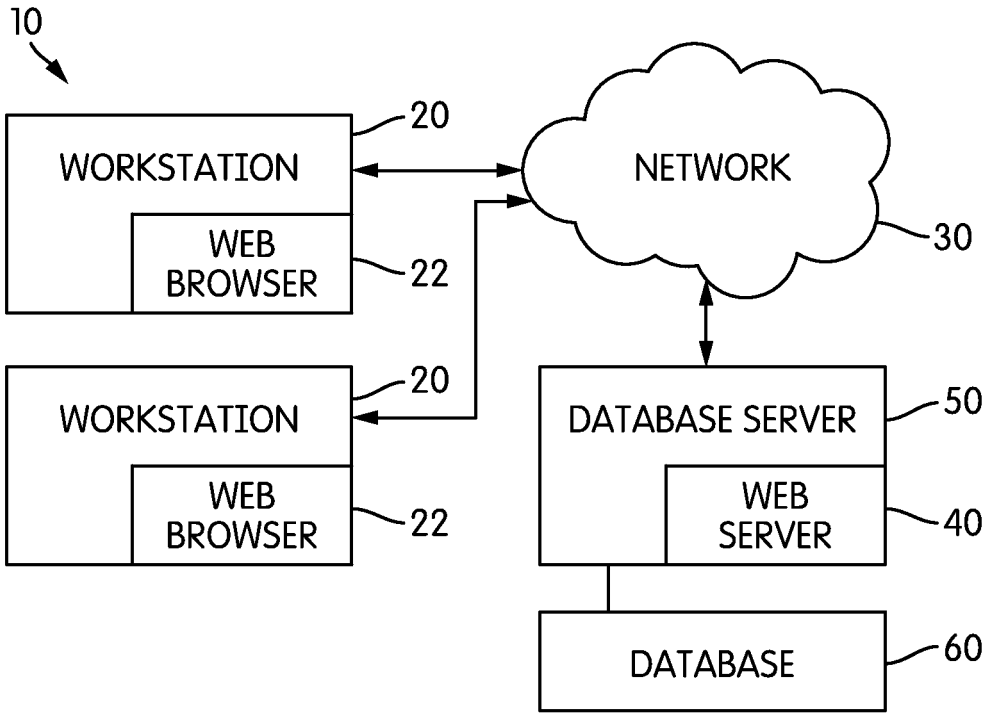
10
WORKSTATION
20
WEB BROWSER
22
NETWORK
30
WORKSTATION
20
WEB BROWSER
22
DATABASE SERVER
50
WEB SERVER
40
DATABASE
60

FIG. 1

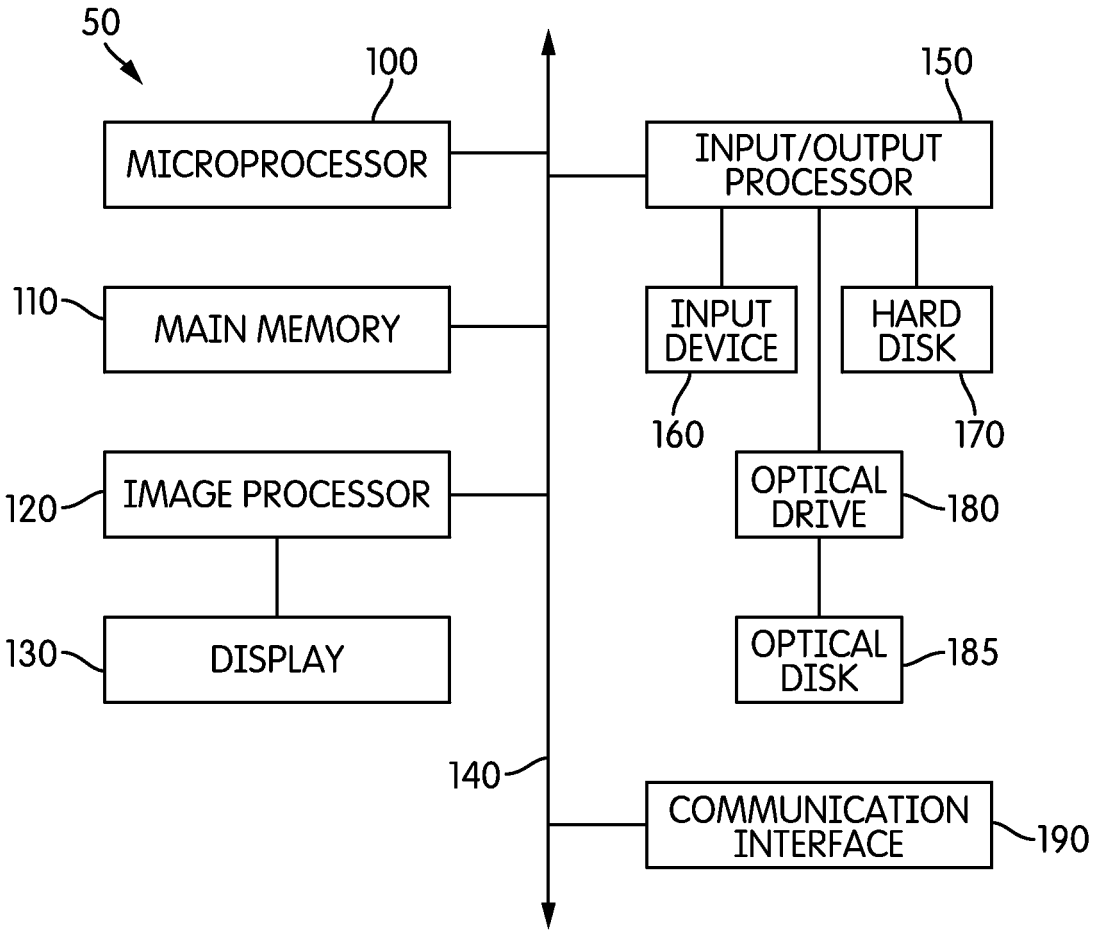
50
100
MICROPROCESSOR
150
INPUT/OUTPUT PROCESSOR
110
MAIN MEMORY
INPUT DEVICE
HARD DISK
160
170
120
IMAGE PROCESSOR
OPTICAL DRIVE
180
130
DISPLAY
OPTICAL DISK
185
140
COMMUNICATION INTERFACE
190

FIG. 2

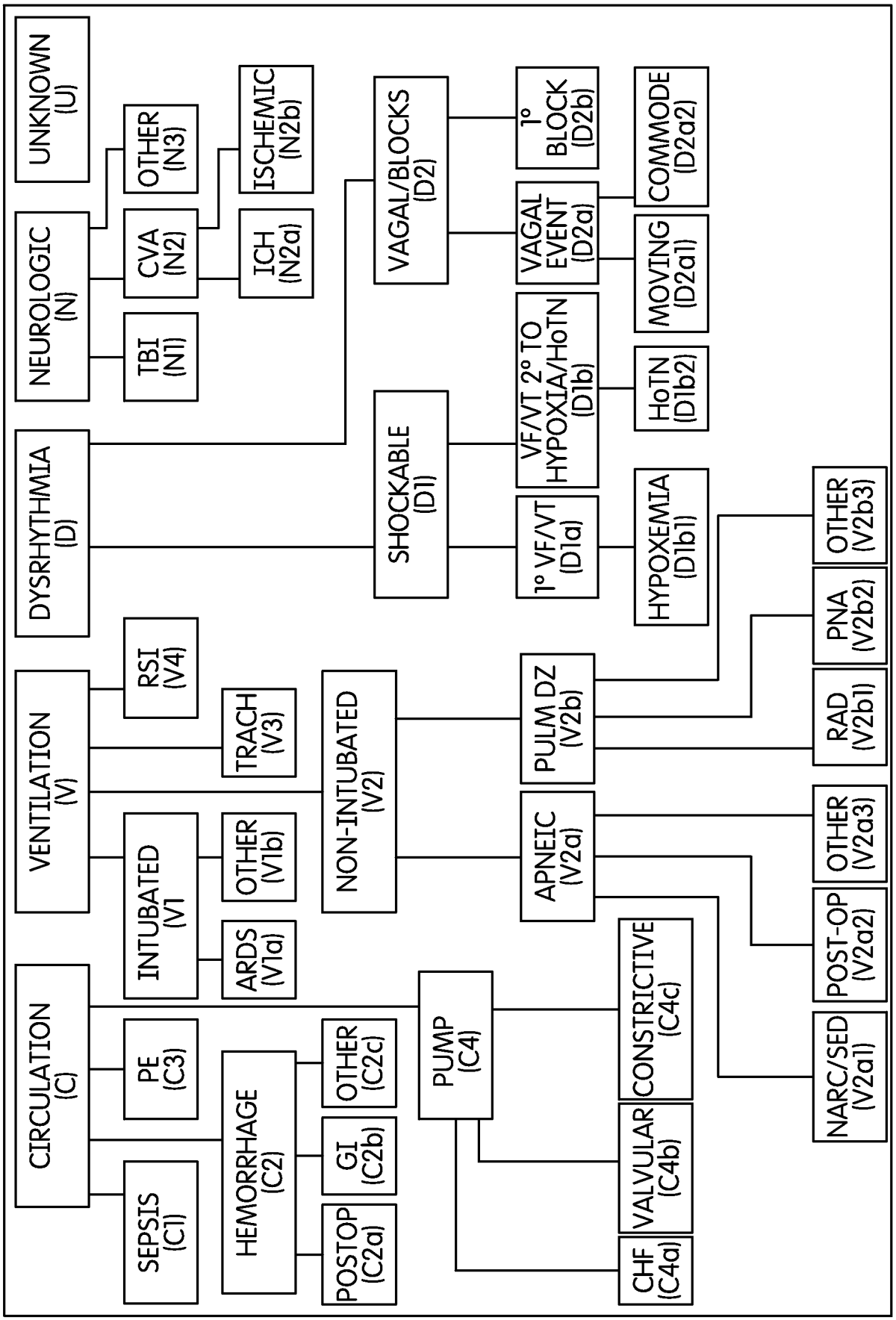
UNKNOWN (U)
NEUROLOGIC (N)
CVA (N2)
OTHER (N3)
ISCHEMIC (N2b)
ICH (N2a)
TBI (N1)
DYSRHYTHMIA (D)
VAGAL/BLOCKS (D2)
1° BLOCK (D2b)
VAGAL EVENT (D2a)
COMMODE (D2a2)
MOVING (D2a1)
SHOCKABLE (D1)
VF/VT 2° TO HYPOXIA/HoTN (D1b)
HoTN (D1b2)
1° VF/VT (D1a)
HYPOXEMIA (D1b1)
VENTILATION (V)
RSI (V4)
TRACH (V3)
INTUBATED (V1
OTHER (V1b)
ARDS (V1a)
NON-INTUBATED (V2)
PULM DZ (V2b)
OTHER (V2b3)
PNA (V2b2)
RAD (V2b1)
APNEIC (V2a)
OTHER (V2a3)
POST-OP (V2a2)
NARC/SED (V2a1)
CIRCULATION (C)
PE (C3)
SEPSIS (C1)
HEMORRHAGE (C2)
OTHER (C2c)
GI (C2b)
POSTOP (C2a)
PUMP (C4)
CONSTRICTIVE (C4c)
VALVULAR (C4b)
CHF (C4a)

FIG. 3

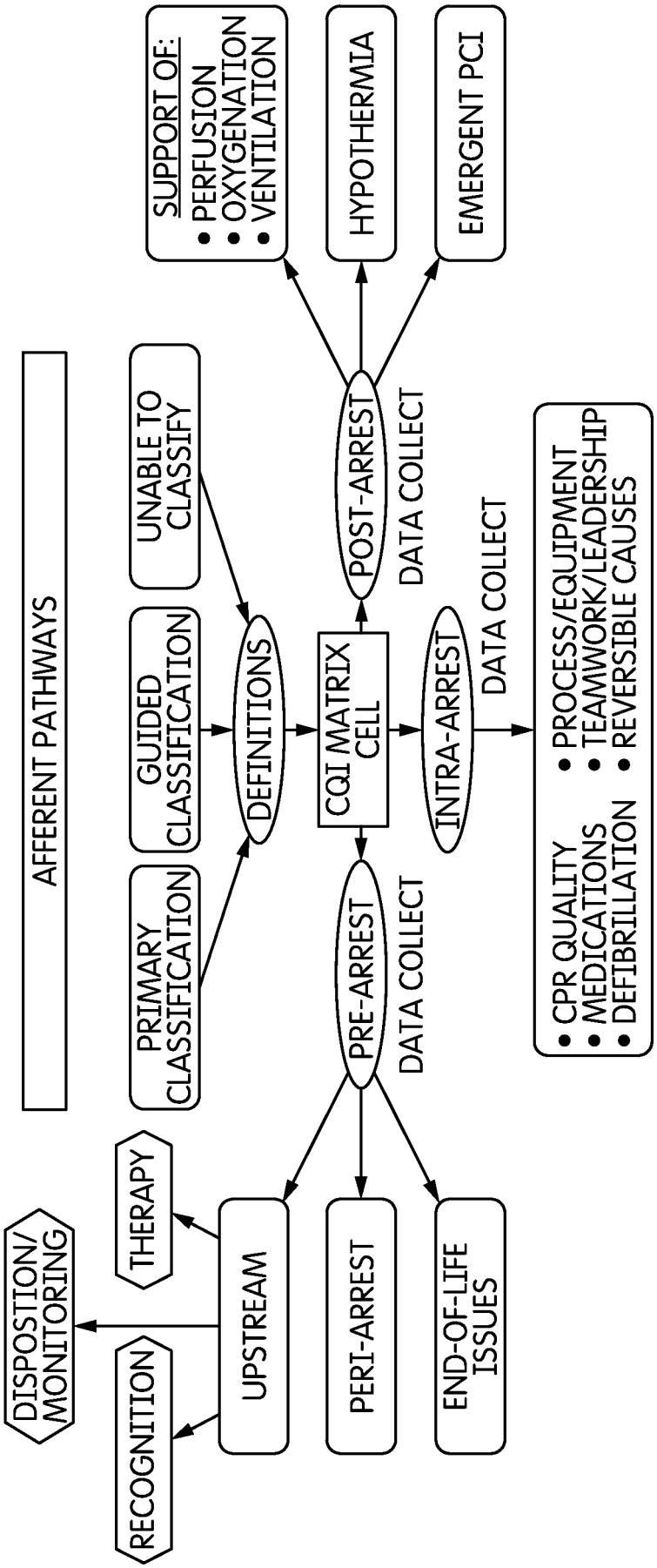
AFFERENT PATHWAYS
PRIMARY CLASSIFICATION
GUIDED CLASSIFICATION
UNABLE TO CLASSIFY
DEFINITIONS
CQI MATRIX CELL
PRE-ARREST
DATA COLLECT
INTRA-ARREST
DATA COLLECT
POST-ARREST
DATA COLLECT
SUPPORT OF:
• PERFUSION
• OXYGENATION
• VENTILATION
HYPOTHERMIA
EMERGENT PCI
• CPR QUALITY
• MEDICATIONS
• DEFIBRILLATION
• PROCESS/EQUIPMENT
• TEAMWORK/LEADERSHIP
• REVERSIBLE CAUSES
UPSTREAM
PERI-ARREST
END-OF-LIFE ISSUES
RECOGNITION
THERAPY
DISPOSITION/ MONITORING

FIG. 4

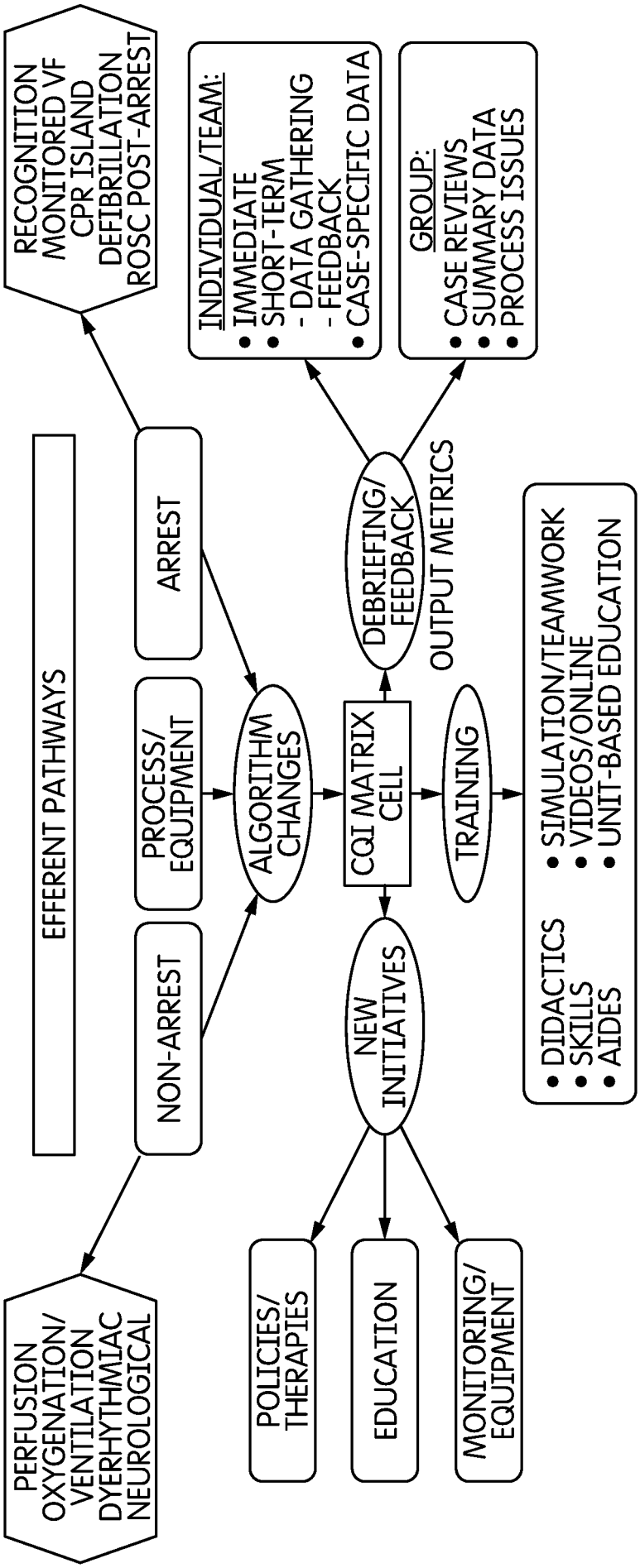
RECOGNITION
MONITORED VF
CPR ISLAND
DEFIBRILLATION
ROSC POST-ARREST
INDIVIDUAL/TEAM:
• IMMEDIATE
• SHORT-TERM
- DATA GATHERING
- FEEDBACK
• CASE-SPECIFIC DATA
GROUP:
• CASE REVIEWS
• SUMMARY DATA
• PROCESS ISSUES
EFFERENT PATHWAYS
ARREST
PROCESS/
EQUIPMENT
NON-ARREST
ALGORITHM
CHANGES
CQI MATRIX
CELL
DEBRIEFING/
FEEDBACK
OUTPUT METRICS
TRAINING
NEW
INITIATIVES
• DIDACTICS
• SKILLS
• AIDES
• SIMULATION/TEAMWORK
• VIDEOS/ONLINE
• UNIT-BASED EDUCATION
PERFUSION
OXYGENATION/
VENTILATION
DYERHYTHMIAC
NEUROLOGICAL
POLICIES/
THERAPIES
EDUCATION
MONITORING/
EQUIPMENT

FIG. 5

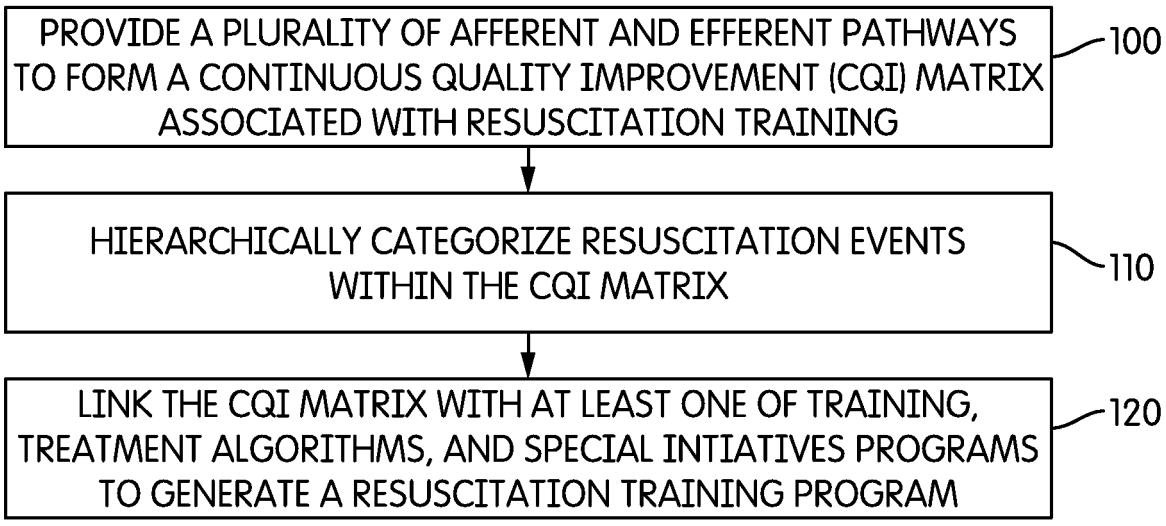
PROVIDE A PLURALITY OF AFFERENT AND EFFERENT PATHWAYS TO FORM A CONTINUOUS QUALITY IMPROVEMENT (CQI) MATRIX ASSOCIATED WITH RESUSCITATION TRAINING
100
HIERARCHICALLY CATEGORIZE RESUSCITATION EVENTS WITHIN THE CQI MATRIX
110
LINK THE CQI MATRIX WITH AT LEAST ONE OF TRAINING, TREATMENT ALGORITHMS, AND SPECIAL INTIATIVES PROGRAMS TO GENERATE A RESUSCITATION TRAINING PROGRAM
120

FIG. 6

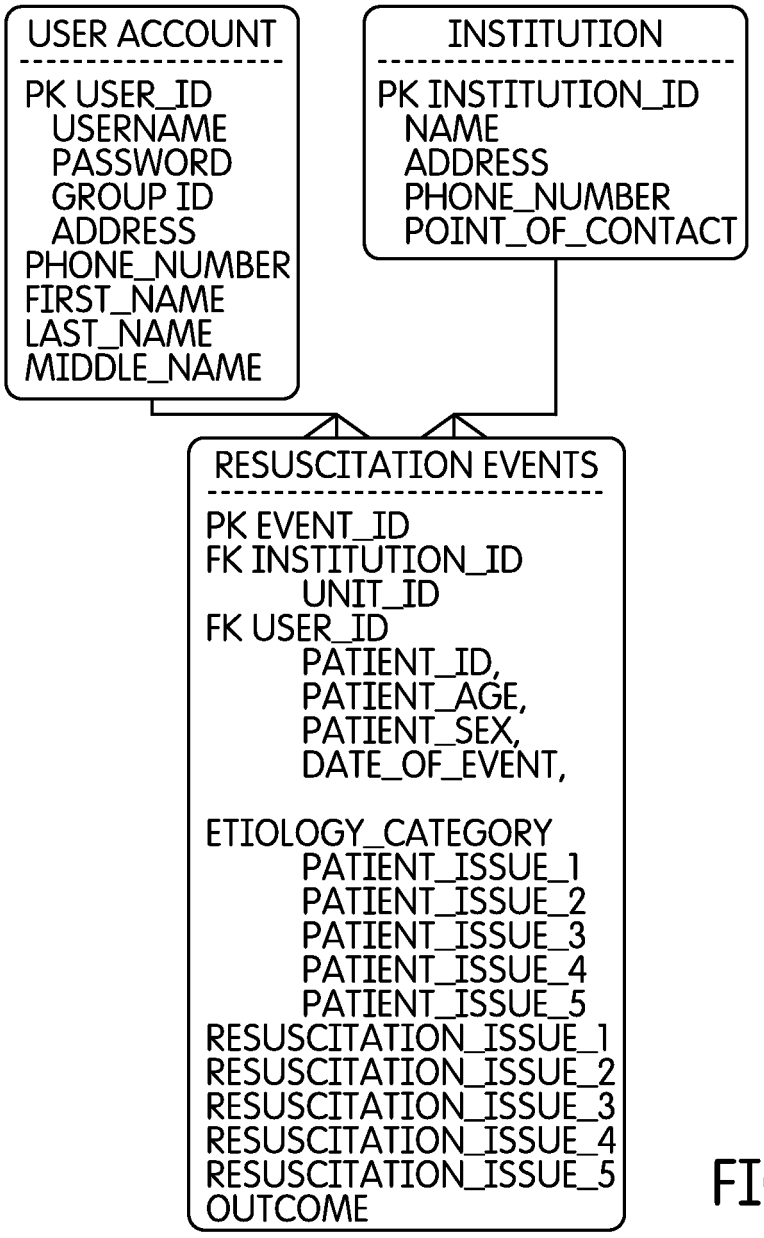
USER ACCOUNT
PK USER_ID
USERNAME
PASSWORD
GROUP ID
ADDRESS
PHONE_NUMBER
FIRST_NAME
LAST_NAME
MIDDLE_NAME
INSTITUTION
PK INSTITUTION_ID
NAME
ADDRESS
PHONE_NUMBER
POINT_OF_CONTACT
RESUSCITATION EVENTS
PK EVENT_ID
FK INSTITUTION_ID
UNIT_ID
FK USER_ID
PATIENT_ID,
PATIENT_AGE,
PATIENT_SEX,
DATE_OF_EVENT,
ETIOLOGY_CATEGORY
PATIENT_ISSUE_1
PATIENT_ISSUE_2
PATIENT_ISSUE_3
PATIENT_ISSUE_4
PATIENT_ISSUE_5
RESUSCITATION_ISSUE_1
RESUSCITATION_ISSUE_2
RESUSCITATION_ISSUE_3
RESUSCITATION_ISSUE_4
RESUSCITATION_ISSUE_5
OUTCOME

FIG. 7

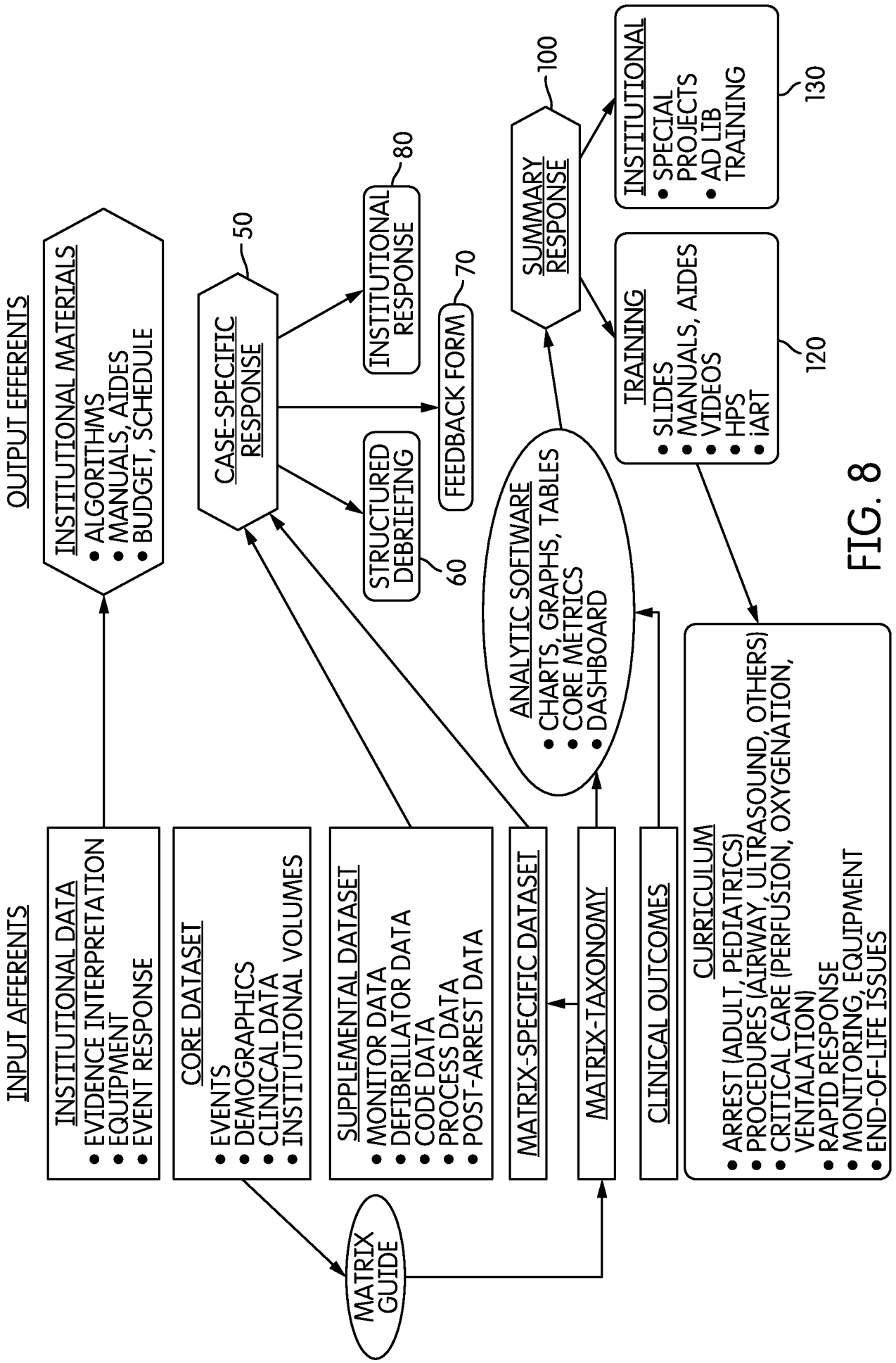
INPUT AFFERENTS
INSTITUTIONAL DATA
• EVIDENCE INTERPRETATION
• EQUIPMENT
• EVENT RESPONSE
CORE DATASET
• EVENTS
• DEMOGRAPHICS
• CLINICAL DATA
• INSTITUTIONAL VOLUMES
SUPPLEMENTAL DATASET
• MONITOR DATA
• DEFIBRILLATOR DATA
• CODE DATA
• PROCESS DATA
• POST-ARREST DATA
MATRIX-SPECIFIC DATASET
MATRIX-TAXONOMY
CLINICAL OUTCOMES
CURRICULUM
• ARREST (ADULT, PEDIATRICS)
• PROCEDURES (AIRWAY, ULTRASOUND, OTHERS)
• CRITICAL CARE (PERFUSION, OXYGENATION, VENTALATION)
• RAPID RESPONSE
• MONITORING, EQUIPMENT
• END-OF-LIFE ISSUES
MATRIX GUIDE
OUTPUT EFFERENTS
INSTITUTIONAL MATERIALS
• ALGORITHMS
• MANUALS, AIDES
• BUDGET, SCHEDULE
CASE-SPECIFIC RESPONSE
50
STRUCTURED DEBRIEFING
60
INSTITUTIONAL RESPONSE
80
FEEDBACK FORM
70
ANALYTIC SOFTWARE
• CHARTS, GRAPHS, TABLES
• CORE METRICS
• DASHBOARD
SUMMARY RESPONSE
100
TRAINING
• SLIDES
• MANUALS, AIDES
• VIDEOS
• HPS
• iART
120
INSTITUTIONAL
• SPECIAL PROJECTS
• AD LIB TRAINING
130

FIG. 8

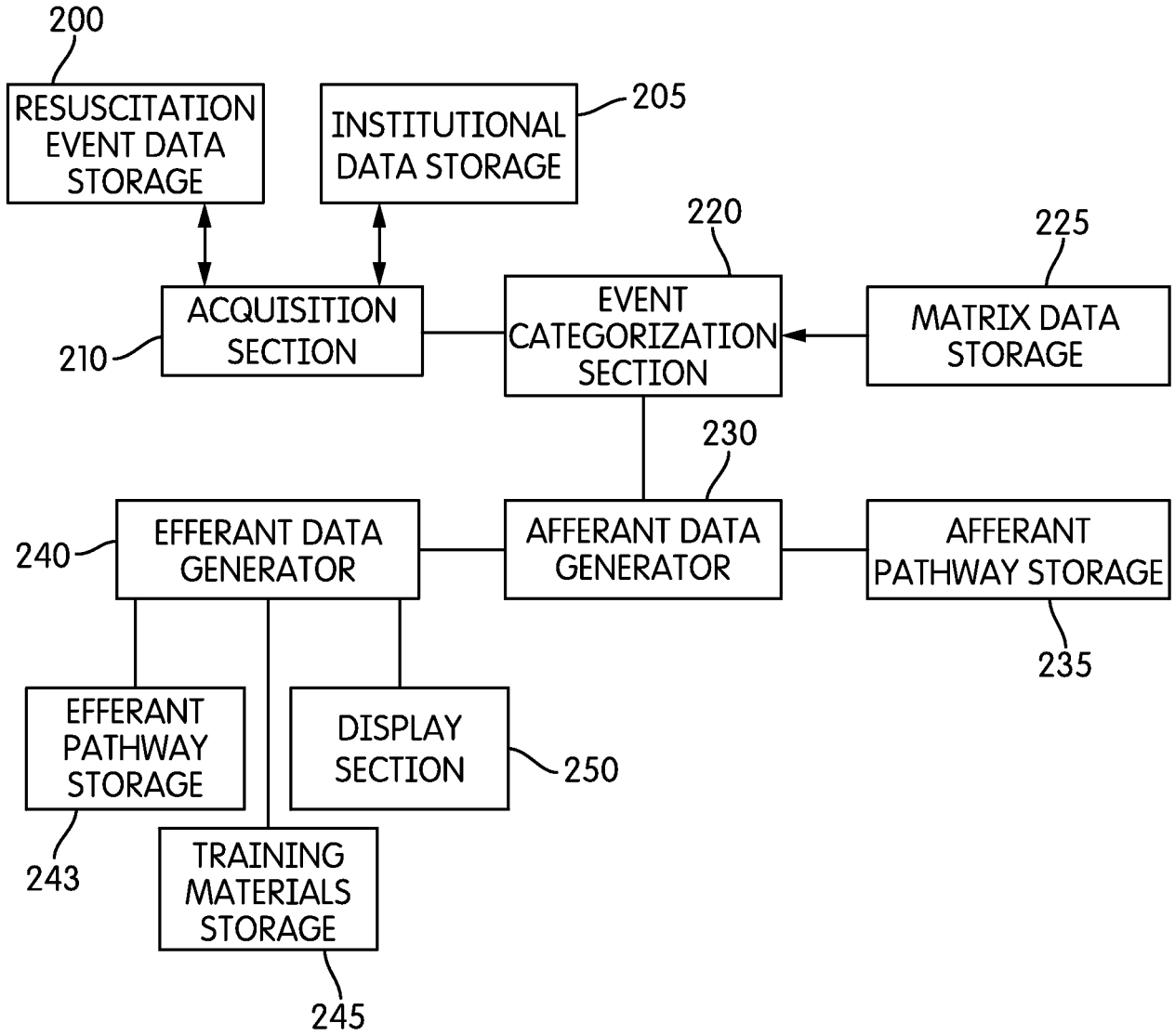
200
RESUSCITATION EVENT DATA STORAGE
INSTITUTIONAL DATA STORAGE
205
220
225
ACQUISITION SECTION
210
EVENT CATEGORIZATION SECTION
MATRIX DATA STORAGE
230
240
EFFERANT DATA GENERATOR
AFFERANT DATA GENERATOR
AFFERANT PATHWAY STORAGE
235
EFFERANT PATHWAY STORAGE
243
DISPLAY SECTION
250
TRAINING MATERIALS STORAGE
245

FIG. 9

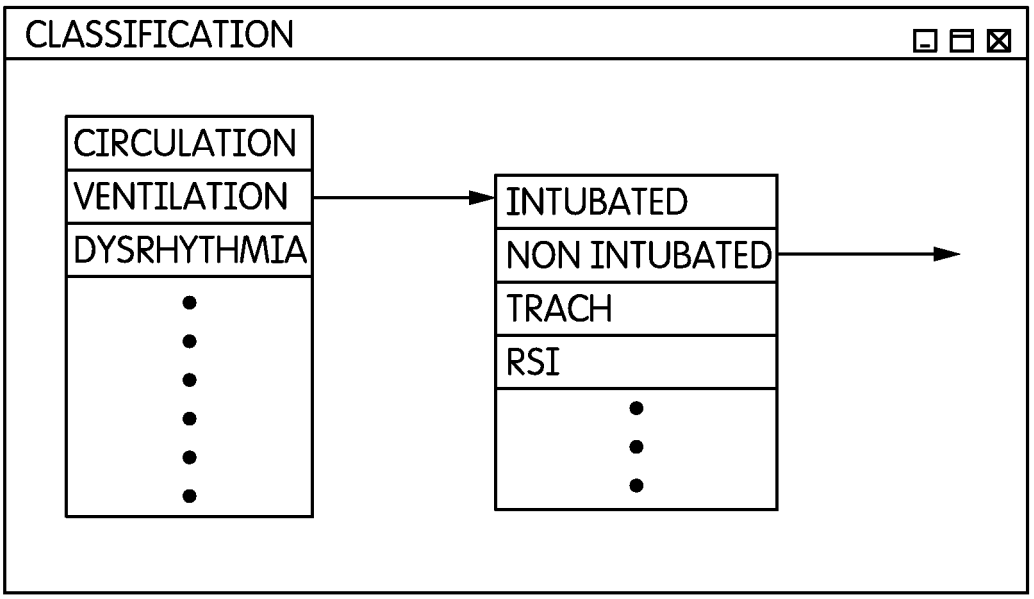

FIG. 10A

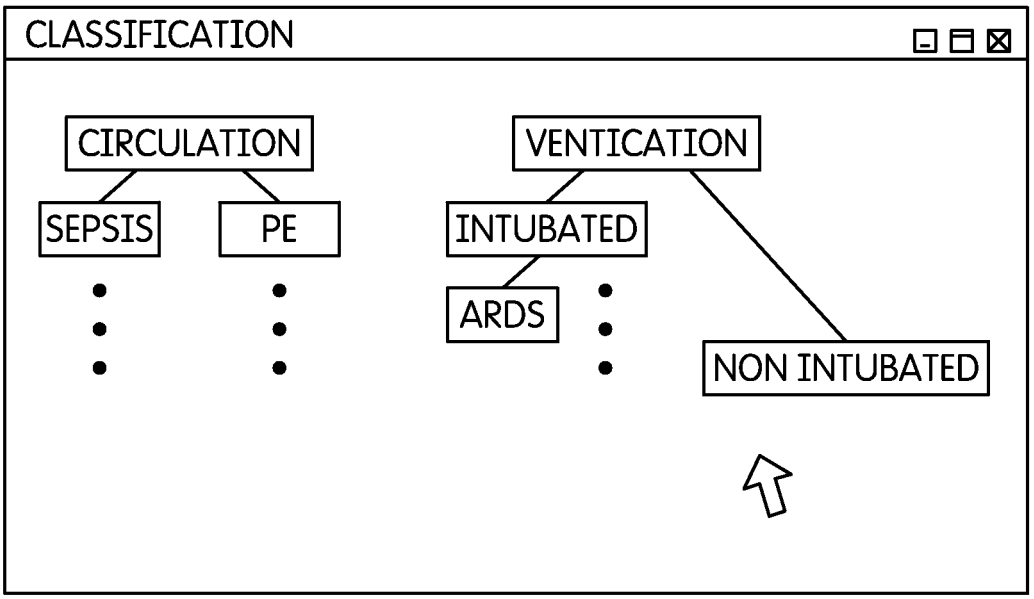

FIG. 10B

Afferents

1 • Demographics
2 • Antecedent events
3 • Intra-arrest
4 • Post-arrest
5 • Process issues
6 • Clinical interpretation

FIG. 11A

Demographics

Core	Supplemental
• Age	• Admission diagnosis
• Gender	• Comorbidities
• Location	• Date of admission
• Service	• Hospital day of arrest
• Date/time	

FIG. 11B

Antecedent Data

- Target preventability
- Based on Matrix
  - Ventilation
  - Perfusion
  - Dysrhythmias
  - Neurological
- Monitor downloads

FIG. 11C

Intra-arrest

Core	Supplemental
• Bystander CPR	• CPR Process
• Defibrillations	• Rate, depth, CCF
• Medications	• Pre-/post-shock pauses
• Intubation	• Perfusion checks
	• Intubation pauses
	• Defibrillation accuracy

FIG. 11D

CPR Process Metrics

• Chest compression fraction	91%
• Compression rate	123/min
• Compression depth	2.6 inches
• Pre-shock pause	2.6 sec
• Post-shock pause	3.6 sec
• Perfusion check	4.3 sec
• Ventilation rate	9.7/min
• PetCO2	15.3 mmHg

FIG. 11E

Post-Arrest

- Temperature management
  - Supportive critical care
  - Emergent PCI
  - Neurocritical care
    - EEG
    - Cerebral edema
    - Other monitoring

FIG. 11F

Process Issues

- Code leadership
- Communication
- Skills performance
- Communication
  - Telecommunications vs. providers
- Medications
- Equipment

FIG. 11G

Clinical

- ART Matrix determination
- Interpretation of process issues
  - Immediate feedback to providers
  - Feedback to leadership
  - Feedback to risk management
- Track-and-trend issues
- Clinical metrics

FIG. 11H

Data Analysis

- Event incidence
  - RRTs per 1,000 discharges
  - Arrests per 1,000 discharges
  - RRT vs. arrest
- Outcomes
  - Survival (event, discharge, neurologic)
  - Hospital mortality
- Unit-specific, service-specific, Matrix-Specific

FIG. 12A

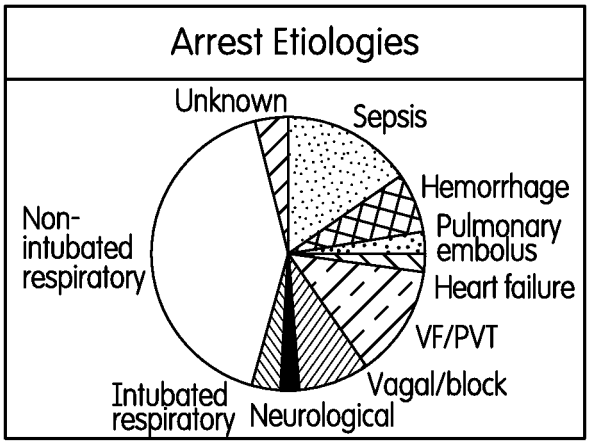

FIG. 12B

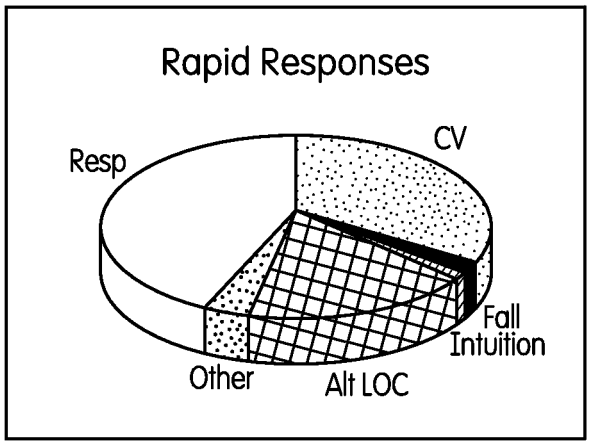

FIG. 12C

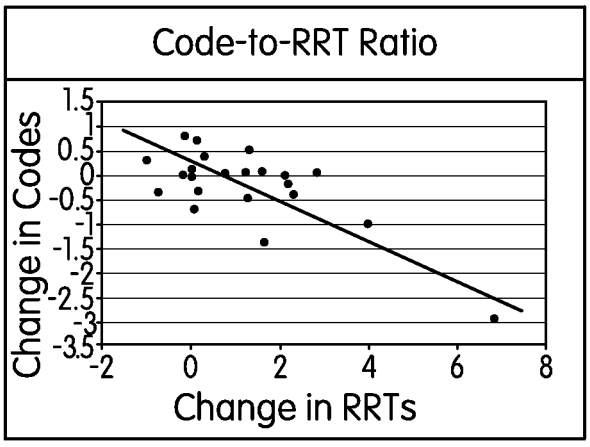

FIG. 12D

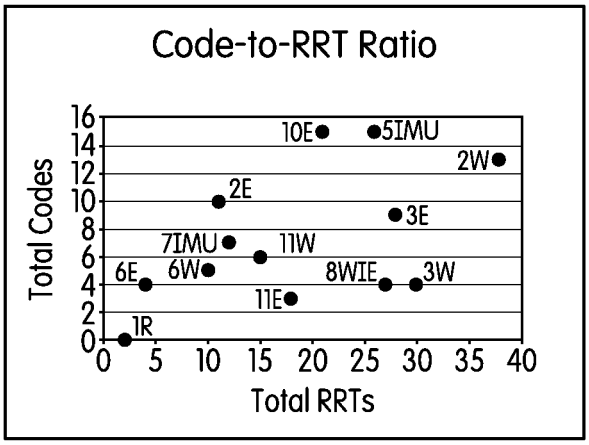

FIG. 12E

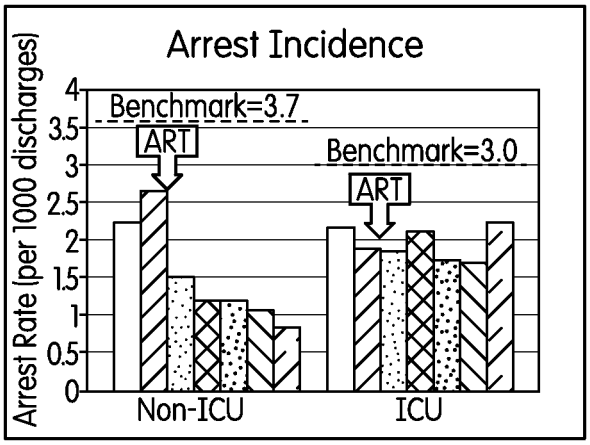

FIG. 12F

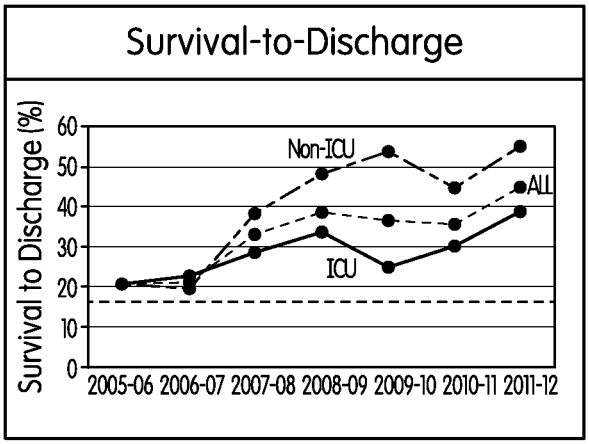

FIG. 12G

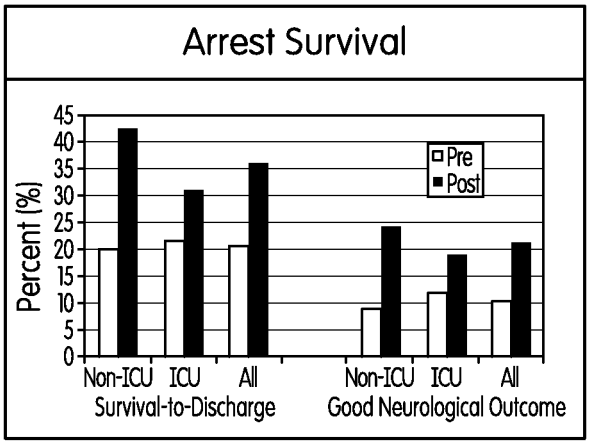

FIG. 12H

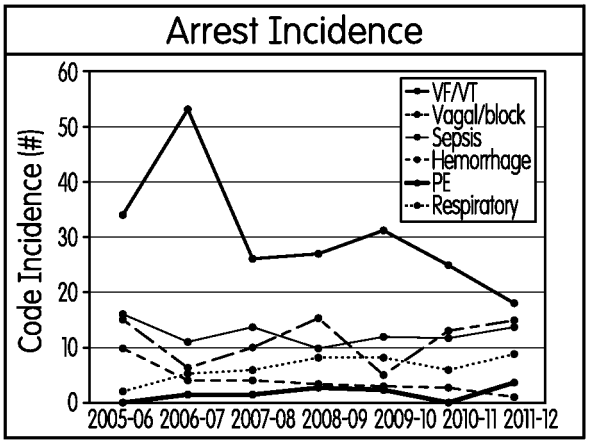

FIG. 12I

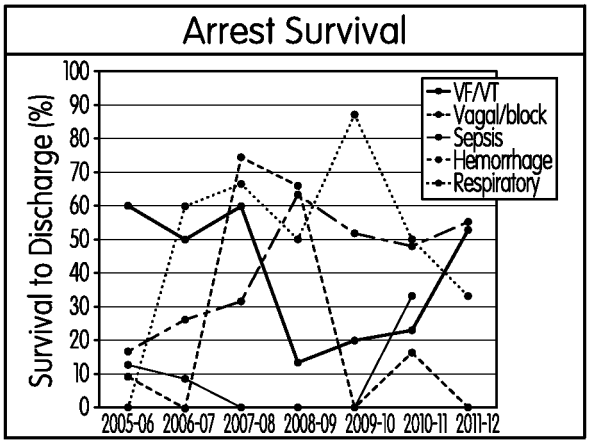

FIG. 12J

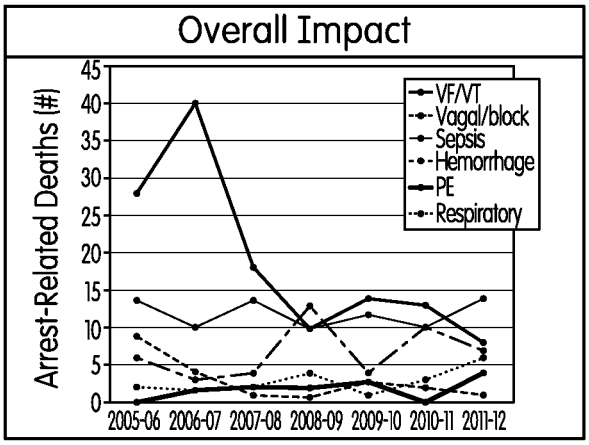

FIG. 12K

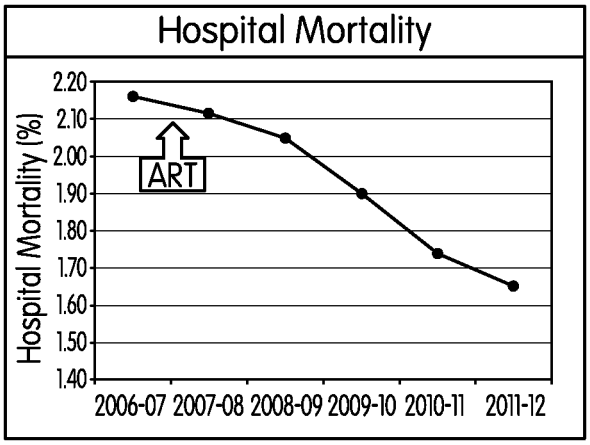

FIG. 12L

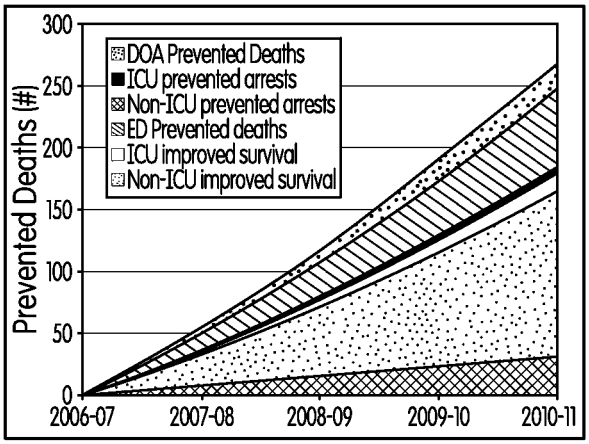

FIG. 12M

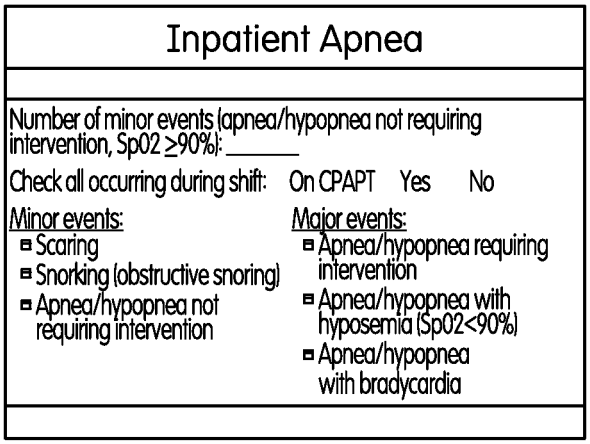

FIG. 12N

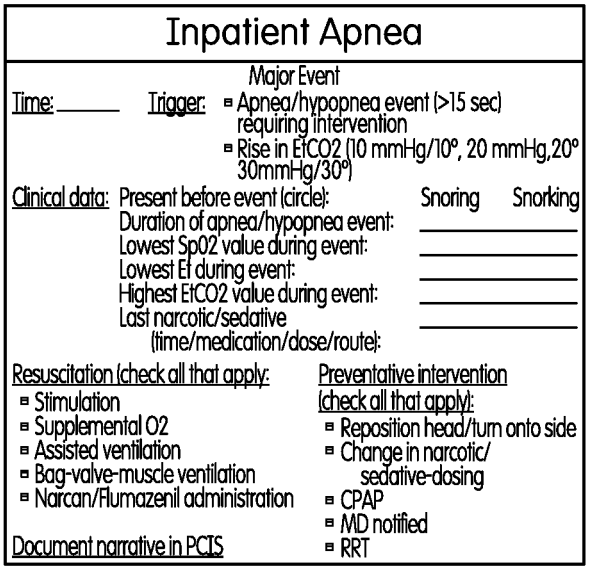

FIG. 12O

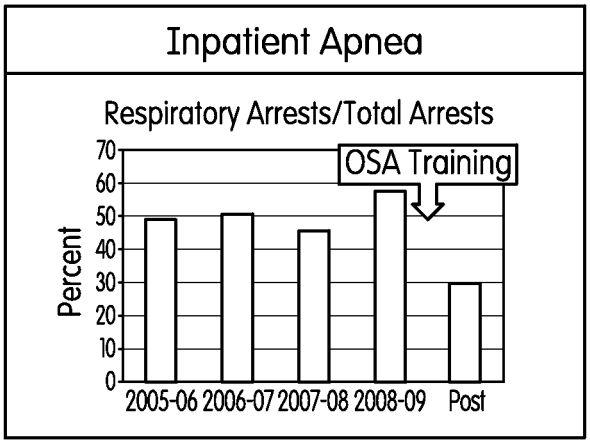

FIG. 13A

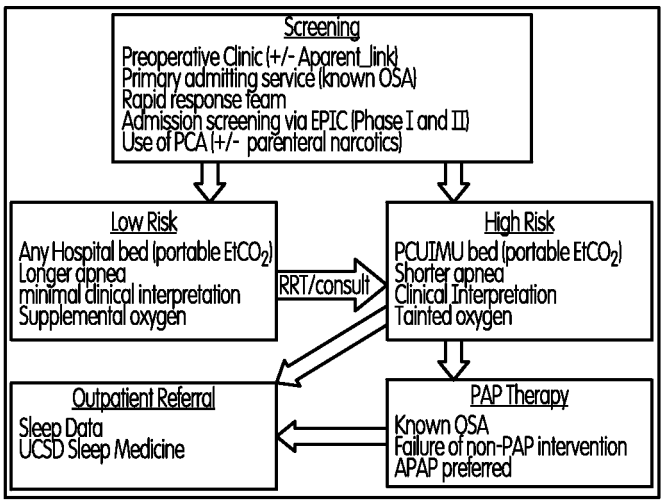

FIG. 13B

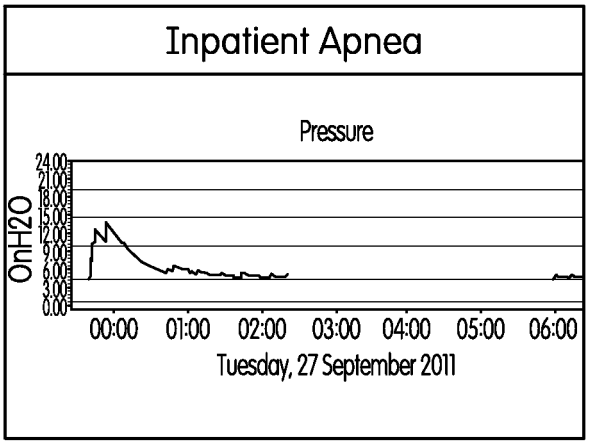

FIG. 13C

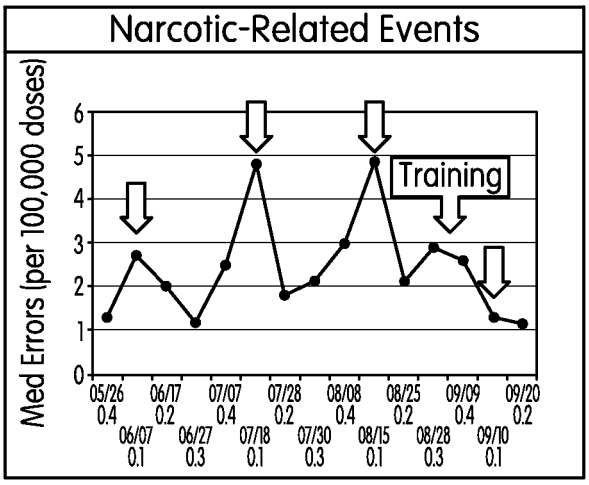

FIG. 13D

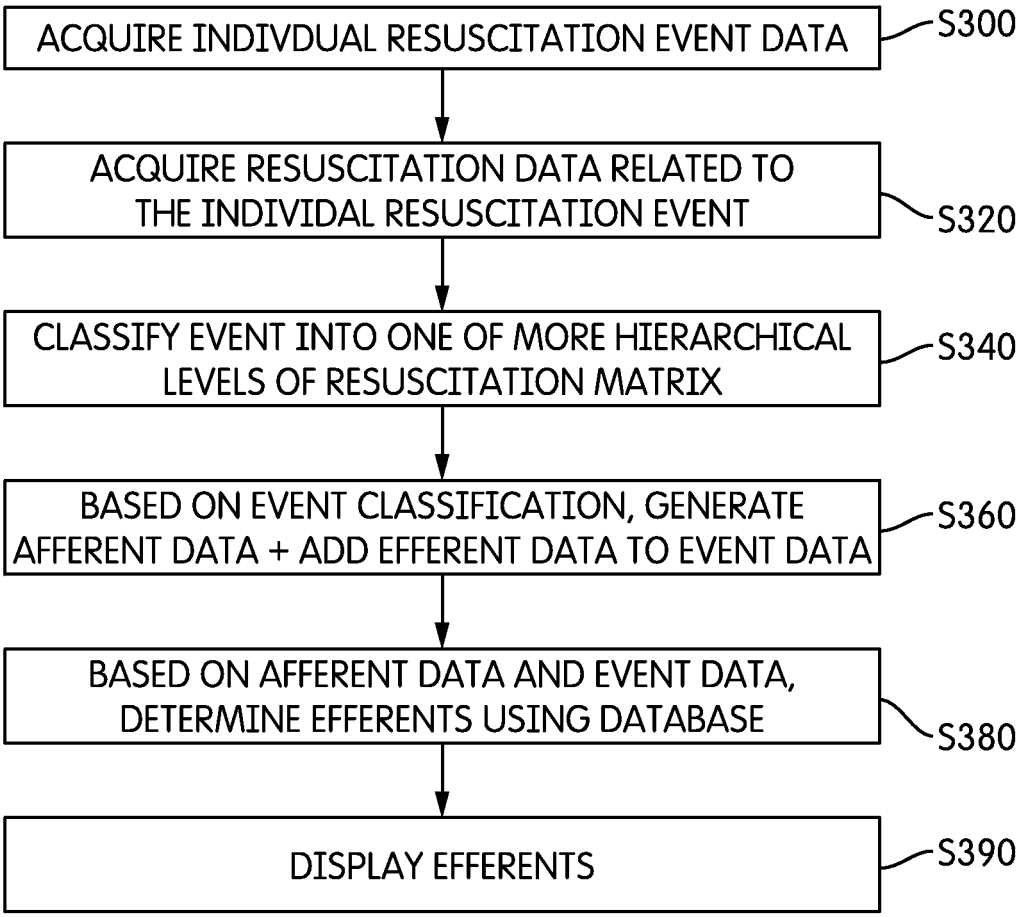
ACQUIRE INDIVDUAL RESUSCITATION EVENT DATA
S300
ACQUIRE RESUSCITATION DATA RELATED TO THE INDIVIDAL RESUSCITATION EVENT
S320
CLASSIFY EVENT INTO ONE OF MORE HIERARCHICAL LEVELS OF RESUSCITATION MATRIX
S340
BASED ON EVENT CLASSIFICATION, GENERATE AFFERENT DATA + ADD EFFERENT DATA TO EVENT DATA
S360
BASED ON AFFERENT DATA AND EVENT DATA, DETERMINE EFFERENTS USING DATABASE
S380
DISPLAY EFFERENTS
S390

FIG. 14

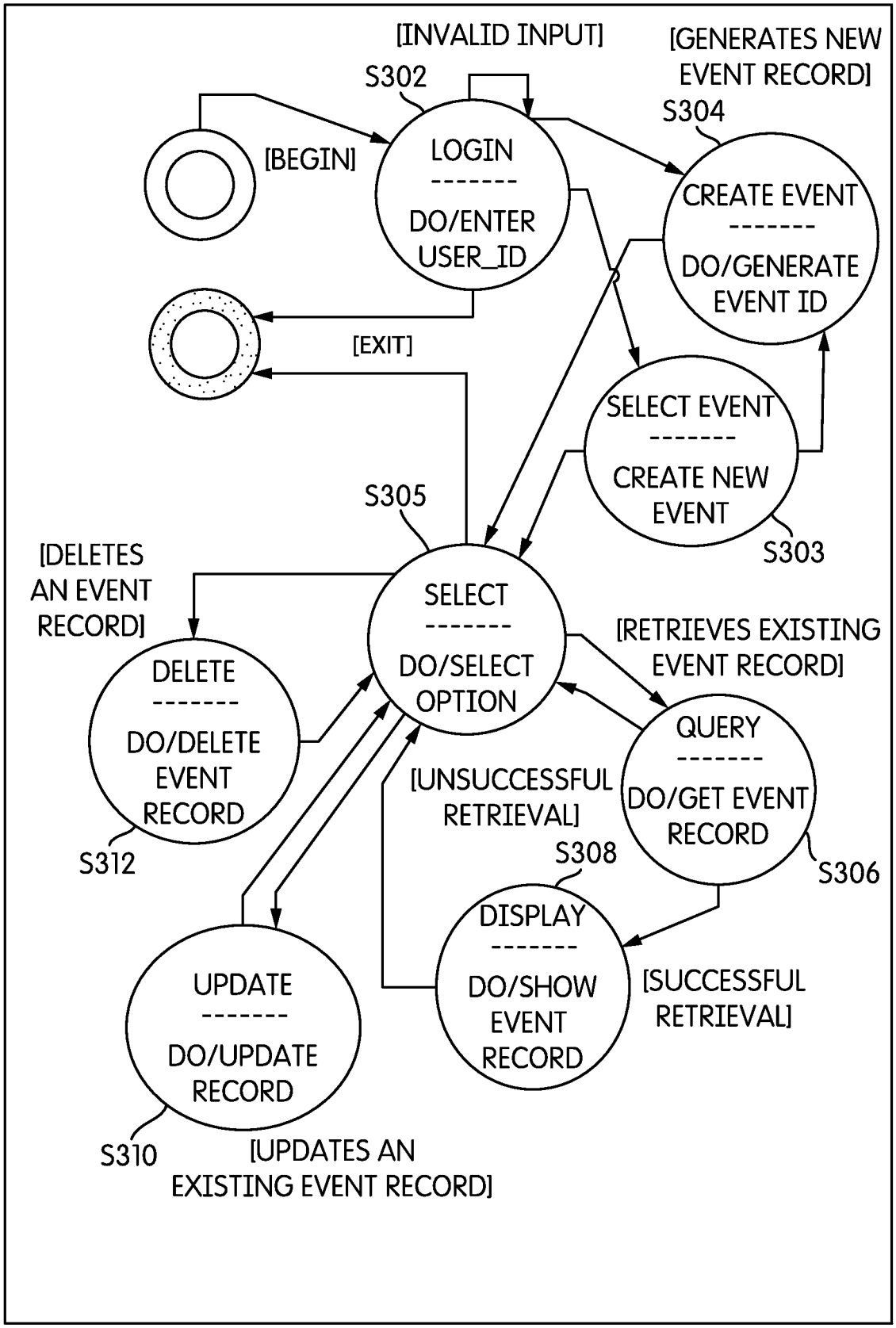
[INVALID INPUT]
[GENERATES NEW EVENT RECORD]
S302
S304
[BEGIN]
LOGIN
DO/ENTER USER_ID
CREATE EVENT
DO/GENERATE EVENT ID
[EXIT]
SELECT EVENT
CREATE NEW EVENT
S303
S305
[DELETES AN EVENT RECORD]
SELECT
DO/SELECT OPTION
[RETRIEVES EXISTING EVENT RECORD]
DELETE
DO/DELETE EVENT RECORD
S312
[UNSUCCESSFUL RETRIEVAL]
QUERY
DO/GET EVENT RECORD
S306
S308
DISPLAY
DO/SHOW EVENT RECORD
[SUCCESSFUL RETRIEVAL]
UPDATE
DO/UPDATE RECORD
S310
[UPDATES AN EXISTING EVENT RECORD]

FIG. 15

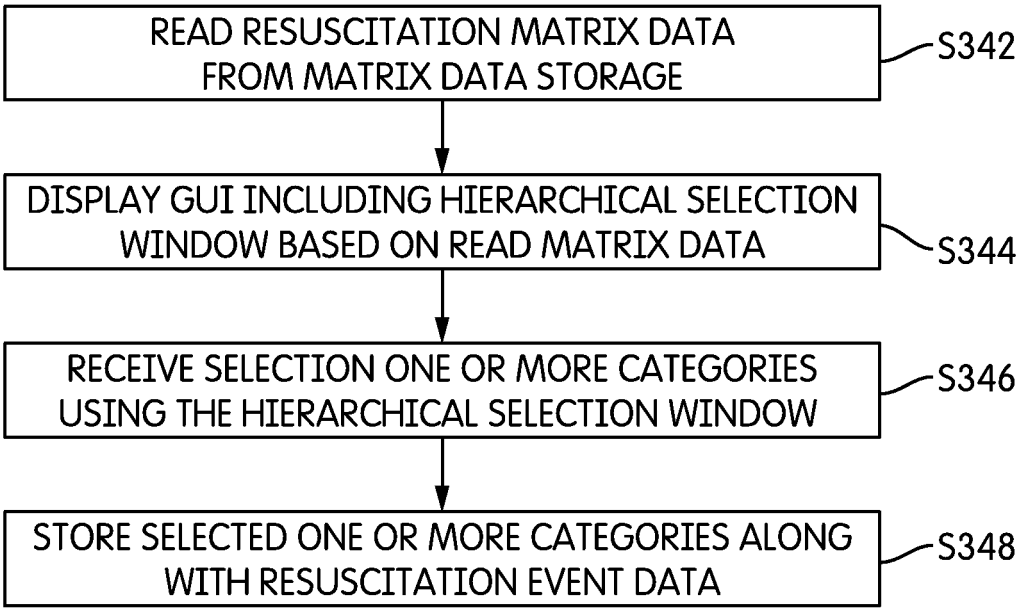
READ RESUSCITATION MATRIX DATA FROM MATRIX DATA STORAGE
S342
DISPLAY GUI INCLUDING HIERARCHICAL SELECTION WINDOW BASED ON READ MATRIX DATA
S344
RECEIVE SELECTION ONE OR MORE CATEGORIES USING THE HIERARCHICAL SELECTION WINDOW
S346
STORE SELECTED ONE OR MORE CATEGORIES ALONG WITH RESUSCITATION EVENT DATA
S348

FIG. 16

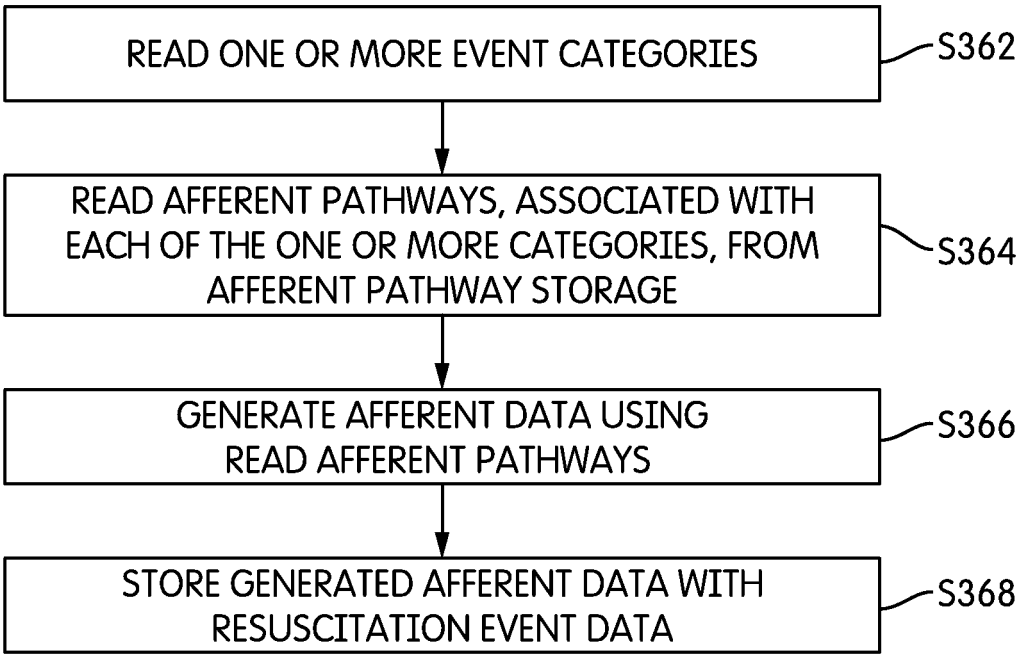
READ ONE OR MORE EVENT CATEGORIES
S362
READ AFFERENT PATHWAYS, ASSOCIATED WITH EACH OF THE ONE OR MORE CATEGORIES, FROM AFFERENT PATHWAY STORAGE
S364
GENERATE AFFERENT DATA USING READ AFFERENT PATHWAYS
S366
STORE GENERATED AFFERENT DATA WITH RESUSCITATION EVENT DATA
S368

FIG. 17

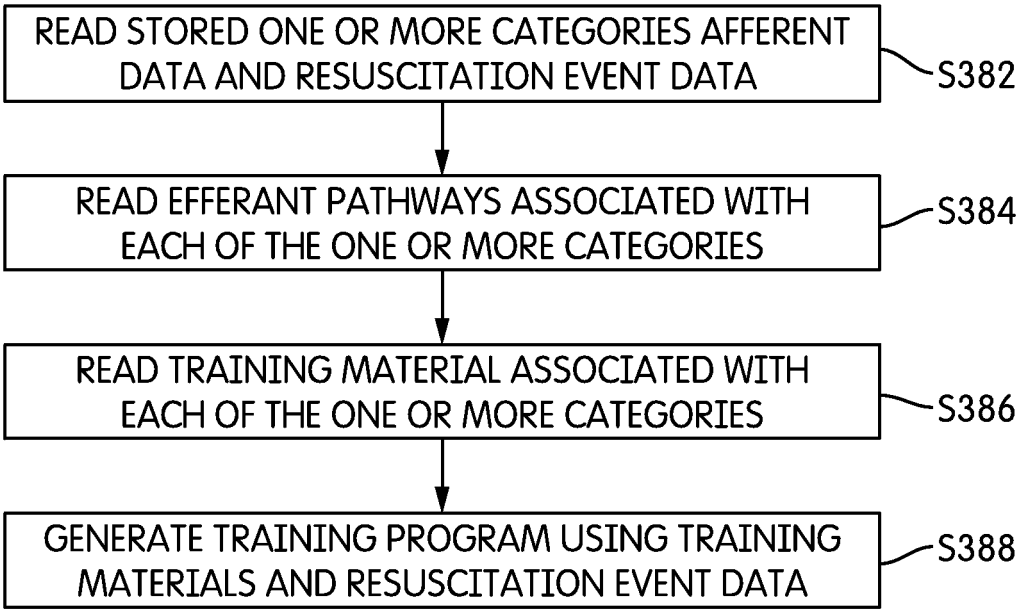
READ STORED ONE OR MORE CATEGORIES AFFERENT DATA AND RESUSCITATION EVENT DATA
S382
READ EFFERANT PATHWAYS ASSOCIATED WITH EACH OF THE ONE OR MORE CATEGORIES
S384
READ TRAINING MATERIAL ASSOCIATED WITH EACH OF THE ONE OR MORE CATEGORIES
S386
GENERATE TRAINING PROGRAM USING TRAINING MATERIALS AND RESUSCITATION EVENT DATA
S388

FIG. 18