors **32** residing in one or more conventional server platforms. The system **30** can include a network interface **35***a* and an application interface **35***b* coupled to at least one processors **32** capable of running at least one operating system **34**. Further, the system **30** can include a network interface **35***a* and an application interface **35***b* coupled to at least one processor **32** capable of running one or more of the software modules (e.g., enterprise applications **38**). Some embodiments also relate to a device or an apparatus for performing these operations. The apparatus can be specially constructed for the required purpose, such as a special purpose computer. When defined as a special purpose computer, the computer can also perform other processing, program execution or routines that are not part of the special purpose, while still being capable of operating for the special purpose. Alternatively, the operations can be processed by a general purpose computer selectively activated or configured by one or more computer programs stored in the computer memory, cache, or obtained over a network. When data are obtained over a network the data can be processed by other computers on the network, e.g. a cloud of computing resources.

[0255] With the above embodiments in mind, it should be understood that the tool described herein can employ various computer-implemented operations involving command center visual display data stores in computer systems. Moreover, the above-described databases and models can store analytical models and other data on computer-readable storage media within the system **30** and on computer-readable storage media coupled to the system **30**. In addition, the above-described applications of the command center visual display system can be stored on computer-readable storage media within the system **30** and on computer-readable storage media coupled to the system **30**. These operations are those requiring physical manipulation of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, electromagnetic, or magnetic signals, optical or magneto-optical form capable of being stored, transferred, combined, compared and otherwise manipulated.

[0256] Some embodiments include the system **30** comprising at least one computer readable medium **36** coupled to at least one data storage device **37***b*, and/or at least one data source **37***a*, and/or at least one input/output device **37***c*. In some embodiments, the command center visual display system can also be embodied as computer readable code on a computer readable medium **36**. The computer readable medium **36** can be any data storage device excluding a modulated electrical signal that can store data, which can thereafter be read by a computer system (such as the system **30**). Examples of the computer readable medium **36** can include hard drives, network attached storage (NAS), read-only memory, random-access memory, FLASH based memory, CD-ROMs, CD-Rs, CD-RWs, DVDs, magnetic tapes, other optical and non-optical data storage devices, or any other physical or material medium which can be used to

tangibly store the desired information or data or instructions and which can be accessed by a computer or processor (including processors **32**).

[0257] In some embodiments, the computer readable medium **36** can also be distributed over a conventional computer network via the network interface **35***a* so that the command center visual display system embodied by the computer readable code can be stored and executed in a distributed fashion. For example, in some embodiments, one or more components of the system **30** can be tethered to send and/or receive data through a local area network ("LAN") **39***a*. In some further embodiments, one or more components of the system **30** can be untethered to send or receive data through an internet **39***b* (e.g., a wireless internet). In some embodiments, at least one software application **38** running on one or more processors **32** can be configured to be coupled for communication over a network **39***a*, **39***b*. In some embodiments, one or more components of the network **39***a*, **39***b* can include one or more resources for data storage, including any other form of computer readable media beyond the media **36** for storing information and including any form of computer readable media for communicating information from one electronic device to another electronic device.

[0258] In some embodiments, the network **39***a*, **39***b* can include wide area networks ("WAN"), direct connections (e.g., through a universal serial bus port) or other forms of computer-readable media **36**. or any combination thereof. Further, in some embodiments, one or more components of the network **39***a*, **39***b* can include a number of client devices which can be personal computers **40** including for example desktop computers **40***d*, laptop computers **40***a*, **40***e*, digital assistants and/or personal digital assistants (shown as **40***c*), cellular phones or mobile phones or smart phones (shown as **40***b*), or smart watch, pagers, digital tablets, internet appliances, and other processor-based devices. In general, a client device can be any type of external or internal devices such as a mouse, a CD-ROM, DVD, a keyboard, a display, or other input or output devices **37***c*. In some embodiments the display can be a heads-up or virtual display, such as a HoloLens available from Microsoft, that can only be seen by the user. In some embodiments, various other forms of computer-readable media **36** can transmit or carry instructions to a computer **40**, including a router, private or public network, or other transmission device or channel, both wired and wireless. The software modules **38** can be configured to send and receive data from a database (e.g., from a computer readable medium **36** including data sources **37***a* and data storage **37***b* that can comprise a database), and data can be received by the software modules **38** from at least one other source. For example, as described earlier, in some embodiments, using the system **30**, the command center visual display system and method can be configured to receive one or more CCD from one or more medical providers for display to the user **31**. In some embodiments, the command center visual display system and method can be configured to receive HL7 messages and or use Application Programming Interfaces (APIs) to send and receive data. Further, in some embodiments, patient data can be retrieved from one or more master patient index databases (e.g. a master patient database managed by a government entity and/or a third party provider such as insurance company or collective of insurance companies). In some further embodiments, data can be retrieved from the national register of drugs and pharmaceuticals. In some further embodiments, data can be retrieved from health information exchanges.

[0259] In some embodiments, at least one of the software modules **38** can be configured within the system **30** to output data to at least one user **31** via at least one digital display (e.g., to a computer **40** comprising a digital display). In some embodiments, the system **30** as described can enable one or more users **31** to receive, analyze, input, modify, create and send data to and from the system **30**, including to and from one or more enterprise applications **38** running on the system **30**. Some embodiments include at least one user **31** coupled to a computer **40** accessing one or more modules of the command center visual display system including at least one enterprise applications **38** via a stationary I/O device **37***c* through a LAN **39***a* or via a wireless connection. In some other embodiments, the system **30** can enable at least one user **31** (through computer **40**) accessing enterprise applications **38** via a stationary or mobile I/O device **37***c* through an internet **39***a*.

[0260] In some embodiments, the software modules **38** can include a server-based software platform that can include medical services tracking software modules suitable for hosting at least one user **31** account and at least one patient account or record. Further, some embodiments include the software modules **38** that can include at least one server-based software platform that can include medical services tracking software modules suitable for hosting at least at least one patient account or record. In some embodiments, using the system **30**, the command center visual display system and method can manage multiple user accounts and/or multiple patient accounts. In some embodiments, the software modules **38** can include a server-based software platform that can include medical services tracking software modules suitable for hosting a plurality of user accounts accessible by multiple medical practitioners (e.g., physicians, surgeons, optometrists, ophthalmologists, podiatrists, dentists, etc.) In some embodiments, patient accounts can be accessible by the patient's medical practitioner and not shared with other medical practitioners holding one or more user accounts within the command center visual display system and method. In some further embodiments, one or more patient accounts can be accessible and shared by a user **31** associated with the patient account. For example, in some embodiments, a user **31** can grant access to at least one other user of the command center visual display system and method. In some embodiments, shared access can be at least partially restricted. For example, in some embodiments, shared access can be restricted to viewing at least a portion of the shared patient's account or record.

Second Embodiment of Data Command Center

[0261] FIG. **15** illustrates another embodiment of a Data Command Center (CC) **2500** implemented as a data interface to a medical record system useful for deploying or launching a second set of embodiments. The CC **2500** in the exemplary embodiment is designed to interact with a conventional EMR system although, as noted above, the CC **2500** may be used with other large data systems to present data to users in a meaningful way. In addition, the exemplary embodiment illustrates a CC **2500** for implementation in an Ophthalmology practice. Those skilled in the art will appreciate that the interface may be readily configured for other medical specialties. Indeed, one of the key features of the CC **2500** described herein is its flexibility to display data

from multiple data sources in multiple different panels on a single interface. In the exemplary embodiment, the CC **2500** provides a comprehensive overview of the patient's clinical and financial history as well as providing a means to quickly order tests while retaining the ability to see previous medical history. Clinical and insurance guidelines as well as preferred practices are quickly accessible based on the patient's conditions, medications and procedures so that the physician may readily provide optimal care and be compliant with medical and billing requirements. The physician thus becomes a part of revenue cycle management for each patient in the physician's practice.

[0262] It will be appreciated by those skilled in the art that specific features of the first embodiment described above may also be included in the second embodiment, and vice-versa, and the descriptions of the features of the first embodiment above are incorporated into the following description by reference. For example, like the first embodiment described above, the Data Command Center **2500** described with respect to FIGS. **15-56** may incorporate self-deleting staff messages that are presented to the Command Center **2500**. For example, a staff person can send a message about a patient to the physician that appears in a display window in the Command Center **2500** with a message such as "the patient has been waiting over an hour and is upset" or the "patient has previously filed a malpractice complaint" that do not become part of the patient's medical record. The message may be programmed to be deleted once the patient's visit is billed.

[0263] FIG. **15** illustrates an exemplary embodiment of a Data Command Center (CC) **2500** for use with an EMR system customized for an Ophthalmology practice. As illustrated, across the top of the page the user has the ability to search for patients at **2502**, select different views of the data at **2504**, add sticky notes at **2506**, access user information at **2508**, and logout at **2510**. Immediately below that on the upper left-hand side of the CC **2500** is the Patient Information Bar **2512**, which contains the patient's identifying information **2514** so the user knows they are looking at the correct patient record. The Patient Information Bar **2512** also notifies the user of patient's outstanding balance **2516**. To the right of the Patient Information Bar **2512** is the Patient Insurance Bar **2518**, which provides the patient's insurance information **2520**, including the ID number **2522** for the patient's primary insurance. Below the Patient Information Bar **2512** is a collection of tabs **2524** displaying different sets of information about the selected patient. A different collection of tabs **2526** is found underneath the Patient Insurance Bar **2518**. Under tabs **2524** is the Summary panel **2528** where the user can enter notes about the patient (e.g. patient did not show up for missed appointments). The next section, the Retina Flowsheet **2530**, is an encounter driven panel that summarizes key clinical and financial information in chronological or reverse chronological order at a glance, allows the user to order new Procedures and Imaging tests, and provides assistance complying with insurance regulations, as will be described in more detail below. Below the Retina Flowsheet **2530** is the Financial Flowsheet **2532** providing a summary of the financial information related to the patient and this is adapted to provide the user with the ability to drill down into individual transactions. On the right side of the CC **2500** are a series of vertical tabs **2534** that when individually clicked slide out to provide more information to the user. The Notes Tab **2536** expands to display patient notes, while the Alerts Tab **2538** expands to display patient alerts (e.g. patient's chart was requested by insurance company or sent for a second opinion). The Images Tab **2540** expands to display images for the patient and the Guidelines Tab **2542** expands to display clinical practice and insurance guidelines along with preferred practice patterns where applicable. On each tab, displayed next to the tab title is the count of the new items **2544** since the last time the user accessed the patient record. Once the tab is expanded, the new count will be removed because the user has seen the information. If important or critical data exists within the tab, a special alert icon **2546** is displayed on the tab. Once viewed, the alert icon **2546** is removed. As will become apparent from the following description, the layout of the CC **2500** permits access by the user to all of the relevant information within one click of the mouse and without having to steer to other screens that would take the user away from the CC **2500**. For example, the information is either available in a display window, behind a tab, or available via a pop-up window; accordingly, the user does not have to leave the display screen to access the information.

[0264] FIG. **16** illustrates the search results **2548** of a patient search input into the patient search field **2502**. To search for a patient, the user types in the Patient Search field **2502**. After the user types the third character in the field, the search results **2548** appear matching the criteria. As the user enters additional characters, the search results are refreshed. The search criteria looks for any patients where the sequential string of characters entered matches the same sequential string of characters in either the patient's first or last name. For example, entering 'sam' matches Sammy Smith, Isamra Turek, Bill Samson, Michelle Bosam, but not Silas Amhearst. In an exemplary embodiment, the results **2548** display the following fields: Name **2550** (Last, First), Patient ID **2552**, Date of Birth and age **2554**, Last Visit (Date) **2556**, and Next Visit (Date) **2558** if scheduled. The results are sorted alphabetically by last name, then first name, followed by date of birth, but the user can change the search order by clicking the sort icons **2560** at the top of each column. This sorting capability is available through the Command Center **2500** when viewing lists. The user may select a patient by clicking on the row in the results list **2548**. When a patient is selected, the results panel **2548** closes and the patient record is retrieved. The user may control the size of the panel by clicking and holding the icon **2562** in the bottom right of the panel **2548**. The user can close the results panel **2548** by clicking the close icon **2564**.

[0265] A key feature of the Command Center **2500** is that it allows the user to control the layout of the screen and to create different views or layouts of the information based on their needs. FIG. **17** illustrates a user View control panel **2566** that displays views for selection by the user. As illustrated, the user may select one of several Views **2568-2574**. Views ePrescribing **2568** and Orders **2570** are examples of task based views, while Diabetes **2572** and Ophthalmology **2574** are examples of condition or specialty specific views. In an exemplary embodiment, the system has several pre-configured views but more can be added over time by deploying new versions of the system or by user modification. The user may edit the Current View **2576**, Reset the Current View **2578** to its default configuration, create a new View **2580**, or create a new Panel **2582**. If the user selects a new view from options **2568-2574**, the screen

layout is changed to reflect the selected view for the current patient. Referring back to FIG. **15**, it should be noted the dimensions of the different panels can be resized by changing the location of the vertical sliders **2584** and horizontal sliders **2586**. This allows the user to control how much real estate (space/area) on the screen is used for each panel. As the user adjusts the sliders **2584** and **2586**, the dimensions are remembered so when the user returns to the view at a later time the system remembers the dimensions. The user also can reset the view to its default dimensions by clicking the Reset Current View **2578** option in the view control panel **2566**. The entire view also resizes based on the dimensions of the user's monitor and the size of the browser displaying the CC **2500**.

[0266] FIG. **18** is an example of a new View **2500***a* created by the user for their personal use. In this View **2500***a*, the financial flowsheet **2532** of FIG. **1** is replaced by panel **2588** for receiving today's visit notes (moved from the top left-hand side of CC **2500** in FIG. **15**), a panel **2590** for illustrating the patient's medical history, and a panel **2592** for illustrating the patient's surgical history. Also, a medication panel **2594** is inserted in place of the panel for today's visit notes illustrated in FIG. **15**. As described above, the user can change views by using the View Selection control **2504** at the top of the FIGS. **15** and **18**.

[0267] FIG. **19** illustrates the panel **2595** presented when the add sticky notes icon **2506** in FIG. **15** or FIG. **18** is selected. As illustrated, the user may click and drag the icon **2506** to any location on the page and drop it where they want it placed. This allows the user to place the note in context of the information to which it refers. The icon **2506** then stays in place and is associated with dynamic data until deleted by a user or it expires based on the note settings. When the icon **2506** is placed, the Edit Sticky Note control panel **2595** is displayed. The Edit Sticky Note control panel **2595** can also be displayed if a user selects the icon **2506**. Once the Edit Sticky Note control panel **2595** is opened, the user can enter a note in field **2596**, select if the note is high priority **2598**, select if the note should only be displayed today **2600**, in which case after the date it is entered the note will no longer display. The user can save the note by clicking the Save Button **2602** or cancel the action by clicking the Cancel Button **2604**. The user can delete the note by clicking the Delete button **2606** at which point the action is confirmed before deleting. When a user moves the mouse over the note icon **2506**, the note text is displayed next to it in a tooltip. The note icon is colored, e.g., black if it is not high priority and, e.g., red if it is high priority or can flash or be highlighted in any other manner. A note icon **2506** is shown in context in the retina flowsheet **2530** in FIG. **18**. If the note is deleted or expires, the note icon **2506** displayed on the page is removed. All deleted or expired Sticky Notes along with the location and duration where they are displayed are preserved for purposes of legal discovery but not accessible to the user as a general practice.

[0268] With reference back to FIG. **15**, when the user selects the user profile icon **2508**, a panel (not shown) is presented to allow the user to edit typical user information including their name, address, phone numbers, email address and password. The user can also select their preferred email or phone number or other method for communications sent by the Command Center.

[0269] When the user selects the Logout icon **2510**, if any data is not saved, the user shall be prompted to save data before closing the system. If the user answers positively that they want to save unsaved data, the user is not logged out. Once all data is saved, the user is prompted to confirm their desire to logout. If confirmed, the user is logged out.

[0270] The Patient Information Bar **2512** illustrated in FIG. **15** displays high level information about the patient. The user can click on the Patient Information Bar **2512** and the Patient Information Panel **2610** shown in FIG. **20** is displayed underneath the Patient Information Bar **2512**. Clicking the bar a second time or anywhere else on the page will close the Patient Information Panel **2610**. The Patient Information Panel **2610** contains the patient's date of birth **2612**, race **2614**, phone number **2616**, the date when the patient was first seen **2618**, the referring physician **2620**, and interesting facts to remember **2622**. Information in the Patient information Panel **2610** can be edited in place by clicking on the item to be changed. When clicked, the field will change to a text field allowing the value to be changed with a Save button displayed next to it (not depicted). Clicking Save will save the data. Clicking a Cancel button (not shown) will not save the data leaving the value unchanged and the control will revert to static text. Below these fields is a Revenue Summary **2624** for the patient. The Revenue Summary **2624** displays patient totals for each year **2626** as well as grand totals **2628** for the total amount billed **2630**, amount paid by insurance **2632**, amount paid by the patient **2634**, amount written off **2636**, and the adjustments **2638** for each year.

[0271] To the right of the Patient Information Bar **2512** in FIG. **15** is the Patient Insurance Bar **2518**. The user can click on the bar and the Patient Insurance Panel **2640** illustrated FIG. **21** is displayed underneath the Patient Insurance Bar **2518**. Clicking the Patient Insurance Bar **2518** a second time or anywhere else on the page will close the Patient Insurance Panel **2640**. The Patient Insurance Panel **2640** contains information about the patient's insurance **2642** including the type **2644**, name **2646**, group number **2648**, insurance ID number **2650**, and phone number **2652** for each insurance company. A link to the patient's benefit document **2654** is provided as well as an overview of the patient's in-network benefits **2656** and out of network benefits **2658** as provided by the patient's insurance company. The values illustrated as **2656** and **2658** are provided for example purposes and will vary based on the data provided by insurance companies. The patient's employer's address and contact information **2660** is also displayed for convenience. Item **2662** displays an alternative embodiment of the Patient Insurance Bar **2520**. In this case, the patient has a high deductible plan and this fact is displayed at **2664** in red in the Patient Insurance Bar **2520** to be sure the physician is aware that, in this case, the patient has a high deductible plan.

[0272] Today's Visit Notes tab **2524***a* as illustrated in FIG. **22** contains elements related to capturing information about notes specific to today's visit. The tab **2524** contains a photo **2666** of the patient, free form text notes **2668**, a control allowing the user to select pre-configured notes **2670**, an icon **2672** that triggers a dictation feature allowing text entry into free form text notes **2668** via voice recognition, and a set of links **2674-2680** that are reminders to complete important aspects of an encounter in the EMR. The patient image **2666** is imported from the EMR and text notes **2668** can also be imported from the EMR through the Command Center CCOW Implementation described below. Items **2674-2680** display the status of the chief compliant (CC)

2674, history of present illness (HPI) **2676**, slit lamp exam (SLE) **2678**, and Fundus photograph **2680**. This status is also provided to the Command Center via the CCOW implementation. Items **2674-2680** are displayed in red until complete at which time they are displayed in black. Based on EMR access and functionality, items **2674-2680** are links back to the specific area in the EMR. In an exemplary embodiment, the physician may dictate or type notes into the Today's Visit Notes tab **2524***a* that automatically generates a letter to a referring physician or another physician alerting that physician about something important in the patient's medical history. Beneficially, the referring letter may be generated while the patient's medical history is on the display screen in the Command Center interface.

[0273] The Problems tab **2524***b* as illustrated in FIG. **23** displays a patient's problem list as imported from the EMR. The following fields are displayed in this embodiment but can be configured to display other fields: date entered **2682**, associated ICD10 code **2684**, body location **2686**, and diagnosis **2688**. The user can manually order the list in order of severity or importance by clicking and dragging the rows. Sort by Date **2690** sorts the list in reverse chronological order and Sort by Importance **2692** sorts the list using the user's manual ordering. If the user has not adjusted the order of Problems, it will display in reverse chronological order. The default sort order is by Date **2690**, but the user's last selection is remembered and automatically selected when the user returns to the application. The Sticky Note icon **2506** is another example of how a Sticky Note can be dropped anywhere on the page as previously seen in FIG. **18**.

[0274] The Checkout tab **2524***c* as illustrated in FIG. **24** is used to determine when a patient should return to the practice. This can also be used for a return visit to a shared physician's office which would then also in some embodiments populate a shared care medical table (FIG. **25**A) that can be given to a patient for a future reminder of appointment. The Checkout tab **2524***c* displays the recommended clinical guideline **2694** based on the Command Center's Clinical Decision Support algorithms. The follow up timeframe **2695**, **2696** is defaulted to the recommendation but can be overridden by the user. The user selects a count **2695** and a period **2696** to generate a time period in which the patient should return. The user can search for a reason using the search field **2697** or select a common reason **2698** from the control. The search feature **2697** implements basic type-ahead, search and results listing allowing the user to select an item. In the case of either the search **2697** or drop down **2698** the selected item is listed underneath at **2699**. The user has the ability to delete the item by clicking the associated delete icon **2700**. The user can also enter a free form text note **2701** or use dictation by selecting icon **2702**. When complete, the user may click the Save button **2703** to save the Checkout information and send it to the EMR or clear the information by clicking the Clear button **2704**.

[0275] The Surgeries tab **2526***a* as illustrated in FIG. **25** displays information about the patient's surgeries. The Surgeries tab **2526***a* displays the date of surgery **2706**. the description **2708** including the billing (ICD10) code **2710**, the primary physician **2712**, and several actions including the ability to email **2713** or share **2714** the patient record with another physician. The shared notation **2714***a* signifies that the patient record has already been shared with the other physician. A notes column (not shown) displays the first few characters or words based on available space of an associated note. Moving the mouse over the specific note displays it in a pop up. In the case of some surgeries, a hospital or physician will not be paid if readmitted in 30 days. In these cases, if a surgery has been performed in the last 30 days a black circle with an exclamation point **2715** shall be displayed next to the date. Moving the mouse over the icon displays a message stating how many days are left until the patient can be readmitted. An associated note **2506** (FIG. **18**) may also indicate that the patient is participating in a capitated plan where anything the physician orders for the patient will not be reimbursed.

[0276] When a patient record is shared with another medical professional, if the professional does not have access to the Command Center **2500**, the other medical professional will receive an email to register for access to the Command Center **2500** (not depicted). If the professional does have an account but a new patient is being shared, the physician will receive an email notification. The new external user will only have access to the specific patients that are shared. Such sharing of patient medical records amongst the patient's physicians better enables the physicians to work together to follow preferred practice patterns for patient treatment as may be required by insurance companies and/or the government. This process is particularly helpful for managing patients with certain chronic diseases like diabetes where a nephrologist, podiatrist, ophthalmologist, endocrinologist, and family physician need to see each other's results. Another example is shared care before and after cataract surgery where optometrists and ophthalmologist need to see each other's results. Another example is shared care before and after cataract surgery where optometrists and ophthalmologist need to see each other's results.

[0277] FIG. **25**A presents an embodiment of a co-managed patient record in the Data Command Center (CC). In this instance, an optometrist and an ophthalmologist share (co-manage) a patient's cataract surgery then share treatment of the patient's glaucoma. A notes field **2716** in the Consultation Visit **2526***a* panel presents a mechanism to facilitate contextual content surrounding the co-managed procedure (s). A Cataract Flowsheet **2530***a* (purpose optimized dynamic panel) is presented with structured data elements designed to facilitate the identified procedure as conducted by multiple care givers. The Cataract Flowsheet **2530***a* (purpose optimized dynamic panel) is presented with structured data elements designed to facilitate the identified procedure as conducted by multiple care givers. The Cataract Flowsheet **2530***a* is arranged by interaction dates **2717** and tracks office visits **2718** (both scheduled and realized) including sending reminders to patients and alerts when an appointment is missed (not shown), provides means to review and issue concurrence or dissent with diagnostic tests **2719**, a summary of symptoms **2720** (clicking opens FIG. **25**B), and a summary of exam findings **2721** (clicking opens FIG. **25**C). Where available, billing summaries **2532** are presented in the Cataract Flowsheet **2530***a* as well. Clicking the billing summary **2532** may open a new billing window such as that illustrated in FIG. **25**D to show billing details and the correct modifier at **2532**. Eye drops after cataract surgery and/or glaucoma treatment is tracked on the Eye Drop Flowsheet **2722** (another purpose optimized dynamic panel). There is panel of co-management tools that provide the user with a means to download relevant forms **2723**, and to send direct messages to the co-managing physician using button **2724** to access a co-management message center. An

indication of the number of postop days remaining **2741** may also be provided. All financial data in the system, including costs to patient, is compartmentalized such that no user may see financial details for users or organizations not authorized in accordance with applicable policies and law.

[0278] To co-manage a patient using the interface embodiment illustrated in FIG. **25**A, when a referring physician outside the practice wants a consultation, he or she can connect to the practice they are referring to and send information by opening the Cataract Flowsheet **2530***a*. The referring physician may manually insert or auto-populate information from any previous visit of the patient, and provide an annotation **2717** giving the reason for the consultation. When the receiving consultation physician examines the patient, the Cataract Flowsheet **2530***a* is auto-populated with the physician's findings. Co-management forms can be downloaded from the table at **2718** either at the time of the referral or after the consulting physician fills out the paperwork and the patient signs a consent form by selecting co-management forms or by visiting the referring physicians website. A message is sent to the referring physician to open the Cataract Flowsheet **2530***a* and the consent or other forms can be clicked upon and the referring physician can read or sign any forms needed. The "co-management consent" can change color or be distinguished in some other fashion when received back from the referring physician. Every time the surgeon sees the patient, the Cataract Flowsheet **2530***a* automatically includes the date and findings. Then, post-operatively the co-managing physician, or consultation physician or optometrist, when they see the patient in their office, auto-populates or fills out on the Cataract Flowsheet **2530***a* and shares any results.

[0279] The headers in the table in FIG. **25**A may be selected to generate drop down menus for communicating results between symptoms **2722** may be selected so that the surgeon can determine if there are new symptoms (FIG. **25**B) or exam clinical findings **2723** may be selected so that the surgeon can determine if there are any new exam findings (FIG. **25**C). In co-managing situations where one office does a diagnostic test but wants to share it with another office, instantly through telemedicine or other methods, including the physician wants to fax the report or scan it to the EMR or the other physician, a report (e.g., "telemedicine study") **2721** maybe selected for a demonstration of the diagnostic tests performed elsewhere. By selecting telemedicine study **2721**, the surgeon/consulting physician can review the diagnostic test and then send a message if he or she agrees with the interpretation of the physician who performed the diagnostic test.

[0280] Notes may be communicated between the physicians by selecting "communication message" **2724** to determine if there is any information that needs to be shared for office visits. The date column **2719** and office visit column **2720** are tied together. Some of the columns are left blank until the patient actually shows up for a future visit. For instance, after a surgery or consultation, the consulting physician, just as they would normally give an appointment card to a patient can actually give a co-management medical summary table where it shows the date of the future appointment at the referring or sharing physician's office, and when that date arrives the patient is seen and everything is auto-populated so the surgeon can see the results that the co-managing physician found. The findings are auto-populated by the optometrist/referring physician/co-managing sharing physician. If the appointment date is missed, the table can link up with the missing ticket report or send an alert to the patient themselves, the surgeon, the referring physician, business managers or anyone else as appropriate.

[0281] The FIG. **25**A is an example also of how shared medical care may be provided in management of common eye conditions besides cataracts, such as glaucoma. An optometrist/general ophthalmologist can manage interval visits after the glaucoma specialist establishes a plan of care. For example, after initial consultation, the plan is shared with the referring or co-managing provider. At a subsequent examination, the referring provider accesses patient data, executes plan and enters the data into Cataract Flowsheet **2530***a* and/or a Glaucoma Flowsheet **3000** as illustrated in FIG. **35**. An alert is sent to the glaucoma specialist confirming that the action plan is being carried out. This facilitates care of the patient by the plan. The glaucoma specialist can follow up every year or two while sharing interval visits with the referring optometrist/general ophthalmologist. Multiple benefits of such an arrangement include excellent care, appropriate supervision, reduced cost, improved quality of care of the patient without undue distance traveled. At any point of execution of the treatment plan, treatment can be altered based on clinical data available to the patient, glaucoma specialist as well as referring provider at all times.

[0282] Of course, other fields of medicine and industry have similar examples. For example, orthopedic surgeons share care with podiatrists and family physicians share care with all medical specialists. A prime example is shared care with multiple healthcare providers caring for a patient with a chronic disease, state such as diabetes. One patient can have an eye doctor, podiatrist, primary care doctor, endocrinologist, nephrologist, dietician, exercise physiologist, all who need to share care. Different providers may order the same or different tests. If they are in separate health systems, they may not know each other's diagnostic tests, but through this shared medical care table they can avoid duplication of ordering tests, thereby, reducing costs and delivering better care. They can share important data. FIG. **36** demonstrates parameters that could be shared among providers (in this case, participating in the care of diabetes patients) and, if so, the doctors sharing care would have a column next to perhaps the date listing the name of the physician and the healthcare provider office or medical practice/hospital they work. As previously noted, all financial data in the system, including costs to patient, is compartmentalized such that no user may see financial details for users of organizations not authorized in accordance with applicable policies and law.

[0283] Referring now to FIG. **26**, the Allergies tab **2526***b* from display panel **2526** in FIG. **15** displays allergy information. The Allergies tab **2526***b* displays the date of diagnosis **2725**, the ICD10 code **2726**, and the description of the allergy **2727**. This Allergies tab **2526***b* also has an option **2728** to show only Ocular related allergies. In other embodiments, different filters may be applied.

[0284] The Medications tab **2526***c* as illustrated in FIG. **27** displays medication information. The Medications tab **2527***c* displays the prescription date **2729**, the medication name **2730**, the dosage **2731**, the frequency **2732**, quantity **2734**, last time it was filled and the number of refills remaining **2736**, and who prescribed the medication **2738**. The medications may be filtered by active medications **2740** and/or ocular medications **2742**. The tab also includes a link to order new medications **2744**. When the new medication

link **2744** is clicked it opens the New Prescription overlay (FIG. **44**) so that the existing medications can be seen when prescribing any new ones.

[0285] The Labs tab **2526***d* (not shown in FIG. **15**) as illustrated in FIG. **28** displays lab information. The Labs tab **2526***d* displays the lab date **2746**, the lab panel **2748**, the lab name **2750**, the result and unit of measure **2752**, whether or not it is an abnormal lab result **2754**, and any associated notes **2756**. The notes column only displays the first few characters or words based on available space. Moving the mouse over the specific note displays it in a pop up. The tab includes filters for displaying only current labs **2758**, only abnormal labs **2760**, and the ability to select any individual lab **2762**. The Labs tab **2526***d* also includes a link to order new Labs **2764**. When the Order Lab link **2764** is clicked it opens the Order Lab overlay (FIG. **46**) so that the existing labs can be seen when ordering new ones. The declining health icon **2766** and improving health icon **2768** are indicators so the user can quickly see how the patient is progressing or not progressing. These icons are determined on data import by Clinical Decision Support features of the Command Center as described below with respect to FIG. **63**.

[0286] The Physician tab **2526***e* as illustrated in FIG. **29**A displays information about the patient's other physicians and provides a listing of letters sent to the patient's other physicians. The Physician tab **2526***e* displays the type of physician **2770**, the physician's full name **2772**, the last time communication was officially recorded **2774**, and the physician's contact information **2776** with the phone number **2778**, link to email **2780**, and a link to create a new letter **2782**. Clicking the email link **2780** opens a window to email the physician using a secure email client on the local computer used to access the Command Center **2500**. Clicking the Letter link **2782** opens the New Letter Popup **2798** shown in FIG. **29**B. The New Letter Popup **2798** displays the title including the name of the physician **2800** to whom the letter is being addressed, a list of letter templates **2802**, a text area to draft the letter **2804**, a Save button **2806**, a Print button **2808**, an eFax button **2810**, a Cancel button **2812**, and a Close Icon **2814**. The user can select a letter template from the list of templates **2802** and the contents are populated in the text area **2804** where the user can edit the letter. Once complete, the user can save the letter by clicking the Save button **2806** in which case it is sent to the EMR. The letter can be printed by clicking the Print button **2808** and can be faxed electronically by clicking the eFax button **2810** in which case the letter is transmitted by an integrated 3rd party fax service. If the user does not want to complete a letter, the user can close the New Letter Popup **2798** by clicking the Cancel button **2812** or clicking the Close Icon **2814**. For each physician, selecting the icon **2816** displays a list of letters **2784** sent to that physician. Clicking the icon **2816** a subsequent time closes the list of letters **2784**. The list of letters **2784** displays the title including the name of the physician for the list **2786** to ensure context, and a list of letters including the date sent **2788**, the topic **2790**, and action column **2792** including View link **2794** and Copy link **2796**. Clicking the View link **2794** displays the letter in a read-only format in a popup (not displayed) and clicking the Copy line **2796** opens the New Letter Popup **2798** of FIG. **29**B with the copied letter content displayed in the text area **2804** for editing or printing by selecting Print button **2808**.

[0287] The Letters/Document tab **2526***f* as illustrated in FIG. **30** displays letters and documents transferred from the EMR system. The list of Letters and Documents displays a tabular list of items. The list includes a Level of Importance icon **2816**, the date the letter was sent **2818**, who the letter was from **2820**, the topic of the letter **2822**, and a link **2824** to View each document. Documents can also be filtered at **2826** so that only the important ones are displayed. The importance icon **2816** may either be blank, a red circle with an exclamation point **2828** if it is important (ex. cancer diagnosis letter the physician does not want to misplace) or a blue circle with a down arrow **2830** if it is low priority. If the user clicks the View icon **2824** for a document, the document is displayed in a popup (not displayed). The user can adjust the priority of a document by clicking on the importance column and selecting a Level of Importance (not displayed). Letters that have not been viewed since the last appointment are also highlighted at **2832** to focus the user's attention on new items and after viewing the items they are no longer highlighted.

[0288] The Summary Panel **2528** as illustrated in FIG. **31** is a permanent note feature allowing the user to save notes that are always visible when viewing the patient, so they do not get "lost" within general encounter notes. The Summary Panel **2528** includes a text area **2834** that when clicked enables in place editing (not displayed) and when complete the notes are saved. A dictation icon **2836** allows for note dictation, and the user can copy the notes at **2838** onto the operating systems copy area and by clicking the View History link **2840** the user can see a past history of edits and recover any of those previous edits (not depicted).

[0289] The Retina Flowsheet **2530** illustrated in FIGS. **32**A and **32**B is the central focus of the Command Center. The Retinal Flow/sheet **2530** is an embodiment of one implementation of how the Table can be configured. Like the embodiment illustrated in FIG. **4**A, the Retina Flowsheet **2530** is based on implementation in an Ophthalmology practice, but can be easily configured for other medical specialties. The Retina Flowsheet **2530** provides a comprehensive overview of the patient's clinical **2900**-**2920** and financial **2922** history as well as providing a means to quickly order tests **2926** while retaining the ability to see past medical history as illustrated in FIGS. **23** and **25**-**29**. As will be explained in more detail below with respect to FIG. **42**, clinical, insurance guidelines and preferred practices are quickly accessible for each imaging modality.

[0290] The Retina Flowsheet **2530** displays the following columns in the illustrated exemplary embodiment: Encounter Date **2900**, Procedure OD **2901**, Procedure OS **2902**, Provider and Location **2903**, Unit **2904**, Office Visit **2905**, Optical coherence tomography (OCT) OD **2906**, OCT OS **2907**, fluorescein angiography (FA) OD **2908**, FA OS **2909**, indocyanine green (ICG) angiography OD **2910**, ICG OS **2911**, Retinal Photo **2912**, Fundus auto fluorescence (AF) **2913**, Visual Field (VF) OD **2914**, VF OS **2915**, Extended ophthalmoscopy (Ext Opth) OD **2916**, Ext Opth OS **2917**, Visual Acuity (VA) OD **2918**, VA OS **2919**, Central Macular Thickness (CMT) **2920**, and Other **2921**. The Other column **2921** includes a financial status icon **2922**, a notes icon **2923** and note text **2924**, if available.

[0291] The first row in the Retina Flowsheet **2530** represents the current visit **2926** and orders placed. The subsequent rows correspond to past encounters **2925**. In the first row, if a pre-authorization is required for a procedure during

today's visit, a tack icon **2927** is displayed. If a precertification is required and not available, the icon is red. If it is required and available it is green. If a precertification is not required, no tack is displayed.

[0292] The Procedure columns **2901**, **2902** contain the procedures) performed **2928** on that date **2900**. The full text may not fit in the field, so the data is truncated and when the user moves the mouse over the displayed text the full text is displayed in a tooltip (not depicted). Multiple procedures may be done on a single day and these would be visible in the tooltip. These will be concatenated into a single string and displayed as appropriate (not depicted). The Provider **2903** column contains the initials of the provider associated with the claim for that day and the location of the provider (as when the practice has more than one office). The Unit **2904** column contains the units of medication delivered, if applicable. The Office Visit **2905** column contains the office visit code, if one was billed for that day. In the VA columns **2918** and **2919** the Visual Acuity is entered either manually or through the CCOW interface (described below with respect to FIG. **60**). The CMT **2920** column also is entered manually or through the CCOW interface. The user clicks on the appropriate row and it becomes a text field allowing entry of the data following standard browser editing data in place conventions. Hitting enter saves the data. Clicking on the value allows it to be edited (not depicted). The data is saved immediately and does not require a Save action. In the Other **2921** column the financial status **2922** icon is displayed. It is black if the claim is finalized, red if rejected or denied, and blue if it is in process. Clicking on a financial status icon **2922** will highlight the corresponding row in the Financial Flowsheet **2532** (FIG. **15**) or if the Financial Flowsheet **2532** is not visible based on the user's configuration, it will open a popup (not depicted) that displays the Financial Flowsheet **2532** with the row highlighted. The notes **2923** icon may be clicked to enter a note (FIG. **32**A) and if a note exists the text that fits in the field will display and when the user moves the mouse over the field it will display in a tooltip (not depicted).

[0293] FIG. **32**B shows the medical treatment information of the Retina Flowsheet **2530** in more detail. As illustrated, a header **2930** embodies several unique features. For example, the header **2930** provides icons for easy access to clinical and insurance guidelines as well as preferred practices for each image modality (OCT, FA, ICG, and VF). Next to each image modality is a Physician icon **2932** and it links to the appropriate clinical and insurance guidelines as well as preferred practice guidelines for that imaging modality and the patient being viewed. The information is displayed on the Guidelines tab **2542** shown in FIG. **15**, for example. In an exemplary embodiment, in addition to making the guidelines available, the Command Center **2500** provides an overview of the guideline to make information relevant to the patient condition more easily located and provides clinical decision support (CDS). These features help optimize the physicians' time with the patient and help them comply with insurance guidelines. An example of the CDS in this embodiment is the Alert icon **2934** and highlighted (e.g. red) X icons **2936**. The alerts may be generated through data analysis (e.g. FIG. **63**) or the alerts may be entered by technicians based on observations during the patient evaluation. For example, these icons may be used by a technician to tell the physician that the patient is allergic to the chemical compound used in performing the ICG imaging test, so the imaging test should not be performed. As another example of CDS, the X icon **2938** for the OCT image test in the right eye (OD) is highlighted (e.g. red). Insurance guidelines do not typically pay for repeat tests within 30 days, so this test cannot be ordered unless the physician overrides the process. Customized to the patient's insurance, this alert assists the physician in meeting insurance guidelines and helps the practice insure they will be paid for procedures they perform, but allow the provider to exercise clinical judgement and perform the test if medically necessary. Once a test is ordered, it appears as a blue bullseye **2940**, **2942** icon until it is completed. Because of the placement of the bullseye icon **2940**, **2942** the user can easily see which tests have been ordered for which eye.

[0294] In each imaging test column **2906**-**2919** in FIG. **32**A, if an image was taken for a date, an image icon is displayed. If the image needs to be interpreted, it is colored red **2944** and an alert icon **2946**—red circle with an exclamation point is displayed next to it. Clicking on the image icon **2944** or the alert icon **2946** displays the image on the Image Tab **2540** (FIG. **15**). Once the image has been interpreted, it is displayed as a black image icon **2948** and the user can move the mouse over the image to see the interpretation (not depicted). The user also may select a Change in Status icon **2950** to signify if the patient is improving, declining or staying the same for each completed image by clicking on the space to the left of each image icon or, once selected, the Change in Status icon **2950**. The available Change in Status icons **2950** in an exemplary embodiment are as follows:

[0295] Horizontal arrows (black)—no change.

[0296] Circle with Up arrow (red)—Negative increasing trend

[0297] Circle with Down arrow (red)—Negative decreasing. trend.

[0298] Circle with Up arrow (green)—Positive increasing trend

[0299] Circle with Down arrow (green)—Positive decreasing trend

[0300] Circle with Up arrow (black)—Increasing trend without comment on outcome

[0301] Circle with Down arrow (black)—Decreasing trend without comment on outcome.

[0302] Several methods have been discussed by which the Command Center uniquely provides CDS to guide the physician to make better clinical and financial decisions. Physicians can also order tests and procedures directly from the Retina Flowsheet or via display panels in other embodiments of the Command Center **2500** without leaving the Command Center **2500** on the display screen. For example, the embodiment in FIG. **33**A illustrates a modified Command Center **2500***b* in which the display panels are replaced by panels for ordering clinical tests and procedures, diagnostic images, and medications. This allows the user to see relevant tests, while further assisting the user in the decision-making process and reducing the cognitive burden imposed by other systems where the user must switch between results and order screens. In the exemplary embodiment, these tests are either ordered directly from the relevant portion of the Retina Flowsheet **2530** or the display panels are replaced by new tab or window popup display panels for ordering clinical tests and procedures, diagnostic images, and medications—all without leaving the display screen of the Command Center **2500**, **2500***a*, or **2500***b*. As explained below

with respect to FIGS. **56**A and **56**B, the configuration of display panels is flexible and may be set up and rearranged as desired by the user.

[0303] By way of example, one or more of the display panels in FIG. **33**A may be adapted to present an overview of every laboratory test performed and display just the abnormal results. Such an additional panel **2951** is shown in FIG. **33**B and may be adapted to enable a physician who is ordering a test to see in overview all that had been ordered in the past thereby tailoring what is needed to be ordered today, all without leaving the Command Center **2500***b*. Such display panels in the Command Center **2500***b* not just allows the physician to see the test that could be ordered while simultaneously knowing the medical conditions, but simultaneously on one screen shows all of the relevant tests ever ordered for this patient whether at the physician's particular practice or their institution or other institutions and in particular abnormal results and even trends the physician wants to track and can be highlighted automatically or that the physician can highlight for their own future reference. Over time, the display panel of FIG. **339** may permit the physician to see everything that was ordered, look for a trend of improvement or decline, and help guide the physician establish what really is medically indicated to now order to help diagnose, manage and treat a patient's condition.

[0304] FIGS. **34**A and **34**B provide an example embodiment of the in situ ordering process using the Command Center of the exemplary embodiments. As illustrated in FIG. **34**A, the user clicks the column header **2930** for the FA exam **2908**, **2909** and the Place FA Order **2952** dialog box is displayed. At this time, the portions of the page not including the FA columns **2908**, **2909** are greyed out to focus the user's attention. The dialog box contains a visual representation of the eyes **2954** allowing the user to visually select either the right OD **2956** or the left OS **2958** or both eyes **2960** by clicking the appropriate link. The user can select Scan **2962** and Lates **2964**, schedule using the variable time frame slider **2965** or select stat **2966**, and then click the Save button **2967** to save the order, which will place a blue bullseye in the field based on the user's selections. The user can in the same dialog box **2952** or in an added dialog box specify the timing of the diagnostic test, e.g., now, ASAP, 2 weeks, x months, etc. The user can also cancel the order by clicking the Cancel button **2968** or the Close icon **2970**. If a more complex order needs to be placed, the user may click the Advanced Order link **2972** to open the Advanced Order Display (FIG. **48**). If a CPT code (required for billing and medical necessity testing) has not been provided, the Advanced Order Display (FIG. **48**) is automatically displayed.

[0305] FIG. **34**B illustrates another example of in situ ordering for the Procedure columns OD **2901** and OS **2902**. As in FIG. **34**A, the areas of the screen not associated with the order are greyed out and the Add Procedure dialog box **2974** is displayed. The dialog box **2974** allows the user to select a Condition **2976** to treat, a medication and dosage **2978** and the eyes upon which the procedure is to be performed. The Medication and Dosage control **2978** only allows the user to select the appropriate medications for the selected condition. For example, for treating AMD (Age-related Macular Edema) Lucentis 0.3 mg (**2980**) is not appropriate, so it is greyed out and not available for selection. If a more complex procedure needs to be performed, the user may click the Advanced Order link **2982** to open the Advanced Order Display (FIG. **48**). The user may schedule the procedure using the variable time frame slider **2983** or select stat **2984**. If a CPT code (required for billing and medical necessity testing) has not been provided, the Advanced Order Display is automatically displayed (FIG. **48**). When finished, the user may click the Save button **2985** to save the order, which will place a blue bullseye in the field based on the user's selections. The user can in the same dialog box **2974** or in an added dialog box specify the timing of the procedure, e.g., now, ASAP, 2 weeks, x months, etc. The user can also cancel the order by clicking the Cancel button **2986** or the Close icon **2988**. The in situ ordering is designed to provide a quick and easy method in context for a provider to order an exam, but allows flexibility for more complex needs.

[0306] While the above embodiments of the flowsheet have focused on managing Retina-related issues, other embodiments addressing other specially practices can be easily created. Sticking with embodiments for ophthalmologists, FIG. **35** presents a possible flowsheet for Glaucoma, which is similar to that presented above in FIGS. **12**A-**12**C. The Glaucoma Flowsheet **3000** shares columns **2900**-**2907** in common with the Retina Flowsheet **2530**, but the group of columns **3010** is unique to this presentation. FIG. **36** presents a flowsheet for Diabetes. FIG. **36** shares the first column Date **2900** with the other flowsheets, but the remaining group of columns **3020** is unique to this presentation. The Meds column **3022** represents an example of further clinical decision support. With limited space, it is not possible to list all of the patient's medication, nor is it necessary in an overview. In this column **3022**, the patient's diabetes medications may instead be categorized into an overall treatment approach. This could be Diet and Exercise (D&E), oral meds only (oral) or insulin therapy (insulin). At a quick glance the user can understand the progression of the patient's condition. This table of important results, tests, exams can also include cost of the labs, tests or procedures, as well as payments. In addition, this information is vitally important to all the healthcare providers caring for patients with chronic disease, in this case diabetes. Sharing care, as shown in FIG. **25**A-D, allows all the patients providers to share information and to notify each other of changes. A column can be added next to the date listing each of the healthcare providers and their locations. As noted above, all financial data in the system, including costs to patients, is compartmentalized such that no user may see financial details for user or organizations not authorized in accordance with applicable policies and law.

[0307] The Financial Flowsheet **2532** is illustrated in FIG. **37**. The Financial Flowsheet **2532** contains a dynamic table **3030** of financial activity for the patient, as opposed to the physician's practice, as is usually the case with conventional EMR systems. As illustrated, an exemplary embodiment of the Financial Flowsheet **2532** includes the following fields: the Service Date **3031**, Bill Date **3032**, Service Description **3033**, Relative Value Units (RVUs) **3034** that determine how a physician is paid in accordance with work effort, Gross Charges **3035**, the Amount Due from the Patient **3036**, the Amount Due from Insurance **3037**, any Adjustments **3038**, Write Offs **3039**, and the outstanding balance **3040**. Selection of the Encounter expansion control **3047** produces a second dynamic table **3041** within the first dynamic table **3030**. The second table **3041** presents individual financial transactions associated with the encounter. In an exemplary

embodiment, the second dynamic table **3041** contains: the Service Date **3042**, Date Entered **3043**, the Type of financial activity entered **3044**, the Service Description **3033**, the Charge or Amount Billed **3045**, Payments **3046**, Adjustments **3038**, Write Offs **3039**, and the outstanding balance **3040**.

[0308] FIG. **38** presents a view of the Notes tab **2536**. The Notes tab **2536** displays notes associated to the patient and may be used to create new notes. An Add Note button **3048** allows a user to create anew Note record (FIG. **39**). A table **3050** presents the Note records previously created for this patient. The table contains several unique items, including: a map placement icon **3052** linking the record to a specified location in the system, the date the Note was created **3053**, the user who created the Note **3054**, the user specified priority of the note **3055**, a preview of the note **3056**, and the actions that the current user may perform **3057**. The available priorities **3055** are low (**3058**), Normal (not shown), or High/Urgent (**3059**). Available actions may include the ability to reply to the Note (**3060**) or delete the Note (**3061**). The View Sent checkbox **3062** allows the user to select if the table filters records sent by the user from the list displayed in the table **3050**. Selecting the reply object **3060** opens a new window **3064**, which includes a free text entry field **3066**, a Cancel button **3067**, and a Save button **3068**. Selection of the Cancel button **3067** causes the window to close without saving the text **3066**. Selection of the Save button **3068** creates a new note.

[0309] FIG. **39** illustrates how the CC **2500** enables the user to add notes. The bottom of the page contains the table **3050** described in detail above with respect to FIG. **38**. The top of the page displays the Add Note panel **3070** for creating a new note. The panel **3070** collects data for the note, including: the intended viewership **3072**, the note's priority **3074**, and the intended retention period of the note (**3076**). The panel **3070** also contains a free text entry field **3078**, a Cancel button **3080**, and a Save button **3082**. The note's priority **3074** may be set to Low, Normal, or High/Urgent. The retention period **3076** of the note may be set to once It's viewed **3084** or after a given date **3086**. The intended viewership **3072** may be restricted by the controls **3088**. The list of approved viewers is presented as tags **3090**. Selecting the External notifications checkbox **3091** will cause Command Center to send the note to the user's EMR. Selection of the Cancel button **3080** causes the panel to close without saving the text **3078**. Selection of the Save button **3082** creates a new note.

[0310] FIG. **40** illustrates a view of the Alerts tab **2538**. The Alerts tab **2538** displays a table **3100** of Alerts created for this patient. The View Complete checkbox **3102** allows the user to select if the table filters completed records **3100**. In an exemplary embodiment, the table **3100** contains: the date created **3104**, the Alert category **3106**, Alert subject **3108**, date completed **3110** (if applicable), and the user who completed the alert (**3112**) (if applicable). Alerts are marked as complete by selecting the appropriate checkbox **3114** and the Mark Complete button **3116**. Priority Alerts are designated by an icon **3118** in the Category **3106** column. Categories **3106** are driven by conditions, medications, procedures, or other process management algorithms. FIG. **63** described below details the Clinical Decision Support used to create the alerts.

[0311] FIG. **41**A illustrates a view of the image tab **2540**. A ribbon **3120** of patient images is displayed along the left side of the interface with a selected image **3122** enlarged for more detailed examination. Interpretation text **3124** associated with the image is presented along with the date **3126** the image was captured. A link **3128** opens the image with an external viewer.

[0312] In an alternative presentation of image tab **2540** in FIG. **41**B, users may drag multiple images onto the viewing area **3129** allowing the user to compare similar images to see changes over time or different image types for a more complete understanding of the body part imaged. The images **3122** will snap or be fixed to a grid layout by default but may also be specifically placed in the viewing area to improve the user's ability to interpret the images (not depicted). Images may be acquired through connectivity with a variety of diagnostic equipment and/or a PACS (Picture Archiving and Communication System) and the images displayed are either PDF representations or the DICOM (Digital imaging and Communication in Medicine) images themselves allowing for complex image manipulation. As noted herein, such images may be ordered directly from the Retina Flowsheet **2530** by selecting an image icon within the flowsheet (FIG. **34**A) or by opening the Add Imaging Order panel (FIG. **48** described below). It is noted that use of a third-party imaging vendor may require the user to navigate to a separate screen where the software of the third-party vendor would look at all diagnostic tests.

[0313] FIG. **42**A illustrates a view of the Guidelines Summary tab **2542**. There are two panels on this tab: a tabbed navigation panel **3130** and a content panel **3131**. The navigation panel **3130** has three tabs, the Patient List tab **3132** which presents a patient-specific list based on the patient's identified insurance, conditions, procedures and medications, the Listing tab **3133** presents an indexed view of all available guidelines, and a Search tab **3134**. The Patient List tab **3132** options are categorized into three lists **3135**: conditions, medications, and procedures. Each list **3135** contains unique items **3136** and presents applicable guidelines **3137** for each item **3136**. The content panel **3131** presents an amalgamated Summary **3138** of associated guidelines when an item **3136** is selected. The summary **3138** provides an Overview **3139** of the guidelines, presents areas where the guidelines agree as Similarities **3140**, and areas where there is not agreement in the guidelines as Differences/Conflicts **3141**. This allows a user to quickly understand complex insurance billing guidelines and clinical practices and optimizes their ability to make sound clinical judgements and accurately bill.

[0314] The Guidelines Summary may be enhanced using a cognitive system enhanced Clinical Decision Support ("CDS") system of type described below with respect to FIG. **72**B to provide the summary **3138** shown in the content panel **3131** of associated guidelines illustrated in FIG. **42**A. FIG. **42**B presents a population process with disparate content encountered from various guideline jurisdictions **3137**. Commercially available Natural Language Processing **3142** is used to contextually parse the language of the guidelines **3137** and to present the user with a unified summary **3138** including overview **3139**, similarities **3140**, and differences/conflicts **3141** described above. The cognitive system enhanced CDS thus augments the practitioner's judgement by representing a holistic view of relevant guidance.

[0315] FIG. **43** illustrates a view of the Published Guidelines, which may include Preferred Practice Patterns, and

which may be accessed by selecting the physician icon **2932** in the header of the flowsheet (FIG. **32**B), the guidelines tab **2542** (FIG. **15**), and in each of the ordering panels for labs (FIG. **46**), medications (FIG. **44**), procedures (FIG. **51**), and imaging (FIG. **48**). The Smart Evaluation Panel in each of the order screens reference the Preferred Practice Patterns which may be used to track the physicians' activities. In FIG. **43**, there are two panels: the tabbed navigation panel **3130** and a content panel **3150**. The content panel **3150** presents a copy of the published guideline **3152** and an Overview **3154** of the guideline when that guideline **3137** is selected in navigation panel **3130**. Clicking on the guideline **3152** opens the actual guideline.

[0316] The next few sections describe methods for ordering medications, labs, procedures, and imaging tests. Each unique panel has the ability to order the relevant items but also provides information about compliance with insurance guidelines, good clinical practice recommendations, provides cost-effective medically equivalent alternatives along with costs and pricing either in a hospital or outpatient selling allowing the clinical and patient may decisions that are both clinically and financially sound. These panels are presented as overlays or pop-up windows on the page allowing the user to easily see relevant medical information, critical notes, alerts and recommendations without leaving the ordering functions in the Command Center **2500**. The user thus can understand the patient's complete medical history across institutions while placing a new order without having to switch contexts like within the typical EMR. By visualizing patterns and trends at the point of care, the user can better tailor the medications, labs, procedures, and imaging test they order to what is medically indicated.

[0317] FIG. **44** illustrates a view of the Medication Order panel **3160**, which may be accessed from the Retina Flowsheet **2530** or may be provided as a separate display panel in the Command Center **2500**. The Medication Order panel **3160** allows authorized users to order prescriptions for patients. There are two sections to the Medication Order panel **3160**, a prescription section **3162** and a Smart Evaluation control section **3164**. The prescription section **3162** allows the user to enter a prescription including: the prescription date **3166**, medication name **3168**, dosage **3170**, frequency **3172**, days' supply **3174**, refills **3176**, Route (Type) **3178**, and text instructions **3180**. The user can search for a medication using the search dialog **3182** or quickly select common prescriptions from the dropdown menu **3184**. Allowing the pharmacist to make substitutions can be indicated with the checkbox **3186**. The prescription can be saved **3188** or canceled **3190**. Saved prescriptions are listed **3192** and they may be printed **3194**, electronically transmitted **3196** to a selected pharmacy, or deleted using the associated checkboxes and Delete button **3198**. The Cancel button **3200** will close the Medication Order panel **3160** and discard any unsaved work.

[0318] The Smart Evaluation control section **3164** contains six sub panels **3202** which may be toggled open and closed by the user. The Coverage subpanel **3204** presents the patient's insurer(s) **3206** and the coverage status **3208** of the selected prescription(s) **3192**. In exemplary embodiments, the coverage status is determined by using third party services. The Smart Evaluation control section **3164** is a core aspect of combining clinical, financial, and insurance guidelines together into one display. The Smart Evaluation control section displays information related to insurance compliance, clinical guideline recommendations, recommendations for cheaper alternatives (drug cost advisor), pricing data from a hospital, practice and a patient's perspective all in the same display panel and all in the context of the patient's past medical history.

[0319] FIG. **45** illustrates the Medication Alternatives (Suggested) sub panel **3210** of the six sub panels **3202** illustrated in FIG. **44**. The Medication Alternatives (Suggested) sub panel **3210** suggests alternative medications **3212** along with cautionary statements **3214** about its use. In exemplary embodiments, the alternative medication and pricing information are determined by using third party services.

[0320] FIG. **46** illustrates a view of the Lab Order panel **3220**, which may be accessed from the Retina Flowsheet **2530** or may be provided as a separate display panel in the Command Center **2500**. The Lab Order panel **3220** allows authorized users to order labs for patients. There are two sections to the panel, a Lab Activity section **3222** and the Smart Evaluation control section **3224**. The Lab Activity section **3222** allows the user to enter a lab order including the order date **3226**, associated diagnosis supporting the lab testing using either a search box **3228** or a drop down menu **3230**, selected diagnosis as tags **3232**, vendor selection **3234**, and to search using a search box **3236** or to select commonly ordered labs from a drop down menu **3238**, and a list of test ordered as tags **3240**, along with instructions **3242**. The priority is indicated with the checkbox **3244**. An e-signature box **3246** is present for completing the lab order. Lab tests may be saved **3248** or canceled **3250** using the proper buttons. Selected lab tests **3252** may be printed **3254**, electronically faxed **3256**, electronically transmitted **3258** to a selected vendor, canceled **3260**, or deleted **3262** with the associated buttons. The Cancel button **3260** will close the panel and discard any unsaved work.

[0321] The Smart Evaluation control panel **3224** contains four sub panels **3264** that may be toggled open and closed by the user. The Coverage subpanel **3266** presents an evaluation of whether or not the patient's insurance **3268** will cover **3270** the ordered tests **3252**. Coverage subpanel **3266** also presents any precertification requirement **3272** and if a specific action is required. In the example demonstrated here, the patient primary insurance is Aetna and secondary insurance is Medicare. The Preferred Practice Guidelines are also evaluated. The question marks **3274** may also be activated to see more detail. In an exemplary embodiment, this evaluation is determined by using third party services.

[0322] FIG. **47** illustrates the Locations/Costs sub panel **3276** of the sub panels **3264** of FIG. **46**. The Locations/Costs sub panel **3276** provides a map **3278** with locations of vendors relative to selected locations **3280** (such as the patient's home, work, or provider's office). The Locations/Costs sub panel **3276** also displays the patient's costs (**3282**) for each vendor and address information in a map legend **3284**. In an exemplary embodiment, this information is provided through a third party service.

[0323] FIG. **48** illustrates a view of the Imaging Order panel **3290**. The Imaging Order panel **3290** allows authorized users to order Imaging for patients. There are two sections to the Imaging Order panel **3290**, an Imaging activity section **3292** and the Smart Evaluation control section **3294**. The Imaging activity section **3292** allows the user to enter an imaging order including the order date **3296**,

search using a search box **3298** or select a common associated diagnosis using drop down menu **3300** to supporting the imaging testing, select a diagnosis presented as tags **3302**, search using search box **3304** or select common symptoms reported by the patient from a drop down menu **3306**, select symptoms displayed as tags **3308**, select the imaging modality **3310** with costs to the hospital and patient for each modality, select the location of the body to be imaged **3312** with supporting tags **3314**, along with instructions **3316**. The priority is indicated with the checkbox **3318**. Imaging tests may be saved **3320** or canceled **3322** using the proper buttons.

[0324] The Smart Evaluation control panel **3294** contains four sub panels **3324** that may be toggled open and closed by the user. The Coverage subpanel **3326** is an evaluation of whether or not the patient's insurance will cover **3328** the ordered images **3310** and check medical necessity **3330** (per the relevant governmental and/or insurance guidelines).

[0325] FIG. **49** illustrates the Locations/Cost sub panel **3332** of the sub panels **3324** illustrated in FIG. **48**. The Locations/Cost sub panel **3332** provides a map **3334** with locations of vendors relative to selected locations **3336** (such as the patient's home, work, or provider's office). The Locations/Cost sub panel **3332** also presents the patient's costs (**3338**) for each vendor and address information in a map legend **3340**. In an exemplary embodiment, this information will be provided through a third party service.

[0326] FIG. **50** illustrates the Recommendations sub panel **3342** of the sub panels **3324** illustrated in FIG. **48**. In this example embodiment, the patient has Type 2 Diabetes, Moderate Non-Proliferative Diabetic Retinopathy and Macular Edema. The Recommendations sub panel **3342** provides recommendations for the proper imaging **3344** based on the patient's specified conditions and preferred practice guidelines. The eye icon **3346** on each of these panel headers signifies there is something on the tab. This prevents the user from having to click on each tab to see if anything exists. The user may expand all panels at the same time by clicking the Expand All link **3348** which is always displayed on the active tab. Once all panels are expanded, the active panel header displays a link to Close Other Panels (not depicted). The Coverage panel also displays a green checkmark or a red X icon **3350** to signify whether the selected diagnosis and imaging modality are covered under the patient's insurance.

[0327] FIG. **51** illustrates a view of the Procedure panel **3360**. The Procedure panel **3360** allows authorized users to order Procedures for patients. There are two sections to the Procedure panel **3360**, a Procedure activity section **3362** and the Smart Evaluation control section **3364**. The Procedure activity section **3362** allows the user to enter a Procedure including the order date **3366**, search using a search box **3368** or select a common associated diagnosis using drop down menu **3370** to supporting the Procedure testing, select diagnoses presented as tags **3372**, search using search box **3374** or select a common procedure using a drop down menu **3376**, or select procedures displayed as tags **3378**, along with notes **3380**. The priority may be indicated with a checkbox (not shown). Selected Procedure(s) **3382** may be printed **3384**, electronically faxed **3386**, electronically transmitted **3388**, canceled **3390**, or deleted **3392** with the associated buttons. The Cancel button **3390** will close the panel and discard any unsaved work.

[0328] The Smart Evaluation control section **3364** contains four sub panels **3394** that may be toggled open and closed by the user. The Coverage subpanel **3396** presents an evaluation of whether or not the patient's insurance will cover **3398** the ordered procedures **3382** and check for medical necessity at **3400**. Links **3402** are also presented to any documents that must be completed by the patient like a consent form. In an exemplary use, if a physician decided to schedule a laser treatment for a patient, the physician would input a plan of treatment by selecting the desired procedures from Procedure activity section **3362** and bring in all of the relevant cost data, effectivity, insurance restrictions, ability for the patient to choose care, etc. into Smart Evaluation control section **3364** for review before proceeding. Peer data (FIG. **55**) may also be displayed to assist the physician in the decision-making process.

[0329] FIG. **52** illustrates the Recommendations sub panel **3404** of the sub panels **3394** illustrated in FIG. **51**. The Recommendations sub panel **3404** provides recommendations **3405** based on the patient's specified conditions, selected procedures and clinical and insurance guidelines. Recommendations may be for alternative procedures based on the patient's condition, insurance regulations and or good clinical practice. Recommendations an also reflect necessary consults, for example rheumatology consult for uveitis. Alternatively, an automated consult request generator may generate prompts showing needed medical referrals based on various database inputs (e.g., rheumatology consult for uveitis). If the patient is already under the care of a rheumatologist, the system will alert the physician of the next scheduled appointment with a rheumatologist, who may, in turn, provide shared care as described with respect to FIG. **25**A. In exemplary embodiments, this information is provided through a third party service.

[0330] FIG. **53** illustrates the Considerations sub panel **3406** of the sub panels **3394** illustrated in FIG. **51**. The Considerations sub panel **3406** provides additional considerations **3407** a user may want to consider when evaluating procedures based on the patient's specified conditions and clinical and insurance guidelines. In exemplary embodiments, this information is provided through a third party service.

[0331] FIG. **54** illustrates the Locations/Costs sub panel **3408** of the sub panels **3394** illustrated in FIG. **51**. The Locations/Costs sub panel **3408** is an embodiment of the panel as used in a hospital setting. The Locations/Costs sub panel **3408** provides a table **3409** with the associated costs and estimated reimbursement for the selected procedure to help the physician better understand the financial implications of providing the service. The Locations/Costs sub panel **3406** also presents the patient's estimated costs **3410**. Where a medically equivalent but less costly alternative is available, it will be presented to the user (not depicted). In exemplary embodiments, this information is provided by the hospital itself from their charge sheet and accounting system and the patient costs from 3^{rd} party services.

[0332] FIG. **55**A illustrates a Physician Quality Reporting panel **3411** within the Smart Evaluation control panel. The Physician Quality Reporting panel **3411** displays Physician Quality reporting metrics **3412**, **3414** related to the procedure that is being ordered. Other quality reporting or peer data may be displayed. For each relevant metric, the Physician Quality Reporting panel **3411** displays the physician's

frequency of performing the procedure in comparison to their peers **3416** as well as outcomes **3418**.

[0333] FIG. **55**B illustrates an Evaluative Clinical Reporting (ECR) interface **6000** that provides an organized view derived from disparate data sources in accordance with user-defined parameters, of a specific report type, executable on a single or group of patients. The ECR interface **6000** displays only necessary and relevant data based on individual patient information in rows **6010** and columns **6020** that allows Clinical Professionals the ability to evaluate many data points and make informed clinical decisions, which would not otherwise be possible in a single display. While reviewing the data, the Clinical Professional can execute multiple actions, including but not limited to the following:

[0334] First, the Clinical Professional can, with a single click, view additional relevant data by clicking on icons **6030**. An example of this would be viewing diagnostic imaging in a separate, overlaid panel **6040**, from the relevant visit date. It is important to note that while viewing the diagnostic imaging, the Clinical Professional can manipulate the underlying flowsheet while manipulating the diagnostic image.

[0335] An additional example of this functionality would be viewing the plan **6050** that was used for that specified visit. As with the previous example, the underlying flowsheet can still be manipulated when viewing the plan **6050**. It is important to note that N number of additional data panels can be simultaneously opened and overlaid on the reporting results.

[0336] A clinical professional can also use a single click on an icon **6030** to load a specified letter for viewing in a separate, overlaid panel, while still able to view the flowsheet in context. As with the previous examples, the Clinical Professional is able to manipulate the flowsheet and also view additional relevant data panels by clicking an icon on the flowsheet while viewing the letter.

[0337] After the Clinical Professional has reviewed the patient, there may be some action to take in order to rectify whatever is causing the patient to be included in the report. The Clinical Professional may choose to create a task for a support staff member to take some action. The Clinical Professional may also choose to create an order for a patient while viewing the report results. An ordering panel may be launched within context by clicking an icon. The panel is overlaid with the reporting results flowsheet. As described above with respect to FIGS. **33**A, **34**A, **34**B, **44**, **46**, and **48**, the panel provides a mechanism by which the Clinical Professional can select the type of order, input the relevant parameters and then create the order. A Clinical Professional may also choose to create a letter to a Referring Provider in order to satisfy regulatory requirements or provide guidance to the referring provider in a co-management situation. The Clinical Professional would launch the create letters interface over the top of reporting results flowsheet allowing them to write a letter in context of the flowsheet data on screen. However, it is possible that the Clinical Professional does not need to take any action and simply chooses to evaluate the many data points in a concise view of rows and columns of relevant data.

[0338] FIG. **55**C illustrates a reporting architecture in a sample embodiment. As data changes on a remote client's EHR **6060**, Practice Management **6061**, Diagnostic Equipment **6062**, or other system, it is pushed to the cloud environment **6064** via an application gateway **6066** to an Integration API server **6068** in web tier **6070**. Once the Integration API server **6068** receives the HTTP request with the updated data, it will then insert a message into the appropriate message queue **6072**. Five separate application containers **6074** are connected to the message queue **6072** waiting to process information as it is received. A container is defined as a method to package an application, all its dependencies, and runs in isolation from other processes.

[0339] The first application container, Data Import Queue Processor **6075**, processes changed data and loads it into the appropriate client database **6080**. During the processing, the data is mapped to the correct database entities by reporting services **6082** and inserted into the Client Relational Database Management System (RDBMS) **6084**. Once the entities are inserted into the client database **6086**, a message is added to a Patient Data Preprocessing queue. Placing this message into the queue will cause the Patient Data Preprocessing Queue to begin processing for the patients whose records were updated.

[0340] The second application container, File Processing **6076**, loads all new diagnostic imaging into Client Storage **6086**. Additionally, a record will be added to the Client Database **6088** which contains a pointer that allows for the UI API **6069** to retrieve the correct image for the patient.

[0341] The third application container, Patient Data Flowsheet Rule Evaluation **6077**, queries the client database **6086** for the latest snapshot information, including, but not limited to, Demographic information, Billing History, Diagnostic Imaging, and Medical Data. Once the relevant information has been loaded into memory, a series of rules are executed in order to transform those data into a JSON object optimized for displaying Medical information, Diagnostic Testing results, etc. in rows and columns of the flowsheet. Once all rules have been run, the Flowsheet Encounter Data is then written to the Client Storage File System **6086**.

[0342] The fourth application container, Patient Data Preprocessing **6078**, will generate an object that contains a historical snapshot of everything that has happened to the patient including, but not limited to, Demographic Information, Billing History, Diagnostic Imaging, and Medical Data. This snapshot, Patient Data Transfer Object (Patient DTO), is stored in a JSON object and written to the Reporting File System **6090** which will be used during the Extract, Transform, and Load (ETL) process to insert rows into the Reporting Database. The ETL process consists of multiple steps to Extract the data from the client RDBMS **6084**, Transform it with logical commands executed by the Data-Analytics platform **6092** which is distributed to multiple worker nodes by Orchestrator **6094**, and Load the data into the Reporting Database **6090**.

[0343] The Reporting Database **6090** includes a series of Facts and Dimensions tables which can be extended to include new tables as new use-cases are encountered. Those skilled in the art will appreciate that the data may be architected to use a Star Schema in order to ensure that data is able to be returned in an acceptable time. All the data is stored in a single database. In order to ensure that data is kept appropriately segregated per client, all tables contain a Customer Id Unique Identifier column. The defined process to generate new reports mandates that Report Developers write all queries to include a Customer ID parameter in the WHERE clause, ensuring that data will only be returned for

the customer that is specified. In order to be able to view the report execution interface, the user must complete the login, or authentication, process. The authentication process requires a practice identifier, a user, and a password be passed as parameters to the authentication controller. Once authentication has completed, a Secure, HTTP Only, Same Site cookie is generated by the Integration API server **6068** which contains a claim that ties the current authenticated user, to a customer ID. When the report execution HTTP request is made, the cookie is passed in the request, the customer ID is extracted from the cookie and passed automatically as a parameter to the stored procedure execution.

[0344] Finally, the Auto Task processing container **6079** runs a set of defined rules to evaluate for certain conditions and to generate a task for a patient once certain conditions are met. If it is found that a certain condition has exceeded a threshold, a task will automatically be sent to the appropriate user to handle the task. For example, if a patient has a diagnosis that requires a certain diagnostic test every 365 days and has exceeded that threshold of 365 days, a task will be sent to the computer **6096** of the Front Desk Staff to schedule that diagnostic test. Once the patient has the required diagnostic test, change data will trigger the reprocessing of the auto task rules, and will automatically resolve the task for the relevant patient.

[0345] In order to move the newly generated files from Client Storage **6086** to Reporting Storage **6098**, a time-based job executes on a scheduled interval (cron job) on the order of minutes, to find all new and/or modified Patient DTOs in the Client File System since the last time the job was run, and then places a replica of the newly modified file in the Reporting File System of the Reporting Storage **6098**. These jobs will continually copy new or modified files to the Reporting File System as the Patient DTOs are generated.

[0346] During the day, Patient DTOs will be moved from Client Storage **6086** to Reporting Storage **6098**, waiting for its data to be loaded into the reporting database **6090**. In order to start the ETL process, another cron job starts the execution of the Orchestrator Master Pipeline **6094** (FIG. **55**D) which contains all its child pipelines. The interval for execution is generally set to each night. The master pipelines specify the order in which the child pipelines should execute, error handling, and other logical functions. The pipelines will load the base changed data from the clients' database to create a batch at **6100**. Base changed data consists of, but is not limited to, patient demographics, patient insurances, customers, providers, practice locations, etc. The orchestrator pipeline allows the addition, or removal, of pipelines at **6102**, **6104** to extend the ability to transform and load new facts and dimensions. While the base data is loaded, an additional pipeline **6106** executes concurrently which will process the Patient DTO data. Each child pipeline **6108** is processed by calling separate transformation jobs which contain the necessary logic to transform the Patient DTO data for insertion to the relevant Facts and Dimensions tables at **6110**. The transformation logic is applied using the distributed data-analytics platform **6092**. After the Orchestrator Pipeline **6094** has finished processing, the data is logged at **6112** and is available to be reported on.

[0347] Once the ETL process begins, the Patient DTO data is staged to be transformed and loaded to the reporting database. To begin the Transformation process, the most recent JSON schema for the Patient DTO object is loaded into memory. The schema is then used to read the DTO object from reporting storage into a proprietary table common for the data-analytics platform **6092**. This object allows, but is not limited to, filtering out certain values, adding new columns, dropping unnecessary columns, and flattening child arrays. Due to the nature of the data. coming from various source systems, with their own constraints for data-integrity, it is expected that some of the data will not be in a state where it can be loaded into the reporting storage. These data, dirty data, must be scrubbed and cleaned, or be discarded for later analysis. If the data has been discarded, an alert is sent, within the reporting system that data has been dropped and inserted into the dropped data table and requires investigation for the reporting developers. If the data can be scrubbed, then it is transformed in order to meet the minimum constraints of the reporting database. Once the data is sufficiently clean, rows in the proprietary table object which contain child data in arrays, must be exploded, or flattened, to create additional rows to be inserted.

[0348] Consider the following:

[0349] A table is defined to have two columns, X and Y

[0350] The table contains one row with values of [{X: 1, Y: [1,2]}]

[0351] The table is then flattened, specifying Y as the column to flatten

[0352] The output of the table is now two rows [{X:1, Y:1}, {X:1, Y:2}]

If the table contains multiple arrays, it may be necessary to flatten the table multiple times. Once the table has been appropriately flattened, columns may be:

[0353] Renamed

[0354] Dropped if they are not needed

[0355] Added with static values including, but not limited to, batch ID, customer ID, etc. or with dynamic lookup values

After the data has been transformed, it is then inserted into the reporting database **6090** to be used in the report execution process which queries two sources, the reporting database **6090** and the client storage **6086** which contains the most recently cached flowsheet encounter data in order to display the results in the UI on the end-user computer **6096**, for example.

[0356] During use, an Interface **6200** (FIG. **55**E) enables a user to select a report from a dropdown list. Once the report has been selected, the UI will make an HTTP request for the available parameters for the report specified from the UI API. FIG. **55**E illustrates the report builder parameter selection interface **6200**. Examples of the parameters which can be used include, but are not limited to, procedure codes, diagnosis codes, number of days since a procedure occurred, clinical data elements, and next appointment status. After the UI receives the response to the HTTP request, a list of parameters is then displayed. This list allows the end-user to dynamically add parameters for the specified report. Those skilled in the art will appreciate the ability to select multiple parameters using Boolean logic to specify whether all the parameters must match (AND Logic) or only some of the parameters must match (OR Logic). It is known that not all the parameters are required but there will always be at least one required parameter. Until all the required parameters have been added and set by the end-user, the report cannot be executed.

[0357] FIG. **55**F illustrates a sequence diagram for executing the report. Once all the required parameters have been

added, the end-user (client **6300**) may then click a button to generate, or execute, the report HTTP request with the user-defined parameters. After the button to execute the report has been clicked, the UI app of the client **6300** will make an HTTP request **6310** to a controller in the UI API server **6320**. The controller is responsible for setting the correct customer ID context, ensuring that the current user has access to the specified report, and calling the correct Stored Procedure in the Reporting RDBMS **6084**. The Stored procedure executes a series of queries and returns an array of Visit Date and Patient ID tuples **6330**. Once the Stored Procedure has finished execution, the array of Visit Date and Patient ID Tuples is returned to the UI App. The UI App then makes another HTTP request **6340** to another controller in the UI API passing the list of Visit Date and Patient ID Tuples. The controller then executes a stored procedure on the Client Database which returns Flowsheet Encounter Data filenames **6350** for the specified visit dates. Once the list of filenames are returned to the controller, the application will loop through all of the unique patient IDs in the array of tuples that was passed as a parameter, and load the encounter data using the specified filenames retrieved from the stored procedure. Once the encounter data has been loaded from the filesystem, a summary row is generated which contains summary information for all columns specified in the flowsheet. An example of summary information could be the number of injections, by type, listed in the procedure column. Another example of summary row information could be for a patient's Visual Acuity (VA).

[0358] It is often helpful to know what a patient's best VA or worst VA over the course of care. The summary row would analyze all the historical data for a patient and insert the patient's worst VA and best VA into the summary row allowing the provider to view and evaluate years' worth of data in seconds. In order to evaluate years' worth of data without a summary row, a Clinical Professional would need to undertake the time consuming task of reviewing all Vision Tests, or Refractions, a patient has had, often having multiple refractions per visit, sometimes over the course of 10+ years of treatment. Finally, the API will then return an array of flowsheet data to the UI app which represents the group of patients which match the report type and user-defined parameters.

[0359] The UI app will then process the flowsheet data and render the relevant data in the appropriate rows and columns as shown, for example, in FIG. **55**B. The columns that are displayed are configurable based on the type of procedures, diagnoses, next appointment status or date, etc., selected as parameters for a report. Based on the parameters specified, an HTTP request will be made to the Flowsheet configuration controller, which will return the flowsheet configuration which contains the columns to display. This allows the Clinical Professional the ability to only see the most relevant data for the group of patients that they may be reviewing.

[0360] The View Configuration page presented in FIG. **56**A provides the user a mechanism to create or modify dynamic dashboards to accommodate their unique requirements. These dashboards are referred to herein as Command Center Views. The user identifies the view to be created or modified by selecting the appropriate option from the drop down menu **3420**. Once the view has been selected, the user will select a panel to place in the view from the list **3422**. Once the panel has been anchored in the View **3424**, the dimensions of the panel may be adjusted by means for manipulating the panel frame(s) **3426**. When the user is finished creating or modifying the view, the user may save (**3428**) or cancel (**3430**) their actions by selecting the associated buttons. Additional horizontal dividers **3432** and vertical dividers **3434** can be dragged and dropped onto the View in order to create new display panels. The dividers also can be removed by clicking on the desired divider and dragging it off the View.

[0361] The Panel Configuration page presented in FIG. **56**B provides the user a mechanism to create or modify display panels to use when populating the dynamic dashboards as described in FIG. **56**A. The user identifies the panel to be created or modified by selecting the appropriate option from drop down menu **3440**. The user then selects data to populate the panel from the Data Selector **3442**. Available data **3444** is selected and migrated to the panel's Column List **3446**. Users may also add custom fields allowing them to track any data relevant to the user. A preview of the panel **3448** is presented and updated as the user makes changes. When the user is finished creating or modifying the panel, the user may save **3450** or cancel **3452** their actions by clicking the associated buttons. The panels from the drop down menu **3440** thus may provide a template for creating a customized Command Center where all information desired by the user may be accessed without leaving the Command Center.

System Implementation

[0362] The Command Center user interface embodiments described above with respect to FIGS. **1-56** are characterized by their ability to present large volumes of dynamic data in a single screen whereby the data may be navigated without leaving the screen. For example, the data is either available in a display window, behind a tab, or available via a pop-up window and is thus accessible without leaving the display screen. To enable such processing to occur without unacceptable delay in data presentation, and to enable the display panels and flowsheet panels to be reconfigured as described, a Command Center architecture has been designed that provides for flexibility in storage and presentation of dynamic data as well as dynamic caching techniques that allow for prompt presentation. As with the first embodiment described above, two-way auto-population techniques are also implemented whereby changes made in the Command Center are not only reflected in the screen display but also the associated electronic medical record is auto-populated as well without leaving the Command Center display screen. The system design will now be described starting with FIG. **57**.

[0363] FIG. **57** illustrates the Command Center architecture **5000** and connectivity to external Health Information Technology systems **5001** and third party services **5002**. The Command Center architecture **5000** is a multi-tenant cloud-based web application. As known by those skilled in the art, multi-tenant means that the application is deployed once and all customers access the same server. Data is segregated by the application so that customers can only access their own data. The Command Center is accessible over the Internet via user platforms **5003** that implement a modern web browser (e.g. Internet Explorer 10, Google Chrome) on a desktop computer **5004**, laptop **5005**, tablet **5006**, or a smartphone **5007** with internet connectivity.

[0364] The Command Center architecture **5000** illustrated in FIG. **57** is one embodiment of how the system can be

configured to support a large user base. For security purposes, access to the cloud platform containing the Command Center is governed by a firewall and Virtual Private Networks (VPNs) **5010**. Additionally, end to end encryption is an inherent part of the Command Center architecture **5000** as the Command Center architecture **5000** is optimized to meet the highest privacy and security expectations. Each component allows for both the application of current high strength encryption (ex. AES 256) as well as continuous implementation of evolving data protection and security best practices. The Command Center architecture **5000** configuration supports proven high-availability and disaster recovery practices, including fully encrypted off-site backup and redundant, geographically dispersed operations. Load balancers **5011** distribute the client requests to the most available web server in the web server farm **5012** to optimize response time. The web servers in the web server farm **5012** pass requests through the load balancer **5011** to the application server farm **5013** to continue processing the client requests. The application servers of the application server farm **5013** process the requests and access data from the core database **5014** and supporting database(s) **5015**. Depending on the client request, the application servers may interact with the Clinical Decision Support Server **5016** where the primary business logic resides. Once processed, the web server returns the results of the client request back to the client for display. Static files are optimized for retrieval by residing on a dedicated server (static file cache) **5017** where they are cached and optimized for this purpose.

[0365] The exchange of information between external health information technology (HIT) systems **5001** and the Command Center **5000** is managed by dedicated servers designed to optimize system throughput and secure communications. All communications take place through a secure VPN **5010** connection. If the integration method is message-based, the sending HIT system **5001** will transmit messages to the Enterprise Service Bus **5018**. However, if communication is based on an API standard, the sending HIT system **5001** will communicate with the Integration Server **5019**. Both of these servers **5018**, **5019** communicate directly with the Interoperability database **5020** and, in turn, with the core and supporting databases **5014**, **5015**. While communications with third party services **5002** are largely outbound from the Command Center **5000** to the services, it is possible to receive inbound communications. These third party communications will also be handled through the Enterprise Service Bus **5018** and the Integration Server **5019**. As illustrated in FIG. **57**, examples of HIT systems **5001** include Electronic Medical Records (EMRs) **5021**, Practice Management Systems **5022**, Health Information Exchanges (HIEs) **5023**, Picture archiving and communication systems (PACS) **5024**, claims-based systems such as Clearinghouses and Insurance Companies billing systems **5025**, and Laboratory Systems **5026**.

[0366] In exemplary embodiments, many third party supporting services **5002** are integrated to provide feedback and advice. Examples of these services include ePrescribing **5027**, Insurance verification including referrals and preauthorizations **5028**, clinical pricing and location services **5029** used to find the best value on purchasing medications, procedures and imaging services, medical necessity checking **5030** to verify a procedure or medication is associated with a correct ICD10 code supporting its use, claim status checking **5031**, services in support of the National Correct Coding Initiative **5032**, Medically Unlikely Edits **5033** provided by Center of Medicare and Medicaid Services (CMS) to proactively ensure claims are coded correctly to prevent issues in billing, and claims compliance services **5034** which evaluate claims against CMS National Coverage Determination (NCD) and Local Coverage Determination (LCD) guidelines as well as local insurance regulations all in an effort to establish and document medical necessity and to document same in support of streamlined billing. Natural language processing program **5045** and artificial intelligence/cognitive systems **5046** may also be provided to, for example, provide the clinical decision support features described with respect to FIGS. **72**A-**72**C. In exemplary embodiments, the NCD and LCD guidance is programmed into the Command Center **5000** so that alerts may be generated when a physician attempts to follow a treatment protocol that is non-compliant with the NCD and LCD guidance.

[0367] Those skilled in the art will appreciate that data latency may be improved by storing the data in the static file cache **5017** in the server of the distributed network of servers that is closest to the geographic location of the patient's appointment. In an exemplary embodiment, the server closest to the geographic location of the patient's appointment could contain data only for today's patients so that there is less data to query, thus improving the access speed for the data. Also, any data that is not stored locally may be cached locally after it has been accessed for the first time as it is more likely to be accessed a second time, thereby speeding up the data access. This architecture implements Proximity Request storage whereby data accessed most frequently is stored geographically closer to the user to reduce the time it takes to travel over the Internet. This approach is used by Netflix and others when hosting large movie files. In the present case, the most relevant patient data is stored within proximity of where it is stored. Relevant patient data is for patients that have been accessed in the past few days and any patients with an upcoming appointment. Having a smaller local subset of data makes the whole network operate more efficiently.

[0368] FIG. **58** illustrates the architecture of a central controlling server platform **5000** and multiple geographically distributed edge server platforms **5000***a* and **5000***b*. Each edge server platform **5000***a*, **5000***b* includes a firewall/VPN **5010***a*, **5010***b*, load balancers **5011***a*, **5011***b*, web servers **5012***a*, **5012***b*, application servers **5013***a*, **5013***b*, and a local Patient Database **5014***a*, **5014***b*. On a nightly basis, data for patients with appointments the next calendar day is transferred to the edge server located geographically closest to the user's primary access point as determined by IP address and stored in the local Patient Database **5014***a*, **5014***b*.

[0369] When a user requests data using platforms **5003**, it is first attempted to be retrieved from the closest edge server **5000***a*, **5000***b* based on the user's location and proximity to the server. If the closest edge server **5000***a*, **5000***b* is not available, access to the central server **5000** is requested. In this configuration, the central server **5000** may be the closest geographically, in which case the user request is just processed on the central server **5000**. If the data was only available on the central server **5000**, in addition to returning the data to the user **5003**, it is also made available on the geographically closest edge server **5000***a*, **5000***b*. This allows subsequent requests to be completed more quickly.

Data is stored on the edge servers **5000***a*, **5000***b* for a pre-determined number of days after it has been last accessed because it is more likely to be accessed during this time period. After this time period has expired the data is purged from the local data storage **5014***a*, **5014***b*. All user entered data is always stored on the central server **5000** first and then propagated to the edge servers **5000***a*, **5000***b*.

[0370] This architecture has several advantages. In particular, the most likely data (patients with appointment during the current day and those that have been accessed in the past days) is made available at the closest geographic server. The response time to complete user's requests are completed faster because network latency is reduced due to a shorter physical distance, but also because queries resolve faster due to smaller datasets being stored on the edge servers. The distributed approach also makes the whole architecture more efficient, because requests handled by the edge servers **5000***a*, **5000***b* reduce the load on the central server **5000**.

[0371] As illustrated in FIG. **59**A, the Command Center **5000** is designed to be integrated with the user's existing Health Information Technology (HIT) **5001** and Third party services **5002** using either industry standard message-based protocols **5035** or API-based methods **5036**. The interconnection between systems is designed to be hi-directional, in that data can be sent and received from these external systems. Those skilled in the art will appreciate that these and all messages transmitted herein are transmitted in compliance with HIPAA requirements or other global privacy and security regulations using transmission media that enable such compliance.

[0372] Systems integration standards used to communicate between the Command Center **5000** and External Systems **5001**, **5002** are depicted in detail in FIG. **59**B. The external systems have been previously discussed, so the focus here is on communication protocols. Integration between systems uses a variety of industry standards methods. The integrations allow the external systems **5001**, **5002** to share data with Command Center **5000**. Communication protocols can be grouped into two categories: message-based protocols **5035** and API-based protocols **5036**. Message-based protocols **5035** are managed through an Enterprise Service Bus **5018**. Enterprise Service Bus **5018** is designed to quickly and efficiently handle large volumes of messages ensuring that all of the messages are processed in order. Examples of message-based protocols **5035** are HL7 v2.x and v3.x (**5037**). V2.x is the most widely used healthcare integration standard and v3.x is similar to v2.x but uses the XML standard for encoding messages. DIRECT (**5038**) is a SMTP-based message protocol and is used for direct transmission of secure email messages. The Digital Archive and Communications in Medicine (DICOM) standard (**5039**) is used in tandem with a PACS system **5024** for processing images. The X12 standard (**5040**) is for the exchange of claims and billing data.

[0373] On the other hand, API-based messaging standards **5036** are managed by the Integration Server **5019**. The supported standards include the Fast Healthcare Interoperability Resources (FHIR) standard **5041**, several independent Vendor standards **5042**, and the National Council for Prescription Drug Programs (DCPDP) standard **5043** used for ePrescribing. FHIR is the next generation method for integrating with HIT **5001** systems, specifically EMRs **5021** and (while not yet approved) is being widely adopted by EMR companies. Several vendors have also emerged that are extending FHIR and in some cases creating their own API-standards for achieving interoperability. Exemplary embodiments of the Command Center **5000** will incorporate each of these standards as they achieve critical mass in the market.

[0374] A major challenge in EMR integration is sharing context so that when the EMR user selects a patient other applications like the Command Center **5000** should display information about the same patient to prevent issues associated with accidentally viewing different patients. The Clinical Context Object Workgroup (CCOW) standard **5044** is designed to be used by separate applications to share this context. By using CCOW **5044**, the EMR **5021** itself can communicate with the Integration Platform **5019** and the Command Center **5000**.

[0375] FIG. **60** illustrates an overview of the industry standard CCOW workflow and the various components involved in several transactions. As illustrated, the first step is sending authentication data **5050**, typically a user account and password from the EMR **5021** to the Command Center CCOW Security Authentication Service **5051**. The service **5051** authenticates the user and sends the request **5052** to the Command Center Auditing Service **5053** for long term storage. Once authenticated, the Security Authentication Service **5051** returns a token **5054** back to the EMR **5021** for use in further transactions. Once authenticated, if the user selects a patient, the Patient's identifying information along with the authentication token **5055** are sent to the Command Center **5000** using HTTP-based protocols. Once complete, the Command Center **5000** will now display the same patient as the EMR **5021**. Upon a successful operation, CCOW Service **5044** will return a success message **5056**. In the event new data is entered into the EMR **5021** that is required to be transferred to the Command Center **5000**, it can be sent at **5057** via CCOW to the Command Center **5000**. The first step is to check that the user is authorized for this action at **5058**. If the user is not authorized, a denial of service message **5064** is returned to the EMR **5021**. If the action is authorized, the message is forwarded at **5059** to the CCOW Message Processing Service **5060** where, upon processing, the message is sent at **5061** to the database **5062** where it is stored. The change in data is also sent at **5063** to the Auditing Service **5053** for long term storage. Upon successful completion of the transaction, a success message **5064** is returned to the EMR at **5064**.

[0376] When data is received from an external system **5001** through any of the messaging standards **5035** or API methods **5036**, a standard workflow is followed as depicted in FIG. **61**. The first step (**5080**) is to receive data using the previously discussed standards. The message is parsed and the patient identifying information is extracted so the correct Patient can be identified (**5081**). Once the patient is identified, the data is standardized (**5082**) so it can be effectively used in the Command Center **5000** and then stored (**5083**). The last step in the process is to evaluate the data (**5084**) using a variety of mechanisms using advanced analytics as will be discussed below.

[0377] FIG. **62** illustrates a more detailed flowchart of the data import process. As illustrated, the process begins when External Data is received (**5100**). The first step is identifying the source of the data (**5101**) to ensure it is from a trusted source and allows the Command Center **5000** to associate it with the proper customer account. Next, the patient's inter-

nal identity must be located (**5102**) using industry standard mechanisms, such as a Master Patient Index. Once the customer and patient have been identified, it can be determined if the message is a duplicate (**5013**). If the message is a duplicate, the message may be abandoned (**5104**) because it has already been processed. This step is necessary to prevent duplicate data and reduce the number of messages processed because the Command Center **5000** cannot control what messages External Systems **5001**, **5002** will send. If the message is not a duplicate message, the message can be stored for archival purposes along with a message digest to facilitate searching for duplicate messages (**5105**).

[0378] Messages can often contain multiple relevant pieces of information, so the Command Center **5000** selects the first data element for processing (**5106**) and then examines to see if the element is using a common vocabulary (**5107**). If it is not, using existing lookup and translation tables, the Command Center **50000** translates (**5108**) the element's code to the common vocabulary used by the Command Center **5000**. These standards include ICD-10 (diagnoses), CPT (procedures), RxNorm (medications), and LOINC (labs) codes. Next, if this element is a lab value **5109**, the Command Center **5000** checks (**5110**) to see if the unit of measure is the UOM used for this lab in the Command Center **5000**. If it is not, the value is converted **5111** using basic math (ex. Converting 10 centimeters to 1000 mm or 6.1 mmol to 106 mg/dL). If the element is not a lab value or has been converted, the data is saved (**5112**) to the Command Center clinical tables in core database **5014**, for example. The clinical tables are designed using common industry standards for storing relational clinical data. If the data is a lab or diagnosis **5113**, the data is evaluated to see if the new data is an improvement or decline from the last similar value **5114** by executing the Clinical Evaluation Algorithm described below with respect to FIG. **63**. After evaluating the data, the data is processed to see if the data should be added to a Command Center flowsheet (**5115**) (see Flowsheet description). Once these steps are complete, the processing algorithm looks for another element in the message (**5116**) and, if another element is present, the process starts over at step **5106**; otherwise the process terminates at **5117**.

Lab and Diagnosis Data Evaluation

[0379] A key feature of the Command Center **5000** is its ability to evaluate lab and diagnosis data to determine if the patient is improving or getting worse based on a comparison of past lab data and diagnosis history and to present that information to the user in an easily recognizable way, using an icon such as health icons **2766**, **2768** (FIG. **28**), for example. This evaluation can then be used by the clinician to make faster decisions. FIG. **63** illustrates a flowchart of the Clinical Evaluation Algorithm. As illustrated, when a new lab value is received (**5200**), if the result is numerical (**5201**), the lab code is looked up in the ClinicalComparator table **5210** using the LOINC vocabulary and the lab code (**5202**). If a comparator exists (**5203**), the algorithm retrieves (**5204**) the most recent previous lab result of the same code for the same patient. If a comparator does not exist or no previous results exist (**5205**), the algorithm is complete (**5206**). If a previous value exists at **5205**, the data is evaluated (**5207**). For example, the algorithm receives an A1c lab result of 6.7 mg/dL (we know the UOM is mg/dL because it was converted in FIG. **62** at steps **5110** and **5111**). The algorithm searches the ClinicalComparator table **5210** using the search parameters Vocabulary=LOINC (**5211**), Code=4548-4 (**5212**). Since a Comparator is found, the previous result is retrieved at **5204**, which in this example is 6.5 mg/dL. Each Comparator Record stores whether or not a lab result is getting better **5213** or worse **5214** based on if it is higher or lower than the previous value. In the example of an A1c lab test, the betterValidator=lessThan and the worseValidator=greaterThan. So the evaluation at step **5207** determines the current value 6.7 is higher or greater than the previous value 6.5, which matches the worseValidator. Once the evaluation is complete, if the new value is worse (**5215**), the lab record is marked as "worse" (**5216**) and either "declining" or "rising" based on matching lessThan or greaterThan. On the other hand, if the new value is better (**5217**), the lab record is marked as "better" (**5218**) and either "declining" or "rising" based on matching lessThan or greaterThan. This pattern allows the use of four icons to better differentiate the patient's condition: better declining, better rising, worse declining, or worse rising. If the patient is neither improving nor getting worse, the evaluation is complete (**5219**) and the record is not marked or is marked as "no change." Those skilled in the art will recognize that this functionality can be expanded to include other clinical values measured and/or tracked within an office visit for example blood pressure and vision.

[0380] The Clinical Evaluation Algorithm can also be applied to certain Diagnosis codes where a pattern of progression is part of the patient condition. For instance, assume that a patient starts with no retinopathy and can then progresses to mild non proliferative diabetic retinopathy (NPDR) and then moderate NPDR and finally to severe NPDR. The ClinicalComparatorList table **5220** (FIG. **63**) stores the information required to determine if a diagnosis is improving or not based on its position **5221** in the list signified by its grouping code **5222**. In this scenario, where a new diagnosis code is received (**5230**), the Comparator listing is retrieved (**5231**). If a Comparator List exists (**5232**), the algorithm retrieves previous diagnosis codes (**5233**); otherwise it stops (**5206**). If previous values do exist (**5234**), the current diagnosis position in the list is compared against the position of the previous value in the list (**5235**). If the value is worse (lower) in the list (**5215**), the diagnosis is marked as "worse" (**5216**). If the new diagnosis is better (**5217**), the diagnosis is marked as "better" (**5218**). If neither is true, the evaluation is complete (**5219**) and the record is not marked or is marked as "no change." Thus, the output of the Clinical Evaluation Algorithm may be used to make decisions and to update the patient's medical record in the EMR accordingly.

Flowsheet

[0381] As noted above, the central focus of the Command Center **5000** is the flowsheet. In the exemplary embodiments described in detail above, the flowsheet is a Retina Flowsheet **2530** for ophthalmologists as illustrated in FIG. **15**; however, those skilled in the art will appreciate that the flowsheet **2530** may be embodied in other formats (e.g., FIGS. **4**, **35**, and **36**). As also noted above, the Command Center **5000** presents data to the screen in such a way that the user need not navigate away from the screen. So that the data may be presented without significant delay, the data is pre-processed and stored for display in the flowsheet. A frequent issue with EMR systems for a variety of reasons is

slow response time. One of the reasons for the slow response is the need to retrieve data from a variety of sources, process the data, and then render it for display. The Command Center **5000** takes an improved approach. As data is received by the Command Center **500** from external sources, the Command Center **5000** dynamically determines if the data is applicable to the flowsheet, processes it and stores it in a simple database table structure described below that can be easily retrieved when requested.

Flowsheet—Images

[0382] FIG. **64** provides a diagram of the tables used to determine if imported data is relevant to the FlowsheetMapping table **5500** and to store data for display on the in the flowsheet database fields **5501**. FIG. **64** also presents the logic used to process the imported data in reference to the flowsheet. For example, when new data is received by the Command Center **5000**, the data includes either images or clinical data and it is determined Whether the data received should be stored for display on the flowsheet. When a new image record is received (**5502**), the image type is extracted (**5503**) from the record and the FlowsheetMapping table **5500** is searched for the image type (Vocabulary—Images, Code=Image Type). If a match is found (**5504**), it means the image reference should be stored and displayed on the flowsheet (**5505**). If a match is not found at **5504**, the image is ignored. In the case of eye images, the particular eye is important so the modifiedInd **5506** will equal 1, which means when the image reference is saved, it should be associated with the correct eve side which is part of the original image record per DICOM standards. For example, if an OCT image record for the left eve is received, the image type OCT is searched for on the FlowsheetMapping table (Code=OCT). Since the image type OCT is relevant to the Retina Flowsheet as well as the eye side, the image reference along with the eye side are stored in the RetinaFlowsheet table **5501** in the octDisplay column **5507**. The placement field on the FlowSheetMapping Table **5500** is the location to where the data should be saved. Instead of having an OCTDisplayOD and OCTDisplayOS columns—one for each eye, the octDisplay column and other similar columns store structured data containing reference to multiple images based on eye side. The format for this column is "OD:image reference|OS:image reference" where image reference is the name and location of the image. If this is the first data for a particular encounter date, a new record is added to the RetinaFlowsheet **5501** and the patientId **5508** and encounterDate **5509** both found in the message are saved to the table.

Flowsheet—Clinical Messages

[0383] FIG. **64** further presents the logic used to process a received clinical message in the context of the flowsheet. As illustrated, when a clinical message (medications, procedures, diagnoses) is received (**5510**) it typically has multiple pieces of information in the same message, so each element is processed separately. The first element is selected from the message (**5511**) and evaluated (**5512**) to determine if it belongs on the Retina Flowsheet table **5501** based on finding a matching entry in the Flowsheet table **5501**. For example, a procedure J2778 Lucentis 0.5 mg is received. A query is executed on the Flowsheet Mapping table **5500** where the Vocabulary=CPT and the code=J2778. If the procedure is not found in the table, the record would be ignored (**5513**) and if another element exists (**5514**) the next element would be selected (**5515**) for processing. If the procedure is found in the table, the procedure data is then stored (**5516**) in the RetinaFlowsheet **5501** where the column is specified by the placement field. In the case of a procedure, a medication may be administered, so the units are relevant. In this case, the unitsInd **5517** in the FlowsheetMapping table **5500** would be set to 1 signaling the algorithm to save the units associated with the record in the unit column of the RetinaFlowsheet **5501**. If there is another code (**5514**), that code will be retrieved (**5515**) and the process starts over; otherwise the process is complete (**5518**).

Flowsheet—Financial Messages

[0384] FIG. **65** illustrates a Financial Analysis Algorithm for processing financial payment information. As illustrated, when financial information is received (**5600**), the matching claim is located (**5601**) and the payment information is stored (**5602**). In an exemplary embodiment, a third-party a claims clearinghouse or insurance company is used to provide an electronic claims status message (**5603**) that is sent to determine the status of the claim. This status is then stored (**5604**) in the RetinaFlowsheet table **5501** in the financial display column **5605**.

Preauthorization and Referral Processing

[0385] FIG. **66**A generally illustrates the process the system follows when the user orders a procedure. When a procedure is ordered at **5610**, the Command Center **5000** evaluates the insurance coverage at **5620**. This process is described in detail in FIGS. **66**B, **67** and **68** below. Next, the Command Center **5000** evaluates the Preferred Practice Patterns and other clinical decision support rules at **5630**. This process is described in FIG. **72**. The last step in the process is to retrieve location, if applicable, and cost data **5640**. This information is then displayed in the Smart Evaluation Control panel in FIGS. **44**-**55**.

[0386] FIG. **66**B illustrates the logic used to check for pre-authorization and/or a referral. As illustrated, when a new procedure is ordered (**5650**), the Command Center **5000** reviews the input data (**5651**) for an associated ICD10 Diagnosis code. If no ICD10 Diagnosis code is found, the user is prompted to provide one (**5652**). Once the ICD10 Diagnosis code has been associated with the CPT procedure code, the Command Center **5000** evaluates the data against the applicable guidelines (**5653**) using a third party API and determines if the combination of CPT and ICD10 codes is acceptable (**5654**). If the input is not acceptable (**5654**), the user is notified of the disposition and provided with a rejection reason (**5655**). A rejection will terminate the process (**5656**). On the other hand, if the input is acceptable (**5654**), the system will review the patient's coverage (**5657**) for the procedure using a third party API. If the procedure is not covered by the patient's insurance (**5658**), the system will provide the user with an error code (**5659**). The patient will then have the Option (**5660**) to continue with the procedure (**5664**) (knowing it will be paid for out of pocket) or to decline the procedure (**5661**), which terminates the process. If the procedure is covered (**5658**), the preauthorization and referral process is invoked (**5662**). If the preauthorization and referral process (**5662**) does not approve the

procedure (**5663**), the patient will again have the option (**5660**) to accept the procedure (**5664**) (knowing it will be paid for out of pocket) or to decline the procedure (**5661**), which will terminate the process. If the preauthorization and referral process (**5662**) approves the procedure (**5663**), the patient can move forward with the procedure knowing it is covered (**5664**).

[0387] The preauthorization and referral process (**5662**) described above with respect to FIG. **66**B has two parallel processes, one which evaluates if the procedure requires preauthorization (FIG. **67**) and another which evaluates if the procedure requires a referral (FIG. **68**). The Precertification process described FIG. **67** is invoked by presentation of a CPT Procedure code and an ICD10 Diagnosis code. It is then determined using a 3rd party API whether or not a preauthorization is required (**5680**). If preauthorization (**5680**) is not required, then it is ok to proceed with the process (**5681**) and the process returns an approval message (**5663** from FIG. **66**B). If preauthorization **5680** is required, the system will then check for a pre-existing preauthorization (**5682**) using a third party API. If a preauthorization exists, the authorization code is stored and the procedure can continue (**5681**) and the process again returns an approval message (**5663** from FIG. **66**B). If a preauthorization does not exist, the system will request a preauthorization (**5683**), again using the third party API. If the request for preauthorization (**5683**) is granted (**5685**), then it is ok to proceed with the process (**5681**) and the process returns an approval message (**5663** from FIG. **66**B). If the request for preauthorization (**5683**) is not granted (**5685**), then the system will evaluate if the request for preauthorization (**5683**) needs to go through medical review (**5686**). If the request for preauthorization (**5683**) needs to go through medical review (**5686**), then it is not ok to proceed with the process (**5687**) and the process escapes to the negative path of **5663** in FIG. **66**B to determine whether to continue anyway. If the request for preauthorization (**5683**) does not need to go through medical review (**5686**), then it is not ok to proceed with the process (**5688**) and the process escapes to the negative path of **5663** in FIG. **66**B to determine whether to continue anyway.

[0388] The referral process illustrated in FIG. **68** is invoked by presentation of a CPT Procedure code and an ICD10 Diagnosis code. It is then determined using a third party API whether or not a referral is required (**5710**). If a referral (**5710**) is not required, then it is ok to proceed with the process (**5711**) and the process returns an approval message (**5663** from FIG. **66**B). If a referral (**5710**) is required, the system will determine if a referral exists. If a referral exists (**5712**), then it is ok to proceed with the process (**5711**) and the process returns an approval message (**5663** from FIG. **66**B). If a referral does not exist, then it is not ok to proceed with the process (**5713**) and the process escapes to the negative path of **5663** in FIG. **66**B to determine whether to continue anyway,

Data Model Overview

[0389] The Command Center data model is grouped into core tables, supporting tables and interoperability tables. The core tables **5014** (FIG. **37**) drive the Command Center (e.g. FIGS. **1** and **15**) and store the patient demographics and insurance information, images and the patient's clinical and financial data. The supporting tables **5015** (FIG. **37**) are largely used behind the scenes to drive functionality and are not directly related to a specific patient. The System Messaging tables in interoperability database **5020** (FIG. **37**) support health information technology interoperability.

[0390] The Command Center data model is based on a relational database model. Each table uses a surrogate primary key. A surrogate primary key is a unique value within the table used to identify the row that is not directly tied to the data in that row. This allows any of the columns to be changed without impacting the primary key. The data is stored in two types of tables—transactional for capturing clinical and billing data as discrete data, and reporting where data is aggregated for a particular physician, practice, health system or other entity. Reporting may extract and report on any data elements captured within the Command Center **5000**. These data extracts or reports can be used for clinical practice, population health management or clinical research or other purposes to improve patient health and well-being and/or the financial outcomes of a practice. Reports can be generated in real-time or batch mode executed on a predetermine schedule and automatically delivered to interested parties.

Core Tables (FIG. **69**)

[0391] The core tables **5014** largely follow industry standard design patterns for storing patient, clinical and financial data in a relational format. One example embodiment of the data model is the Observational Health Data Sciences and Informatics (OHDSI) standard—(http://www.ohdsi.org/). Another has been established by OpenEHR group—http://www.openehr.org/. The classes of data illustrated in FIG. **69** are stored as part of the core tables **5014**. The Account Data tables **5700** store information about customer accounts and physical locations as well as group Users and Patients so they can share information and communicate among each other. The Users tables **5701** store user accounts, credentials, personal configuration information, and data related to an individual user's profile including password and password history. Users are medical professionals such as clinicians, physicians, nurses, and billers, not patients. Patient tables **5702** store demographics and basic contact information. Insurance tables **5703** contain references to the patient's insurance information including benefits and amount paid and/or remaining deductible for the calendar year. Insurance data also includes referrals and pre-authorization information as required by the insurance company. Access to this data is compartmentalized to ensure compliance with global privacy and security regulations. The Encounter/Claim tables **5704** store encounter based data including but not limited to chief complaint, the review of systems, and the patient plan of care. Associated with encounters is claims data, which is also stored in these tables **5704**. The Encounter/Claim tables **5704** are also the key set of tables that tie patient information together with the clinical and financial data. Clinical tables **5705** store data sets for vitals, procedures, diagnoses, problem lists, medications, allergies, admission/discharge information, and surgeries. Imaging tables **5706** store references to the different patient images. Example image types include fundus photography, optical coherence tomography, fluorescein angiography, indocyanine green angiography, magnetic resonance, X-ray, and ultrasound. The actual images are stored on a PACS or similar service and are not typically directly stored in the Command Center core database **5014**. Financial tables **5707** include the payments by the insurance companies as well as

information about claim adjustments and write-offs. The Financial tables **5707** also include a general ledger. The Document tables **5708** store key information about documents either sent or received from other providers as well as other documents pertinent to the patient care. Messaging tables **5709** hold the actual notes and messages created within the Command Center **5000** and track external notifications. Finally, the Flowsheet tables **5710** contain the processed/aggregated data used in presentation of the Flowsheets within the application.

Interoperability Tables (FIG. **70**)

[0392] The interoperability tables **5020** illustrated in FIG. **70** are used to handle receiving and sending of data between systems. The Routing tables **5720** store information about the connections between different systems. The Routing tables **5720** are designed to ensure data that is received are stored with the correct customer account and data that is transmitted is routed to the proper system. For auditing and debugging purposes, all inbound and outbound messages are stored in the Message Archive tables **5721**. The Master Patient Index (MPI) tables **5722** are used to identify a patient record so data is properly attributed. For instance, a patient named Robert could be identified as Robert, Bob, Robbie or even Bert. The MPI tables **5722** are used to handle this patient attribution. Different systems use different vocabularies to encode data. The Vocabulary Translation tables **5723** are used to translate one system such as CPT to another like SNOMED-CT. This allows the data in the Command Center **5000** to be stored in a common format, so it is more easily processed.

Supporting Tables (FIG. **71**)

[0393] The supporting tables **5015** in FIG. **71** include tables for handling behind the scenes processing. For example, Security tables **5730** handle authorization and authentication of user accounts and system requests. This is to ensure compliance with global privacy and security regulations. Auditing tables **5731** store data related to which user accessed which patient account and how long it was accessed, but also data about who entered or changed information within the system. The audit trail would include the date/time of the change, the user performing the action, the old data and the new data. The audit trail may be sent with any medical record requests from insurance companies, peer groups, or legal requests. The Configuration tables **5732** are used to store Application and Account-specific configuration changes. Code tables **5733** provide storage and access to common drop downs and filters used throughout the system to standardize the data and make it easier to update. The Document tables **5734** store references to the insurance benefits and guidelines, CMS NCD and LCD documents, Preferred Practice Patterns, and Clinical Practice Guidelines as well as the information unique to the Command Center **5000** such as the summary, similarities and differences between documents covering common conditions. The Vocabulary tables **5735** store the core reference tables used throughout the Command Center **5000** related to clinical data. The Vocabulary tables **5735** include but are not limited to ICD-10, CPT, RxNorm, and LOINC codes. Other examples could be SNOMED-CT or ICD-10 PCS codes. The Activity-based costing tables **5736** provide cost information related to performing procedures including but not limited to human capital expenses, material expenses, ancillary services and overhead. Finally, the Clinical Decision Support tables **5737** contain the rules and algorithm supporting data that drive the Command Center clinical decision support capabilities.

Clinical Decision Support (CDS)

[0394] The Command Center clinical decision support logic is implemented in a variety of methods. Pre-authorization, referral management, claims scrubbing, medical necessity checking for compliance with governmental and insurance regulations, and similar rules are embodied in the system through the use of third party systems. Internally, the Lab and Diagnosis Data Evaluation (FIG. **63**) is an implementation of the if-then style of clinical decision support.

[0395] More complex clinical decision support is illustrated in FIG. **72**A. In FIG. **72**A, the support is handled through the use of a RETE style (pattern matching, rules-based) algorithm. A RETE rules engine or inference engine embodies a set of rules built around a data model whereby when an event is triggered **6000** (data input or a new day starts) potential rules **6001** are identified (**6002**) that relate to the data/event. If rules are identified, they are executed (**6003**) along with the evaluation of workflow rules **6004** using supporting data retrieved (**6005**) as needed from the patient, insurance, clinical, financial and imaging data repositories. Once complete, the outcome is returned (**6006**) to the requesting system for processing. Typically, the output is displayed on the screen for the user to consume or for storage in the designated database in the Command Center **5000**. In exemplary embodiments, the Command Center CDS illustrated in FIG. **72**A is based on the Health Level (HL7) and Object Management Group (OMG) Decision Support Standards making it flexible and compatible with other similar systems. Those skilled in the art will appreciate that the inference engine may implement conventional artificial intelligence techniques such as those provided commercially by Watson Health and Truven Health Analytics, Inc. to process received data in connection with data repositories to provide diagnostic feedback and the like.

[0396] Certain Command Center interpretations may be the product of cognitive system enhanced clinical decision support ("CDS"). As illustrated in FIG. **72**B, certain guidance requests triggered at **6000** are triaged at **6007** and structured data may be simultaneously routed to the core Command Center CDS **6002** while unstructured data is routed through 3rd party commercially available Natural Language Processing services **6008**. The systems **6002** and **6008** compare the incoming request against their curated knowledge base to contextually interpret the guidance as well as to provide suggestions beyond the scope of the guidelines based decision support. For example, an artificial intelligence cognitive system **6009** may continuously learn about billing and reimbursement processes, medications, insurance formularies, and patient outcomes. In such a system, an incoming medication recommendation request would then not only receive both the adopted clinical best practice recommendation but also inform the clinician of recently approved alternatives that may be both more clinically and financially effective. The cognitive system enhanced CDS of FIG. **72**B may be adapted to provide guidance on: Value Management; Medication Management; Medication Pricing/Formulary Optimization; Co-Management; chart completeness; patient to treatment center match-

ing; billing and billing code optimization; and insurance submission/audit procedures. Those skilled in the art will further appreciate that cognitive system enhanced CDS may be applied to medical records to compare medical data and to notice patterns, errors and anomalies in different entries or EMR notes. For example, when one internist is calling something a disease or has a finding yet another physician is finding something else different, or there is a disease or a billing anomaly between two different physicians, and the like. Cognitive system enhanced CDS may also be used to find discrepancies in payments, to alert physicians about inconsistent medical documentation or improper orders, to speed up the process of complying with regulations, or to alert the physician that a plan or order is inconsistent with a preferred practice plan for a patient.

[0397] Other embodiments of the cognitive system enhanced CDS provide direction and review of process details via Natural Language Interpretation using natural language processing (NLP) **3142** of system notes (e.g., notes **2506**/**2668**/**2701**/**3066**/**3078**/et al.) described above. In FIG. **72**C, visit notes **2506**, etc. are parsed by NLP **3142** for alternative diagnosis identification. The unstructured data content in notes **2506**, etc. is evaluated for potential ICD10 codes via Natural Language Interpretation **3142**. If the potential rules process **6002** identifies ICD10 codes at **6010** not covered by existing diagnostic codes **6012**, the user is alerted to the potentially viable alternative diagnosis at **6014**. This code may then be selected for introduction into the Clinical Evaluation Algorithm shown in FIG. **63** for further review. The mechanics of this process may be replicated for other structured evaluation processes identifiable through Natural Language Interpretation of unstructured data.

[0398] CDS is used proactively and reactively within the Command Center **5000**. Proactively, users are warned that billing certain procedures might not be covered. An example embodiment is demonstrated in FIG. **32**B item **2938** where according to insurance guidelines the OCT imaging test can only be performed after 30 days have passed since the last test. In this case, the user can override the warning and proceed with the test because they deemed it medically necessary. Another example of a proactive warning is demonstrated in FIG. **32**B items **2934** and **2936** where a patient is anemic to the chemical agent used to perform the ICG test so it should not be performed. Decision support is also provided in real time as users use the Command Center **5000**. These rules are both clinically and financially focused to ensure lab, procedures, and imaging tests that are ordered will be covered by the insurance companies as well as to provide alternatives that may be more financially affordable for the hospital and patient but provide equivalent clinical care. Examples of these rules are demonstrated in several places including prescribing medications (FIGS. **44** and **45**), ordering labs (FIGS. **46** and **47**), ordering images (FIGS. **48**-**50**), and ordering procedures (FIGS. **51**-**54**).

Database Schema

Note Tables

[0399] FIG. **73** is a diagram of the tables used to display data on the Note tab (FIG. **39**). The Note table **5500** has a surrogate primary key, noteId **5501**. Notes are uniquely associated to a single patient and the reference or foreign key to the patient is stored in the patientId **5502** column. createdId **5503** is a foreign key to the User that created the note. dateCreated **5504** is the date/time when the note was created. viewType **5505** determines who can see the note. If it is 0, everyone who has access to the Patient can see the note. If the value of ViewType is 1, only specific people can see the note, and if it is 2 only specific groups can see the note. The specific users are stored in the viewUsers **5506** column as a comma-separated list. viewGroups **5507** stores a comma-separated list of the groups that can see the note. The actual message is stored in the message column **5508**. The priority is stored in the Priority column **5509** using the convention 0 if low, 1 if normal, 2 if high priority. The displayUntilWhen column **5510** determines how long the note is viewable. If it is null it is viewable until deleted; otherwise it is viewable until the date/time is passed. The activeInd **5511** is set to 1 if the Note can be seen and 0 if deleted or can no longer be seen based on the displayUntilWhen date/time. The activeInd **5511** column is used for convenience in that it allows faster retrieval of Notes because a date comparison is a more computationally expensive process than comparing a bit value. When the user replies to a note, the reference to the original note is stored in replyToNoteId **5512**. This is a foreign key to the Note table. If there is a value in noteLocation **5513**, it signifies this is a sticky note that is associated with a specific location within the Command Center **5000** (see FIGS. **18**-**19**). The location is specific to a display panel. If it is a static display panel, i.e. the data does not change over time like an order panel, the x/y coordinates relative to the placement of the panel are stored. However, if the panel displays changing data such as rows associated to dates that change over time, the location is stored as a column and row referenced by the primary key id of the row. The externalNotificationInd **5514** stores whether or not the message should be transmitted back to the user's EMR. This process keeps the sticky note associated with the correct content, even when the content includes dynamic data such as new encounters or dates in the flowsheet.

[0400] The ViewedNote table **5520** illustrated in FIG. **73** tracks which users viewed the notes and when. The surrogate primary key is viewNoteId **5521** and the note id is stored in noteId **5522**. The user who viewed the note is recorded in the userId column **5523**. The date/time it is viewed is stored in whenViewed column **5524**. A note can be viewed many times by the same user, but only the first time the note is viewed is it recorded in the ViewedNote table **5520**.

Alert Tables

[0401] FIG. **74** is a diagram of the tables used to display Alerts **5530** that are generated for a patient. The surrogate primary key id is alertId **5531**. The alertCreated column **5532** holds the date/time of when the alert is created. The alertCategoryId column **5533** is a method of categorizing the alert, so they can be displayed in proximity or used in the appropriate places in the application. The column in the table is a foreign key to a code table (not depicted), but example categories are Insurance, General Wellness, Diabetes, and Billing. alertText **5534** is a short title used for the purpose of display, while alertDescription **5535** is a longer description of the alert. If the alert is associated with a patient, the patientId **5536** is stored. When the alert is completed, the date/time is stored in alertCompleted **5537** and the completedBy column **5538** stores the user who

completed (deletes) the alert. If an alert is active (not deleted) the alertInd **5539**=1; otherwise it is 0. Use of this column increases the speed of data retrieval. The alert priority (low, normal or high) is stored in priorityInd **5540**. The values are 0 if low, 1 if normal, 2 if high priority. alertReference **5541** is used to store information about the rule/conditions that applied at the time the alert was created to better understand how the system is working. It is not intended for viewing, only troubleshooting and research. Finally, the last column externalNotificationInd **5542** is 0 if it is not transmitted back to the EMR **5021** and 1 if it was transmitted.

[0402] The ViewedAlert table **5550** illustrated in FIG. **74** stores data about which users have viewed the alerts and when they viewed it. The surrogate primary key is viewedAlertId **5551**. The Alert Id is stored in alertId **5552** and the user is stored in userId **5553**. The date/time the alert was viewed is stored in the whenViewed column **5554**. An alert can be viewed many times by the same user, but only the first time the alert is viewed is it recorded in the ViewedNote **5550** table.

View/Panel Tables

[0403] The Command Center **5000** supports multiple configurations of the data based on the user's interests, patient's condition and task being performed. The ViewLayout table **5570** illustrated in FIG. **75** stores the panels and tabs that make up the view and how they are positioned. The Panel table **5580** illustrated in FIG. **76** stores references to the data displayed within a panel. FIGS. **75** and **76** contain the table diagrams, while FIGS. **77** and **78** are examples of the XML used to store the layout and panel information. The ViewLayout table **5570** and the Panel table **5580** thus store the configuration information generated when the view screens are configured, as described above by way of example with respect to FIGS. **41**A, **41**B and FIGS. **55**-**56**.

[0404] As illustrated in FIG. **75**, the ViewLayout table **5570** has a surrogate primary key called viewLayoutInd **5571**. The name of the layout used for display purposes is stored in the name column **5572**. The actual XML that contains the layout is stored in the gridXML column **5573**. If the userid column **5574** is null, the view is a default system view that every user can use the first time they login. The userid **5574** relates custom Views to the User who created them. The defaultInd column **5575** denotes the initial layout for each view so the user can reset the View to the default.

[0405] As illustrated in FIG. **76**, the Panel table **5580** has a surrogate primary key called panelId **5581**. The name of the layout used for display purposes is stored in the name column **5582**. The columnXML **5583** store the actual XML that defines how the panel is laid out. Like the ViewLayout table **5570**, the Panel table **5580** has Panels specific to users as stored in the userId column **5584** and a defaultInd column **5585** allowing the user to reset a panel presentation.

View XML

[0406] The view XML illustrated in FIG. **77** provides means for moving and storing the different display panel and flowsheet views in exemplary embodiments. As illustrated, the view XML contains a collection of panels **5590** and tabs **5591**. Within each panel **5590** is the panelId **5593** that links to the Panel tab **5591**, its position **5594** and whether or not it is stacked **5595** with the preceding panel, which allows for the positioning of tabs. Whether or not each panel is fixed **5596** in position or moveable is also saved. For tabs, the position **5597** on screen for the tabs to be displayed is stored. Then each tab with reference to a panelId **5598** and its order of display is stored **5599**.

PanelXML

[0407] The panel XML illustrated in FIG. **78** provides means for setting up the display panels and flowsheets in exemplary embodiments. As illustrated, the panel XML contains a collection of columns **5601**. For each column, the name of the column **5602** is specified along with the source **5603** where it comes from (e.g. Table=Labs Column=LabDate) the width **5604** of the column and the order the columns **5605** are also tracked.

Guidelines

[0408] The Guideline tables illustrated in FIG. **79** are used to store individual guidelines, groups of guidelines in order to store common information about the group, and associations of those groups with clinical codes (such as ICD10, CPT, RxNorm) to enable physicians to assimilate the information quickly. GuidelineSource **5800** is a reference table that contains the source of the Guideline. For example, insurance company, a professional society in the case of Preferred Practice Patterns, or the government. The surrogate primary key is guidelineSourceId **5801**. The name **5802** is for display purposes and the description **5803** provides more detail. GuidelineJurisdiction **5810** is a reference table that contains geographic locale references. These are applied to the Guidelines to understand where they apply. For instance, insurance guidelines are usually state specific. The surrogate primary key is guidelineJurisdictionId **5811**. The geographicScope **5812** is country, state, or region and the name **5813** specifies the specific jurisdiction, so in the case of New Jersey, the geographicScope would be state and the name would be New Jersey. The core table is GuidelineDocument **5820**. The GuidelineDocument table **5820** stores information about individual Guidelines. The guidelineDocumentId **5821** is a surrogate primary key. The guidelineSourceId **5822** is a foreign key to the GuidelineSource table **5800** so that it is known where the guideline originates. The guidelineJurisdictionId **5823** is a foreign key to the GuidelineJurisdiction table **5810** so that it is known where the guideline is used. The activeInd **5824** is 1 if it is active and 0 if it is not. This column is used to make retrieval easier. The effectiveDate **5825** is the date when the Guideline is effective, so guidelines can be added before they are actually used. Title **5826** is used for display purposes, while shortDescription **5827** and summary **5828** provide more detailed information about the Guideline. The documentURL **5829** is a link to the actual guideline document for retrieval and display. The Guideline document, usually a PDF, would be stored in the static File Cache **5017** in FIG. **57**.

[0409] Individual guidelines are then grouped into a collection so an overview can be provided of the guidelines and information about how they are similar and different. This allows the physician to easily assimilate complex information when minute differences may be buried in hundreds of pages of documentation. The GuidelineGroup **5840** table has a surrogate primary key guidelineGroupId **5841**, a groupName **5842** for display purposes and then several text

fields to capture the overview **5843**, similarities **5844** and differences **5845** about the group. The Guidelines are then grouped into a collection using the GuidelineCollection **5850** table. The surrogate primary key is guidelineCollectionId **5851** and the other columns are foreign keys—guidelineDocumentId **5852** and guidelineGroupId **5853**. It will be appreciated that these entries enable the user to aggregate all of the guidelines together and to write and store a common overview that outlines the similarities and differences in the guidelines.

[0410] The last table related to Guidelines is the GroupClinicalMapping **5860** table. Table **5860** maps clinical codes to GuidelineGroups **5840**. Table **5860** has a surrogate primary key groupClinicalMappingId **5861**, a foreign key guidelineGroupId **5862** to the GuidelineGroup **5840** table, a vocabularyId **5863** identifying the vocabulary being used and the code **5864** that can be searched. The GroupClinicalMapping table **5860** allows users to easily search for collections of guidelines that apply to a specific clinical code (ICD10, RxNorm, CPT, or other codes) or see at a glance a set of guidelines based on patient specific data (see FIG. **42**).

Utilization of Rows in User Interface

[0411] FIG. **80** illustrates how three rows or panels in the user interface **8000** may convey much information for a healthcare professional in sample embodiments. Header **8002** is an example of a header that can appear on each individualized specialty-based provider's actionable dashboard. As illustrated at **8004**, different actionable dashboards that have been particularly designed for different providers of different specialties may be accessed. As illustrated, a summary row **8006** may be provided on each individualized dashboard for each doctor, specialist, or other user and may be specialized for each user.

[0412] Referring back to header **8002**, which also represents the column where all rows underneath would have information related to this description, the date is represented at **8008**. The date is the time, day, and/or date of the encounter of a patient or a group of patients that the encounter/action took place. The initials or name of the provider who cared for the patient or if just testing, would be the location or the test done. In one common embodiment, the provider's initials are presented at **8010**, which may also include a location, as providers can have multiple offices. An abbreviation, description, or identifying factor of which office that provider saw and had the encounter with a patient would be listed at **8010**. **8022** shows an example of one of many patient encounters over time.

[0413] An example of a column that is a procedure and, in this case, is divided into the side of the body is shown at **8012**. OD is displayed, which in eye care means right and in this example, means the right eye. In the case of orthopedics, **8012** could reference the right knee. Similarly, **8014** represents the left column or the left eye, where OS represents the left eye or left knee in this example. As illustrated, the OS or left column of the header can be a procedure **8016**. Under the column of the left eye is listed, by encounter, identifying procedures such as injections **8018**. Item **8020** shows a focal procedure that has been performed (e.g., injection of Eylea), while **8022** shows the date of service being Mar. 21, 2017.

[0414] As illustrated at **8024**, the header **8002** may also show that a cataract surgery has been done and that a postoperative period is counting down. The header **8002** may also show that injections **8026** were last performed six months and ten days ago. Another data element **8028**, such as FA, may be shown over time. **8030** shows the last time this test or item was done. In this case, it was 2 years and 16 days ago. Header **8002** also includes a pop-up **8030** of underlying information. In this case, the patient has a diagnosis of glaucoma and has not had a visual field in over six months.

[0415] The summary row **8006** shows how not only is the total number of something that had occurred in the rows above counted, but it can be divided according to what was performed. So, it is a smart summary column. In this case, **8032** demonstrates that there were twenty-six Ls and seven Es of which one E (Eylea) is shown at **8020**. Not shown in the diagram, would be the dates of service/encounters. This can measure or count anything. This happens to be an example of a retina doctor who does injections in the right eye in this case, and used "L," which stands for Lucentis times and "E," which stands for Eylea. **8034** similarly demonstrates the summary cell in a column of the left eye. **8036** shows the vision in the left eye is 20/80-1 and could also reflect the best number or event that occurred in the entire row overall of dates of service, and can be highlighted to inform the user that it is the best value. **8038** shows CF. In this illustration of a retina surgeon, CF means count fingers, which is very bad vision and is, therefore, red. For the first time in this illustration, a retina surgeon can know, over the time that the doctor has been delivering services, or any doctor, what is being reflected in encounters and rows above. The best vision was 20/80 (**8036**). The worst was count fingers (**8038**). This can also be the best blood pressure and the worst blood pressure. Every different specialty in medicine has different ways that it would like to measure the highs and lows in a column. **8040** simply shows the counting of the number that had occurred in all of the encounters. In this case five FAs **8028**.

[0416] It is important to note that the tool can measure anything in the row and display it in multiple different ways. The choice could be just to see the high and low as in **8036** and **8038** over a short period of one year or over as many years as there have been encounters. It can also be set to show percentage changes over time. In any case, this summary provides a tremendous amount of information to the provider for enabling rapid decisions.

[0417] A panel **8050** may be located at the top, side, or bottom of the display in FIG. **80** and may provide access for each specialist to different types of healthcare providers or different doctors who want to customize the display. Any type of doctor or dentist or other health care provider of any specialty can be listed. As few or as many as have actionable dashboards that can be accessed immediately with direct access by simply clicking on the specialist's name. For instance, the specialists may be retina doctors **8052**, glaucoma doctors **8054**, or an optometrist **8056**. All three happen to be types of eye doctors. All three could be in the same practice, separate practices, or even in different countries. Each, when clicked on, pulls up an actionable dashboard specially designed for them or their practice in that specialty. **8058** provides an example of a non-eye doctor, in this case, the family doctor.

[0418] It is important to note that any health care provider, if given permission by the patient, and each specialty noted in FIG. **80** could see the actionable dashboard of the other specialists for as little or as much as each would allow. There is some information in an actionable dashboard to each

specialist, practice, or doctor that they might not want others to see, which can be hidden (e.g., payments and costs). In addition, next to each actionable dashboard can also be additional information that can also be pulled up instead of the actionable dashboard itself. For instance, a dollar sign **8060** could be for providing for each practice or actionable dashboard, payments, costs or any financial matter that can pop-up to show a different type of financial dashboard. **8062** shows an example that can pull up any type of additional information, such as a shared care dashboard between different providers.

[0419] **8064** illustrates that an entire cell can alert all of the other providers of something important. It can be a color change, or flash, or blink. When activated, it represents that there is some type of important event, for instance, that all providers should know. A pop-up **8066** also may be shown at all times or by hovering over **8064**. The popup could represent whatever the important item is to be alerted. For instance, a new diagnosis like the patient had a stroke on Jan. 2, 2020, which all providers would like to know. It can also inform all providers that the patient missed an appointment that was very important with that doctor. So, that all specialist would know that and be able to remind the patient.

[0420] It will be further appreciated that the actionable dashboard may further include a communication center where users can send messages to each other in a HIPAA compliant way. In other words, a physician, while seeing a patient, can send a message to their chief technician or the office manager to talk about following up on a patient or also to the billing office that there is a billing problem. Then, staff can report back to the doctor and this message can be imbedded into the smart actual dashboard so that the next time a doctor sees the patient through icons and columns of correspondence of communication within the practice, the doctor can pull up what was the response to a message they had sent earlier. This response can be read live while treating the patient so that the doctor can take it into perspective while making decisions. The messaging system, attachments or anything else can be sent to the doctor or health care provider in any way that they would want. Whether through email or the internal messaging system or as a tickler system within the EMR system that automatically toggles back and forth to the actionable dashboard, so the doctors can see their messages at the end of the day or the end of the week, or while seeing the patient. It really helps organize the doctor's life, so this actionable dashboard becomes the communication hub, the switchboard, for the entire practice, while communicating with the health care provider.

[0421] FIG. **81** demonstrates a display that enables a healthcare provider while delivering medical care to a patient to participate in revenue cycle management. Without interrupting medical care, the healthcare provider may understand what things cost, whether they have been authorized to do something like a procedure, and whether the previous claims were rejected or paid. Critical compliance issues of properly following the laws can now be often confirmed because if the healthcare provider was paid for something and the services was not performed, the failure to perform the service would be detected. The billers know when charges are paid or rejected and the corresponding diagnosis and CPT codes, but this embodiment correlates the financial with clinical as the doctor is seeing the patient without interrupting the patient flow.

[0422] The display **8100** shows a particular patient's name or the name of a number of patients at **8102**. The date of a particular encounter is shown at **8104**. The patient data can be seen over many encounters listed in the different rows. The provider who delivered the service as well as the location of the provider who saw the patient is provided at **8106**. The clinical information that can be displayed simultaneously for the doctors to be able to care for the patient is provided at **8108**. This clinical information is different for all medical specialties. Eye doctors might look at vision. Family doctors might look at blood pressure or blood sugar.

[0423] A column of procedures **8110** that were performed are defined that need to be measured by specialty. Every specialty might have different procedures and the tool can have multiple columns for different procedures. **8112** and **8114** demonstrate that a procedure can be on different sides of the body. **8112** represents the right (in eye care—OD) side while **8114** represents the left side of the body (in eye care—OS). In orthopedics, procedures of the right knee and left knee could be populated.

[0424] **8116** provides an example three types of different diagnostic tests usually performed and billed in an eye doctor's office (e.g., VF, OCT, and FA) but any diagnostic test or other CPT code could be in these columns. **8118** is the office visit that was charged as there are different levels of office visits that a provider can charge at different times. **8120** illustrates whether proper documentation was needed or not needed to be able to bill any of the procedures, diagnostic tests, or office visits.

[0425] A financial column **8122** may include an authorization column **8124** where providers as they are seeing patients can actually know whether or not the insurance company has authorized the procedure. A referral column **8126** may indicate whether the proper referral from a family doctor to a specialist was received. A sent insurance column **8128** may be used to indicate whether insurance information has been received for the patient, while message column **8130** may provide messages or tasks that manually or automatically can be created by the user or anyone in the practice to communicate to the user. Financial column **8122** may include many different ways of indicating to a doctor or provider the financial information. For instance, indicator **8132** could be red which could mean rejected, or green for paid, or yellow for partially paid. Another indicator **8134** that is associated with one of the other columns representing something performed and charged by the user that particular date **8136** may also be provided. A third indicator **8138** could be red, yellow or green to represent payments or express costs and corresponding to another of the charges for date **8136**. **8140** demonstrates that a focal laser type surgery was performed on a particular encounter date. Indicator **8132** could be associated with the focal laser type surgery **8140** and represents, if red, that the insurance company rejected payment and nothing was paid. Indicator **8134** could relate to whether another item performed on date **8136** was paid. Similarly, indicator **8138** could correlate with whether office visit **8142** was paid.

[0426] Instead of all indicators of payment being on one row together in column **8122**, the indicators could instead be in the column next to the medical service charged for. In addition, an indicator **8144** may show that there was rejection right next to the procedure, in this case the focal laser, as there is a red dot **8144** which correlates to zero payment. This type of indicator can instead of being all in one column

8122 also can be in each column associated directly with what was done as at indicator **8146** where icon **8148** shows that a VF was performed. Indicator **8150** shows the procedure focal itself can be red or even written 'rejected'. Similarly, a zero **8152** may be used to show rejected payments. Indicator **8154** demonstrates that a VF was performed but could be highlighted green meaning it was fully paid or red if it was rejected. On the other hand, the amount paid **8156** could in the same cell next to, above or below what was performed, in this case $80.

[0427] The healthcare provider may also confirm that something was done or if they want to see the actual item being billed or to interpret it. For example, icon **8158** would allow the healthcare provider to click on it and actually the image itself comes up and an interpretation could be seen. If no image is attached, they might discover that it was not done and billed incorrectly, so the healthcare provider could elect to return the money to the insurance company. This decision may be made rapidly while examining a patient. Additionally, a lack of documentation may be indicated in column **8120**. Because doctors often use scribes or assistants, they may have inadvertently not completed the chart. Column **8160** is an exam column, while column **8162** is a plan column. Perhaps they are completed or not, but instantly doctors can see whether a check mark **8164** has been provided to indicate that documentation has been completed. Alternatively, the word 'yes' **8166** or any other appropriate word or indicator may indicate that the documentation has been provided, while the word 'no' **8168** or other appropriate word or indicator may indicate that the documentation has not been completed. **8144** could be a 'X' noting that the indicated documentation was not completed. In this fashion, doctors instantly can be informed and take action to complete the chart.

[0428] Doctors may have an interest in running a report on any of the elements, columns or rows to identify payments in one patient or a group of similar patients. **8170** depicts the ability to run a report. The type of report that is requested may be indicated at **8172**, where patient list **8102** may list a whole group of patients, perhaps sharing a common insurance company, but doctors can quickly make decisions because they have at their access not only the exact financial information, but in context for each individual patient can understand what was really done that day, how the patient's care was performed, what tests were or were not completed and whether they were paid properly or improperly or, from a compliance point of view not documented correctly as indicated in column **8120**. The user may elect to export the data at **8174**.

[0429] In sample embodiments, the indicators **8132**, **8134**, or **8138** could be selected to bring up a ledger that matches each CPT code individually with payments. Here the exact row of the date of service with all the CPT codes one or more done that day and payments can all be brought up as described above with respect to FIG. **13**B.

Summary Reports

[0430] Another aspect of the tool is the reporting mechanism. Because the actionable dashboard also stores most everything that is important to the doctor, literally anything can be reported, and columns can be compared to rows and any information that it stores, whether it is financial or not, all reports can be written and created from this actionable dashboard. FIGS. **82**A and **82**B together illustrate a display of a report **8200** that in addition to identifying information on the patient and specific information that the report pertains to enables to user to bring up and analyze more information by going into the patient's medical record, EMR, PM system in the context of the report itself. The interface in FIGS. **82**A and **82**B together provide all the relevant information necessary for a user to evaluate the situation, identify the similarities or differences in a group of patients, provide direct access to more information such as images and plans allowing the user the ability to then in context correlate this additional information to other information and to edit notes and make notes in context and to even place orders for actions to be taken.

[0431] FIGS. **82**A and **82**B together illustrate one of countless reports **8200** that can be run by user of the tool. This example happens to ask the question "show me all patients in the practice who have the diagnosis of glaucoma and have not been seen in greater than 365 days." FIG. **80** illustrated at **8030** how an alert could be shown on a single patient, for example, showing a single patient having "glaucoma but no visual field in six months". But an alert or a report can be for any set length of time. The tool thus allows individual patients to have alerts as the patient is being examined by the doctor or all patients in a practice or any subset in a report.

[0432] **8202** is the patient name. By way of example, there are eight rows, so in this illustration, there would be eight patient names in the row **8202** and more patients in the report can be scrolled or on different pages. **8204** lists the visit date or encounter of that patient that the report is evaluating and reporting on. **8206** in one embodiment might show the date of the most recent visit of the patient, in this case, Dec. 3, 2019. Note, a report before it is run the user can specify any dates or any data. to be presented in the rows and columns. In the example **8208**, a visit date of Dec. 2, 2014 is indicated. The subject in this example of the report may identify patients in the practice, for instance, who have not had a particular test. In this example, the VF (visual field) **8212**, which indicator **8214** shows that the last visual field done was Dec. 2, 2014 (**8208**). This is the subject of this report, so in this patient's case (Patient A under column **8202**) the patient has not had a visual field as shown at **8208** and **8214** since Dec. 2, 2014.

[0433] In addition to particular dates of service at **8206** and **8208**, row **8210** can also be included for each patient in the report as a summary. FIG. **80** at **8006** illustrates the summary row features. Much information can be gathered about this patient by the summary row taken into consideration while looking at dates from rows **8206** and **8208**.

[0434] The next scheduled visit may be indicated at **8216**, showing the date at **8218** and the location at **8220**.

[0435] **8222** may indicate the referring doctor, while **8224** may indicate the diagnoses of the patient (ICD-10). **8226** indicates the diagnoses for the right side of the body. In this case, an eye doctor's example, right is OD. On the other hand, **8228** indicates the diagnoses of the left side of the body, where OS is the abbreviation for the left eye. All diagnosis recorded for any date can be seen by hovering or clicking.

[0436] **8230** indicates a column of the right eye where anything can be followed. In this example, injections **8232** are listed. **8234** shows that an injection was done for this patient at the most recent visit (row **8206**, Dec. 3, 2019).

[0437] **8236** indicates a clinical measurement column. In this case, in the field of ophthalmology, IOP, which is intraocular pressure, which happens to be related to glaucoma, is the subject of the report. **8238** shows right eye readings over time. In this case, **8206** is the last visit, while **8208** is the visit when the last visual field was done. On the other hand, **8240** shows the measurements of the pressure for the left eye in the two visits reported at times **8206** and **8208**.

[0438] Column **8242** illustrates where on the two visits that the report was told to show for the dates **8206** and **8208** the respective plans **8244** and **8246** that the doctors had written for the respective days.

[0439] Without leaving the screen, the user may also directly access the visual field by selecting or hovering over the icon **8214**. Upon selection, image viewer **8248** may bring up a visual field **8250** from Dec. 2, 2014. **8252** is the image itself. Now, the doctor can actually see if there was a problem when the last visual field was performed and interpret in context, but the doctor might want another concurrently active window for display. For instance, and its logical for this report, by clicking on plans **8244** and/or **8246** the doctor may access the plan viewer **8254** that shows simultaneously plans **8256** (for Dec. 3, 2019) and **8258** (for Dec. 2, 2014).

[0440] **8260** illustrates how the doctor can read the two relevant plans and instantly determine that the doctor on Dec. 2, 2014 had written that they wanted to see the patient "one year for dilated fundus exam, visual field **24-2**" (shown enlarged at **8262**). The user now realizes that the patient should have seen this doctor four years earlier and can even see by looking at image **8252** a visual field (VF) back then (Dec. 2, 2014) can determine if, back at that time, the VF was abnormal. Shown in this example is the fact that **8264** in the summary row shows this patient has had many injections of different kinds in this right eye. This is enough information to speculate since all of these types of injections are for a certain retina condition and when looking at **8234** it becomes apparent that in fact, Eylea, was performed on the most recent visit at **8206**. The reviewer can look at the plan **8256** and see from the note the fact that the patient had glaucoma was not even mentioned and certain conclusions could be reached for what has happened that resulted in the visual field not being performed in five years. Now, the doctor can even edit in context a plan or note by selecting to edit at **8266** and to edit the note and input the accurate up to date note or create a message. Now the doctor can take action and open up an ordering panel which can be accessed by any means on the screen by popping up a window as described with respect to FIGS. **34**A and **34**B. The ordering can be for all the patients at **8268** or each patient may be selected individually at **8270** **8284** as the doctor evaluates each patient one by one to see the common problems and repeating the steps noted for a patient A again in patients B through H. If more information is needed for any patient A through H, by selecting the name A through H, the healthcare provider may open the individual patient actionable dashboard or take the user to the EMR of that patient.

[0441] It is important to note that for the statement **8262** written or the scheduled appointment, the visual field follow up ordered by the doctor wanting to see patient in one year for a VF as seen in **8262**, the doctor at the time of reviewing this report can take action. However, the statement **8262** of a visual field in one year could, through NLP, and machine learning could have already been discovered four years ago when the doctor said they wanted the patient to return. In one embodiment, the tool could have sent an automatic task to the appropriate person in the practice, informing them of the importance of this patient keeping a scheduled appointment. Additionally, if the appointment is not scheduled, as indicated by the plan, an automatic task would be sent indicating a return exam visit and a certain diagnostic test is needed. An automatic task could in some embodiments at that time have looked exactly like what is seen in this report but row **8206** would not be the date of service of the report which ran the last time the patient was seen, but rather whatever date would be when the task was generated of the last appointment the patient was seen.

[0442] By way of example, if through NLP and ML and artificial intelligence or even if there had been a scheduled appointment by the doctor who wanted to see the patient in a year for a visual field, in this case from Dec. 2, 2014, was missed or canceled or the event did not occur at that time, the tool would send an automatic task, not depicted with all the information from row **8208** along with the most recent visit, closest to the canceled and/or missed appointment or an appointment that never was scheduled. Through machine learning and NLP, all of this information would go as an automatic task to the appropriate person who could then immediately discover the urgency and need and place an order from this task, including linked to the task a mechanism up, properly schedule the appointment and visual field or Whatever diagnostic test or procedure that might have been missed but the tool now discovers had been planned. The task includes the needed information to act with direct accessed with no more than a click to information in the display that enables the user to efficiently make a decision and take action.

[0443] The tool offers a three-tiered safety net for capturing potential mistakes and/or improving medical care. The auto task system can discover instantly when something that was ordered, needed to be evaluated or measured or performed and automatically send the task. In addition, an alert system goes into effect so that whichever doctor or user that next sees this patient for any reason which could be within the practice itself or if it is so urgent that any or all doctors or users of other actionable dashboards could be alerted about a critical event as is programmed and chosen as truly an urgent or critical event and light. This way, the patient can be reminded of the importance of making an appointment and also the treating doctor or treating practice, the next time the patient comes in in a variety of ways can be alerted that in this case the visual field (VF) is needed as described as an example of a report in FIGS. **82**A and **82**B. FIG. **80**, described above, illustrates how the alert may function. Even the patient can be reminded because through the portal or text messaging or other method automatically a message/task can be sent to the patient that a test (VF) is needed.

[0444] So, the tool offers three-tiered safety net with alert at the point of care, and automatic task option to the user and finally as described in FIGS. **82**A and **82**B an actionable fully evaluative report that can be run at any time. If the embodiment that allows for the automatic tasks and alerts is in fact acted upon, then this patient would not even have been on this report because the necessary care would have been provided. As noted above, even the patient can be alerted of an important visit, test or procedure that should have occurred and therefore be scheduled. Presenting this

information to the user in rows and columns is an efficient way to allow the user to quickly make decisions, but in other embodiments it is not limited to rows and columns, it could be anywhere on a screen and does not necessarily have to have all this information it could be a part of the information or even comprehensive information, with the entire actionable dashboard sent in a task with just the most important rows and columns highlighted in any manner to quickly draw the attention of the user to the issue and the action that needs to be taken so in context the entire patient situation can be shown. Direct access to more information in the EMR or link anywhere can be connected to a task, alert or report. Through natural language processing, machine learning and AI just the important information can also be sent. In one embodiment of the tool, when the action is self-evident because of orders previously placed by the doctor, even without human interaction, the proper scheduling of the patient can occur, when the doctor had already in the past placed the order.

Patient Scheduling/Triaging System

[0445] In other embodiments, a medical guidance system is provided that helps doctors, and just as importantly, their staff, avoid mistakes. The medical guidance system offers preferred practice pattern advice, as set by a practice and supported by the medical literature, it helps with scheduling patients and makes certain that patients needing appointments and follow up appointments do not fall through the cracks and gives them timely appointments based on the risk that can be evaluated through algorithms of the medical guidance system. It also properly triages patient queries.

[0446] The medical guidance system addresses and solves the following issues:

[0447] 1. Scheduling of patients with automated methodology to help ancillary medical staff (i.e. receptionists), call centers, and doctors to prevent patients from falling through the cracks by prioritizing the risks of symptoms and diseases, and associating these with past procedures, diagnostic tests and other critical items that need to be evaluated. In this way, staff and physicians are guided as to which patients needs the timeliest interventions, appointments and follow up.

[0448] As an example, as a patient is checking out from an appointment, the algorithm double checks that a mistake did not occur, what was ordered in regards to follow up, and if the prescribed follow up time period is not able to be done provides guidance to those that are scheduling about the potential risk of not precisely following what has been ordered so that if the doctor or staff needs to be asked and notified that there is a problem in scheduling, this is done so that a patient is not placed at undue risk. In addition, if a patient with certain high-risk diagnoses, procedures, diagnostic tests and symptoms misses an appointment, he or she is identified. What normally happens when patients miss appointments is that they are put into a recall system or the patient is called directly. However, there is currently no system available that identifies high-risk conditions, procedures and diagnostic tests and tracks the patient's attendance at the related appointments. The medical guidance system identifies which patients require strict follow up care and cannot be missed. It tracks patients who might miss multiple appointments, whether the patient cancels or the doctor's practice cancels, and what the risk is to that particular patient if he or she is not scheduled in a certain period of time. In addition, risks are calculated and tasks created for anyone in the office, including the office manager and receptionist, and depending on the risk, the task list can even be elevated to the physicians themselves.

[0449] A patient scheduling risk identifier identifies patient risks based on their medical history and can be applied to any domain that schedules patients. This includes all fields of medicine: ophthalmology, dentistry, chiropractic, podiatry, etc., and also includes practitioners such as physicians' assistants, nurses, hospitals, and emergency rooms. The patient scheduling is performed under a variety of circumstances as they leave the practice from a current visit, by calling reception, email, portal, etc. Also, scheduling can occur when patients are not in the office. Patients can call, or even through email, portal or other electronic means request information for an appointment and a receptionist or call center might answer with little clinical knowledge and, using the medical guidance system, all of the ancillary staff can ask certain questions or patients may electronically fill out questions relevant to scheduling. Precise calculations can be created through formulas to then give guidance on a time period for scheduling and if it cannot be calculated or there is an increased risk, referral to the physician or their assistant to make a decision about a particular patient. For example, who is making the telephone call is taken into account. If it is a referring doctor in a subspecialty that clearly would know what constitutes a medical emergency, like another eye doctor, who certainly knows an emergency in regard to eyes versus a foot doctor might not be as knowledgeable when they refer a patient with diabetes about eyes. All important data points related to scheduling an appointment are collected and evaluated to determine the speed at which a patient needs to be seen for an evaluation. If the patient cancels an appointment the same sort of evaluation can occur but, in this case, the patient is not calling, rather, the risk for that patient who "missed" an appointment can be calculated. The question can be discovered not by what patient says but by auto populating from what is in the patient's chart. For instance, a procedure that had been done and normally follows up post-operatively in 30 days, if the patient cancels it at 30 days and then misses another appointment a week later, this is a much higher risk than a person who did not have a procedure that required a follow up unless, of course, symptoms are dramatic, all of this is measured against the patient's disease state, diagnoses and past history. All are calculated to give guidance to ancillary staff to help medical practices schedule properly, as patients are checking out, as patients who are new or existing patients call in for appointments or as patients miss appointments due to either cancelling or the provider cancels.

[0450] The medical guidance system also provides methods for determining that patients are properly followed up for an office visit with the correct provider. This method becomes important because patients can be lost in the shuffle of so many different specialists. If a patient comes into a multispecialty practice of any kind, and even if there are only three specialists, a patient can be scheduled with the wrong provider. By way of example, in ophthalmology there may be in one office a general ophthalmologist, an optometrist, a retina surgeon and a glaucoma surgeon. A patient with diabetes and glaucoma may see the retina surgeon four times a year and the glaucoma surgeon three times a year. The front desk or the patient may get confused as to which

doctor to see. For instance, if the glaucoma doctor sees the patient and does not schedule the patient to return to the retina doctor, who handles another type of disease, not infrequently, patients can be totally lost and the wrong provider is assigned to give care. While one provider may be taking care of one disease state. (i.e. glaucoma), the other state (i.e., diabetic eye disease or macular degeneration), may be lost to follow up to that retina doctor. The same can be true in a multispecialty practice of internists, cardiologists and pulmonologists. The internist has a good rapport with the patient and sees them on a regular basis, and does not realize that the patient did not keep an appointment with their cardiologist; whether it be that the patient cancelled or the cardiologist cancelled, the internist may be assuming that someone in the practice, such as an ancillary staff member, is making an appointment for the cardiologist, but that may never happen. Each time the patient comes back in to see the internist, it is possible the internist might not know this. This tracking system identifies all these situations in medicine: it is able to see when a patient is supposed to return for a visit, what the high-risk scenarios are, whether there was a procedure that always requires a follow up with a particular doctor, whether that does or does not occur, and reminds any doctor in the practice that they should consider sending a patient back to another doctor. Not only are there indicators and alerts sent to the doctor who sees the patient, but these can be sent to the original doctor whose appointment has been missed, to the practice manager, or to anyone else in the practice to double-check whether a particular patient should be seeing a particular doctor and has been lost in the shuffle of so many visits. This kind of mistake also can happen in health systems and hospitals where a patient who is not knowledgeable about medicine makes the assumption that each doctor talks to one another and shares records; therefore, the patient may assume that if one doctor does not suggest that the patient sees another doctor, that the original doctor will be taking care of everything and the patient does not need follow-up care from a different doctor. This is a regular occurrence in medicine and puts patients at tremendous risk, because if they do not get to the specialist when the disease is most treatable, the patient might not be cured.

[0451] The medical guidance system also identifies if there are results from tests ordered and letters from outside doctors that can become just "attachments" within an EMR and get lost. The medical guidance system triages attachments by their critical nature, and alerts are provided if the attachments have not been opened by particular doctors, including identifying the doctors most specified to interpret the attachments (often the ordering physicians). For instance, in a multispecialty practice, if the pathology results of a biopsy of a skin lesion come back and the family doctor sees the results, but the dermatologist who ordered the biopsy does not see the results, an alert is sent out. This is an example of where the family doctor could make the assumption that the dermatologist sees the results, but that assumption would be incorrect.

[0452] The medical guidance system also includes a pre-patient visit analyzer that helps the physicians identify the patients they will see in the future, which could be today's patients, future patients, or any future patients with particular disease states requiring certain procedures or diagnostic tests. This feature presents the doctors with the information they need to prepare for these visits, or to find errors in scheduling, tests, etc. For instance, this feature lets the doctor know what is scheduled for today for that patient, when the patient last had similar tests, what their disease states are, what the likelihood is that they might need additional tests or another type of procedure, and even whether or not something might have been scheduled in error because information from the previous visit does not match up. For instance, if the plan says injection in the left eye but the schedule says injection in the right eye, the tool can discover that and warn the doctor to be very careful with this particular patient. The doctor may receive a summary identifying what had been done in the past, i.e. diagnostics, procedures and through algorithms that are tailored to each practice and specialty, be alerted so that the doctor can plan for what happens this day or a future day for that patient or a group of patients. It is also helpful for managers to properly staff the doctor, which will reduce waiting time for patients, because if managers are able to know how many tests are likely to be scheduled in addition to what has been scheduled and what procedures are scheduled, managers can plan how many technicians, scribes or other support staff are needed for each doctor for that day or a week in advance.

[0453] The medical guidance system also enables physicians to pull up—as can their staff at any time, on any day, or in any office—any past patients seen in any office or a particular patient seen with certain disease states or procedures or diagnostic tests and see what was done on any given time period or visit. This is especially useful if the doctor references the record on the same day or shortly thereafter when the patients are fresh in their memory. Doctors can make certain that their examinations were filled out correctly, and these summaries enable the doctor to see what they are missing in documentation and what has not been ordered and/or they see everything that was performed diagnostically and procedurally and recall that a mistake might have occurred therefore allowing them to correct billing or the documentation in the chart before it is finalized while the patient examination is fresh in their mind. They might also see that a diagnostic test should have been done but during the busy day, they might have missed something and then at the end of the day they can quickly discover that something should have been done and order it for the next visit. They might even send a message through the system that has been created to ask that the patient come in sooner than the next scheduled appointment to get something done that might have been missed; or they could even call the patient. The user of the medical guidance system may also toggle between the summary page of all the patients seen on a day and instantly open up either a command center that summarizes that patient's entire historical data or the patient's chart in the EMR for further identification. This medical guidance system is the "bird's-eye view" of what will happen in any particular time period for any group of patients in an entire day or otherwise. This allows a doctor to home into the patient's chart and/or another summary page, such as the command center, and then quickly toggle back to the summary of all the patients seen that day.

[0454] The medical guidance system further enables doctors to create indicators for clinical support and preferred practice patterns. In particular, the doctors can set indicators for preferred practice patterns that would be able to be shown at the end of the day or other days through rows and columns what the doctor personally wants to say is an important thing to do or measure depending on the patients' diagnoses. Procedures performed, symptoms, or other indi-

cators can be alerted to the doctor. Tasks are created to warn doctors and the reporting systems measure these impacts.

[0455] The medical guidance system further enables doctors and their practices to track lack of authorizations, payments or rejections at the very earliest moment. Current systems require user-driven reports to be run manually to identify items that have not been paid or are rejected by insurance carriers. Most insurance companies send payment for hundreds of separate patient claims on the same electronic check that is then posted automatically to many different patient accounts without inspection or review by a billing or staff member. This electronic process was developed to reduce workloads on staff who before were required to read the explanation of benefits and apply the payment manually to each individual claim item in the billing system, which allowed for greater oversight of incorrect payments and rejections. Practices are now being forced to identify potential problems like lack of referrals, lack of authorizations, and documentation errors through cumbersome reports that then require personnel to research, correct, and resubmit to rectify. For instance, a provider may not be credentialed with the patient's insurance carrier because they are new to the practice. Practices can sustain huge loses if an error like this is not identified quickly. The medical guidance system enables individual CPT codes to be tracked instantly when rejected depending on the algorithm and the severity including the amount, specific insurance payors, and/or patients with high deductible plans. All pertinent data is analyzed and an indicator in a summary sheet or a task can be created to alert the appropriate staff members and physicians allowing the practice users to make corrections rapidly. Based on practice/user specifications—fully automated queries can generate indicators viewed with EC2 live while treating the patient, generate tasks to be worked by staff members, send automatic notifications to users identifying trends and errors immediately upon receipt of a rejection to prevent further errors, and drop rejected items into an open task system to be resolved and tracked by the appropriate staff. The medical guidance system informs multiple user groups within a practice ensuring proper communication of potential problems, patterns, and trends that impact every area of the business efficiently and rapidly, thereby improving the delivery of patient care and revenue cycle management.

[0456] Another embodiment of the medical guidance system automates the process of scheduling patients for new or return appointments as well as the need to respond and prioritize when patients call with issues or concerns. Scheduling can be initiated in a number of ways from a patient calling the first time for an appointment or if the patient is calling with an emergency or to schedule a required follow up visit. Also, an appointment may be initiated by a referring doctor calling directly to the office to schedule an appointment for a new or existing patient. In one embodiment, the complete past history of important data regarding the patient is available to determine how quickly and with which provider a patient may need to be scheduled. Human interaction can create misunderstandings, misinformation, and all the data about the patient may not be known. However, proper scheduling may be performed utilizing the known complete past history of important data including diagnosis, treatments and medications already integrated into the tool from the EMR.

[0457] FIG. **83** illustrates an embodiment of a patient scheduler and triage system implemented in a flowsheet table. The first step is identifying the patient to make sure there are past data elements in the system, which even if not in the practice being scheduled for, the tool integrates with all data bases, appointments, and encounters that the patient may have ever had. So, the tool cross-references and discovers issues of concern and important features when scheduling for that individual patient.

[0458] A medical record number **8301** is automatically inputted as this patient is checking out in the office for a future appointment. If it is on the phone, portal, or other mechanism where it is not automatically confirmed, the system asks for or automatically inputs medical record number **8301**. The name of the patient **8302** and date of birth **8303** is also provided along with the last four digits of the social security number **8304**. **8305** depicts that the patient is checking out from an office visit today and scheduling for a future appointment, while **8306** indicates that the patient is calling to schedule. **8307** indicates that a referring doctor called to schedule an existing patient, while **8308** indicates that a referring doctor called to schedule a new patient. **8309** indicates that a patient called not for a particular scheduled appointment, but rather called for a concern, question, or issue of any kind. **8310** indicates that the patient contacted the doctor's office through a patient portal or patient scheduling system.

[0459] A patient encounter is recorded, dated, and time stamped at **8311** using the information gathered at **8301**-**8310**.

[0460] **8312** illustrates a method of selecting what the current issue is which is most important. If a patient calls with symptoms, the system can relate new symptoms to any major diagnosis, or past procedures. A diagnosis that was selected within the last year or any time frame is illustrated at **8313**. The symptom or diagnosis may relate to a certain part of the body. In this illustration, the right eye **8314** includes rows that actually identify by codes that are internationally approved for active disease, inactive disease, or even scarring which is the least active of all. The same process, by the international codes, ICD 10, 9 or other is repeated for **8315**, the left side of the body. **8316** indicates that the code is occurring in both sides of the body. The codes depicted happen to be retina conditions in the eve that are known to have certain risk factors.

[0461] **8317** notes the last time any procedure or injection was performed and the system knows the more recent the procedure or the higher the risk, factors in the acute or not acute nature. For instance, certain surgical procedure actually have postoperative periods of one week, one month, three months based on regulations as well as risk factors of when the patient is totally healed.

[0462] **8318** indicates any relevant clinical measurement that is important that has been followed for that patient. The worst the clinical element compared to **8317** or the diagnosis in **8314**, **8315**, and **8316** increase the risk factors and help the system know the interaction of the event or encounter that is defined in **8311**. The system knows the diagnostic test or measurement that has been used to follow or multiple diagnostic tests that have been used to follow conditions in **8313**, **8314**, **8315**, and **8316** that also impact **8317** and **8318**.

[0463] **8320** indicates whether all patients sign consents when any procedure is performed, which list the specific risk factors and complications that occur with every procedure

and through natural language processing and actually inputting, the system knows what the risks are and correlate them to **8317** and the procedures.

[0464] Whenever **8317**, **8318** or **8319** are performed, the user and doctor inputs a plan of action assessment into each plan at **8321** and in that note it is explained the patient goals and possible risks or complications. **8317** or **8319** indicates whether it is a special type of diagnostic test such as an angiogram or if an injection as occurred in the arm or elsewhere as well as the treatment effect is expected to be, including if medications have been prescribed and that is the action taken in **8317** cross referencing of allergies, expected outcomes, adverse events. **8322** will identify if in the plan or EMR particular risks or symptoms may occur from the treatment.

[0465] **8323** identifies if in the EMR or plan there is a timing issue that is of particular concern or consideration. For instance, if after a treatment pain is expected for 24 hours if a patient calls 10 hours later the risk is low but if the pain continues for 48 hours the risk is higher.

[0466] **8324** is the symptoms if in fact the patient has at **8311** and at **8309** or **8310** contacted the practice in some form what the patient is reporting The systems as noted elsewhere can prompt the patient to answer certain questions yes/no to evaluate the symptoms and the patient respond yes or not but the symptoms factors in all of the data to be able to prompt correctly the questions for that particular patient based on **8312**, **8317**, **8318**, and **8319** and through techniques of NLP, machine learning and AI, and other techniques they have what is written in **8320**, **8321**, **8322**, and **8323**. **8323** specifies the timeliness of a complaint. For instance, if there is a procedure for **8317** and it is expected the patient will have pain for 24 hours and the patient calls for pain, there does not need to be a necessary emergent visit but if there is pain reported 24 hours or more the system will know the timing of this system in regards to expected versus not expected for **8317** or **8319**. **8325** will prompt the patient if **8324** is more than a symptom but perhaps there is a complaint or condition that **8317** or **8312** are associated so another series of questions can prompt the patient.

[0467] **8326** is for the special situations that the patient has cancelled, no showed or the doctor is cancelling an appointment and the risk factor associated with how quickly this patient needs to come in is evaluated.

[0468] **8327** indicates whether it is through a patient portal contact or other method and not through a phone call an entirely different way of prompting rather than responding yes or no on the phone or by human interaction by actually inputting the invention tells them to input from these prompted questions this would need to be more of a manual total automated communication with no human interaction like a call center of scheduling person.

[0469] **8328** indicates the preferred practice plans, clinical decision support and other means that can be suggested and evaluated when processed taking into the account the rest of the situations and what had been programmed in the system in one embodiment in an actionable dashboard that the user who is caring for this patient had set. Now taking all that into consideration **8329** allows a conclusion of how soon a patient should be seen at **8330**, **8331**, **8332**, or **8333**.

[0470] **8334** indicates when the system cannot form a conclusion and now the doctor or appropriate representative in the practice must be contacted. The indication can be a message or task or phone call or personal contact from a scheduler in the same office who is now asked to present the situation to the doctor. A task message or any other message may be used as described herein so that the doctor can make an informed efficient decision.

[0471] **8335** demonstrates the tool would also interact with the practice management system or clearinghouse or billing company and knows for that patient if any money is owed or other financial issues or whether a referral or authorization is needed and can send this information to the billing department, clinical department so when the patient presents for the appointment an authorization is already received and the automated computer or the human being in addition to scheduling the appointment with the patient can mention please bring 'X' amount of money owed or the following needs to be done to be able to be seen.

[0472] Thus, in this embodiment, the actionable dashboard acts as a patient triage and scheduler, assisting receptionists and in some embodiments scheduling appointments. If human interaction is warranted, because a patient initiates contact with the practice by way of a telephone call or through a patient portal or automatically and can answer some questions, the dashboard is programmed to identify certain issues or symptoms that a patient may have and evaluate the importance of time and the danger to that individual patient. This is done based on data that had been previously entered in the actionable dashboard in some embodiments in rows and columns. If the patient had any kind of procedure, surgical, injections, or had been given any type of new medication or an action taken that could impact the patient, i.e. an allergic reaction, pain, or any other factor, the actionable dashboard is aware that this patient is at risk and can schedule an appointment. Based on the risk identified by the invention, the patient will be scheduled either emergently, in one day or other period indicated according to the risk factor.

[0473] Whenever a user performs a procedure, an action, or prescribes a medication, patients have to consent to actions, especially the procedural and surgical ones. This could include injections, laser, biopsies or the like. At the time of consent, the risks and side effects are explained to the patient and the patient signs permission to have the specific procedure be performed. The consent allowing treatment to be done is stored within the EMR system. Additionally, when a provider performs a procedure the doctor explains and notes in their plan or elsewhere, what the side effects and risks to this procedure can be. Through natural language processing and machine learning, all of this is known and interpreted by one of the embodiments and takes into account the risks of each of the symptoms, side effects that can occur and how much of a risk it is to the person. The moment a patient contacts the provider by any means, whether through the portal or a telephone call by this communication being inputted into the system the tool identifies any side effects, risks, symptoms or signs that could be related to the procedure or prior action or medical service delivered by the provider. Any possible complications, problem, ineffective treatment, or worsening from treatment or medical services or medications prescribed, in one embodiment this is measured, evaluated, processed and displayed in multiple ways and can be help direct a human scheduler, if they are inputting this. The tool can also make automated contact and response to a scheduling module, which then schedules appropriately the patient as needed based on determined risk. The same is true when a patient

misses, no shows, or cancels an appointment or the user and the doctor cancel an appointment. Unbeknownst to the doctor, are the risks of delay of care and evaluation when patient appointments are not kept for any reason, including even the practice cancels an appointment perhaps when they cancel. The patients being canceled by the practice can be evaluated and risk to cancellation measured with proper scheduling of the patient to limit risk performed. For instance, if it is a postoperative visit, after a major procedure, or the patient has been having some symptoms that are high-risk and have been inputted into the plan and through natural language processing, the risks are known so when this patient is being re-scheduled because the practice cancels, when this patient should be re-scheduled, can also automatically occur based on risk factors or human interaction and the tool displays the appropriate scheduling action. This is critical because the doctor can go on vacation and cancel important follow up for patients. Receptionists who re-schedule the patient are not doctors or trained professionals who really understand the risk factors of delaying care. The tool can evaluate and identify the proper time for re-scheduling. Note, the risks, complications or expected results for any action or medical service that a doctor or user does, is inputted into the system. The tool integrates with EMR and PM system and already has the data.

[0474] The tool knows, the diagnosis, the doctor previously entered with treatments and when performed. All interpreted together with natural language processing and the complaints and symptoms of the risk can be identified. Once an appointment is missed or a patient contacts the office for any reason, the risk factor for this patient is identified by the tool with input from the scheduler, phone triage person or automated selection by the patient.

[0475] The tool also can work with the human being that makes the telephone call or portal contact is the invention knows all the diagnosis, the procedures, and the risk of complications and symptoms. When the patient makes contact, very similar to in automated phone calls, like when you try to make a ticket on an airplane, certain questions are asked to the user to then hit one, two, or say yes, no. So, when the patient calls, the questions would be: state you name, what is your date of birth, and what are the last four digits of your social security number. The invention then has the identifying information and can then lead with certain questions that the tool can determine is a high-risk for that patient. For instance, "I see you had the following procedure when you were last in the office on . . . . We would like to ask you a series of questions to identify how to best answer your questions and schedule you if needed." Are you having the following symptoms? Press 1 if yes or say yes or press 2 if no. Are you having the following situation . . . ? Press 1 if yes, press 2 for no or say no, or if uncertain, press 3. FIGS. **84**A-**84**C illustrate sample questions for the patient.

[0476] This would continue depending on what the tool has identified that the user had inputted in the past and through preferred practice plans and the understanding of those conditions, a series of questions of importance can be asked. NLP, AI, and machine learning all can see and interpret what has been inputted in the EMR. The questions then are tailored appropriately for the patient. The concluding statement could be "We understand you have said, after you receive certain medical service on the date last seen, and you are calling because you are saying that you have symptom X, concerns Y, new developments Z." Press or say yes if this is the question you are calling about. Press or say no if it is not the question. The tool based on the responses, can make recommendations transferring the patient to this scheduling office.

[0477] Clinical staff that will have to make the decision when a scheduler or receptionist requests direction. When a patient is seen in the office and is checking out to get an appointment and something does not match up, the tool can confirm the orders the doctor placed for scheduling is followed by the receptionist. If not, the tool can warn the receptionist or the patient if they are scheduling themselves through the computer check out process. All can be double-checked by the tool and if there is an alert or human interaction needed, it occurs. The provider have far fewer issues to address because the automated process of the tool can work more accurately, efficiently, and quickly to solve all these problems. No longer do patients get lost in the mix of waiting for a return phone call or being scheduled incorrectly. But, when the doctor is contacted because the invention is unable to come up with an answer or the patient, needs to contact the doctor for other issues, the doctor instantly has the task or an alert sent along with the single screen display view the tool creates, along with the issue the patient or staff have identified, and the doctor, can make an accurate recommendation on scheduling. FIG. **84**D illustrates sample formulas for urgency of appointments, while FIG. **84**E illustrates a flow for handling patient calls for an appointment.

[0478] In another sample embodiment, the medical guidance system may include a triage scheduling tool that allows someone who is not a sophisticated clinician the ability to rapidly understand the urgency of scheduling the patient's next appointment. To properly triage the patient and determine the urgency of when the patient should be seen next, the triage scheduling tool displays information about the patient's current condition and a computed severity index. It is important to note that this interface could be a graphical user interface or, in some cases, adapted to create a severity index using a phone system in conjunction with the task system in the tool in order to alert staff members to schedule an appointment. The severity index consists of a lower bound and an upper bound. An example of the lower bound would be 0 and the upper bound would be 10. Severity indexes with high values are understood to be more urgent for the patient to be seen. Those values which approach the maximum upper bound are understood to be emergency situations. Values which are at the lower end of the scale are known to be less important and can be scheduled at the patient's and/or clinic's convenience.

[0479] FIG. **85** illustrates the interaction of the triage scheduling with a machine learning system. As illustrated in FIG. **85**, in order to be able to assign a severity index to patient, the triage scheduling tool is first trained using Machine Learning techniques on millions of rows of existing patient data examining chief complaints and the various outcomes that occur based on a patient's medical history. As the system continues to train, it is understood that the severity index will become more accurate over time. An additional way the system will improve its accuracy is by creating a feedback loop whereby the staff member is able to rate the severity index as to how accurate it was. Once the staff member has assigned a rating as to how accurate it was, the feedback loop will incorporate the rating into future severity index calculations. The system shall also learn by

examining when the appointments were made in relationship to available openings to determine the selected course of action. Once the system has been sufficiently trained, it will then be able to assess risk by analyzing the patient's chief complaint to create a severity index to assist staff with scheduling the patient.

[0480] The severity index is created by examining the patient's procedures, problems, observations as well as understanding the patient's chief compliant and the medical professionals notes, such as but not limited to assessment, outcomes and plans using natural language processing. The patient's complaint is classified using machine learning classification algorithms in order to classify portions of the chief complaint which are relevant to the patient's current condition. Once the text has been classified, it can then be included in a calculation in conjunction with the patient's current problem list, observation history, recent procedures.

[0481] For example, a patient may have an acute complaint which, in conjunction with a certain procedure, would require an appointment immediately because the patient is at major risk of suffering severe complications which includes, but is not limited to, blindness, death, etc. Such a situation would result in a severity index which is close to or at the upper bound indicating the need for an immediate appointment or recommendation to proceed to an emergency room. Another possible example is that the patient has an acute complaint of mild discomfort but has not had any of the following but not limited to, a recent procedure, new prescription, medical observation, etc. In such a scenario, the patient's severity index could be at the lower end of the scale indicating the patient can be scheduled at the clinic or patient's convenience

[0482] The state of triage and knowing when patients are urgent and when they are not can always be improved upon in a practice. Practices handle things in different ways. Every practice has its own ideas of what they think is urgent and how to triage and questions that can be answered. But, often practices are not even implementing what they actually have written. Training is suspect and unless there is a fool-proof way where every patient is put through a computer program, which can be verified to double-check what is hopefully to happen verbally, patients will slip through the cracks. Another idiosyncrasy is often patients can be more demanding and some less demanding. Some might insist on being seen urgently because they have higher stress and others will just accept what the person on the telephone says. Even these factors need to be known. If a patient has higher stress and is pushier, that needs to be calculated and possibly the computer program bumps it out because that type of person should be seen and not just by the person on the telephone, who is an operator, but rather get someone else on the telephone who can talk to that patient or even if the patient cannot be fit in that day and the initial assessment is that it is not urgent and can wait a week, if the patient is that stressed, suggestions in the computer can then be made and someone in management calls the referring doctor to explain and the referring doctor's office can help a patient understand that the next available appointment given is appropriate.

[0483] With too few doctors, too many patients and so many diseases, there needs to be a way of figuring out which patients need to be seen when and leaving it up to whoever is answering the telephone is how the world of medicine has now and always worked. The medical guidance system can help triage the patients whereby when a patient calls for an appointment, the medical guidance system would triage the patient appropriately and then further questions can be answered by a human being if necessary. A computer answering service may triage medical appointments in urgent situations.

[0484] By tracking what the patient is looking for, or the questions or the query, the proper risks can be identified. So, even if it is not a situation where the patient is calling by telephone but rather emailing or texting and now with the days of patient portals where patients can communicate online, now more than ever it is important that there be a computer algorithm within the medical guidance system that can evaluate, assess and manage all of these patient queries.

[0485] Another aspect of the medical guidance system enables it to interface with the patient portals when they try to contact doctors or staff with questions or requests. Anything from refills of medications or symptoms and asking the doctor to communicate with them. The reality is doctors often do not have the time to communicate with each and every single patient. Therefore, medical guidance system will evaluate every query, look at the patient from a historical aspect if they are an existing patient, if they have had procedures or a risky diagnosis so that they can manage to let the doctor know when they get many queries a day, which ones might be more problematic and urgent based on patient's symptoms, diagnosis, and past procedures. If the doctor does not respond in a specified period of time, these queries will then bounce to the practice manager or anyone else to try to help practices manage the numerous requests that are coming in every day because of portals and electronic abilities. In the past, simple telephone calls were difficult to manage. Now patients can simply go online and email and text or through the portal and ask any question. This makes it very difficult to be able to assess the type of risk. In sample embodiments, natural language processing may be used to assess the risk.

[0486] The medical guidance system may also include a Smart Actionable Dashboard that enables users to send a message to each other in a HIPAA compliant way. n other words, a physician, while seeing a patient, can send a message to their chief technician or the office manager to talk about following up on a patient or also to the billing office that there is a billing problem. Then, staff can report back to the doctor and this message can be imbedded into the smart actual dashboard so that the next time a doctor sees the patient through icons and columns of correspondence of communication within the practice, the doctor can pull up what was the response to a message they had sent earlier. This response can be read live while treating the patient so that the doctor can take it into perspective while making decisions. The messaging system, attachments or anything else can be sent to the doctor or health care provider in any way that they would want. Whether through email or the internal messaging system or as a tickler system within the EMR system that automatically toggles back and forth to the actionable dashboard, so the doctors can see their messages at the end of the day or the end of the week, or while seeing the patient. This feature really helps organize the doctor's life, so this actionable dashboard becomes the communication hub, the switchboard, for the entire practice, while communicating with the health care provider.

[0487] The medical guidance system further provides the ability to tailor what is being evaluated and followed for any

particular patient in regard to both scheduling appointments, scheduling laboratory work, diagnostic tests and that is problem list orientated where the system identifies a particular problem list that a patient has. A particular problem list or disease state has a very clear-cut way of providing care for the patient and even treating the disease that have been statistically and clinically evaluated. These guidelines are what the tool uses to populate but also it allows for doctors to tailor care and testing based on their clinical judgment. Patient's appointments, diagnostic tests, surgeries and even clinical findings can all he tracked over time by many different methods including columns and rows of the patient flowsheet's table. One method follows a patient over time to make certain they get correct scheduled appointments or diagnostic tests ordered, is for all the office visits or any kind of encounter the patient has (e.g., testing days, procedure days, etc.) and even forms of communication that all can be date stamped and organized chronologically or otherwise in many ways the tool allows but also in rows or columns in the flowsheet table. Columns or rows can represent many different procedures, diagnostic tests, laboratories, scheduled appointments, vaccinations that the patient receives or should receive over time. As the patient receives tests or anything necessary in any column, it is auto populated or can be inserted manually. The columns or rows may identify what procedure needs to be followed based on a problem list or condition the patient has can change so that for instance if this is followed in a flow sheet or any type of dashboard can be tied to columns and/or rows changing based on the particular disease state or problem list or symptoms that a patient has. The problem list can be anything from disease state to any ICD-10 or CPT code, symptom or even social and community problems.

[0488] By way of example in the field of obstetrics, certain clinical findings that are followed have been suggested by the American College of OB-GYN including clinical measurement findings like fundal height and according to the week's gestation, which corresponds to how many weeks the patient has been pregnant. There are set guidelines on what needs to be ordered for different weeks. All patients have their weight followed, blood pressure and may get one ultrasound done during the pregnancy or a fetal stress test perhaps. However, most healthy women will not require certain things to be followed, which can be listed in columns. Diagnostic tests such as EKGs and echocardiograms are not something that would normally be needed in a pregnant female. However, if a problem list or ICD-10 of the patient having chronic hypertension, those patients automatically need EKGs, echocardiograms and might need baby aspirin and therefore columns can appear for that patient's specially designed dashboard because the problem list of chronic hypertension was identified. A column for EKG and echocardiogram occur and based on the date it is auto populated when the EKG or echocardiogram is done in comparison to all of the times corresponding to all the rows of different dates the patient was examined or had a test done. This way a doctor can quickly be looking at a glance and see all the clinical findings of a patient, but have a dashboard automatically tailored because the patient has chronic hypertension. Further, since some of these tests are at certain periods of time dependent on the age of the patient and weeks of gestation to remind a doctor to get an EKG or echocardiogram, a particular column and/or row and or date and the cross-section of a date/row/column and the test can light up reminding the doctor to order or if a particular vaccination is needed at a particular time that column or the header can in some way alert a doctor by blinking, changing colors, etc. Each of the columns and what is needed for an individual patient can change based on different chronic diseases such as chronic hypertension and morbid obesity where a column with the heading consults needed (i.e., nutritional counseling) and when completed the day of order is noted and the day of completion all perhaps on a row of the date of action. Another of the hundreds of examples might be a patient with advanced maternal age can be another problem list which requires an entirely different group of tests and procedures need to be performed at designated times. Those tests would be programmed in and the columns would appear for that particular patient. If the patient has more than one problem list the computer will know what tests need to be ordered and when for each of the problem lists and then the dashboard is specifically tailored automatically for that patient.

[0489] The tool works as follows in the case of an obstetrics example. When a patient first comes in to see the doctor when they loam or believe they are pregnant, the doctor evaluates the patient and creates various problem lists the patient has and the doctor anticipates what that patient in particular may need over the next nine months of the pregnancy until delivery. All of this may be anticipated at the first or second visit with regimented follow up visits over the remainder of the pregnancy and very specific tests, counseling, vaccinations, treatments planned for according to the needs of the patient and the problem list that patient may have and with population health and understanding the socioeconomic and cultural and religious considerations all needs to be factored in. The doctor develops the plan of action and sets up the game plan. But the challenge is how to make certain that everything is carried out and how to check each time the patient returns for a visit. The doctor will fill out on the first visit a section on risks the patient has (i.e. chronic hypertension, diabetes, advanced maternal age, etc.) Depending on specialty and EMR they use, the doctors may have a menu of items that are sorted though and templates filled out of what to expect and is needed during the pregnancy so that the plan may be followed. However, ail of this often has to be done manually and updated manually by the doctors or their technicians, perhaps residents and if they are not careful to really comb through each problem list at every visit, things will get missed. Things might be updated for one problem, but not in a different problem and if there is overlap and therefore it can be not clear to know what did. or did not happen mistakes happen and in EMR systems there is no real way to unify that in one space.

[0490] The medical guidance system may understand that these are the problems that the provider clicks off. The tool receives all the menu of items that the provider likes to provide for these patients into one single dashboard. Thereby the providers know if their patient has chronic hypertensive, diabetic and advanced maternal age and can be certain all is correctly being done. Then, columns in the actionable dashboard are updated with what all clinical and diagnostic information is needed i.e. blood pressures, did the patient get her echo, did she get her EKG. The provider then can click on perhaps an icon or representation or column or row that hosts the results and the provider can view the results and even see the test itself. Then, if a patient needs

something like an ultrasound in the third trimester a future row or column lights up because all the future office visits expected can be seen in rows and alerts on rows as needed.

[0491] In obstetrics, the is usually paid one time for all the visits over the nine months. But if there is an unplanned visit because the patient comes in for a sore throat or discharge that can be separately billed so even the billings and payments can be on each row so that the provider can be involved in all aspects. If a patient misses a particular visit, the medical guidance system knows this and can send a reminder or message or alert. By having everything the provider needs to know and to evaluate that particular patient, customized columns for that patient's situation provides everything at a glance for evaluation with no information more than a click or two away and all brought up on the same screen so that the doctors do not lose track of the global situation.

[0492] Some insurance providers may only allow certain number of tests for a particular condition (i.e., in obstetrics a number of ultrasounds that are included in the "package" and others pay for each one). The tool informs the healthcare provider of all such options.

[0493] It will be appreciated that a personalized dashboard can be generated by the healthcare provider by clicking on the problems and the diagnosis that the patient has and the tool through AI and algorithms knows what is needed to be done and when, which test need ordering, which symptoms should be asked about based on each of those diagnoses. Obviously, in primary care there are a lot more diagnoses then in ophthalmology or pregnancy but they all can work with each other. The tool has a built dictionary and all doctors. seen by the patient can share dashboards. Even though the respective doctors may have separate dashboards by specialty, the healthcare providers can click on which columns are in each problem dashboard and migrate into a central dashboard—the snapshot dashboard.

[0494] Those skilled in the art will appreciate that the operations described herein are implemented in software implemented as instructions stored in instruction memory and processed in processors of one or more of the servers of the Command Center **5000** illustrated in FIG. **57** and/or the processors **32** of FIG. **14**. The design of the data tables and XML structures have been laid out to enable all of the data generated for presentation to the Command Center interface of FIGS. **1** and **15**, for example, to be processed in advance and stored in the presentation tables where possible in order to minimize delays in table generation. Also, the display tables are all tied to the Command Center interface so that the user need not navigate away from the Command Center interface to access any of the data described herein. The software operations may be implemented in a special purpose system of the type illustrated in FIG. **57**, for example, or the software may be implemented in a general purpose computer that can also perform other processing, program execution or routines that are not part of the special purpose, while still being capable of operating for the special purpose. Alternatively, the operations can be processed by a general purpose computer selectively activated or configured by one or more computer programs stored in the computer memory, cache, or obtained over a network. When data is obtained over a network the data can be processed by other computers on the network, e.g. a cloud of computing resources.

[0495] Those skilled in the art will appreciate that the software instructions for implementing the algorithms and XML functionality described herein may be stored in conventional computer-readable storage media. Computer-readable storage media, as used herein, refers to physical or tangible storage (as opposed to signals) and includes without limitation volatile and non-volatile, removable and non-removable storage media implemented in any method or technology for the tangible storage of information such as computer-readable instructions, data structures, program modules or other data.

[0496] Although method operations can be described in a specific order, it should be understood that other housekeeping operations can be performed in between operations, or operations can be adjusted so that they occur at slightly different times, or can be distributed in a system which allows the occurrence of the processing operations at various intervals associated with the processing, as long as the processing of the overlay operations are performed in the desired way.

[0497] Those skilled in the art will appreciate that while XML is used to encode data in the illustrated embodiments, other data formats can be used, for example JSON or simple comma delimited text files. Also, those skilled in the art will appreciate that the Command Center embodiments described herein may be modified to include automated mobile messages to patients for usage of medication with feedback to the patient's Command Center along with appointment reminders, bill reminders, etc. A summary of this information may be provided in a display panel of the Command Center in succinct form for the physician. This information enables the physician to determine at a glance whether the patient is reliable or unreliable regarding taking medications, following medical directions, and the like.

[0498] It will be appreciated by those skilled in the art that while the description has been directed to particular embodiments and examples, the tool described herein is not necessarily so limited, and that numerous other embodiments, examples, uses, modifications and departures from the embodiments, examples and uses are intended to be encompassed by the claims attached hereto. For example, while detailed embodiments describe the use of systems for presenting medical and financial data related to treatment of patients by an ophthalmologist, those skilled in the art will appreciate that the medical data may relate to other medical practices such as dentistry, orthopedics, oncology, and the like. In addition, the techniques described herein may be applied to the presentation of data in other contexts, such as the presentation of stock market and other types of dynamic data. These and other features and advantages are set forth in the following claims.

1. A data command center visual display system that displays data on a display screen, comprising:

a patient database that stores patient identification information and patient medical information;

a computer readable storage medium having instructions stored thereon; and

a processor that executes said instructions, said instructions when executed causing the processor to perform operations including:

creating adjustable display panels configured to display predetermined combinations of said patient identification information and patient medical information;

creating a patient flowsheet including a table that presents the patient's medical information by at least one of medical service, medical procedure, diagnostic test,

medication, and diagnosis that is prescribed, ordered, performed, or selected during respective encounters with at least one medical provider;

in response to selection by a user of the visual display system, presenting at least two of the adjustable display panels containing medical information relating to one or more patients in the patient flowsheet,

enabling the user to edit or move the medical information or the patient identification information within the at least two display panels while the at least two display panels are simultaneously open; and

presenting the at least two adjustable display panels and the patient flowsheet to the display screen in a single view.

2. The display system of claim **1**, wherein the table in the patient flowsheet comprises a summary report of medical conditions of a plurality of patients, the instructions further including instructions that when executed cause the processor to perform operations including enabling the user to at least one of order and schedule at least one of a medical service, medical procedure, diagnostic test, medication, and diagnosis for one or more patients from the table.

3. The display system of claim **1**, wherein the table in the patient flowsheet comprises a summary row that summarizes at least one of a medical service, a medical procedure, a diagnostic test, a medication, and a diagnosis that has been provided to the patient in a previous encounter, the instructions further including instructions that when executed cause the processor to perform operations including enabling the user to select medical information corresponding to at least one of the summarized medical service, medical procedure, diagnostic test, medication, or diagnosis from the table for viewing.

4. The display system of claim **1**, wherein the instructions further include instructions that when executed cause the processor to perform operations including selectively activating portions of the table to instruct the user that actions should be taken to update the medical information or the patient identification information in the table based on at least one of medical service, medical procedure, diagnostic test, medication, and diagnosis that has previously been prescribed, ordered, performed, or selected during a current or previous encounter with the at least one medical provider.

5. The display system of claim **1**, wherein the instructions further include instructions that when executed cause the processor to perform operations including performing a search of the patient database and creating a patient flowsheet for those patients that match one or more search criteria.

6. A method of displaying data on a display screen, comprising:

creating adjustable display panels configured to display predetermined combinations of patient identification information and patient medical information;

creating a patient flowsheet including a table that presents the patient's medical information by at least one of medical service, medical procedure, diagnostic test, medication, and diagnosis that is prescribed, ordered, performed, or selected during respective encounters with at least one medical provider;

in response to selection by a user of the visual display system, presenting at least two of the adjustable display panels containing medical information relating to one or more patients in the patient flowsheet,

enabling the user to edit or move the medical information or the patient identification information within the at least two display panels while the at least two display panels are simultaneously open; and

presenting the at least two adjustable display panels and the patient flowsheet to the display screen in a single view.

7. The method of claim **6**, wherein the table in the patient flowsheet comprises a summary report of medical conditions of a plurality of patients, further comprising enabling the user to at least one of order and schedule at least one of a medical service, medical procedure, diagnostic test, medication, and diagnosis for one or more patients from the table.

8. The method of claim **6**, wherein the table in the patient flowsheet comprises a summary row that summarizes at least one of a medical service, a medical procedure, a diagnostic test, a medication, and a diagnosis that has been provided to the patient in a previous encounter, further comprising enabling the user to select medical information corresponding to at least one of the summarized medical service, medical procedure, diagnostic test, medication, or diagnosis from the table for viewing.

9. The method of claim **6**, further comprising selectively activating portions of the table to instruct the user that actions should be taken to update the medical information or the patient identification information in the table based on at least one of medical service, medical procedure, diagnostic test, medication, and diagnosis that has previously been prescribed, ordered, performed, or selected during a current or previous encounter with the at least one medical provider.

10. The method of claim **6**, further comprising performing a search of the patient database and creating a patient flowsheet for those patients that match one or more search criteria.

* * * * *