



Standardized Data File - Appendix 1 Phenotype Specifications

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Appendix 1 Table of Contents

Admission Type.....	1
Age (Years).....	2
AHRQ Complication - Pulmonary - Administrative.....	3
Anesthesia CPT (Primary).....	5
Anesthesia CPT - Base Unit Value.....	6
Anesthesia Duration.....	7
Anesthesia End.....	8
Anesthesia Start.....	9
Anesthesia Technique: Epidural.....	10
Anesthesia Technique: General.....	11
Anesthesia Technique: Neuraxial.....	13
Anesthesia Technique: Peripheral Nerve Block.....	17
Anesthesia Technique: Sedation.....	20
Arterial Line Used.....	21
ASA Class.....	22
BMI.....	23
Body Region.....	24
Cardiopulmonary Bypass Duration.....	25
Cardiopulmonary Bypass End.....	26
Cardiopulmonary Bypass Start.....	28
Case Duration.....	30
Case End.....	31
Case Start.....	32
Duration of Anesthesiology Attending Sign-in.....	33
Duration of Anesthesiology Resident Sign-in.....	34
Duration of CRNA and Anesthesia Assistant Minutes.....	35
Elixhauser Comorbidity - Aids/HIV.....	36
Elixhauser Comorbidity - Alcohol Abuse.....	37
Elixhauser Comorbidity - Blood Loss Anemia.....	38
Elixhauser Comorbidity - Cardiac Arrhythmias.....	39
Elixhauser Comorbidity - Chronic Pulmonary Disease.....	40
Elixhauser Comorbidity - Coagulopathy.....	41
Elixhauser Comorbidity - Congestive Heart Failure.....	42
Elixhauser Comorbidity - Deficiency Anemia.....	43
Elixhauser Comorbidity - Depression.....	44
Elixhauser Comorbidity - Diabetes (Complicated).....	45
Elixhauser Comorbidity - Diabetes (Uncomplicated).....	46
Elixhauser Comorbidity - Drug Abuse.....	47
Elixhauser Comorbidity - Fluid Electrolyte Disorders.....	48
Elixhauser Comorbidity - Hypertension (Complicated).....	49
Elixhauser Comorbidity - Hypertension (Uncomplicated).....	50
Elixhauser Comorbidity - Hypothyroidism.....	51

Elixhauser Comorbidity - Liver Disease.....	52
Elixhauser Comorbidity - Lymphoma.....	53
Elixhauser Comorbidity - Metastatic Cancer.....	54
Elixhauser Comorbidity - Obesity.....	55
Elixhauser Comorbidity - Other Neurological Disorders.....	56
Elixhauser Comorbidity - Paralysis.....	57
Elixhauser Comorbidity - Peptic Ulcer Disease, Excluding Bleeding.....	58
Elixhauser Comorbidity - Peripheral Vascular Disorders.....	59
Elixhauser Comorbidity - Psychoses.....	60
Elixhauser Comorbidity - Pulmonary Circulation Disorders.....	61
Elixhauser Comorbidity - Renal Failure.....	62
Elixhauser Comorbidity - Rheumatoid Arthritis Collagen Vascular Diseases.....	63
Elixhauser Comorbidity - Solid Tumor Without Metastasis.....	64
Elixhauser Comorbidity - Valvular Disease.....	65
Elixhauser Comorbidity - Weight Loss.....	66
Emergency Status (ASA Class)	67
Halogenated Anesthetic Gases.....	68
Height (cm).....	69
Holiday.....	70
Hospital Bed size.....	71
Ideal Body Weight.....	72
Induction End.....	73
Induction Start.....	74
Institution.....	75
Last Known Alive Date.....	76
Medical School Affiliation.....	77
Mortality (In Hospital 30-day).....	79
MPOG Comorbidity - Cerebrovascular Disease.....	80
MPOG Comorbidity - Coronary Artery Disease.....	81
MPOG Complication - Acute Kidney Injury (AKI).....	82
Nitrous Oxide Used.....	84
Non-Opioid Analgesics.....	85
Obstetric Anesthesia Type.....	86
Oral Morphine Equivalent.....	90
Oral Morphine Equivalent (Normalized).....	92
Patient In Room Date/Time.....	93
Patient Out Of Room Date/Time.....	94
Peak inspiratory pressure (PIP) Median	95
Positive end-expiratory pressure (PEEP) Actual Median.....	96
Positive end-expiratory pressure (PEEP) Set Median.....	97
Postoperative Troponin Highest.....	98
Preop Albumin.....	99
Preop Alk Phosphatase.....	100
Preop ALT.....	101

Preop AST Value.....	102
Preop BUN.....	103
Preop Calcium Ionized.....	104
Preop Calcium Total.....	105
Preop Carbon Dioxide (CO2), Arterial.....	106
Preop Carbon Dioxide (CO2), Mixed Venous.....	107
Preop Carbon Dioxide (CO2), Serum.....	108
Preop Carbon Dioxide (CO2), Venous.....	109
Preop Chloride.....	110
Preop Creatinine.....	111
Preop EGFR (Most Recent).....	112
Preop Glucose.....	114
Preop HCG.....	115
Preop Hematocrit.....	116
Preop Hemoglobin.....	117
Preop HgbA1c.....	118
Preop INR, Total Value.....	119
Preop Lactate.....	120
Preop Platelet Count.....	121
Preop Potassium.....	122
Preop Protein.....	123
Preop PT.....	124
Preop PTT, Total Value.....	125
Preop Sodium.....	126
Preop Total Bilirubin.....	127
Preop Troponin (Highest).....	128
Preop Troponin (Most Recent).....	129
Preop WBC (White Blood Count).....	130
Procedure Room Duration.....	131
Procedure Text.....	132
Procedure Type: Cardiac.....	133
Procedure Type: Liver Transplant.....	139
Procedure Type: Lung Transplant.....	140
Procedure Type:MRI.....	141
Propofol infusion.....	142
Race.....	143
Sex.....	144
Surgery End.....	145
Surgery Start.....	146
Surgical CPTs (All).....	147
Tidal Volume Actual (Median).....	148
Tidal Volume Set (Median).....	149
Tobacco Smoking Classification.....	150
Total blood administered as PRBC, Derived (ml).....	151

Total Cryoprecipitate Administered, Derived (ml).....	152
Total Estimated Blood Loss (EBL).....	153
Total FFP Administered, Derived (ml).....	154
Total Platelets Administered, Derived (ml).....	155
Total Urine Output.....	156
Waiting For Transport Duration.....	157
Weekend.....	158
Weight (kg).....	159
WHO (World Health Organization) BMI Classification.....	160



Phenotype	Admission Type
Description	Type of admission for each operative case
Logic	This collation takes text from the concept description from the intraoperative case info and returns a raw string value corresponding to the above listed values along with the associated MPOG concept ID.
Granularity	One value per case
Value Type	categorical
Limitation	none

Phenotype	Age (Years)
Description	Patient age in years for each procedure, returned as a continuous variable. Ages less than 2 yo are returned including one decimal place to reflect fractions of year when appropriate.
Logic	<p>This phenotype returns the patient's age from the dedicated column in the cases file. The phenotype makes the following adjustments before returning a value:</p> <ol style="list-style-type: none"> 1. If the patient age was documented in anything other than years: <ol style="list-style-type: none"> a. If the patient's age is in weeks: Divides the age by 52 to get the age in years b. If the age was documented in months: Divides the age by 12 to get age in years 2. The maximum age returned in years is 90 as defined by PHI regulations 3. For patients <2 years, the age will be returned as a decimal number (eg 16 months = 1.33 years old) 4. For patients >2 years, the age will return as a whole number 5. If age in years <0 then NULL is returned
Granularity	One value per case
Value Type	int
Limitation	Maximum returned age is 90 as defined by PHI regulations.

Phenotype

AHRQ Complication - Pulmonary - All

Description

This is an ICD-9/10 code based phenotype. It is used to determine if cases had a pulmonary complication ICD 9/10 code documented from day of surgery through 90 days after surgery. Both Professional fee and Hospital discharge diagnosis codes are considered.

Logic

ICD-9	ICD-10	Description
518.7	J95.84	Transfusion-related acute lung injury (TRALI)
997.3	-----	Respiratory complications not elsewhere classified
997.31	J95.851	Ventilator associated pneumonia
997.32	J95.89	Post-procedural aspiration pneumonia
	J95.859	Other complication of ventilator
997.39	J95.88	Other intraoperative complications of respiratory system, not elsewhere classified
	J95.89	Other postprocedural complications and disorders of respiratory system, not elsewhere classified

Additional Pulmonary Complication Codes

ICD-9	ICD-10	Description
518.81	J96.00	Acute respiratory failure, unspecified whether with hypoxia or hypercapnia
	J96.90	Respiratory failure, unspecified, unspecified whether with hypoxia or hypercapnia
	J96.91	Respiratory failure, unspecified with hypoxia
	J96.92	Respiratory failure, unspecified with hypercapnia
518.84	J96.20	Acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia
	J96.21	Acute and chronic respiratory failure with hypoxia
	J96.22	Acute and chronic respiratory failure with hypercapnia
517.3	J99	Respiratory disorders in diseases classified elsewhere
518.5	-----	Pulmonary insufficiency following trauma and surgery
518.51	J95.821	Acute postprocedural respiratory failure
	J96.01	Acute respiratory failure with hypoxia
	J96.02	Acute respiratory failure with hypercapnia
518.52	J95.1	Acute pulmonary insufficiency following thoracic surgery
	J95.2	Acute pulmonary insufficiency following nonthoracic surgery
	J95.3	Chronic pulmonary insufficiency following surgery
518.53	J95.822	Acute and chronic postprocedural respiratory failure
518.82	J80	Acute respiratory distress syndrome
518.83	J96.10	Chronic respiratory failure, unspecified whether with hypoxia or hypercapnia
	J96.11	Chronic respiratory failure with hypoxia
	J96.12	Chronic respiratory failure with hypercapnia
799.1	R09.2	Respiratory arrest
481	J13	Pneumonia due to streptococcus pneumonia
482	-----	Other bacterial pneumonia
482.1	J15.1	Pneumonia due to Pseudomonas
482.3	-----	Pneumonia due to streptococcus
482.4	-----	Pneumonia due to staphylococcus
482.41	J15.211	Pneumonia due to Methicillin susceptible Staphylococcus
482.42	J15.212	Pneumonia due to Methicillin susceptible Staphylococcus aureus
482.82	J15.5	Pneumonia due to Escherichia coli
482.83	J15.6	Pneumonia due to other Gram-negative bacteria
482.89	J15.8	Pneumonia due to other specified bacteria
482.9	J15.9	Unspecified bacterial pneumonia
483.8	J16.8	Pneumonia due to other specified infectious organisms
484.6	B44.0	Invasive pulmonary aspergillus
485	J18.0	Bronchopneumonia, unspecified organism
486	J18.9	Pneumonia, unspecified organism
-----	J15.0	Pneumonia due to Klebsiella pneumonia
-----	J15.4	Pneumonia due to other streptococci

507	-----	Pneumonitis due to solids and liquids
514	J18.2	Hypostatic pneumonia, unspecified organism
799	-----	Other ill-defined and unknown causes of morbidity and mortality
506	-----	Respiratory conditions due to chemical fumes and vapors
-----	J69	Pneumonitis due to solids and liquids
507	J69.0	Pneumonitis due to inhalation of food and vomit
512.1	J95.811	Postprocedural pneumothorax
415.11	I26.90	Septic pulmonary embolism without acute cor pulmonale
	I26.99	Other pulmonary embolism without acute cor pulmonale
999.1	T80.0XXA	Air embolism following infusion, transfusion and therapeutic injection, initial encounter
997.2	T81.718A	Complication of other artery following a procedure, not elsewhere classified, initial encounter
997.79	T81.72XA	Complication of vein following a procedure, not elsewhere classified, initial encounter
996.71 996.72	T82.817A	Embolism due to cardiac prosthetic devices, implants and grafts, initial encounter
996.73 996.74	T82.818A	Embolism due to vascular prosthetic devices, implants and grafts, initial encounter

Granularity One value per case

Value Type categorical

Limitation IMPORTANT: The pulmonary complication identified by this phenotype may have been present preoperatively and continued postoperatively. The pulmonary complication phenotype does not necessarily indicate a postoperative complication was identified. The complication may or may not be related to the procedure performed. Reasons why include:

- 1) ICD 9/10 'present on admission' documentation is not consistent across MPOG sites and therefore is not considered by this phenotype.
- 2) ICD-9/10 codes from professional fee and hospital/facility billing diagnoses data are considered.
- 3) The patient may have had more than one procedure during the 90 day timeframe for this phenotype. The complication code will trigger for both procedures if the start date for the ICD-9/10 code falls within the 90-day window for both cases.
- 4) The crosswalk between ICD-9 and ICD-10 codes was done manually using <https://www.icd10data.com/>

Phenotype	Anesthesia CPT (Primary)
Description	This phenotype is used to determine the single primary anesthesia Current Procedural Terminology (CPT) billing code for each case.
Logic	<ol style="list-style-type: none"> 1. Search for any anesthesia procedure codes linked to the case. Consider all codes marked as anesthesia codes, as well as any codes starting with 00 or 01 that are marked as surgical codes <ol style="list-style-type: none"> a. If a single code is found, that one is returned as the primary anesthesia code b. If multiple codes are found, they are ranked using the following criteria and the highest ranked code is returned as the primary code: <ol style="list-style-type: none"> i. The procedure code priority (if available) ii. Total anesthesia time units (if unavailable, use the base time units from the CPT catalog) iii. Codes defined as secondary are ranked below other codes iv. As a final tiebreaker, the CPT codes are ranked alphabetically c. If a case has no documented anesthesia procedure codes, search for surgical procedure codes linked to the case. Those surgical codes are then matched to the typical anesthesia code for that procedure, as listed in the ASA CPT crosswalk <ol style="list-style-type: none"> i. If a single code is found, that one is returned as the primary anesthesia code ii. If multiple anesthesia codes arise from the cross-walking, they are ranked using the following criteria. The highest ranked code is returned as the primary code: <ol style="list-style-type: none"> 1. The original surgical code's procedure priority (if available) 2. Radiology procedures are ranked below non-radiology procedures (given they have atypically high base time unit) 3. The anesthesia codes' base time units from the CPT catalog 4. Codes defined as secondary are ranked below other codes 5. As a final tiebreaker, the CPT codes are ranked alphabetically 2. If there is not a CPT uploaded, then the case is omitted from the collation, return NULL
Granularity	One value per case
Value Type	categorical
Limitation	Any combined cases are returned as a single CPT code. An example is in OB, an epidural case that emergently goes to the OR for a C/S, if not listed as a separate case will return only a single anesthesia CPT code. Uploaded unit values are freely entered by presenting site and are unbounded. Thus, they may contain errors in documentation that fall outside acceptable base unit value ranges.

Phenotype	Anesthesia CPT - Base Unit Value
Description	This phenotype returns the base unit value associated with the primary anesthesia CPT code for the case. This version of the phenotype is built using the 2018 base units by CPT code values (for reference: https://www.cms.gov/Center/Provider-Type/Anesthesiologists-Center). The anesthesia base units remained unchanged for 2019 and 2020. This phenotype will be updated when a new version becomes available.
Logic	Assigns the corresponding numeric base unit value based on the primary anesthesia CPT code phenotype associated with the case.
Granularity	One value per case
Value Type	int
Limitation	none

Phenotype	Anesthesia Duration
Description	Duration of anesthesia care provided for an operative procedure
Logic	<p>This collation will calculate the difference in minutes between the Anesthesia Start and Anesthesia End Collations.</p> <p>If the value returned is >36 hrs (>2160 minutes) or <0 (negative) the value returned is NULL.</p>
Granularity	One value per case
Value Type	int
Limitation	We omit the cases whose Duration is > 36hrs or < 0

Phenotype	Anesthesia End
Description	Anesthesia end time/date for a procedure/case
Logic	This phenotype uses note concept ID 50009 (AACD Anesthesia End Date/Time) and returns the date/time of the last anesthesia end on a case
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype uses note concept ID 50009 (AACD Anesthesia End Date/Time) to define the anesthesia stop time for the case. Those defined outside this concept will not be captured.

Phenotype	Anesthesia Start
Description	Anesthesia start time/date for a procedure/case
Logic	This phenotype uses note concept ID 50002 (AACD Anesthesia Start Date/Time) and returns the associated time observed for the variable mapped to the AACD Anesthesia Start Date/Time concept. If there are more than one anesthesia start times for the case, this phenotype will result the earliest time.
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype uses note concept ID 50002 (AACD Anesthesia Start Date/Time) to define the anesthesia start time. Those defined outside this concept will not be captured.

Phenotype	Anesthesia Technique: Epidural
Description	Collation for determining the cases for which a perioperative epidural was used or attempted.
Logic	<p>This collation returns a “yes” (1) value for cases that has documentation of an Epidural used or attempted within the case documentation (as determined by the ConceptSubsets listed in dependencies), otherwise returns a “no” (0).</p> <p>Specifically:</p> <ul style="list-style-type: none"> • Any note or note detail with a concept in the concept subset “Epidural Notes” <p>OR</p> <ul style="list-style-type: none"> • Any medication with a route concept in the concept subset “Epidural Routes” <p>OR</p> <ul style="list-style-type: none"> • Any site with a site type in concept subset “Epidural Routes”
Granularity	One value per case
Value Type	categorical
Limitation	This phenotype relies upon the use of concept subsets which are periodically updated and subject to change. This collation will report a yes (1) if the technique is attempted. It does not differentiate if the attempt is successful. There is some overlap in this phenotype with spinals and blocks.

Phenotype

Anesthesia Technique: General

Description

This phenotype attempts to classify each case in terms of general anesthesia technique. This returns type of anesthetic used within the possibilities listed in the value types.

Logic

This phenotype relies on three internal phenotypes: General Anesthesia Notes Present (GeneralNotes), Volatile Gases (VolatileGasesUsed), and Paralytics (ParalyticsUsed).

- **General Anesthesia Notes Present** = includes General - unknown, LMA, ETT and both ETT and LMA notes
- **Halogenated Gases Used** = includes General - inhaled anesthetic only
 - Volatile Gases documented between 'Anesthesia start' and 'Anesthesia end' only will be considered by this phenotype
- **Paralytics Used All** = includes General - neuromuscular blockers only
 - Paralytics administered from 60 minutes before 'Anesthesia start' through 'Anesthesia end' only will be considered by this phenotype

Airway notes documented between 24 hours before 'Anesthesia Start' through 'Anesthesia End' are considered. Observed time take priority over entered time. If no observed time is available, entered time is considered

CASE RESULT

IMPORTANT: 'ETT' result takes precedence over all other results except 'ETT and LMA'

Here is the hierarchical order of return for this phenotype:

General - Both ETT and LMA: ETT and LMA notes both exist

General - ETT: ETT note with any other inhaled anesthetic, neuromuscular blocker or general unknown note

General - LMA: LMA note exists, without any ETT notes

General - inhaled anesthetic only: inhaled anesthetic documented without any ETT or LMA notes

General - neuromuscular blocker only: Paralytic administered without inhaled anesthetic, ETT or LMA note.

General - unknown: Note from General - Unknown Concept Subset* without ETT, LMA, paralytic or inhaled anesthetic notes.

No : No general notes, sedative medications, inhaled anesthetics or paralytics associated with the case.

Invalid Value: Cases missing either 'Anesthesia Start' or 'Anesthesia End'

***General - Unknown Concept Subset:**

- 50099 Intubation - Nasal approach note
- 50100 Intubation - Videolaryngoscopy View
- 50115 Intubation Laryngoscopy Blade Type and Size
- 50116 Intubation Laryngoscopy Cricoid Pressure or BURP Applied
- 50117 Intubation - ETT Placed
- 50118 Intubation Number of Attempts
- 50119 Intubation Direct Laryngoscopy View
- 50120 Intubation Bougie Introducer Used
- 50127 Intubation Extubated Awake or Deep
- 50129 Intubation Fiberoptic Asleep or Awake

- 50130 Intubation Fiberoptic Nasal or Oral
- 50131 Intubation Fiberoptic Topicalization Type
- 50132 Intubation Fiberoptic Transtracheal block
- 50133 Intubation Fiberoptic Number of Attempts
- 50134 Intubation Fiberoptic Existing Airway Device
- 50160 ECMO Start
- 50187 ECMO Stop
- 50197 Intubation - atraumatic
- 50202 Emergence - patient extubated
- 50207 Intubation device and adjunct note
- 50208 Intubation view note
- 50311 Induction - GA Induction type (mask, iv, rapid)
- 50334 Intubation - cricoid pressure applied
- 50653 Intubation - Retrograde technique
- 50669 Airway - Cuff inflation volume
- 50670 Intubation - performed awake
- 50688 Intubation - comment
- 50695 Categorized note - Intubation

Granularity

One value per case

Value Type

categorical

Limitation

This phenotype has several limitations. Tracheostomy is not considered. ETT and LMA single notes will return as general - unknown if there is only a single ETT or single LMA note in the case., meaning if there are no accompanying general, ETT, or LMA note. This phenotype also does not differentiate type of intubation (ex. fiberoptic or glidescope). Also, there is no differentiation of success, only if the type was documented as attempted. A negative return ("no") means there was either no general anesthetic attempted in the case (ex. a MAC / sedation case) or not enough documentation to determine a general anesthetic. Neuromuscular Blocker Only and Inhaled Anesthetic Only were used as distinct categories as they may convey meaning if isolated such as in pediatric mask induction cases or ECT cases in which succinylcholine was used. Only airway notes from 24 hours before anesthesia start through anesthesia end are considered.

Phenotype

Anesthesia Technique: Neuraxial

Description

This phenotype is used to determine whether or not a case included neuraxial anesthesia and if that neuraxial anesthesia was spinal, epidural, caudal, multiple types, combined spinal-epidural, or unknown. This phenotype is applicable to all cases. This phenotype is used in exclusion/inclusion criteria for measures.

Logic

Start with all cases.

First, compile list of all neuraxial types that a case may qualify for using steps 1-6.

Step 1: Determine if case has 'Epidural' flags

1. Evaluate if case has any of the notes
 - a. 50051 Obstetrics- Labor epidural end
 - b. 50614 Neuraxial technique- combined spinal/epidural technique note
 - c. 50050 Obstetrics- labor epidural start
 - d. 50154 Epidural anesthesia catheter placement note
 - e. 50643 Neuraxial - Epidural placed for postoperative pain control
2. If any of the above notes present, evaluate if that note has text 'Epidural' AND that note does not have text 'Combined Spinal'
 - a. If yes, add '**Epidural**' to list of neuraxial types that case qualifies for and move to step 2.
3. OR if case has meds with 2005 (epidural) route concept OR if case has 10513 (other-epidural medication) medication concept
 - a. If yes, add '**Epidural**' to list of neuraxial types that case qualifies for and move to step 2.
4. If no flags present, move to step 2

Step 2. Determine if case has 'Spinal' flags

1. Evaluate if case has any of the following notes
 - a. 90320 High spinal
 - b. 50614 Neuraxial technique - Combined Spinal / Epidural technique note
2. If any of the above notes present, evaluate if that note has text 'Spinal' or 'SAB' AND note does not contain 'Combined Spinal'
 - a. If yes, add '**Spinal**' to list of neuraxial types that case qualifies for and move to Step 3
3. OR Evaluate if case has note concept 50680 and does not contain 'Combined Spinal'
 - a. If yes, add '**Spinal**' to list of neuraxial types that case qualifies for and move to Step 3
4. OR case has a spinal access type concept 100313 (Spinal)
 - a. If yes, add '**Spinal**' to list of neuraxial types that case qualifies for and move to Step 3
5. If no flags present, move to Step 3

Step 3. Determine if case has 'Combined Spinal Epidural (CSE)' flags

1. Evaluate if case has one of the note concepts
 - a. 50614 Neuraxial technique - Combined Spinal / Epidural technique note
 - b. 50154 Epidural anesthesia catheter placement note

2. If any of the above notes present, evaluate if the note has text 'CSE' or 'Combined Spinal'
 - a. If yes, add '**Combined Spinal Epidural (CSE)**' to list of neuraxial types that case qualifies for and move to Step 4

3. If no flags present, move to Step 4

Step 4. Determine if case has 'Caudal' flags

1. Evaluate if case has note 50635 (Regional - Caudal block performed)
 - a. If yes, add '**Caudal**' to list of neuraxial types that case qualifies for and move to final check.
 - b. If no, move to Step 5

Step 5. Determine if the case has broad neuraxial notes

1. Evaluate if case has the following note concepts
 - a. 50677 Regional - Block location
 - b. 50665 Procedures - Other unlisted procedure
 - c. 50691 Categorized note - Neuraxial anesthesia
 - d. 50356 Regional - Block performed
 - e. 50229 Induction procedure
 - f. 50507 Procedures - Epidural Blood Patch
 - g. 50764 Misc - Primary Anesthesia Technique Used
 - h. 50165 Epidural dermatomal level achieved
 - i. 50156 Epidural needle approach
 - j. 90100 Actual procedure performed
2. If any of the above notes have text 'CSE' or 'Combined Spinal' OR has text 'Epidural' AND 'Spinal' in same note, then add '**Combined Spinal Epidural (CSE)**' to list of neuraxial types that case qualifies for and move to Step 6.
3. If any of the above notes have text '**Epidural**' but does not have text 'Spinal', 'Combined Spinal', or 'CSE', then add '**Epidural**' to list of neuraxial types that case qualifies for and move to Step 6.
4. If any of the above notes have text '**Spinal**' but do not contain 'Epidural' or 'Combined Spinal' or 'CSE', then add '**Spinal**' to list of neuraxial types that case qualifies for and move to Step 6.
5. If any of the above notes have text '**Caudal**' but do not have text 'Combined Spinal' or 'CSE', then add '**Caudal**' to list of neuraxial types that case qualifies for and move to Step 6.
6. If none of the above, move to Step 6.

Step 6. Then, check for additional neuraxial note concepts:

1. Evaluate if case has any of the following note concepts
 1. 50687 Neuraxial - comment
 2. 50679 Neuraxial - complications
 3. 50340 Neuraxial / Regional- Assessment of Neuraxial or regional technique
 4. 50341 Neuraxial / Regional - Assessment of neuraxial or regional technique - detail
 5. 50020 Neuraxial Approach
 6. 50338 Neuraxial insertion aspiration of blood or CSF- detail
 7. 50337 Neuraxial insertion aspiration of blood or CSF - note
 8. 50335 Neuraxial insertion paresthesia assessment- note
 9. 50336 Neuraxial insertion paresthesia yes / no detail
 10. 50165 Epidural dermatomal level achieved
 11. 50154 Epidural anesthesia catheter placement note
 12. 50371 Neuraxial technique - Bilateral Sensory Level Detail
 13. 50370 Neuraxial technique - Bilateral Sensory Level Tested Note

14. 50372 Neuraxial technique - Bilateral Sensory Level Testing Device Detail
15. 50364 Neuraxial technique - Sensory Level Left Detail
16. 50365 Neuraxial technique - Sensory Level Left Testing Device Detail
17. 50367 Neuraxial technique - Sensory Level Right Level Detail
18. 50368 Neuraxial technique - Sensory Level Right Testing Device Detail
19. 50363 Neuraxial technique - Sensory Level Tested Left Note
20. 50366 Neuraxial technique - Sensory Level Tested Right Note
21. 50146 Neuraxial technique patient position
22. 50329 Neuraxial technique sterile prep and drape note
23. 50330 Neuraxial technique sterile prep type detail
24. 50333 Neuraxial technique subcutaneous skin infiltrated with local anesthetic
25. 50344 Epidural catheter secured
26. 50163 Epidural catheter type or brand
27. 50164 Epidural catheter withdrawn to depth (cm)
28. 50339 Epidural catheter withdrawn to depth (cm) - detail
29. 50161 Epidural loss of resistance (saline or air)
30. 50162 Epidural loss of resistance depth (cm)
31. 50347 Epidural meniscus fall assessment - note
32. 50348 Epidural meniscus fall yes / no - detail
33. 50159 Epidural needle length (cm)
34. 50166 Epidural parasthesias during placement
35. 50349 Epidural test dose administered - note
36. 50350 Epidural test dose administered - number of ML detail
37. 50155 Epidural vertebral interspace final
38. 50153 Neuraxial- Spinal dermatomal level achieved
39. 50148 Neuraxial- Spinal needle approach
40. 50150 Neuraxial- Spinal needle diameter (gauge)
41. 50151 Neuraxial- Spinal needle length (cm)
42. 50353 Neuraxial - Spinal placement Blood observed in spinal needle note
43. 50354 Neuraxial - Spinal placement Blood observed yes / no detail
44. 50351 Neuraxial - Spinal placement CSF observed note
45. 50352 Neuraxial - Spinal placement CSF observed yes / no detail
46. 50147 Neuraxial- Spinal vertebral interspace final
47. 50034 Neuraxial – Vertebral interspace final (unspecified)
48. 50691 Categorized note - Neuraxial anesthesia

2. If case has any of the above note concepts, add '**Neuraxial - Unknown Type**' to list of neuraxial types that case qualifies for. Do not consider any terms in note text. Proceed to Final Check.

Final Check: Compile complete list of Neuraxial Types that a case qualifies for based on above logic. One case can have zero assignments or many assignments. Consider complete list of Neuraxial Types assigned in the steps above:

1. If list has 'Combined Spinal Epidural (CSE)', then assign final result '**Combined Spinal Epidural (CSE)**'
2. If case does not have 'Combined Spinal Epidural (CSE)' assignment, then check for 'Caudal', 'Epidural' and 'Spinal' independently
 1. If case has 'Caudal' and no other neuraxial types on list OR has 'Caudal' and 'Epidural', then assign final result '**Caudal**'
 2. If case has 'Epidural' and no other neuraxial types on list, then assign final result '**Epidural**'
 3. If case has 'Spinal' and no other neuraxial types in list, then assign final result '**Spinal**'
 4. If case has 'Caudal' and 'Spinal', then assign final result '**Neuraxial- Mixed Types Listed**'
 5. If case has 'Epidural' and 'Spinal', then assign final result '**Neuraxial- Mixed Types Listed**'

6. If case does not have 'Epidural', 'Spinal', 'Caudal' or 'Combined Spinal Epidural (CSE)' and has 'Neuraxial- Unknown Type Assignment', then assign final result '**Neuraxial- Unknown Type**'
3. If case has no neuraxial types assigned to it, then assign final result '**None**'

Granularity	One value per case
Value Type	categorical
Limitation	Variance in electronic health record documentation or incorrect variable mapping may cause an incorrect result for a case. This phenotype is limited to documentation within notes that are associated with neuraxial anesthesia.

Phenotype

Anesthesia Technique: Peripheral Nerve Block

Description

This phenotype is used to determine if a peripheral nerve block was attempted or placed for a given case.

Logic

Start with all cases.

First, compile a list of all peripheral nerve blocks that may be documented on the case using steps 1-3.

Step 1: Determine if the case has any notes associated with peripheral nerve blocks

1. Evaluate if the case has any of these MPOG note concepts documented with an observed time between 24 hours before anes start through 24 hours after anesthesia end; if observed time is not documented, will use entered time:

- 50065 Regional - Cervical Plexus Block
- 50081 Regional - Adductor Canal Block Performed
- 50383 Regional - Supraclavicular Block
- 50384 Regional - Interscalene Block
- 50385 Regional - Infraclavicular Block
- 50386 Regional - Axillary Block
- 50387 Regional - Femoral Nerve Block
- 50388 Regional - Popliteal Block
- 50389 Regional - Sciatic Block
- 50390 Regional - Ankle Block
- 50391 Regional - Bier Block
- 50398 Regional - Lumbar Plexus Block
- 50629 Regional - Retrobulbar Block by surgeon
- 50724 Regional - Superior Laryngeal Block
- 50765 Regional - Saphenous Nerve Block
- 50798 Regional - Inguinal Field Block
- 50808 Regional - Transversus Abdominis Plane (TAP) Block
- 50243 Regional - Quadratus Lumborum Block

2. If only one of the above note concepts is present, **assign the block type as listed in the concept** to the case and move to step 2.

3. If more than one of the above note concepts is present, add **Block, Multiple Types** and move to step 2.

4. If none of the above note concepts are present, move to step 2.

Step 2. Determine if the case has any regional note concepts with text indicating a peripheral nerve block was attempted/used.

1. Evaluate if the case has any of the following MPOG note concepts documented with an observed time between 24 hours before anes start through 24 hours after anesthesia end; if observed time is not documented, will use entered time:

- 50021 Regional- Peripheral Nerve Catheter Placed
- 50356 Regional- Block Performed
- 50690 Categorized Note- Regional Anesthesia

- 50665 Procedures - Other unlisted procedure
 2. If any of the above note concepts (50021, 50356, 50690, 50665) are present, evaluate if any of the notes have the following text and then proceed to the next step:
 - If text 'femoral' OR 'fascia ili' is present, add '**Femoral Nerve**'
 - If text 'bier' is present, add '**Bier**'
 - If text 'retrobul' is present, add '**Retrobulbar**'
 - If text 'eye block' is present, add '**Eye Block**'
 - If text 'cervical plex' OR 'cervical paraver' is present, add '**Cervical Plexus**'
 - If text 'interscal' is present, add '**Interscalene**'
 - If text 'axillary' is present, add '**Axillary**'
 - If text 'transversus abdom' OR 'TAP' is present, add '**Transversus Abdominis Plane (TAP)**'
 - If text 'lumbar plexus' is present, add '**Lumbar Plexus**'
 - If text 'inguinal' is present, add '**Inguinal**'
 - If text 'sciatic' is present, add '**Sciatic**'
 - If 'saphenous' is present, add '**Saphenous Nerve**'
 - If text 'supraclav' is present, add '**Supraclavicular**'
 - If text 'popliteal' OR 'peroneal' OR 'IPACK' is present, add '**Popliteal**'
 - If text 'superior laryngeal' is present, add '**Superior Laryngeal**'
 - If text 'adductor can' is present, add '**Adductor Canal**'
 - If text 'infraclav' is present, add '**Infraclavicular**'
 - If text 'ankle' is present, add '**Ankle**'
 - If text 'quadratus lum' or 'QL b' is present, add '**Quadratus Lumborum**'
 3. If peripheral nerve block text listed in the prior step are not identified within the note concepts 50021, assign '**Block, Unknown Type**' and continue to step 3.
 4. If peripheral nerve block text is not identified within the note concept 50356 or 50665 or 50690, continue to step 3.
 5. If none of the regional block concepts are present (50021, 50356, 50690, 50665), continue to step 3.
- Step 3:** Compile complete list of peripheral nerve block types that a case qualifies for based on steps 1-2. One case can have zero, one, or many assigned block types at this point.
1. If multiple specific block types result from steps 1-2, then the final result will be '**Block, Multiple Types Listed**'
 2. If no blocks result from steps 1-2, move to step 4.
 3. If case has only 'Block, Unknown Type' from step 1 & 2 and no other blocks from step 1, then the final result will be '**Block, Unknown Type**'
 4. If case has a specific block type from step 1 and a 'Block, Unknown Type' from step 2, then final result will be **specific block type identified in step 1.**
 5. If case has only 'Cervical Plexus' from steps 1-2, then the final result will be '**Cervical Plexus**'
 6. If case has only 'Adductor Canal' from steps 1-2, then the final result will be '**Adductor Canal**'
 7. If case has only 'Supraclavicular' from steps 1-2, then the final result will be '**Supraclavicular**'
 8. If case has only 'Interscalene' from steps 1-2, then the final result will be '**Interscalene**'
 9. If case has only 'Infraclavicular' from steps 1-2, then the final result will be '**Infraclavicular**'
 10. If case has only 'Axillary' from steps 1-2, then the final result will be '**Axillary**'
 11. If case has only 'Femoral Nerve' from steps 1-2, then the final result will be '**Femoral Nerve**'
 12. If case has only 'Popliteal' from steps 1-2, then the final result will be '**Popliteal**'
 13. If case has only 'Sciatic' from steps 1-2, then the final result will be '**Sciatic**'
 14. If case has only 'Ankle' from steps 1-2, then the final result will be '**Ankle**'
 15. If case has only 'Bier' from steps 1-2, then the final result will be '**Bier**'

16. If case has only 'Lumbar Plexus' from steps 1-2, then the final result will be '**Lumbar Plexus**'
17. If case has only 'Retrobulbar' from steps 1-2, then the final result will be '**Retrobulbar**'
18. If case has only 'Superior Laryngeal' from steps 1-2, then the final result will be '**Superior Laryngeal**'
19. If case has only 'Saphenous Nerve' from steps 1-2, then the final result will be '**Saphenous Nerve**'
20. If case has only 'Inguinal' from steps 1-2, then the final result will be '**Inguinal**'
21. If case has only 'Transversus Abdominis Plane (TAP)' from steps 1-2, then the final result will be '**Transversus Abdominis Plane (TAP)**'
22. If case has only 'Eye Block' from steps 1-2, then the final result will be '**Eye Block**'
23. If case has only 'Quadratus Lumborum' from steps 1-2, then the final result will be '**Quadratus Lumborum**'

Step 4: (Only assessed if steps 1-3 do not identify any block concepts.)

Determine if the case has any route of administration associated with peripheral nerve blocks:

1. Evaluate if the case has one of these route of administration MPOG concepts:
 - 2019 Perineural (Route of Administration)
 - 2020 Bier Block (Route of Administration)
2. If the Perineural route of administration concept is present, then the final result will be '**Perineural Block**'
3. If the Bier Block route of administration concept is present, then the final result will be '**Bier Block**'
4. If both routes of administration concepts are present, then the final result will be '**Block, Multiple Types Listed**'
5. If none of the above route of administration concepts are present, then the final result will be '**None**'

Granularity	One value per case
Value Type	categorical
Limitation	Variance in electronic health record documentation or incorrect variable mapping may produce an incorrect result for a case. This phenotype is limited to variables mapped to regional block MPOG concepts and examines only the documentation within those notes for specific peripheral nerve block text. This phenotype will result if the block was attempted; it does not differentiate if the attempt was successful. All regional block notes documented in the perioperative period will be examined however, the results of this phenotype do not differentiate whether the block was attempted before, after, or during a procedure.

Phenotype	Anesthesia Technique: Sedation
Description	This phenotype is used to determine if monitored anesthesia care was used during a case with or without sedation medications
Logic	<p>This phenotype relies on the internal phenotype <i>AnesthesiaTechniqueGeneral</i> Includes General - unknown, LMA, ETT, ETT+LMA, Neuromuscular Blocker Only and Inhaled anesthetic only.</p> <p>If case returns value_code '0' for <i>AnesthesiaTechniqueGeneral</i> and there is documentation of at least one sedative medication between <i>PreopStart</i> and <i>AnesthesiaEnd</i>, then the case is assigned 'Anesthesia Technique Sedation: Yes'</p> <p>Sedation Medication Concepts:</p> <ul style="list-style-type: none"> • 10020 ALFENTANIL • 10149 DEXMEDETOMIDINE • 10154 DIAZEPAM • 10183 ETOMIDATE • 10186 FENTANYL • 10187 FENTANYL/MIDAZOLAM 40 MCG/ML / 200MCG/ML • 10238 KETAMINE • 10272 LORAZEPAM • 10290 METHADONE • 10292 METHOHEXITAL • 10301 MIDAZOLAM • 10377 PROPOFOL • 10390 REMIFENTANIL • 10414 SUFENTANIL • 10427 THIOPENTAL • 10453 PROPOFOL W/ KETAMINE 10 MG/ML + 1 MG/ML • 10700 CLONAZEPAM
Granularity	One value per case
Value Type	categorical
Limitation	none

Phenotype	Arterial Line Used
Description	To identify cases that have at least 20 valid blood pressure values taken from an invasive arterial line.
Logic	<p>This collation checks for the following invasive SBP physiologic concepts: 3011, 3026, 3030, 3041, 3046, and 3475</p> <p>If there are ≥ 20 valid (post blood pressure artifact reduction) values total (combined across concepts), then return a 1 for “yes”</p> <p>Else If there are more than 0 values but less than 20 total values, return 2 for “inconclusive”</p> <p>Else return a 0 for “no”</p>
Granularity	One value per case
Value Type	categorical
Limitation	none

Phenotype

ASA Class

Description

This phenotype returns the ASA classification assigned to a case based on collation mapping of raw text and numeric values documented within the electronic medical record. These data include AIMS variables mapped to 'Assessment and Plan - ASA Physical Status' (ID 70233). Collation mapping is completed at the MPOG Coordinating Center.

Logic

The AsaStatusClassification phenotype returns a single ASA Class per case based on the collation mapping of raw text/numeric values documented in the preoperative MPOG Concept 'Assessment and Plan - ASA Physical Status' (ID 70233). If more than ASA class is documented per case, the highest ASA class is resulted.

Mapping ID	Mapping Name	Mapping Description
-999	Missing or Unknown	When a case has no documentation for ASA class.
-998	Invalid Value	When the ASA class documentation does not contain a valid ASA class.
1	ASA Class 1	
2	ASA Class 2	
3	ASA Class 3	
4	ASA Class 4	
5	ASA Class 5	
6	ASA Class 6	

Granularity

One value per case

Value Type

categorical

Limitation

Data quality is limited to proper documentation. Conflicting data returns the highest ASA value documented for the case.

Phenotype	BMI
Description	<p>Body Mass Index (BMI)</p> <p>Returns a continuous variable, with the limits of 10-80 as valid ranges of BMI.</p>
Logic	<p>Height and Weight collations have specific valid ranges which are defined in their respective collation documentation. See these collation documents for more information.</p> <ol style="list-style-type: none"> 1. This collation determines if either/both Weight(kg) or Height(cm) is a NULL value, BMI returns NULL 2. Then, calculates $BMI = Weight(kg) / (Height(cm)^2)$ 3. After the BMI calculation is made only include values [10-80]. If outside this range, BMI returns as NULL. <p>[] = inclusive (meaning including the values of BMI=10 and BMI=80)</p>
Granularity	One value per case
Value Type	int
Limitation	BMI calculation is reliant upon accurate patient height and weight data. Inaccurate height or weight patient data can cause an error in the reported BMI. Missing height or weight data will not return a value for BMI.

Phenotype

Body Region

Description

This phenotype categorizes procedures into 18 body regions based upon the primary anesthesia CPT.

Logic

For the body region groupings:

Value (Body Region)	Value Code	Included CPT codes
Head	1	00160, 00162, 00164, 00100, 00102, 00170, 00172, 00174, 00176, 00120, 00124, 00126, 00103, 00140, 00142, 00144, 00145, 00147, 00148, 00190, 00192, 00210, 00211, 00212, 00214, 00215, 00216, 00218, 00220, 00222, 00104
Neck	2	00300, 00320, 00322, 00326, 00350, 00352
Thorax - Extrathoracic	3	00400, 00410, 00402, 00404, 00406, 00450, 00452, 00454, 00470, 00472, 00474
Thorax - Intrathoracic	4	00500, 00520, 00522, 00524, 00528, 00529, 00539, 00540, 00541, 00546, 00548, 00542, 00530, 00532, 00534, 00537
Cardiac	5	00550, 00560, 00561, 00562, 00563, 00566, 00567, 00580
Spine and Spinal cord	6	00640, 00600, 00604, 00620, 00622, 00625, 00626, 00630, 00632, 00634, 00635, 00670
Upper Abdomen	7	00700, 00702, 00730, 00731, 00732, 00740, 00750, 00752, 00754, 00756, 00790, 00792, 00794, 00796, 00797, 00770
Lower Abdomen	8	00800, 00802, 00820, 00810, 00811, 00812, 00813, 00830, 00832, 00834, 00836, 00840, 00844, 00848, 00866, 00902, 00904, 00880, 00882
Urologic	9	00862, 00868, 00864, 00870, 00872, 00873, 00865, 00908, 00910, 00912, 00914, 00916, 00918, 00860
Gynecologic	10	00842, 00948, 00950, 00952, 00846, 00851, 00942, 00944, 00906, 00940
Male Reproductive System	11	00921, 00922, 00924, 00926, 00928, 00930, 00932, 00934, 00936, 00938, 00920
Pelvis	12	01112, 01130, 01160, 01120, 01140, 01150, 01170, 01173, 01180, 01190
Hip/Leg/Foot	13	01200, 01220, 01340, 01380, 01390, 01420, 01462, 01490, 01202, 01210, 01212, 01214, 01215, 01230, 01232, 01234, 01250, 01320, 01360, 01382, 01392, 01400, 01402, 01404, 01464, 01470, 01472, 01474, 01480, 01482, 01484, 01486, 01260, 01270, 01272, 01274, 01430, 01432, 01440, 01442, 01444, 01500, 01502, 01520, 01522
Shoulder/Arm/Hand	14	01620, 01680, 01682, 01730, 01820, 01860, 01610, 01622, 01630, 01634, 01636, 01638, 01710, 01712, 01714, 01716, 01732, 01740, 01742, 01744, 01756, 01758, 01760, 01810, 01829, 01830, 01832, 01650, 01652, 01654, 01656, 01670, 01770, 01772, 01780, 01782, 01840, 01842, 01844, 01850, 01852
Radiologic	15	01916, 01920, 01922, 01924, 01925, 01926, 01930, 01931, 01932, 01933, 01935, 01936
Burn	16	01951, 01952, 01953
Obstetrics	17	01958, 01960, 01961, 01968, 01967, 01962, 01963, 01969, 01964, 01965, 01966
Other Procedures	18	01990, 01991, 01992, 01995, 01996, 01999
Unknown	-999	

Granularity

One value per case

Value Type

categorical

Limitation

If there is no primary anesthesia CPT code attached to the case, then this phenotype will return a -999 (unknown) value.

Phenotype	Cardiopulmonary Bypass Duration
Description	This phenotype is used to determine the duration (in minutes) of cardiopulmonary bypass per case.
Logic	This phenotype calculates the difference between Cardiopulmonary Bypass End and Cardiopulmonary Bypass Start collations. Duration is returned in minutes.
Granularity	One value per case
Value Type	int
Limitation	<ul style="list-style-type: none"> • Does NOT capture undocumented partial/left heart cardiopulmonary bypass (if NOT documented in notes, otherwise DOES capture) • Does NOT capture VA/VV bypass (these are separate concepts) e.g. for ECMO, liver transplant, or IVC thrombectomy Only gets first start, and last end • Only captures first start and last end, thus multiple CPB runs will return as one consecutive run. • This group returns the time of the first instance and last instance, regardless of the type of the specific cardiopulmonary bypass (CPB) trigger. Thus, if a case has documented 50426 (Ice off head) twice, and only these CPB concepts, this phenotype will return the first and last instance of documentation and the duration in between for the documentation.

Phenotype

Cardiopulmonary Bypass End

Description

This phenotype returns the latest date/time of cardiopulmonary bypass specific concepts for each case.

Logic

This phenotype returns the latest date/time of the concepts listed below per case. Only considers notes documented between Anesthesia Start and Anesthesia End **For intraoperative notes, the following concepts are used:**

- 50418 Cardiopulmonary bypass -- Access cannula removed location detail
- 50423 Cardiopulmonary bypass -- Arterial cannula insertion flow detail
- 50647 Cardiopulmonary bypass - Aprotinin test dose performed
- 50766 Cardiopulmonary bypass -- Circulatory arrest start
- 50427 Cardiopulmonary bypass -- Ice on head
- 50412 Cardiopulmonary bypass -- perfusion start
- 50425 Cardiopulmonary bypass -- Blood pressure lowered therapy detail
- 50406 Cardiopulmonary bypass rewarm temperature - detail
- 50428 Cardiopulmonary bypass - cardioplegia start
- 50408 Cardiopulmonary bypass systemic cooling temperature - detail
- 50420 Cardiopulmonary bypass -- Isoflurane vaporizer turned on
- 50413 Cardiopulmonary bypass -- perfusion end
- 50407 Cardiopulmonary bypass systemic cooling initiated
- 50403 Cardiopulmonary bypass vent on detail
- 50404 Cardiopulmonary bypass vent off detail
- 50429 Cardiopulmonary bypass - cardioplegia stop
- 50401 Cardiopulmonary bypass vent on - note
- 50405 Cardiopulmonary bypass rewarm - note
- 50402 Cardiopulmonary bypass vent off - note
- 50411 Cardiopulmonary bypass -- ventilator turned off
- 50399 Cardiopulmonary bypass -- aortic clamp on/off note
- 50419 Cardiopulmonary bypass -- Aortic crossclamp removal requiring therapy
- 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
- 50424 Cardiopulmonary bypass -- Blood pressure lowered note
- 50417 Cardiopulmonary bypass -- Access cannula removed note
- 50409 Cardiopulmonary bypass terminated
- 50767 Cardiopulmonary bypass -- Circulatory arrest stop
- 50422 Cardiopulmonary bypass -- Arterial cannula insertion site detail
- 50410 Cardiopulmonary bypass initiated (full)
- 50415 Cardiopulmonary bypass -- aortic crossclamp off
- 50714 Cardiopulmonary bypass - Bypass start / stop event
- 50421 Cardiopulmonary bypass -- Arterial cannula inserted note
- 50426 Cardiopulmonary bypass -- Ice off head
- 50047 Perfusion - Retrograde Arterial Prime/Venous Antegrade Prime Performed (Yes/No)

- 50346 Vascular - Aortic cross clamp on**

**This concept is used for vascular cases, but often to mark cardiac bypass start as well.

If none of the concepts are in the case, then the case will not be included in the results of the collation.

Granularity	One value per case
Value Type	datetime
Limitation	<ul style="list-style-type: none"> • Does NOT capture undocumented partial/left heart cardiopulmonary bypass (if NOT documented in notes, otherwise DOES capture) • Does NOT capture VA/VV bypass (these are separate concepts) à e.g. for ECMO, liver transplant, or IVC thrombectomy Only gets first start, and last end • Only captures first start and last end, thus multiple CPB runs will return as one consecutive run. • This group returns the time of the first instance and last instance, regardless of the type of the specific cardiopulmonary bypass (CPB) trigger. Thus, if a case has documented 50426 (Ice off head) twice, and only these CPB concepts, this phenotype will return the first and last instance of documentation and the duration in between for the documentation.

Phenotype

Cardiopulmonary Bypass Start

Description

This phenotype determines the earliest date/time of cardiopulmonary bypass specific concepts for each case.

Logic

This phenotype returns the earliest date/time of the concepts listed below per case. Only considers notes documented between Anesthesia Start and Anesthesia End.

For intraoperative notes, the following concepts are used:

- 50418 Cardiopulmonary bypass -- Access cannula removed location detail
- 50423 Cardiopulmonary bypass -- Arterial cannula insertion flow detail
- 50647 Cardiopulmonary bypass - Aprotinin test dose performed
- 50766 Cardiopulmonary bypass -- Circulatory arrest start
- 50427 Cardiopulmonary bypass -- Ice on head
- 50412 Cardiopulmonary bypass -- perfusion start
- 50425 Cardiopulmonary bypass -- Blood pressure lowered therapy detail
- 50406 Cardiopulmonary bypass rewarm temperature - detail
- 50428 Cardiopulmonary bypass - cardioplegia start
- 50408 Cardiopulmonary bypass systemic cooling temperature - detail
- 50420 Cardiopulmonary bypass -- Isoflurane vaporizer turned on
- 50413 Cardiopulmonary bypass -- perfusion end
- 50407 Cardiopulmonary bypass systemic cooling initiated
- 50403 Cardiopulmonary bypass vent on detail
- 50404 Cardiopulmonary bypass vent off detail
- 50429 Cardiopulmonary bypass - cardioplegia stop
- 50401 Cardiopulmonary bypass vent on - note
- 50405 Cardiopulmonary bypass rewarm - note
- 50402 Cardiopulmonary bypass vent off - note
- 50411 Cardiopulmonary bypass -- ventilator turned off
- 50399 Cardiopulmonary bypass -- aortic clamp on/off note
- 50419 Cardiopulmonary bypass -- Aortic crossclamp removal requiring therapy
- 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
- 50424 Cardiopulmonary bypass -- Blood pressure lowered note
- 50417 Cardiopulmonary bypass -- Access cannula removed note
- 50409 Cardiopulmonary bypass terminated
- 50767 Cardiopulmonary bypass -- Circulatory arrest stop
- 50422 Cardiopulmonary bypass -- Arterial cannula insertion site detail
- 50410 Cardiopulmonary bypass initiated (full)
- 50415 Cardiopulmonary bypass -- aortic crossclamp off
- 50714 Cardiopulmonary bypass - Bypass start / stop event
- 50421 Cardiopulmonary bypass -- Arterial cannula inserted note

- 50426 Cardiopulmonary bypass -- Ice off head
 - 50047 Perfusion - Retrograde Arterial Prime/Venous Antegrade Prime Performed (Yes/No)
 - 50346 Vascular - Aortic cross clamp on**
- **This concept is used for vascular cases, but often to mark cardiac bypass start as well.

If none of the concepts are in the case, then the case will not be included in the results of the collation.

Granularity One value per case

Value Type datetime

Limitation

- Does NOT capture undocumented partial/left heart cardiopulmonary bypass (if NOT documented in notes, otherwise DOES capture)
- Does NOT capture VA/VV bypass (these are separate concepts) à e.g. for ECMO, liver transplant, or IVC thrombectomy Only gets first start, and last end
- Only captures first start and last end, thus multiple CPB runs will return as one consecutive run.
- This group returns the time of the first instance and last instance, regardless of the type of the specific cardiopulmonary bypass (CPB) trigger. Thus, if a case has documented 50426 (Ice off head) twice, and only these CPB concepts, this phenotype will return the first and last instance of documentation and the duration in between for the documentation.

Phenotype	Case Duration
Description	This phenotype aims to determine the duration of time a patient is anesthetized.
Logic	Case End - Case Start = Case Duration. Returned in minutes. Typically this phenotype will be shorter in duration than Anesthesia Duration as it will begin at Induction End if documented for the case.
Granularity	One value per case
Value Type	int
Limitation	Dependent on proper documentation of case start and case end. There could be negative values if there are documentation errors.

Phenotype	Case End
Description	This phenotype is used to determine the 'Case End' date/time for a given case based on provided date/time documentation available on the case. See 'logic' section for concepts considered.
Logic	<ol style="list-style-type: none"> 1. Patient Extubated (as determined by the Extubation Times phenotype). If not available, then 2. 50007 Procedure End. If not available, then 3. 50008 AACD Patient out of Room Date/Time. If not available, then 4. 50009 AACD Anesthesia End Date/Time
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype only results "observed" dates and times. "Observed" dates and times are those that are explicitly entered or documented in the record and must be documented as part of the note. MPOG will not default to the "time entered" to determine case start. "Time entered" reflects the time that the documentation was written, and not necessarily the time that care was provided.

Phenotype	Case Start
Description	This phenotype returns the documented date/time of case start for each case. One value per case.
Logic	<p>The case start will be equal to the following logic:</p> <p>Case Start</p> <ol style="list-style-type: none"> 1. Anesthesia Induction End. If not available, then 2. Anesthesia Induction Begin. If not available, then 3. Procedure Start. If not available, then 4. Patient in Room. If not available, then 5. Anesthesia Start
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype only results "observed" dates and times. "Observed" dates and times are those that are explicitly entered or documented in the record and must be documented as part of the note. MPOG will not default to the "time entered" to determine case start. "Time entered" reflects the time that the documentation was written, and not necessarily the time that care was provided.

Phenotype	Duration of Anesthesiology Attending Sign-in
Description	Duration of time (minutes) that anesthesiology attending(s) are signed into the case between anesthesia start and anesthesia end.
Logic	<p>This phenotype relies on the StaffRoles phenotype to determine provider roles. If the role of anesthesiology 'attending' is identified by the StaffRoles phenotype, the duration phenotype will determine how many minutes an attending was signed into the case between anesthesia start (MPOG Concept ID: 50002) and anesthesia end (MPOG Concept ID:50009).</p> <p>If multiple anesthesiology attendings are signed in during the case, the phenotype will add the total time of all providers together. If the providers' signed-in time overlaps, the overlapping time will only be counted once. If a provider is signed in before anesthesia start, the duration start time will be adjusted to begin at anesthesia start. If a provider is signed out after anesthesia end, the duration end time will be adjusted to anesthesia end. If multiple anesthesia start times are documented, the first one will be used. If multiple anesthesia end times are documented, the last one will be used.</p> <p>For this phenotype, seconds will be ignored for the signed-in duration and anesthesia start/end calculations. The duration values returned will be minutes only.</p>
Granularity	One value per case
Value Type	int
Limitation	<p>Will only count sign-in time between anesthesia start and end.</p> <p>If a provider has signed in as both a resident and attending in the same month, the phenotype may assign minutes to the resident role rather than the updated role of the 'attending.'</p>

Phenotype	Duration of Anesthesiology Resident Sign-in
Description	Duration of time (minutes) that anesthesiology resident(s) are signed into the case between anesthesia start and anesthesia end.
Logic	<p>This phenotype relies on the StaffRoles phenotype to determine provider roles. If the role of anesthesiology 'resident' is identified by the StaffRoles phenotype, the duration phenotype will determine how many minutes a resident was signed into the case between anesthesia start (MPOG Concept ID: 50002) and anesthesia end (MPOG Concept ID:50009).</p> <p>If multiple anesthesiology residents are signed in during the case, the phenotype will add the total time of all providers together. If the providers' signed-in time overlaps, the overlapping time will only be counted once. If a provider is signed in before anesthesia start, the duration start time will be adjusted to begin at anesthesia start. If a provider is signed out after anesthesia end, the duration end time will be adjusted to anesthesia end. If multiple anesthesia start times are documented, the first one will be used. If multiple anesthesia end times are documented, the last one will be used.</p> <p>For this phenotype, seconds will be ignored for the signed-in duration and anesthesia start/end calculations. The duration values returned will be minutes only.</p>
Granularity	One value per case
Value Type	int
Limitation	<p>Will only count sign-in time between anesthesia start and end.</p> <p>If a provider has signed in as both a resident and attending in the same month, the phenotype may assign minutes to the resident role rather than the updated role of 'attending.'</p>

Phenotype	Duration of CRNA and Anesthesia Assistant Sign-in
Description	Duration of time (minutes) that Certified Registered Nurse Anesthetist(s) or Anesthesia Assistant(s) are signed into the case between anesthesia start and anesthesia end.
Logic	<p>This phenotype relies on the StaffRoles phenotype to determine provider roles. If the role of 'CRNA' or 'Anesthesiology Assistant' is identified by the StaffRoles phenotype, the duration phenotype will determine how many minutes a CRNA or AA was signed into the case between anesthesia start (MPOG Concept ID: 50002) and anesthesia end (MPOG Concept ID:50009).</p> <p>If multiple CRNAs or anesthesiology assistants are signed in during the case, the phenotype will add the total time of all providers together. If the providers' signed-in time overlaps, the overlapping time will only be counted once. If a provider is signed in before anesthesia start, the duration start time will be adjusted to begin at anesthesia start. If a provider is signed out after anesthesia end, the duration end time will be adjusted to anesthesia end. If multiple anesthesia start times are documented, the first one will be used. If multiple anesthesia end times are documented, the last one will be used.</p> <p>For this phenotype, seconds will be ignored for the signed-in duration and anesthesia start/end calculations. The duration values returned will be minutes only.</p>
Granularity	One value per case
Value Type	int
Limitation	<p>Will only count sign-in time between anesthesia start and end.</p> <p>The phenotype does not separate out between CRNA and Anesthesiology Assistant.</p>

Phenotype

Elixhauser Comorbidity - AIDS \ HIV

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components	04[2-4]	HUMAN IMMUNODEFICIENCY VIRUS (HIV) DISEASE	B2[0124]
	04[2-4].%		B2[0124].%

Granularity

One value per case

Value Type

categorical

Limitation

It is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Alcohol Abuse**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. "Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data", Medical Care, 43 (11), Nov 2005

Logic 1 – Quan, et. al. "Coding Algorithms for Defining Comorbidities in ICD-9-CM and ICD-10 Administrative Data", Medical Care, 43 (11), Nov 2005

	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>) ^a
Components	980	Toxic effect of (an alcohol)	T51
	980.0%		T51.1%
	265.2	Pellagra (Niacin deficiency)	E52
	291.1-35-9.1%	Alcohol abuse (withdrawal, mental changes), Acute alcohol intoxication, Non-dependent	F10
	303.109.1%	Alcohol abuse	
	305.0%		
	357.5%	Alcoholic polyneuropathy	G62.1%
	425.5%	Alcoholic cardiomyopathy	I42.6%
	535.3%	Alcoholic Gastritis	K29.2%
	571.10-3.1%	Alcoholic fatty liver, hepatitis, cirrhosis	K70.1039.1%
	V11.3%	Problem w/ alcohol use	Z72.1%
		Alcohol Abuse Counseling / Rehab	Z50.2% Z71.4%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Blood Loss Anemia**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes			ICD-10 Code conversion (<i>derived, non-standardized</i>)*
	Components	1	280.0%	
			Iron Deficiency Anemia 2/2 Blood Loss (chronic)	D50.0%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Cardiac Arrhythmias**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 200

Logic		ICD-g Codes	Description	ICD-10 Code conversion
	Components1	996.0[14]	Mechanical Complication of Pacemaker/Defibrillator	T82.1%
		426.0[079]%	AV block and various dysrhythmias	I44[1-3].%
		426.1[023]		I45.[69]%
		427.0-46-9]%		I4[7-9]
				I4[7-9].%
		785.0%	Tachycardia, bradycardia Unspecified	R00.[018]%
	V45.0%	Defibrillator, pacemaker, cardiac device	Z45.0%	
V53.3%	Z95.0%			

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Chronic Pulmonary Disease**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>) [*]
Components ¹	49[0-9].%	Various chronic lung conditions (bronchiectasis, asthma, obs, etc.)	J6[0-7].%
	49[0-9]		J6[0-7]
	506.4%		J68.4%
	50[0-5]		J4[0-7].%
	50[0-5].%	Bronchitis, emphysema, COPD, pneumoconiosis, asbestosis	J4[0-7]
	508.[18].%	Chronic pulmonary manifestation	J70.[13].%
	416.[89].%	Chronic Pulm Heart Disease	I27.[89].%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Coagulopathy**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>)*
Components	286	Various coagulation defects	D6[5-8]
	286.%	and DIC	D6[5-8].%
	287.[13-5].%	Platelet defects, thrombocytopenia	D6g[13-6].%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Congestive Heart Failure**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>)*
Components	425.[4-9]%	Cardiomyopathy	I43 I43.% I42.[05-9] % I25.5%
	428 428.% 1404.[019]3 40[24].[019]1	Heart Failure	I50 I50.% I11.0% I13.[02] %
	398.91	Rheumatic Heart Failure	I09.9%
		Neonatal Cardiac Failure	P29.0%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Deficiency Anemia**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>)*
Components1	280.[1-9]%	Iron Deficiency	D50.[89]%
	281	B12 and Folate deficiencies	D5[1-3]
	281.%		D5[1-3].%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Depression**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>) [*]
Components	296.2-351%	Depression, and Major Depressive Disorder	F3[23]
	311 311.1%		F3[23].1%
	300.4%	Dysthymic disorder	F34.1%
	309 309.1%	Depressive states	F4[13].2% F20.4% F31.[3-5]%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Diabetes (Complicated)**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic		ICD-9 Codes	Description	ICD-10 Code conversion (<i>derived, non-standardized</i>)*
	Components	250.[4-9]%	Various diabetic complications	E1[0-4].[2-8]%

Granularity One value per case

Value Type categorical

Limitation ICD 9/10 codes may exist on hospital admission, after, or both. This collation does not differentiate.

Phenotype **Elixhauser Comorbidity - Diabetes (Uncomplicated)**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD_9 Code			Description		ICD_10 Code conversion	
	ICD_9 Code			Description		ICD_10 Code conversion	
Components 1	250.[0-3]%			Diabetes: not uncontrolled; uncomplicated		E1[0-4].[019]%	

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Drug Abuse**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	305.[2-9]%, 292, 292.%, 304, 304.%	Various substance abuse	F1[1-68g].%
	V65.42	Counseling on substance use and abuse	Z71.5%, Z72.2%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Fluid/Electrolyte Disorders

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components(1)	253.6%	SIADH	E22.2%
	276 276.6%	Various electrolyte and Acid/Base disorders	E8[6-7].%

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Hypertension (Complicated)**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic		ICD-9 Codes	Description	ICD-10 Code conversion
Components1		40[2-5] 40[2-5].%	Hypertensive end organ	I1[1235].%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Hypertension (Uncomplicated)**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	401.% 401	Essential HTN (primary)	I10 I10.%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Hypothyroidism**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components	24[34]	Various hypothyroidism	E0[0-3]
	24[34].%		E0[0-3].%
	240.9%		E89.0%
	246.[18]%	Dysmorphic goiter	

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Liver Disease**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	456.[0-2]%	Various hepatic vascular diseases, including viral hepatitis	K71.[13457]%
	572.[2-8]%		K76.[02-9]%
	573.[3489]%		I98.2%
	57[01]		B18.%
	57[01].%		I8[56].%
	070.[23][23]		K70.%
	070.[45]4		K7[2-4].%
	070.[69]%		
	V42.7%	Liver Transplant	Z94.4%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Lymphoma**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	20[0-2] 20[0-2].%	Lymphoma, sarcoma, myeloma, mycosis fungoides, macroglobinemia	C8[123458] C8[123458].%
	203.0%	Multiple myeloma, plasmacytoma, and plasma cell leukemia	C90.[02]%
	238.6%	Histiocytosis, carcinoma, Mast cell tumor	C96 C96.%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Metastatic Cancer**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components(1)	19[6-9].% 19[6-9]	Metastatic neoplasm	C7[7-9].% C80.%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Obesity**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components(1)	278.0%	Obesity, overweight	E66.%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Other Neurological Disorders

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. "Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data", Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	33[45] 33[45].%	Ataxia, spastic paraplegia, spinocerebellar disease	G1[0-3].% G1[0-3]
	34[015] 34[015].%	MS, demyelinating diseases, epilepsy	G3[2567] G3[2567].% G4[01].%
	332.[01].% 333.92	Parkinson's Disease, Neuroleptic Malignant Syndrome	G2[0-2] G2[0-2].%
	78[04].3%	Seizures, convulsions, aphasia	R56.% R47.0%
	331.9% 336.2% 348.[13].%	Various cognitive and degenerative impairments	G31.[289].% G93.[14].%
	333.[45].%	Choreas (including Huntington's)	G25.[45].%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Paralysis**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	34[23] 34[23].%	Hemiplegia, paraplegia, quadriplegia	G8[12].%
	334.1% 344.10-69%	Various paralysis, including monoplegia and hereditary spastic paraplegia	G83.10-49% G80.1[2]% G11.4% G04.1%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype
Elixhauser Comorbidity - Peptic Ulcer Disease, Excluding Bleeding
Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	53[1234].[79]%	Gastric, duodenal, peptic, gastrojejunal, etc. ulcerative disease	K2[5678].[79]%

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Peripheral Vascular Disorders**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic		ICD-9 Codes	Description	ICD-10 Code conversion
Components		093.0%	Syphilitic aortic aneurysm	
		437.3%	Nonruptured cerebral aneurysm	
		443.1-9%	Various aneurysms and dissections	
		447.1%	Artery Stricture	I77.1%
		V43.4%	Presence of implant or graft including cardiac, heart assist device, artificial heart, or vascular	Z95.189%
		44.01	Various peripheral vascular disease (including intestinal)	I73.189%
		44.01.1%		I79.02%
		557.19%		K55.189%
			I70.1.1%	

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Psychoses

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. "Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data", Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	29[578] 29[578].%	Schizophrenia, paranoid, psychosis, and delusional disorders	F2[02-589] F2[02-589].%
	296.[0145]4 293.8%	Various disorders w/ psychotic symptoms	F3[01].2% F31.5%

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Pulmonary Circulation Disorders

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	417.[089]%	Pulmonary vessel disease	I28.[089]%
	416 416.% 415.[01]%	Pulmonary embolism, pulmonary hypertension, cor pulmonale	I2[67].%

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Renal Failure**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	58[56] 58[56].% 403.[019]1 404.[019][23]	Chronic kidney disease, kidney failure	N1[89] N1[89].% I12.0% I13.1%
	V56 V56.% V45.1%	Dialysis and dialysis care	Z99.2% Z49.[0–2]%
	588.0%	Renal osteodystrophy	N25.0%
	V42.0%	Kidney transplant	Z94.0%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Rheumatoid Arthritis Collagen Vascular Diseases

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components	446	Various, including polyarteritis Nodosa, thrombotic microangiopathy, granuloma	M30.%
	446.%		M31.[0-3].%
	714	Rheumatic disease	M0[568].%
	714.%		M12.[03].%
	719.3%	Scleroderma	L94.[013].%
	701.0%		
	72[05]	Inflammatory spondylopathies	M45.%
	72[05].%		M46.[189].%
	710.[0-489].%	Various, including arthritis, lupus, systemic sclerosis, and hypermobility syndrome	M3[2-5].%
	711.2%		
	728.5%	Fasciitis including panniculitis	
	728.89		
	729.30		

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Elixhauser Comorbidity - Solid Tumor Without Metastasis

Description

ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:

aims_billingdiagnoses

Prior time frame – 90 days prior to date of service

Post time frame – 7 days after date of service

Reference:

(1) Quan, et. al. "Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data", Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components	1[4-6][0-9].% 17[0-24-9].% 19[0-5].% 1[4-6][0-9] 17[0-24-9] 19[0-5]	Malignant neoplasms	C[01][0-9].% C2[0-6].% C3[0-47-9].% C4[0135-9].% C5[0-8].% C6[0-9].% C7[0-6].% C97.% C[01][0-9] C2[0-6] C3[0-47-9] C4[0135-9] C97 C7[0-6] C5[0-8] C6[0-9]

Granularity

One value per case

Value Type

categorical

Limitation

A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Valvular Disease**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic	ICD-9 Codes	Description	ICD-10 Code conversion
Components1	39[4-7]	Valve diseases including rheumatic	I09.[18]%
	39[4-7].%		I10[5-8].%
	424		I3[4-9]
	424.%		I3[4-9].%
	093.2%	Syphilitic heart disease	A52.0%
	746.[3-6]%	Congenital	Q23.[0-3]%
	V42.2%	Prosthetic or xenogenic heart valve	Z95.[2-4]%
	V43.3%		

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype **Elixhauser Comorbidity - Weight Loss**

Description ICD-9, ICD-10 based comorbidity measure derived from hospital discharge administrative codes. Does not reference professional billing diagnoses, anesthesia history and physical diagnoses, or problem summary list diagnoses. Codes are based upon the Quan et al article (see below for full reference).

Data source:
aims_billingdiagnoses

Prior time frame – 90 days prior to date of service
Post time frame – 7 days after date of service

Reference:
(1) Quan, et. al. “Coding Algorithms for Defining Comorbidities in ICD-9- CM and ICD-10 Administrative Data”, Medical Care, 43 (11), Nov 2005

Logic

	ICD-9 Codes	Description	ICD-10 Code conversion
Components	26[0-3]	Kwashiorkor, marasmus, etc.	E4[0-6]
	26[0-3].%		E4[0-6].%
	799.4%	Cachexia	R64
	783.2%	Loss of weight and underweight	R63.4%

Granularity One value per case

Value Type categorical

Limitation A limitation with this collation is that it is not known whether each ICD-9/10 code was present on admission.

Phenotype

Emergency Status (ASA Class) Yes/No

Description

This phenotype returns a yes/no answer for the Emergency Status in ASA Classification. When used with ASA status will return the ASA status and emergent status (example "2E" as opposed to just "2" or "E" if used independently).

References:

1. <https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system>

Logic

As developed by the American Society of Anesthesiologists (ASA), the ASA Physical Status Classification is a six-category system for assessing health and fitness of patients prior to anesthesia/surgery¹.

This collation uses the Emergency Status collation value and maps it to a "Yes" (1) or a "No" (0) response. Yes (1) indicates that the case was listed as Emergency Status, a No (0) indicates it was not. If the value is invalid (does not fit emergent documentation) it returns "Invalid" (-998). If there are multiple valid documented values a "Conflicting" (-997) is returned. Missing documentation is returned "Missing" (-999). A NULL may be returned if the note is available but has yet to be mapped.

This collation can accompany the ASA Class (cleaned) collation to return a numerical ASA Classification and the traditional alpha "E" notation in the form of this collation's Yes/No (1/0) response.

Granularity

One value per case

Value Type

categorical

Limitation

none

Phenotype **Halogenated Anesthetic Gases**

Description **This phenotype is used to determine if any halogenated gases were used during a case**

Logic This phenotype uses the following MPOG concepts and thresholds to determine if a halogenated gas was administered during the case:

MPOG Concept ID	Concept Name	Artifact Values (%)	Artifact Values (reported as number not percentage)
3260	Isoflurane Exp %	< 0.2	< 0.002
3265	Isoflurane Insp %	< 0.2	< 0.002
3270	Sevoflurane Exp %	< 0.5	< 0.005
3275	Sevoflurane Insp %	< 0.5	< 0.005
3280	Desflurane Exp %	< 0.5	< 0.005
3285	Desflurane Insp %	< 0.5	< 0.005
3290	Halothane Exp %	< 0.5	< 0.005
3295	Halothane Insp %	< 0.5	< 0.005
3297	Enflurane Exp %	< 0.5	< 0.005
3298	Enflurane Insp %	< 0.5	< 0.005
3299	Miscellaneous Volatile Agent Insp %	< 0.3	< 0.003
3300	Miscellaneous Volatile Agent Exp %	< 0.3	< 0.003

A case must have ≥ 5 halogenated gas physiologic values above threshold to return (1) Yes, halogenated gas was used during the case. If < 5 valid halogenated gas values then, (0) No, halogenated gas was not used during the case.

***Note:** These readings do not have to be consecutive or of the same type of volatile gas.

Granularity One value per case

Value Type categorical

Limitation Note these readings do not have to be consecutive or of the same type of halogenated agent.

Phenotype	Height (cm)
Description	This phenotype returns the height for a patient in cm on a per case basis.
Logic	<p>Takes values mapped to 70257 Physical exam- height (cm) and 70258 Physical exam-height (in) Valid height range is 12.70 - 243.85 cm (5-96 inches)</p> <ol style="list-style-type: none"> 1. If case reported height in inches, converts the value to cm (Height in cm = Height in inches * 2.54cm). 2. Then this collation determines if the value is in a valid range of [12.70-243.85]. If outside the range returns as NULL <p>[] = inclusive (meaning including the values of 12.70 cm and 243.85 cm)</p> <p>Note:</p> <ul style="list-style-type: none"> - Only one result is returned. If there are multiple results, the latest recorded result within 12 hours past anesthesia end is used. If multiple heights are recorded at the chosen time, then the height recorded in CM is chosen. If there are still multiple heights at the same time, the tallest measurement is used - Heights recorded after 12 hours postop or missing a recorded time are not excluded, but they won't be chosen if there are heights recorded before 12 hours postop
Granularity	One value per case
Value Type	int
Limitation	Dependent on height AIMS variables being correctly mapped to MPOG Concepts 70257 Physical exam-height (cm) and 70258 Physical exam-height (in)

Phenotype	Holiday
Description	<p>This returns an indication if the "anesthesia start" for a specific MPOG_CASE_ID occurred on a designated holiday.</p> <p>For the purpose of US Holidays, the following holidays are recognized:</p> <ul style="list-style-type: none"> - New Year's Day - Memorial Day - Independence Day - Labor Day - Thanksgiving Day - Friday After Thanksgiving Day - Christmas Day
Logic	<p>Aim: To identify days on which limited clinical activity occurs.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Determine if the Anesthesia Start Falls on a Weekday 2) Determine if this date is a designated holiday. If it is, then return 1 else return 0.
Granularity	One value per case
Value Type	categorical
Limitation	<p>We do not validate if each site treats these actual dates as holidays/non-observed/observed on another day.</p> <p>There may be additional site specific holidays which are unaccounted for.</p> <p>Accounts only for weekday holidays. Weekend holidays are excluded.</p> <p>For the purposes of Dutch holidays the following will be recognized (following a date specific approach) in a later version of this phenotype:</p> <ul style="list-style-type: none"> - New Year's Day - Good Friday (Easter Sunday - 2) - Eater Sunday - Easter Monday (Easter Sunday + 1) - King's Day - Liberation Day (Every 5 years, start 2015) - Ascension Day - Pentecost Sunday (Easter Sunday + 49 Days) - Pentecost Monday (Easter Sunday + 50 days) - Christmas Day - Boxing Day (Christmas Day + 1)

Phenotype

Hospital Bed Size

Description

This phenotype returns a categorical value indicating the the bed-size for each hospital affiliated with an MPOG institution.

Logic

Value	Description
1	6-24 beds
2	25-49 beds
3	50-99 beds
4	100-199 beds
5	200-299 beds
6	300-399 beds
7	400-499 beds
8	500 or more beds

Granularity

One value per case

Value Type

not set

Limitation

Bed-sizes are based on 2018 hospital data.

Phenotype

Ideal Body Weight

Description

Calculating the ideal body weight for a patient

References:

1. Phillips S, Edlbeck A, Kirby M, Goday P. Ideal Body Weight in Children. Nutrition in clinical Practice (2007) 22:240-245
2. ARDS Network. <http://www.ardsnet.org/tools.shtml>
3. CDC Children growth charts: https://www.cdc.gov/growthcharts/percentile_data_files.htm

Logic

IF patients aged: 1-17 years AND height > 74cm
then IBW using the McLaren Method uses the CDC growth charts to determine IBW for children 2-17 years old and WHO growth charts for children < 2 years old by sex. This method plots the child's height for age and extends a line horizontally to the 50th percentile height-for-age line. You then extend a line vertically from the 50th percentile height-for-age line to the corresponding 50th percentile weight. This the child's IBW.

For patients aged >= 18 years

If collation.Sex = 0 then $IBW = 50 + 0.91 * (collation.height - 152.4cm)$

If collation.Sex = 1 then $IBW = 45.5 + 0.91 * (collation.height - 152.4cm)$

If patient height < 74cm or patient age <1, returns NULL

Granularity

One value per case

Value Type

int

Limitation

There are 2 formulas used in this collation, one for patient's aged 1-17 years old and one for patient's aged >=18 years old.

Phenotype	Induction End
Description	This phenotype is used to determine the induction time end for cases as applicable.
Logic	Retrieves date and time recorded under mpog concept id = 50005 (Induction End Date/Time) from intraop notes. It returns the earliest time per case if there are multiple entries. The note must not be deleted. The note cannot be timestamped before 1995 or a date in the future.
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype is limited to cases where induction end time is documented and the appropriate AIMS variable is mapped to MPOG concept 50005 (Induction End Date/Time)

Phenotype	Induction Start
Description	This phenotype returns the associated date/time of Induction Start (MPOG concept ID 50004)
Logic	This phenotype uses note concept ID 50004 (Induction Start Date/Time) and returns the associated time observed for the variable mapped to the Induction Start Date/Time concept. If there are more than one induction start times for the case, this phenotype will result the earliest time.
Granularity	One value per case
Value Type	datetime
Limitation	This phenotype uses MPOG concept ID 50004 (Induction Start Date/Time) to define the induction start time. Those defined outside this concept will not be captured.



Phenotype	Institution
Description	This phenotype links cases to the instution from which they are processed.
Logic	Returns a text value of the institution assigned to the case, along with an MPOG_Institution ID.
Granularity	One value per case
Value Type	varchar
Limitation	Institutions may have different instances if the institution has multiple electronic medical record (EMR) systems, or has changed EMR while in MPOG. Of note, to protect patient privacy, there are instances where the MPOG Institution ID will be appropriately de-identified.

Phenotype

Last Known Alive

Description

This phenotype returns the last known date that the patient was considered alive according to MPOG data. It is used to help determine the date of death and Mortality data

Logic

The latest date of the following criteria is returned as the 'Last Known Alive' date:

1. The latest 'Anesthesia Start' minus 1 day
2. The latest medication dose minus 1 day
3. The latest lab observation date minus 2 days

Other Details:

- Observation date is used as it reflects the date that the lab was drawn and may be different from the date that the lab was resulted
- This phenotype evaluates each patient ID at each institution
- This phenotype omits dates where the patient is recorded as an ASA 6 (A declared brain-dead patient whose organs are being removed for donor purposes).
- It will only return patients with a last known alive date. If there is no last known alive date by this logic (no reported anes start, medications, or labs for this patient), this collation will not return the patient.

References:

1. <https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system>

Granularity

One value per case

Value Type

datetime

Limitation

none

Phenotype

Medical School Affiliation

Description

Indicates whether the case occurred at an institution affiliated with a medical school.

Logic

This phenotype will return a 1=Yes or 0=No flag for whether the institution where the case occurred has an associated medical school.

Please note that this phenotype does NOT return the institution name and will only return the medical school affiliation value. We include the institution name and medical school affiliation designation below for informational purposes.

Institution Name	Medical School Affiliation
Beaumont Dearborn	0
Beaumont Farmington Hills	0
Beaumont Grosse Pointe	0
Beaumont Royal Oak	1
Beaumont Taylor	0
Beaumont Trenton	0
Beaumont Troy	1
Beaumont Wayne	0
Brigham and Women's Hospital	1
Bronson Healthcare Group	0
Childrens Hospital of Orange County	1
Cleveland Clinic	1
Columbia University Medical Center	1
Dartmouth-Hitchcock Medical Center	1
Duke University	1
Henry Ford Health System – Allegiance	0
Henry Ford Health System - Detroit	1
Henry Ford Health System – Macomb	0
Henry Ford Health System - West Bloomfield	0
Henry Ford Health System – Wyandotte	0
Holland Hospital	0
Massachusetts General Hospital	1
MD Anderson Cancer Center	1
Memorial Sloan Kettering Cancer Center	1
NYU Langone Medical Center	1
Oregon Health and Science University	1
Sparrow Health System	0
Stanford Hospitals and Clinics	1
Trinity - Mercy Health Muskegon	0
Trinity - St. Joseph Mercy Ann Arbor	0
Trinity - St. Joseph Oakland	0
Trinity - St. Mary Mercy Livonia	0
UChicago Medicine	1
UCLA Medical Center	1

University Medical Center - Utrecht	1
University of Amsterdam - Academic Medical Center	1
University of Arkansas for Medical Sciences	1
University of California San Francisco	1
University of Colorado Denver	1
University of Florida Health Jacksonville	1
University of Florida, Gainesville	1
University of Michigan Health System	1
University of Oklahoma Health Sciences Center	1
University of Pennsylvania Medical School	1
University of Tennessee Medical Center	1
University of Utah Health Care	1
University of Vermont - Fletcher Allen Health Care	1
University of Virginia Health System	1
University of Washington Medical Center	1
Vanderbilt University Medical Center	1
Wake Forest Baptist Medical Center	1
Washington University School of Medicine	1
Weill Cornell Medical College	1
Yale New Haven Hospital	1

Granularity One value per case

Value Type categorical

Limitation This phenotype is determined by MPOG. This is not associated with the American Hospital Association definition for teaching hospital. Please contact us if the affiliation for your institution should be updated.

Phenotype	Mortality (In Hospital 30-day)
Description	30-day in-hospital mortality
Logic	<p>Looks to see if the institution has in-hospital mortality within the current month or +/- 1 month. If none, -999 "Missing" is returned. If patient is labeled as an ASA 6 for the case, return -2 "ASA6". Next, looks at mortality date and checks last known alive date and if >48 hrs from recorded death, return -1 "conflicting". If mortality is w/in the 30 days following anesthesia start, last known alive is <48hrs prior, and the case is not an ASA 6, return 1 ("Yes").</p> <p>Given all the above, if there is no date of death within 30 days of anes start, return 0 ("No").</p>
Granularity	One value per case
Value Type	categorical
Limitation	none

Phenotype	MPOG Comorbidity - Cerebrovascular Disease
Description	This phenotype will be used to determine if the patient has a diagnosis of cerebrovascular disease using administrative billing data.
Logic	<p>Any patient that have the following ICD codes for cerebrovascular disease will be classified as a 1 for yes. If none of the codes below are present, the patient will be classified as a 0 . If there are no ICD codes, then the data will be classified as missing and reported as -999.</p> <p>Prior time frame – 90 days prior to date of service Post time frame – 7 days after date of service</p> <p>ICD-9-CM: 433.X, 434.X, 435.X, 437.X, 438.X</p> <p>ICD-10-CM: I63.X, I65.X, I66.X, I67.X, I68.X</p> <p>X = any number of any digits</p> <p>KEY: 433 - Occlusion and stenosis or precerebral arteries 434 - Occlusion of cerebral arteries 435 - Transient cerebral ischemia 437 - Other and ill-defined cerebrovascular disease 438 - Late effects of cerebrovascular disease</p> <p>I63 - Cerebral Infarction I65 - Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction I66 - Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction I67 - Other cerebrovascular diseases I68 - Cerebrovascular disorders in diseases classified elsewhere</p>
Granularity	One value per case
Value Type	categorical
Limitation	<p>This phenotype relies on ICD-9 & ICD-10 codes to determine if the patient has a history of cerebrovascular disease. These codes must be included in the hospital discharge or pro fee administrative billing data submitted to MPOG. This collation does not reference problem summary list diagnoses.</p> <p>MPOG is unable to determine if diagnosis of cerebrovascular disease was present on admission.</p>

Phenotype	MPOG Comorbidity - Coronary Artery Disease
Description	ICD-9 and/or ICD-10 codes used to identify a history of coronary artery disease
Logic	<p>Any patient that have the following ICD codes for coronary artery disease (CAD) will be classified as a 1 for yes. If none of the codes below are present, the patient will be classified as a 0 for CAD. If there are no ICD codes, then the data will be classified as missing and reported as -999.</p> <p>Prior time frame – 90 days prior to date of service Post time frame – 7 days after date of service</p> <p>ICD-9-CM: 412, 414.2, 414.8, 414.9, V45.81, V45.82</p> <p>ICD-10-CM: I25.10, I25.110, I25.111, I25.118, I25.119, I25.2, I25.5, I25.6, I25.700, I25.701, I25.708, I25.709, I25.710, I25.711, I25.718, I25.719, I25.720, I25.721, I25.728, I25.729, I25.730, I25.731, I25.738, I25.739, I25.750, I25.751, I25.758, I25.759, I25.760, I25.761, I25.768, I25.769, I25.790, I25.791, I25.798, I25.799, I25.810, I25.811, I25.812, I25.82, I25.83, I25.84, I25.89, I25.9, Z95.1, Z95.5, Z98.61</p> <p>KEY: I25 – Chronic Ischemic Heart Disease Z95.1 - Presence of aortocoronary bypass graft Z95.5 - Presence of coronary angioplasty implant and graft Z98.61 – Coronary Angioplasty Status (primarily coded as presence of a stent, CAD)</p> <p>412 – Old MI 414.2 – Chronic total occlusion of coronary artery 414.8 – Other specified forms of chronic ischemic heart disease 414.9 – Chronic ischemic heart disease, unspecified V45.81, V45.82 - Coronary Angioplasty Status (primarily coded as presence of a stent, CAD)</p>
Granularity	One value per case
Value Type	int
Limitation	ICD codes do not specify if they were present on admission versus present on hospital discharge.

Phenotype

MPOG Complication - Acute Kidney Injury (AKI)

Description

Lab-based postoperative outcome measure, defined by Kidney Disease – Improving Global Outcomes (KDIGO) definition.
Specifically, an increase in serum creatinine by ≥ 0.3 mg/dL within 48 hours of anesthesia end time, or a $\geq 50\%$ increase within seven postoperative calendar days.

References:

Kellum JA, Lameire N. Diagnosis, evaluation, and management of acute kidney injury: a KDIGO summary (Part 1). Crit Care. 2013;17(1):204.

* CKD-EPI Formula: <https://www.niddk.nih.gov/health-information/health-communication-programs/nkdep/lab-evaluation/gfr/estimating/Pages/estimating.aspx>

** Cockcroft-Gault Formula: <http://www.mdcalc.com/creatinine-clearance-cockcroft-gault-equation/>
Body Surface Area (BSA) by Du Bois and Du Bois Formula: <http://www.ncbi.nlm.nih.gov/pubmed/2520314>
BSA-Indexed EGFR conversion reference: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879308/>

*** Bedside Schwartz Formula: <https://www.kidney.org/content/creatinine-based-%E2%80%9Cbedside-schwartz%E2%80%9D-equation-2009>

Logic

1. Determine if institution where case was performed is contributing laboratory data
 - a) If no laboratory data available → Output = -999 [collation complete]
2. Obtain most recent (latest) valid serum creatinine level in mg/dL (MPOG concept ID 5002) prior to anesthesia start = Baseline creatinine
 - a) Valid = ≥ 0.2 mg/dL and ≤ 25.00 , ignore non-valid values
 - b) If no creatinine within 60 days prior to anesthesia start → Output = -3 [collation complete]
3. Calculate BSA-Indexed EGFR based upon Baseline creatinine: Adults >18 years old:
 - a). If race data available → use CKD-EPI formula*:

$$\text{CKD-EPI EGFR} = 141 \times \min(\text{Scr}/\kappa, 1) \alpha * \max(\text{Scr}/\kappa, -1.209 * (0.993)^{\text{Age}} * (1.018 \text{ if female}) * (1.159 \text{ if black}))$$
 Scr indicates the baseline serum creatinine in mg/dL
 - $\kappa = 0.7$ for females, 0.9 for males
 - $\alpha = -0.329$ for females, -0.411 for males
 - Age = age in years
 - min indicates the minimum of Scr/ κ or 1
 - max indicates the maximum of Scr/ κ or 1
 - 1) Age mandatory
 - 2) If no gender data available → assume female
 - 3) If no race data (and no weight data for Cockcroft-Gault) available → use CKD-EPI and assume non-black
 - b) If no race data available → use Cockcroft-Gault formula**: $\text{EGFR} = ((140 - \text{age in years}) * (\text{weight in kg}) * (0.85 \text{ if female})) / (72 * \text{Baseline creatinine})$

$$\text{BSA} = (\text{weight in kg})^{0.425} * (\text{height in cm})^{0.725} * 0.007184.$$

$$\text{BSA-Indexed EGFR} = \text{EGFR} * 1.73 / \text{BSA}$$
 - 1) Age mandatory
 - 2) If no gender data available → assume female
 - 3) If no height data available → assume BSA = 1.73

- 4) If no weight data available → use CKD-EPI formula instead, assume non-black
Pediatric Patients ≤18 years old:
Bedside Schwartz EGFR = $0.413 * (\text{height in cm}) / (\text{baseline creatinine})$
1) Height mandatory
4. Diagnose preoperative renal failure, if present:
1) BSA-Indexed EGFR < 15 mL/min/1.73 m² → Output = -2 [collation complete]
5. Obtain highest valid postoperative serum creatinine level recorded within 7 days after anesthesia end, AND before anesthesia start date/time of subsequent surgery.
1. Valid = ≥0.2 mg/dL and ≤25.00, ignore non-valid values
 2. If no postoperative creatinine within 7 days after anesthesia end → Output = -1 [collation complete]
 3. Otherwise, if this value is ≥200% greater than baseline creatinine (i.e. ≥3.0 times baseline) OR Cr > 4.0 mg/dL → Output = 3 [collation complete]
 4. Otherwise, if this value is ≥100% greater than baseline creatinine (i.e. ≥2.0 times baseline) → Output = 2 [collation complete]
 5. Otherwise, if this value is ≥50% greater than baseline creatinine (i.e. ≥1.5 times baseline) → Output = 1 [collation complete]
 6. Otherwise, obtain highest postoperative serum creatinine level recorded within 48 hours after anesthesia end, AND before anesthesia start date/time of subsequent surgery.
 - a) If this value is ≥0.3 mg/dL greater than baseline creatinine → Output = 1 [collation complete]
 - b) Otherwise → Output = 0 [collation complete]

Granularity One value per case

Value Type categorical

Limitation This phenotype is for research purposes and not quality. The quality AKI metric returns different parameters and has different exclusion criteria.

- Returns negative values in enumeration (see below), for non-applicable cases
- Intended for use on adults >18 yo only

Phenotype **Nitrous Oxide Used**

Description **This phenotype is used to determine if non-halogenated gases were given during a case**

Logic This phenotype uses the following MPOG concepts and thresholds to determine if a non-halogenated gas was administered during the case:

MPOG Concept ID	Concept Name	Artifact Threshold (%)	Artifact Threshold (reported as number not percentage)
3250	Nitrous Insp %	15	0.15
3255	Nitrous Exp %	15	0.15
3225	Flows Nitrous Oxide (L/min)	0.2	na

A case must have = 5 physiologic values of nitrous oxide to return (1) Yes, nitrous oxide was used during the case. If a case has < 5 valid values of nitrous oxide then (0) No, nitrous oxide was not used during the case.

Note: These readings do not have to be consecutive or of the same type of volatile gas.

Granularity One value per case

Value Type categorical

Limitation Note these readings do not have to be consecutive or of the same type of non-halogenated agent

Phenotype

Non-Opioid Analgesics

Description

This phenotype describes which non-opioid medications were given during a case. It returns a key code of all of the medications given from the non-opioid list as a yes/no for each. Please see logic below for more details.

Logic

If a medication from the list below is found to be used at any time during the case, the corresponding letter is returned. All letters are then concatenated (placed together) and returned as a single alpha return per case.

'A' --Acetaminophen

'B' --Aspirin

'C' --Celecoxib

'D' --Diclofenac

'E' --Dexamethasone

'F' --Dexmedetomidine

'G' --Gabapentin

'H' --Ibuprofen

'I' --Ketamine

'J' --Ketorolac

'K' --Indomethacin

'L' --Magnesium Sulfate

'M' --Lidocaine

'N' --Pregabalin

Med/Route combinations covered are listed below:

```

WHEN meds.MPOG_Med_Concept_ID = 10007 AND meds.MPOG_Route_Concept_ID IN(2008,2023,2001) THEN 'A' --Acetaminophen
WHEN meds.MPOG_Med_Concept_ID = 10040 AND meds.MPOG_Route_Concept_ID IN(2008,2023) THEN 'B' --Aspirin
WHEN meds.MPOG_Med_Concept_ID = 10116 AND meds.MPOG_Route_Concept_ID IN(2008,2023) THEN 'C' --Celecoxib
WHEN meds.MPOG_Med_Concept_ID = 11000 AND meds.MPOG_Route_Concept_ID IN(2008,2023,2001) THEN 'D' --Diclofenac
WHEN meds.MPOG_Med_Concept_ID = 10147 AND meds.MPOG_Route_Concept_ID IN(2008,2023,2001) THEN 'E' --Dexamethasone
WHEN meds.MPOG_Med_Concept_ID = 10149 AND meds.MPOG_Route_Concept_ID IN(2001) THEN 'F' --Dexmedetomidine
WHEN meds.MPOG_Med_Concept_ID = 10199 AND meds.MPOG_Route_Concept_ID IN(2008,2023) THEN 'G' --Gabapentin
WHEN meds.MPOG_Med_Concept_ID = 10222 AND meds.MPOG_Route_Concept_ID IN(2008,2023,2001) THEN 'H' --Ibuprofen
WHEN meds.MPOG_Med_Concept_ID = 10238 AND meds.MPOG_Route_Concept_ID IN(2001) THEN 'I' --Ketamine
WHEN meds.MPOG_Med_Concept_ID = 10239 AND meds.MPOG_Route_Concept_ID IN(2008,2023,2001) THEN 'J' --Ketorolac
WHEN meds.MPOG_Med_Concept_ID = 10323 AND meds.MPOG_Route_Concept_ID IN(2008,2023) THEN 'K' --Indomethacin
WHEN meds.MPOG_Med_Concept_ID = 10276 AND meds.MPOG_Route_Concept_ID IN(2001) THEN 'L' --Magnesium Sulfate
WHEN meds.MPOG_Med_Concept_ID = 10477 AND meds.MPOG_Route_Concept_ID IN(2001) THEN 'M' --Lidocaine
WHEN meds.MPOG_Med_Concept_ID = 10570 AND meds.MPOG_Route_Concept_ID IN(2008,2023) THEN 'N' --Pregabalin

```

Granularity

One value per case

Value Type

categorical

Limitation

Essentially returns a yes/no for each medication from the list irrespective of dosing characteristics. Routes included in this phenotype are listed in the Logic section and specific to each medication as shown.

Phenotype

Obstetric Anesthesia Type

Description

This collation will be used to determine if cases with predicted or actual CPT codes for labor epidurals, cesarean deliveries, or cesarean hysterectomies (01961, 01967, 01968, 19969, or 01963) are one of eight case types: labor epidural, cesarean delivery, labor epidural converted to cesarean delivery, cesarean hysterectomy, conversion (labor epidural portion), conversion (cesarean delivery portion), conversion (cesarean hysterectomy portion) or unable to determine. High variability in use of CPT codes and frequent mismatches between CPT codes and procedures performed necessitate this phenotype. This phenotype will be used to include or exclude cases from obstetric specific measures and other general measures.

Logic

Step I: Examine CPT codes

1. If case has actual or predicted CPT codes 01961, 01967, 01968, 01969, or 01963 proceed to Step II. If not, return value "No" and stop.

Step II: Determine if case should be included in phenotype

1. Evaluate if procedure text contains "XRT IMRT TX DELIVERY COMPLEX-KV IGRT W ANES" or "PROTON"

1. If yes, exclude case. Return value "No"

2. If no, continue to number 2

2. Evaluate if case includes *Neonate Delivered (50358)* between *Anesthesia Start (50002)* and *Anesthesia End (50009)*

1. If yes, include case and move to Step III

2. If no, evaluate if case procedure text includes any of the following, and does not include "resection"

1. Included procedure texts

1. Active labor
2. Antepartum
3. Ante
4. Induction + n/a
5. Assisted Delivery
6. C sec
7. C/s
8. Cesarean
9. Ces section
10. Cesarean Delivery
11. C-hyst
12. CS
13. Deliver
14. Induction + no other words
15. Delivery
16. Induction + labor
17. Induction + OB
18. IOL
19. Labor
20. CLE

21. PPROM
22. TOLAC
23. Primary Section
2. If yes, include case and move to Step III
3. If no, evaluate if procedure text includes any of the following procedure texts AND has any of the following OB concepts between *Anesthesia Start (50002)* and *Anesthesia End (50009)*
 1. Conditional procedure text
 1. Active labor
 2. Evaluation
 3. Consult
 4. Salpingectomy
 5. Version
 6. Amnioreduction
 7. Ligation
 8. Btl
 9. Tubal
 10. Cerclage
 11. ECV
 12. Epidural
 13. L&D
 14. Blood patch
 15. Anesthesia consult
 16. Possible Cesarean Delivery
 17. Cesarean (or derivatives) + Cephalic
 18. Cesarean (or derivatives) + Scar
 19. Cesarean (or derivatives) + Wound
 20. Cesarean (or derivatives) + Methotrexate
 21. Delivery + Placenta
 22. Analgesia
 23. D&C
 24. Observation
 25. Ovarian
 26. Obs
 27. Hyster
 28. Placenta
 29. D and C
 30. Postpartum
 31. Pregnancy
 32. Regional Block
 33. Retained Placenta
 34. Alpingectomy
 35. Loss
 36. Anesthesia
 37. OB
 2. Obstetric Concepts Considered
 1. 50357 Obstetrics- Uterine Incision
 2. 50050 Obstetrics - Labor Epidural start
 3. 50051 Obstetrics - Labor epidural end
 4. 50189 Obstetrics- Deliver of Neonate 2

5. 50359 Obstetrics- Apgar score checked at 1 minute note
6. 50360 Obstetrics- Apgar score 1 minute detail
7. 50358 Obstetrics- delivery of neonate
8. 50049 Duration of contractions
9. 50052 Frequency of contractions
10. 50596 Obstetrics- labor continued as c-section
11. 50361 Obstetrics - Vaginal delivery note
12. 50362 Obstetrics - Vaginal Delivery in/out of OR detail
13. 50369 Obstetrics- Vaginal Delivery in/out of OR detail
14. 50373 Obstetrics - Apgar score checked at 5 minute note
15. 50374 Obstetrics- Apgar score at 5 minute detail
16. 3181 Frequency of Contractions
17. 3188 Duration of Contractions

3. If yes, include case and move to step III
4. If no, exclude case from phenotype. Return value "No"

Step III: Determine if case is surgical

1. Evaluate if case includes CPT codes 01963 or 01969 AND has procedure texts including "cesarean" + "hysterectomy", "C-Hyst", or "C Section Hyst"
 1. If yes, then assign preliminary result 'Cesarean Hysterectomy'. Proceed to Step V
 2. If no, proceed to number 2
2. Evaluate if case meets any of the following criteria:
 1. Meets General Anesthesia criteria as determined by the 'Anesthesia Technique: General' phenotype OR
 2. Any of the following between *Anesthesia Start (50002)* and *Anesthesia End (50009)*
 1. Uterine Incision (50357)
 2. Surgical Incision Time (50235)
 3. AACD Procedure Start (50006)
 4. AACD Procedure Finish (50007)
3. If 'No' then assign preliminary result 'Labor Epidural'. "Proceed to Step V
4. If 'Yes' then proceed to Step IV

Step IV: Refine Obstetric surgery type

1. Determine if *Neonate Delivered* (50358) is after or at the same time as *Procedure Start* (50006), *Uterine Incision* (50357), *Surgical Incision Time* (50235) or *Obstetrics- Labor Epidural Continued as C-Section* (50596)
 1. If no, then assign preliminary result 'Unable to Determine'. Proceed to Step V
 2. If yes or n/a, move to number 2
2. Determine if procedure text includes "cesarean" + "hysterectomy", "C-Hyst" or "C Section Hyst"
 1. If yes, then assign preliminary result 'Cesarean Hysterectomy'. Proceed to Step V
 2. If no, move to number 3
3. Determine if anesthesia duration is greater than 240 minutes
 1. If yes, move to number 6
 2. If no, move to number 4
4. Determine if Obstetrics-Labor Continued as C-Section (50596) is within 30 minutes of Anesthesia Start (50002)
 1. If yes, then assign preliminary result 'Cesarean Delivery'. Proceed to Step V
 2. If no, then move to number 5
 3. If n/a, then move to number 6

4. Determine if *Obstetrics-Labor Continued as C-Section (50596)* is before the start of any of the surgical criteria listed in Step II
 1. If yes, then assign preliminary result '**Labor Epidural Converted to Cesarean Delivery**'. Proceed to Step V
 2. If no, then assign preliminary result '**Cesarean Delivery**'. Proceed to Step V
5. Determine if *Anesthesia Start (50002)* is >120 minutes before *Procedure Start (50006)*, or if *Procedure Start* not available, if *Anesthesia Start* is >150 minutes before *Surgical Incision (50235)* or *Uterine Incision (50357)*
 1. If yes, then assign preliminary result '**Labor Epidural Converted to Cesarean Delivery**'. Proceed to Step V
 2. If no, then assign preliminary result '**Cesarean Delivery**'. Proceed to Step V

Step V: Assign Final Decision

1. If preliminary result 'Unable to Determine' then assign final result '**Unable to Determine**'
2. If preliminary result 'Cesarean Hysterectomy', then check for a 'Labor Epidural' or 'Conversion (Labor Epidural Portion)' case starting or ending within 24 hours after the current case for the same patient
 1. If yes, then assign final result '**Conversion (Cesarean Hysterectomy Portion)**'
 2. If no, then assign final result '**Cesarean Hysterectomy**'
3. If preliminary result 'Cesarean Hysterectomy' then assign final result '**Cesarean Hysterectomy**'
4. If preliminary result 'Labor Epidural Converted to Cesarean Delivery', then assign final result '**Conversion**

(Labor Epidural and Cesarean Delivery Combined)

5. If preliminary result 'Labor Epidural', then check for a 'Cesarean Delivery', 'Conversion (Cesarean Delivery Portion)', 'Conversion (Cesarean Hysterectomy Portion)', or 'Cesarean Hysterectomy' case starting or ending within 24 hours before the current case for the same patient
 1. If yes, then assign final result '**Conversion (Labor Epidural Portion)**'
 2. If no, then assign final result '**Labor Epidural**'
6. If preliminary result 'Cesarean Delivery', then check for a 'Labor Epidural' or 'Conversion (Labor Epidural Portion)' case starting or ending within 24 hours after the current case for the same patient
 1. If yes, then assign final result '**Conversion (Cesarean Delivery Portion)**'
 2. If no, then assign final result '**Cesarean Delivery**'

Granularity One value per case

Value Type categorical

Limitation This phenotype is limited to cases with predicted or actual CPT codes 01961, 01967, 01968, 01969 or 01963. Errors in coding may prevent an obstetric case of interest to be missed by this phenotype. Further, this phenotype is unable to determine procedures outside of labor epidural, cesarean delivery, cesarean hysterectomy or labor epidural converted to cesarean delivery. Cases not designated at one of these obstetric case types will be labeled as 'unable to determine.' Cesarean hysterectomies done without specifying 'hysterectomy' (or related terms) in the procedure text will not be differentiated from cesarean deliveries or not picked up by this collation.

Phenotype **Oral Morphine Equivalent**

Description This phenotype takes the opioid medications given for a case and converts them into oral morphine equivalents, expressed in milligrams oral morphine. This phenotype also returns whether an opioid medication was documented as given but was not included in the OME for the case due to lack of dosing information (labeled as "unknown"). For example, if 10mg IV morphine was recorded and an unknown dose of IV fentanyl, the case would return the OME for the morphine and "unknown" as a 1, indicating another opioid medication was given and not included in the OME calculation. Additionally, this phenotype returns whether Remifentanyl was included as the current OME conversion used is 0.

Logic This collation returns the following columns:

- a single value for OME per case
- unknown dose - yes (1) / no (0) - an indicator for opioids that were unable to calculate OME value as data was missing to calculate dose given
- REMI - yes (1) / no (0) - an indicator whether remifentanyl was used in the case

All medications for each case are gathered and converted to mg for their doses administered. Then these medications are converted to oral morphine (mg) using the following conversions:

Oral Morphine Equivalence Table					
Opioid	Route	Equivalence (mg)	Potency	Source	Comment
Morphine	Oral	30	1.00	APS/CDC	
MS Contin (controlled release Morphine)	Oral	30	1.00	https://www.healthcare.uiowa.edu/familymedicine/fpinfo/Docs/adultopioidrefguide.htm	
Codeine	Oral	200	0.15	APS/CDC	
Hydromorphone (Dilaudid)	Oral	7.5	4.00	APS/CDC	
Hydrocodone	Oral	30	1.00	CDC	
Oxycodone	Oral	20	1.50	APS/CDC	
Oxymorphone	Oral	10	3.00	APS/CDC	
meperidine	Oral	300	0.10	APS	
levorphanol	Oral	2	15.00	APS	
tramadol	Oral	120	0.25	APS	
tapentadol	Oral	100	0.30	APS	
Fentanyl	transdermal (mcg/hr)	25-300 ug/hr	2.40	CDC	*note this figure varies significantly based on resource. For consistency we stuck with CDC recommendations.
Methadone	Oral	1-20 mg/day	4.00	CDC	** Walker et al found 1:4.7 ratio in a study of 29 patient. Important that below numbers not be used for equianalgesic conversion
Methadone	Oral	21-40 mg/d	8.00	CDC	
Methadone	Oral	41-60 mg/day	10.00	CDC	
Methadone	Oral	>61-80 mg/d	12.00	CDC	
Buprenorphine (SL) Suboxone	Sublingual	0.4 (SL)	75.00	Other	Either exclude from inclusion or flag OME result with "includes buprenorphine". Demystifying Opioid Conversion Calculations - Mary Lynn McPherson

IV Morphine Equivalence Table					
Opioid		Equivalence (mg)	Potency	Source	Comment (from Epic Review)
Morphine	IV	10	1.00	APS	
Codeine	IV	100	0.10	APS	
Fentanyl	IV	0.1	100.00	APS	
Hydromorphone (Dilaudid)	IV	1.5	6.67	APS	
Oxymorphone	IV	1	10.00	APS	From UpToDate; Cancer pain management with opioids: Optimizing analgesia
meperidine	IV	100	0.10	APS	
tramadol	IV	100	0.10	APS	
buprenorphine (Suboxone)	IV	0.4	25.00	APS	
nalbuphine	IV	10	1.00	APS	
Butorphanol	IV	2	5.00	APS	
morphine IT	IT	0.1	100.00	Krames / OpenAnesthesia	Morphine: 10mg IV = 1mg Epidural = 0.1mg Intrathecal (1/10 ratio; very hydrophilic)
morphine epidural	epidural	1	10.00	Krames	
sufentanil IV	IV	0.01	1000.00	Anderson	*not a consensus. Sufenta is 2.5x to 24x more potent than fent. Most likely 2.5-10x more potent
remifentanyl IV	IV	0	0.00		
methadone IV	IV	IV:PO -->1:2	2.00	MLM	convert to PO methadone then to OME
hydromorphone	epidural	0.3	33.33	Open Anesthesia	
hydromorphone	IT	0.06	166.67	Open Anesthesia	Hydromorphone: 1mg IV = 0.2mg Epidural = 0.04 Intrathecal (1/5 ratio; intermediate)
fentanyl	epidural	0.03	300.00	Open Anesthesia	
fentanyl	IT	0.01	1000.00	Open Anesthesia	Fentanyl: 100mcg IV = 33mcg Epidural = 6-10mcg Intrathecal (between 1/3 to 1/5 ratio; very lipophilic)

Sources

APS APS Principles of Analgesic Use 7th ed. Table 2 p. 27-36

CDC CDC guidelines for prescribing opioids for chronic pain 2016

MLM Mary Lynn McPherson - Demystifying opioid conversion calculations, ch 6 p. 134, 2010.

Krames Intrathecal Infusional Therapies for intractable pain: patient management guidelines. J Pain Symptom Manage 1993;8:36-46.

Anderson Anderson R, Saiers JH, Abram S, et al. Accuracy in equianalgesic dosing, conversion dilemmas. J Pain Symptom Manage. 2001;21(5):397-406. PMID 11369161.

Granularity One value per case

Value Type int

Limitation For intraoperative medications documented without dosing parameters we note there was a medication given for which we could not convert to OME, labeled as "unknown". Not all listed medications are found in the MPOG data, as some medications listed in the table are not used in the perioperative setting. Additionally, this phenotype calculated intraoperative OME without consideration of the patient's home medications or the patient's preoperative opioid tolerance. Documentation errors for medications occur in medical records. We have found that OME values >600 typically contain a documentation error and should be considered in error for any given case.

Phenotype	Oral Morphine Equivalent (Normalized)
Description	<p>This phenotype uses the results of the "oral morphine equivalent" phenotype and normalizes (divides by) to patient weight (kg) and case duration (minutes).</p> <p>As with the parent phenotype, this normalized phenotype also returns whether an opioid medication was documented as given but was not included in the OME for the case due to lack of dosing information (labeled as "unknown"). For example, if 10mg IV morphine was recorded and an unknown dose of IV fentanyl, the case would return the OME for the morphine and "unknown" as a 1, indicating another opioid medication was given and not included in the OME calculation. Additionally, this phenotype returns whether Remifentanyl was included as the current OME conversion used is 0. As this phenotype is dependent on patient weight and case duration, it returns a column for these values indicating if either is missing.</p>
Logic	<p>This collation returns the following columns:</p> <ul style="list-style-type: none"> - a single value for normalized OME per case, this value is the OME derived from the "Oral Morphine Equivalent" phenotype divided by the case duration (min) and patient weight (kg). If case duration is less than one hour, one hour is used for calculations - unknown dose - yes (1) / no (0) - an indicator for opioids that were unable to calculate OME value as data was missing to calculate dose given - REMI - yes (1) / no (0) - an indicator whether remifentanil was used in the case - WeightMissing - yes (1) / no (0) - an indicator whether patient weight was missing for the case (if missing we are unable to normalize the OME) - DurationMissing - yes (1) / no (0) - an indicator whether case duration was missing for the case (if missing we are unable to normalize the OME)
Granularity	One value per case
Value Type	not set
Limitation	none

Phenotype	Patient In Room Date/Time
Description	Returns date/time of patient documented in room for a given procedure. One value per case.
Logic	Looks for the concept 50003 - Patient In Room Date/Time, and returns this date/time as long as the documentation was not deleted. If multiple, returns the earliest.
Granularity	One value per case
Value Type	datetime
Limitation	Dependent on proper documentation.

Phenotype	Patient Out Of Room Date/Time
Description	Returned the date/time of the documented patient out of room for a given case.
Logic	Looks for the concept 50008 - Patient Out Of Room Date/Time, and returns this date/time as long as the documentation was not deleted. If multiple, returns the latest.
Granularity	One value per case
Value Type	datetime
Limitation	Dependent upon proper documentation.

Phenotype	Peak Inspiratory Pressure (Median)
Description	This phenotype determines the median of all non-artifact peak inspiratory pressure values captured between Case Start and Case End.
Logic	This phenotype returns the median value for peak inspiratory pressure (PIP) using values mapped to MPOG concept 3185. Non-artifact values captured between case start and case end are used in determining the median value.
Granularity	One value per case
Value Type	int
Limitation	Only values mapped to the specific concept IDs included in the logic section during the specified time range will be used for calculation. This phenotype does not apply any ranges or logic to the values.

Phenotype	PEEP Actual Median
Description	This phenotype determines the median PEEP value for all measured (actual) PEEP values captured between Case Start and Case End.
Logic	<p>This phenotype returns the median value for positive end expiratory pressure (PEEP) using actual or measured values mapped to MPOG concept 3210 Positive End Expiratory Pressure- Measured. Only values captured between case start and case end are included in determining the median value.</p> <p>The PEEPAcual phenotype is used to determine the list of starting PEEP values. The median PEEP is then determined from the resulted list.</p>
Granularity	One value per case
Value Type	int
Limitation	Only values mapped to MPOG concept 3210 Positive End Expiratory Pressure - Measured will be considered for this phenotype. Case start and case end times are determined using additional MPOG logic- please reference those phenotypes specifications for more details on limitations.

Phenotype	PEEP Set Median
Description	This phenotype determines the median PEEP value for all set PEEP values captured between Case Start and Case End.
Logic	<p>This phenotype returns the median value for positive end expiratory pressure (PEEP) using set PEEP values mapped to MPOG concept 3212 Positive End Expiratory Pressure- Set. Only values captured between case start and case end are included in determining the median value.</p> <p>The PEEPSet phenotype is used to determine the list of starting PEEP values for calculating the median PEEP set value.</p> <p>Documented dates before January 1, 1995 will not be included.</p>
Granularity	One value per case
Value Type	int
Limitation	Only values mapped to MPOG concept 3212 Positive End Expiratory Pressure - Set will be considered for this phenotype. Case start and case end times are determined using additional MPOG logic- please reference those phenotypes specifications for more details on limitations.

Phenotype	Postop Troponin (Highest)
Description	<p>Highest postoperative troponin (I or T) with 72 hours (3 days) after surgery.</p> <p>Note that additional troponin-related collations include:</p> <ul style="list-style-type: none"> • PreopTroponin - most recent (not necessarily highest) preoperative troponin (I or T) within 42 days (6 weeks) prior to surgery • ComplicationMyocardialInfarctionTroponinPreop - highest (not necessarily most recent) preoperative troponin (I or T) within 42 days (6 weeks) prior to surgery <p><i>* Rationale for preoperative troponin monitoring up to 42 days prior is based upon ACC/AHA guidelines recommending a delay in elective surgery for 6 weeks following myocardial infarction (1)</i></p> <p><i>** Rationale for preoperative and postoperative troponin monitoring within 72 hours of surgery based upon the Third Universal Definition of Myocardial Infarction, recommending routine troponin monitoring 48-72 hours after surgery in high-risk patients. (2)</i></p> <p>References:</p> <ol style="list-style-type: none"> 1. Fleisher L, et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. J. Nucl. Cardiol. (2015) 22: 162. doi:10.1007/s12350-014-0025-z 2. Thygesen K, et al. Third Universal Definition of Myocardial Infarction, Global Heart, Volume 7, Issue 4, December 2012, Pages 275-295, ISSN 2211-8160, http://dx.doi.org/10.1016/j.gheart.2012.08.001.
Logic	<p>Obtain highest valid troponin level (MPOG Concept ID 5011) within 72 hours* of anesthesia end</p> <ol style="list-style-type: none"> 1. Valid = ≥ 0 ng/ml 2. If "< cutoff" is documented (example: < 0.01). Output = 0 3. If data missing or invalid → Output = -999 4. If data valid → Output = (numeric value in g/dL) <p>Reference Values:</p> <ul style="list-style-type: none"> • Different per assay • Either Troponin T or Troponin I is measured – this is registered for every institution separately. <p>Conversion not necessary when mcg/l is used.</p> <p>Conversion of mcg/ml to ncg/ml:</p> <p>amount mcg/ml x 1000 = amount in ng/ml</p>
Granularity	One value per case
Value Type	int
Limitation	none

Phenotype **Preop Albumin**

Description **Most recent preoperative albumin within 365 days**

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. Kermansaravi M, Abdolhosseini MR, Kabir A, Pazouki A.; Severe hypoalbuminemia and steatohepatitis leading to death in a young vegetarian female, 8 months after mini gastric bypass: A case report; Int J Surg Case Rep. 2016 Dec 11;31:17-19.
5. Yoo SH, Kim HJ, Kim JH, Lee GW, Lee JH, Kim SH, Kim JW, Kim JW, Lee JO, Kim YJ, Lee KW, Kim JH, Bang SM, Lee JS.; Nephrotic syndrome associated with metastatic thymoma treated with chemotherapy. Medicine (Baltimore). 2017 Jan;96(1);
6. Mutlu EA, Keshavarzian A, Mutlu GM; Hyperalbuminemia and elevated transaminases associated with high-protein diet. Scand J Gastroenterol. 2006 Jun;41(6):759-60.

Logic Values collected under MPOG ID 5057 (Formal Lab – Albumin Serum/Plasma). All values converted to g/dl. Obtain most recent (latest) valid serum albumin level in g/dL prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid: >0 g/dL and <50 g/dL
2. If data invalid → Output = -999
3. If data valid → Output = (numeric value in g/dL)

General reference ranges

- 3.5-5.5 g/dl (Conventional Unit) 1,2,3
 - 35-55 g/l (SI Unit)2
 - Mild hypoalbuminemia 2.5-3.5 g/dl4
 - Severe hypoalbuminemia: < 2.5 g/dl4, 5
 - Low: case report: 1.1 g/dl4
 - Limited data on hyperalbuminemia. Case report 5.7 g/dl5
- Conversion to g/dl before classifying as valid or invalid
- amount g/l ÷ 10 =amount in g/dl

Granularity One value per case

Value Type int

Limitation This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop Alk Phosphatase
Description	Most recent preoperative alkaline phosphatase within 365 days
Logic	Values collected under MPOG ID 5033 (Formal lab - Alkaline Phosphatase, Serum/Plasma) Range 0-1000 IU/L Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop ALT
Description	Most recent preoperative alanine aminotransferase (ALT) within 365 days.
Logic	Values collected under MPOG ID 5032 (Formal lab - ALT (SGPT), Serum/Plasma) Range 0-100000 units/L Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop AST
Description	Most recent preoperative aspartate aminotransferase (AST) within 365 days
Logic	Values collected under MPOG ID 5031 (Formal lab - AST (SGOT), Serum/Plasma) Range 0-100000 units/L Missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop BUN
Description	Most recent preoperative Blood Urea Nitrogen (BUN) within 365 days
Logic	Values collected under MPOG ID 5012 (Formal lab - Blood Urea Nitrogen, Serum/Plasma) Range 0-1000 mg/dl or mmol/L Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Calcium Ionized
Description	Most recent preoperative ionized calcium within 365 days
Logic	<p>Values collected under MPOG ID 3395(POC - Blood gas - Ionized Calcium) OR MPOG ID 5028(Formal lab - Ionized Calcium, Serum/Plasma) OR MPOG ID 5039 (Formal lab - Blood gas - Ionized Calcium)</p> <p>Range: 0-100 md/dl Invalid or missing values = -999</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Calcium Total
Description	Most recent preoperative calcium total within 365 days
Logic	Values collected under MPOG ID 5058 (Formal lab - Calcium (Total), Serum/Plasma) Range 0-100 md/dl Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Carbon Dioxide (CO₂), Arterial
Description	Most recent preoperative <u>arterial</u> carbon dioxide (CO₂) from 365 days prior to anesthesia start to anesthesia start
Logic	<p>Values collected under MPOG ID 5020 (POC – Blood gas - pCO₂ (arterial)) OR MPOG ID 5042 (Formal lab – Blood gas - pCO₂ (arterial))</p> <p>All values expressed in mmHg</p> <p>Obtain most recent (latest) value, prior to anesthesia start and within 365 days of anesthesia start. Return with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid >0 mmHg and <200 mmHg 2. If data invalid or missing → Output = -999 3. If data valid → Output = (numeric value) <p>General normal reference ranges: 35-45 mmHg (5.1 to 5.6 kPa)</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop Carbon Dioxide (CO2), Mixed Venous
Description	Most recent preoperative <u>mixed venous</u> carbon dioxide (CO2) from 365 days prior to anesthesia start to anesthesia start
Logic	<p>Values collected under MPOG ID 5124 (Formal lab – Blood gas - pCO2 (mixed venous)) All values expressed in mmHg</p> <p>Obtain most recent (latest) value, prior to anesthesia start and within 365 days of anesthesia start. Return with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid >0 mmHg and <200 mmHg 2. If data invalid or missing → Output = -999 3. If data valid → Output = (numeric value) <p>General normal reference ranges: 40-50 mmHg</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop Carbon Dioxide (CO2), Serum
Description	Most recent preoperative <u>serum</u> carbon dioxide (CO2) from 365 days prior to anesthesia start to anesthesia start
Logic	<p>Values collected under MPOG ID 5029 (Formal lab – CO2 (Serum/Plasma)) All values expressed in mmHg</p> <p>Obtain most recent (latest) value, prior to anesthesia start and within 365 days of anesthesia start. Return with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid >0 mmHg and <200 mmHg 2. If data invalid or missing → Output = -999 3. If data valid → Output = (numeric value) <p>General normal reference ranges: 40-50 mmHg</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop Carbon Dioxide (CO₂), Venous
Description	Most recent preoperative <u>venous</u> carbon dioxide (CO₂) from 365 days prior to anesthesia start to anesthesia start
Logic	<p>Values collected under MPOG ID 5023 (POC - Blood gas - pCO₂ (venous) OR (Formal lab – Blood gas - CO₂ (venous))</p> <p>All values expressed in mmHg</p> <p>Obtain most recent (latest) value, prior to anesthesia start and within 365 days of anesthesia start. Return with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid >0 mmHg and <200 mmHg 2. If data invalid or missing → Output = -999 3. If data valid → Output = (numeric value) <p>General normal reference ranges: 40-50 mmHg</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop Chloride
Description	Most recent preoperative chloride within 365 days
Logic	Values collected under MPOG ID 5030(Formal lab - Chloride, Serum/Plasma) OR MPOG ID 5035(Formal lab - Blood gas - Chloride) Range 0-200 mEq/L Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Creatinine
Description	<p>Most recent preoperative creatinine within 60 days</p> <p>References:</p> <ol style="list-style-type: none"> 1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814 2. FDA, investigations operations manual 2015, appendix C, Blood Serum Chemistry – Normal Values ; published 2015, accessed 10-17-2016; http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf 3. Farmacotherapeutisch kompas, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie 4. Abuhasna SD; Highest serum creatinine ever reported; Hemodial Int. 2013 Jan;17(1) 137-8
Logic	<p>Values collected under MPOG ID 5002 (Formal lab – Creatinine, Serum/Plasma) All values converted to mg/dl.</p> <p>Obtain most recent (latest) valid creatinine (MPOG concept ID 5002) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid ≥ 0.2 mg/dl and < 25 mg/dl 2. If data invalid \rightarrow collation only returns values in the valid range (if there are only invalid values, a -999 would be returned) 3. If data valid \rightarrow Output = (numeric value in mg/dl) 4. If there are no values a -999 will be returned <p>General reference ranges 1,2</p> <ul style="list-style-type: none"> • 1-2 mg/dl (Conventional Unit) • 45-100 $\mu\text{mol/l}$ (SI Unit) 3 • Extreme value: 61.3mg/dl 4 <p>Conversion to mg/dl before classifying as valid or invalid $\text{amount } \mu\text{mol/l} \div 88.4 = \text{amount in mg/dl}$ 3</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units. There is no returned “invalid” value as this collation only uses values in the valid range.

Phenotype	Preop EGFR (Most Recent)
Description	Most recent estimated glomerular filtration rate (eGFR) within 60 days
Logic	<p>Values collected under MPOG ID 3366 (Formal lab – Estimated Glomerular Filtration Rate (African-American) or MPOG ID 3367 ((Formal lab – Estimated Glomerular Filtration Rate (Non African-American)) All values expressed in ml/min/1.73m²</p> <p>When not present; use collation PreopCreatinine (Values collected under MPOG ID 5002 (Formal lab – Creatinine, Serum/Plasma in mg/dl; when in mcmol/l: mount mcmol/l ÷ 88.4 =amount in mg/dl)</p> <p>Obtain most recent (latest) valid eGFR (MPOG concept ID 33666 or 3367, when not available MPOG collation PreopCreatinine) prior to anesthesia start and within 60 days of anesthesia start</p> <ol style="list-style-type: none"> 1. Valid >0 and <300 2. If data invalid → Output = -999 3. If data is completely missing → Output = -999 <p>If data valid → Output = (numeric value in ml/min/1.73m²)</p> <p>Reference values:</p> <ul style="list-style-type: none"> • >150 ml/min/1.73m² <p>eGFR can be derived from creatinine values: first conversion from mcmol/l to mg/dl for centers using SI units (the Netherlands) instead of Conventional Units.1,2,3 Then use:</p> <p>Adults > 18 years old:4,5,6 CKD-EPI $eGFR = 141 \times \min(Scr / \kappa, 1)^\alpha \times \max(Scr / \kappa, 1)^{-1.209} \times 0.993^{Age} \times 1.018 [\text{if female}] \times 1.159 [\text{if black}]$ <ol style="list-style-type: none"> 1. Scr is serum creatinine in mg/dL, 2. κ is 0.7 for females and 0.9 for males, 3. α is -0.329 for females and -0.411 for males 4. min indicates the minimum of Scr /κ or 1 5. max indicates the maximum of Scr /κ or 1. Requirements: <ol style="list-style-type: none"> 1. Age is mandatory 2. If no gender data available assume female 3. If no race data (and no weight data for Cockcroft-Gault) available, use CKD-EPI and assume non-black <p>When no race data available, but weight provided use: 4,5,6 Cockcroft-Gault formula $eGFR = ((140 - \text{age in years}) * (\text{weight in kg}) * (0.85 \text{ if female})) / (72 * \text{Baseline creatinine})$ $BSA = (\text{weight in kg})^{0.425} * (\text{height in cm})^{0.725} * 0.007184.$ With BSA-Indexed EGFR = eGFR * 1.73 / BSA <ol style="list-style-type: none"> 1. Age is mandatory 2. If no gender data available assume female 3. If no height data available, assume BSA = 1.73 m² 4. If no weight data available, use CKD-EPI and assume non-black. 5. Baseline creatinine in mg/dL </p> </p>

Pediatric Patients ≤ 18 years old:7

Bedside Schwartz

$eGFR = 0.413 * (\text{height in cm}) / (\text{baseline creatinine})$

1. Height is mandatory

References:

1. Frank H. Wians, Jr., PhD; Merck Manual, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch compass 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. National Institute of Diabetes and Digestive and Kidney Disease, published april 2015, accesses 10-27-2016; <https://www.niddk.nih.gov/health-information/health-communication-programs/nkdep/lab-evaluation/gfr/estimating/Pages/estimating.aspx>
5. Levey AS, Stevens LA, Schmid CH, Zhang YL, Castro AF, 3rd, Feldman HI, et al. A new equation to estimate glomerular filtration rate. Ann Intern Med. 2009;150(9):604-12
6. Michaels WM, Grootendorst D.C., Verduijn M, Elliott EG, Dekker FW, Krediet RT; Performance of the Cockcroft-Gault, MDRD and New CKD-Epi Formulas in Relation to GFR, Age and Body size, Clin J Am Soc Nephrol 5: 1003-1009, 2010
7. Schwartz GJ, Muñoz A, Schneider MF, Mak RH, Kaskel F, Warady BA, Furth SL.; New equations to estimate GFR in children with CKD. J Am Soc Nephrol. 2009 Mar;20(3):629-37

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. Collation is based upon the creatinine collation. There is a conversion for this collation for sites that use alternate units.

Phenotype

Preop Glucose

Description

Most recent preoperative glucose within 365 day

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. <http://www.guinnessworldrecords.com/world-records/highest-blood-sugar-level>; accessed 10-17-2016
5. Viswanathan V, Beardsley AL, Walvoord EC, Nebesio TD; Extreme hyperglycemia and hyperosmolar state in new onset type 1 diabetes: are sugar- and salt-containing beverages at fault? Clin Pediatr (Phila). 2011 Apr;50(4)
6. Piot VM, Verrijcken A, Vanhoof M, Mertens I, Soetens F.; Full neurological recovery after extreme hypoglycemia during intensive insulin therapy: a case report.; J Diabetes Sci Technol. 2012 Jul 1;6(4):973-7.
7. Abellán P, Cámara R, Merino-Torres JF, Pérez-Lazaro A, del Olmo MI, Ponce JL, Rayón JM, Piñón F; Severe hypoglycemia after gastric bypass surgery for morbid obesity; Diabetes Res Clin Pract. 2008 Jan;79(1):e7-9. Epub 2007 Sep 5.
8. Erasmus Medical Center Rotterdam; Diagnostiek, Conversiefactoren; published March 2010; accessed 10-17-2016; <http://www.erasmusmc.nl/akc/Diagnostiek/Diagnostiek/4012531/?view=active>

Logic

Values collected under MPOG ID 5003 (formal lab – Glucose, Serum/Plasma), or MPOG ID 5036 (Formal lab – Blood gas – Glucose), or MPOG ID 3405 (POC – Blood gas – Glucose) or MPOG ID 3361 (POC – Glucose (Fingerstick)) or MPOG ID 3362 (POC – Glucose (unspecified source)) All values expressed in mg/dl

Obtain most recent (latest) valid glucose (MPOG concept ID 3405, 3361, 3362, 5003 or 5036) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 and <3000
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value in mg/dl)

General reference ranges

- 80-120 mg/dl (Conventional Unit) 1,2,3
 - 4- 6.4 mmol/l (SI Unit, institution) 1,2,3
 - Extreme values: 2656 mg/dl^{4,5} and 13 mg/dl^{6,7}
- Conversion to g/dl before classifying as valid or invalid
amount mmol/l ÷ 0.0555 = amount in mg/dl⁸

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype

Preop HCG

Description

Most recent preoperative human chorionic gonadotropin (HCG) within 365 days

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompas, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chemistry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
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5. van Cromvoirt SM1, Thomas CM2, Quinn MA1, McNally OM1, Bekkers RL3. Gynecol Oncol.; Identification of patients with persistent trophoblastic disease after complete hydatidiform mole by using a normal 24-hour urine hCG regression curve. 2014 Jun;133(3):542-5.

Logic

Values collected under MPOG ID 5063 (formal lab – HCG, Serum/Plasma) OR MPOG ID 3368 (POC – HCG, Urine)

Obtain most recent (latest) valid HCG prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 IU/l and <350.000 IU/l
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value in IU/l)

General reference ranges

- <5 mIU/mL (Conventional Unit) 1,2,3
- <5 IU/l (SI Units) 1,2,3

Extremes: “Molar pregnancy: levels of hCG >100,000 mIU per milliliter in 41-46% of cases. Only 1 of 17 patients with a partial mole had levels >300,000 mIU per milliliter.” 4,5

No conversion necessary when mU/ml used.1,2,3

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype **Preop Hematocrit**

Description **Most recent preoperative hematocrit within 365 days**

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
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6. Braun SL, Eicken A, Kaemmerer H.; Iron deficiency in a patient with extreme erythrocytosis due to cyanotic congenital heart disease. Int J Cardiol. 2007 Mar 20;116(2):e74-5. Epub 2006 Nov 9.
7. Erasmus Medical Center Rotterdam; Diagnostiek, Conversiefactoren; published March 2010; accessed 10-17-2016; <http://www.erasmusmc.nl/akc/Diagnostiek/Diagnostiek/4012531/?view=active>

Logic Values collected under MPOG ID 3415 (POC – Blood gas – HCT measured) OR MPOG ID 3435 (POC – hematocrit spun) OR MPOG ID 3450 (POC – Coulter Counter – Hematocrit) OR MPOG ID 5006 (Formal lab – hematocrit) OR 5038 (Formal lab – blood gas – HCT measured)
All values converted to %.
Obtain most recent (latest) valid hematocrit (MPOG concept ID 3415 OR 3435 OR 3450 OR 5006 OR 5038) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0% and < 100 %
2. If data invalid → Output = -999
3. If data valid → Output = (numeric value %)

General reference ranges (1,2,3)

- 36-51% (Conventional Unit)
- 0.36-0.51 l/l (SI Unit, proportion)
- absolute polycythemia: male 60%, female > 55%
- Extreme: low: 6% (5), high 80% (6)

Conversion to % before classifying as valid or invalid

- amount l/l * 100 = amount in % (7)

Granularity One value per case

Value Type int

Limitation This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype **Preop Hemoglobin**

Description **Most recent preoperative hemoglobin within 365 days**

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. Chojnowski K, Janus A, Blizniewska K, Robak M1, Trelinski J.; Long-lasting extreme anemia during the therapy of acute lymphoblastic leukemia in a Jehovah's Witness patient; Transfusion. 2016 Oct;56(10):2438-2442. doi: 10.1111/trf.13703. Epub 2016 Jul 7.
5. Kariya T, Ito N, Kitamura T, et al. Recovery from extreme hemodilution (hemoglobin level of 0.6 g/dL) in cadaveric liver transplantation. A Case Rep 2015;4:132-6.
6. Braun SL, Eicken A, Kaemmerer H.; Iron deficiency in a patient with extreme erythrocytosis due to cyanotic congenital heart disease. Int J Cardiol. 2007 Mar 20;116(2):e74-5. Epub 2006 Nov 9.
7. Erasmus Medical Center Rotterdam; Diagnostiek, Conversiefactoren; published March 2010; accessed 10-17-2016; <http://www.erasmusmc.nl/akc/Diagnostiek/Diagnostiek/4012531/?view=active>

Logic Values collected under MPOG ID MPOG ID 3440 (POC – Coulter Counter – Hemoglobin) OR MPOG ID 5005 (Formal lab – Hemoglobin) OR MPOG ID 5080 (Formal lab – Blood gas – Hemoglobin) OR MPOG ID 5081(POC – Blood gas – Hemoglobin)
All values expressed in g/dl

Obtain most recent (latest) valid hemoglobin. (MPOG concept ID 3440 OR 5005 OR 5080 OR 5081) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 g/dl and <30 g/dl
2. If data invalid and missing → Output = -999
3. If data valid → Output = (numeric value g/dl)

General reference ranges

- 12-18 g/dl (Conventional Unit, whereas SI unit = g/l)1,2,3
- 7.5-11 mmol/l 1,2,3
- Extreme values: 0.6 g/dl4,5 and 25.76

Conversion to g/dl before classifying as valid or invalid7

- amount in mmol/l / 0.6206 =amount in mg/dl7

Granularity One value per case

Value Type int

Limitation This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. There is a conversion for this collation for sites that use alternate units.

Phenotype	Preop HgbA1c
Description	Most recent preoperative HgbA1c percentage within 365 days
Logic	<p>This phenotype returns the most recent of all valid labs with concept 5026 [Formal lab - Glycosylated Hemoglobin, Serum/Plasma (HbA1c)] and a numeric value that were observed within the preop date range defined as [Anesthesia Start minus 365 days] to [Anesthesia Start]. If a lab value is returned as a text field (for example with a > or < sign), the phenotype returns the numeric portion of that value.</p> <p>Please note that cases occurring at University of Amsterdam - Academic Medical Center and University Medical Center – Utrecht are converted using the following formula: $0.09148 * \text{Lab Value} + 2.152$.</p> <p>The phenotype returns the following:</p> <ul style="list-style-type: none"> • The value of the lab if it was within the valid result range (0, 20) <i>not inclusive</i> • -999 if the lab was out of the valid result range or no lab was found
Granularity	One value per case
Value Type	int
Limitation	There is a conversion for this collation for sites that use alternate units.

Phenotype

Preop INR

Description

Most recent preoperative international normalized ratio (INR) within 365 days

Ref: Odén A., Fahlén M. Oral anticoagulation and risk of death: a medical record linkage study ; BMJ. 2002 Nov 9; 325(7372): 1073–1075.

References:

1. Odén A., Fahlén M. Oral anticoagulation and risk of death: a medical record linkage study ; BMJ. 2002 Nov 9; 325(7372): 1073–1075.
2. Lee JE, Ryu DH, Jeong HJ, Kim JH, Jun JE, Kim JS, Lee SY; Extremely elevated international normalized ratio of warfarin in a patient with CYP2C9*1/*3 and thyrotoxicosis; J Korean Med Sci. 2014 Sep;29(9)
3. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
4. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
5. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>

Logic

Values collected under MPOG ID 3460 (POC – International Normalized Ratio) or MPOG ID 5008 (Formal lab – International Normalized Ratio)

Obtain most recent (latest) valid INR (MPOG concept ID 3460 or 5008) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 and <20
 2. If data invalid or missing → Output = -999
 3. If data valid → Output = (numeric value)
 4. Extreme value: 151,2
- General reference ranges 3,4,5
- 0.8 – 1.2
- No difference in units between institutions

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype

Preop Lactate

Description

Most recent preoperative arterial lactate within 365 day

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. Oster Y, Wexler ID, Heyman SN, Fried E.; Recoverable, Record-High Lactic Acidosis in a Patient with Glycogen Storage Disease Type 1: A Mixed Type A and Type B Lactate Disorder. Case Rep Med. 2016;2016:4362743.

Logic

Values collected under MPOG ID 5086 (Formal lab - Blood gas - Lactate (arterial), MPOG ID 5018 (Formal lab - lactate, Serum/Plasma) MPOG ID 3410 (POC - Blood gas - Lactate) or MPOG ID 5040 (Formal lab - Blood gas - lactate (unknown sample type))

All values reported in mg/dl.

Obtain most recent (latest) valid arterial lactate prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 mg/dl and <30 mmol/l
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value)

General reference ranges

- 0.5-2.2 mmol/l (SI unit) 1,2,3
- Extreme: 27 mmol/l 4

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype

Preop Platelet Count

Description

Most recent preoperative platelet count within 365 days

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompas, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. Hu R, Li J, Hu Y, Zhang J, Miao M, Zhu K, Liao A, Yang W, Liu Z.; Acute mono-megakaryoblastic leukemia associated with extreme thrombocytosis and complex karyotype abnormalities; Am J Case Rep. 2013 May 17;14:157-160.

Logic

Values collected under MPOG ID 3445 (POC – Coulter counter – Platelets) OR MPOG ID (5004 (Formal lab – Platelets)

All values converted to x 103 /mcl

Obtain most recent (latest) valid (MPOG concept ID 3345 or 5004) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 and <1500
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value x 103 /mcl)

General reference ranges 1,2,3

- 150-450 x 103 /mcl (Conventional units; = 103 /mm³)
- 150-450 x 10⁹ /l (SI units)
- Extreme: trombocytosis: 2646 *103/mcl⁴

No conversion necessary, numeric value x 103 /mcl = numeric value x 109/l^{1,2,3}

Granularity

Not Set

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Potassium
Description	Most recent preoperative potassium within 365 days
Logic	Values collected under MPOG ID 3390(POC - Blood gas - Potassium) OR MPOG ID5001 (Formal lab - Potassium, Serum/Plasma) OR MPOG ID 5051 (Formal lab - Blood gas - Potassium) Range: 0-50 mmol/L Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Protein
Description	Most recent preoperative protein within 365 days
Logic	Values collected under MPOG ID 5062 (Formal lab - Protein (Total), Serum/Plasma) Range: 0-500 mg/dl Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop PT
Description	<p>Most recent preoperative prothrombin time (PT) within 365 days</p> <p>References:</p> <ol style="list-style-type: none"> 1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814 2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie 3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf 4. Hough RE, Makris M; Recent onset of bleeding and gross coagulopathy.; Postgrad Med J. 2001 Jan;77(903):53, 57-8
Logic	<p>Values collected under MPOG ID 3455 (POC_Prothrombin Time) or MPOG ID 5007 (Formal lab – Prothrombin Time)</p> <p>All values expressed in seconds.</p> <p>Obtain most recent (latest) valid PT (MPOG concept ID 3455 or 5007) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery</p> <ol style="list-style-type: none"> 1. Valid >0 seconds or <150 seconds 2. If data invalid or missing → Output = -999 3. If data valid → Output = (numeric value in seconds) <p>General reference ranges 1,2,3</p> <ul style="list-style-type: none"> • 10-20 seconds • Extreme: 230 seconds⁴ <p>No difference in unit between institutions.1,2,3</p>
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. Some institutions use partial thromboplastin time, whereas others use activated partial thromboplastin time.

Phenotype

Preop PTT

Description

Most recent preoperative activated partial thromboplastin time within 365 days

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
3. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
4. Takamizawa Y, Araki M, Yoshida N, Yoshioka T, Miura K.; A case of a severe factor XI deficiency in patient undergoing hemodialysis without the use of heparin. Blood Coagul Fibrinolysis. 2014 Dec;25(8):898-9.
5. Moon JM, Chun BJ; Severe Coagulopathy after Ingestion of "Snake Wine"; J Emerg Med. 2016 Jun;50(6)

Logic

Values collected under MPOG ID 3465 (POC – Partial Thromboplastin Time) or MPOG ID 5009 (Formal lab – Partial Thromboplastin Time)

All values expressed in seconds.

1. Obtain most recent (latest) valid PTT (MPOG concept ID 3465 or 5009) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >0 seconds or <170 seconds
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value in seconds)

General reference ranges

- 30-45 seconds^{1,2,3}
- Some institutions might be using PTT (reference 60-70)^{1,2,3}
- Extreme: 145.2 seconds.^{4,5}

No difference in unit between institutions⁴

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes. Some institutions use partial thromboplastin time, whereas others use activated partial thromboplastin time.

Phenotype

Preop Sodium

Description

Most recent preoperative sodium within 365 days

References:

1. Frank H. Wians, Jr., PhD; Merck Manuel, professional version; Blood Tests: Normal Values; accessed 10-17-2016; <http://www.merckmanuals.com/professional/appendixes/normal-laboratory-values/blood-tests-normal-values#v8508814>
2. Farmacotherapeutisch kompass, 2016, the Netherlands; published 10-01-2016; accessed 10-17-2016; <https://www.farmacotherapeutischkompas.nl/bladeren-volgens-boek/inleidingen/inl-referentiewaarden-klinische-chemie>
3. FDA, investigations operations manual 2015, appendix C, Blood Serum Chesitry – Normal Values ; published 2015, accessed 10-17-2016; <http://www.fda.gov/downloads/ICECI/Inspections/IOM/UCM135835.pdf>
4. Sterns RH; Disorders of plasma sodium--causes, consequences, and correction. N Engl J Med. 2015 Jan 1;372(1):55-65.
5. Arambewela MH, Somasundaram NP, Garusinghe C; Extreme hyponatremia as a probable cause of fatal arrhythmia: a case report.; J Med Case Rep. 2016 Oct 1;10(1):272.
6. Smith JD, Roberts L, Schneider HG; A case of extreme hyponatraemia secondary to a low solute diet and primary polydipsia. Pathology. 2016 Feb;48 Suppl 1:S13-S14.

Logic

Values collected under MPOG ID 3385 (POC – Blood gas – Sodium) or MPOG ID 5027 (Formal lab – Sodium – Serum/plasma) OR MPOG ID 5053 (Formal lab – Blood gas – Sodium)

All values expressed in mEq/l

Obtain most recent (latest) valid sodium (MPOG concept ID 3385 OR 5027 OR 5053) prior to anesthesia start and within 365 days of anesthesia start with number of days prior to surgery

1. Valid >90 mEq/l and <190 mEq/l.
2. If data invalid or missing → Output = -999
3. If data valid → Output = (numeric value mEq/l)

General reference ranges

- 135-147 mEq/l (Serum; Conventional Unit) 1,2,3
- 135-145 mmol/l. (SI Unit) 1,2,3
- Severe hyponatremia <120 mEq/l 4
- Severe hyponatremia >150 mEq/l, extreme >190 mEq/l (rare) 4,5
- Extreme: 94-226 mEq/l 5,6

No conversion necessary when mmol/l used. 1,2,3

Granularity

One value per case

Value Type

int

Limitation

This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Total Bilirubin
Description	Most recent preoperative total bilirubin within 365 days
Logic	<p>Values collected under MPOG ID 5014(Formal lab - Bilirubin Total, Serum/Plasma) OR MPOG ID 3369 (Formal lab - Bilirubin Total, body fluid (not serum/plasma)) OR MPOG ID 5015 (Formal lab - Bilirubin Unconjugated, Serum/Plasma) OR MPOG ID 5016 (Formal lab - Bilirubin Conjugated, Serum/Plasma)</p> <p>Range: 0-1000 mg/dl</p> <p>Invalid or missing values = -999</p> <p>One value per case</p>
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop Troponin (Highest)
Description	<p>Highest preoperative troponin (I or T) with 42 days (6 weeks) prior to surgery.</p> <p>Note that additional troponin-related collations include:</p> <ul style="list-style-type: none"> • PreopTroponin - most recent (not necessarily highest) preoperative troponin (I or T) within 42 days (6 weeks) prior to surgery ComplicationMyocardialInfarctionTroponinPostop - highest (not necessarily most recent) postoperative troponin (I or T) within 72 hours after surgery. <p>*Rationale for preoperative troponin monitoring up to 42 days prior is based upon ACC/AHA guidelines recommending a delay in elective surgery for 6 weeks following myocardial infarction¹</p> <p>References: Fleisher L, et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. J. Nucl. Cardiol. (2015) 22: 162. doi:10.1007/s12350-014-0025-z</p>
Logic	<p>Obtain highest valid troponin level (MPOG Concept ID 5011) within 42 days* of anesthesia start</p> <ol style="list-style-type: none"> 1. Valid = ≥ 0 ng/ml 2. If "< cutoff" is documented (example: < 0.01). Output = 0 3. If data missing or invalid → Output = -999 4. If data valid → Output = (numeric value in g/dL) <p>Reference Values:</p> <ul style="list-style-type: none"> • Different per assay • Either Troponin T or Troponin I is measured – this is registered for every institution separately. <p>Conversion not necessary when mcg/l is used. Conversion of mcg/ml to ncg/ml:</p> <ul style="list-style-type: none"> • amount mcg/ml x 1000 = amount in ng/ml aa
Granularity	One value per case
Value Type	categorical
Limitation	none

Phenotype	Preop Troponin (Most Recent)
Description	<p>Most recent preoperative troponin (I or T) within 42 days (6 weeks) prior to surgery</p> <p>Note that additional troponin-related collations include:</p> <ul style="list-style-type: none"> • ComplicationMyocardialInfarctionTroponinPreop - highest (not necessarily most recent) preoperative troponin (I or T) within 42 days (6 weeks) prior to surgery ComplicationMyocardialInfarctionTroponinPostop - highest (not necessarily most recent) postoperative troponin (I or T) within 72 hours after surgery <p>*Rationale for preoperative troponin monitoring up to 42 days prior is based upon ACC/AHA guidelines recommending a delay in elective surgery for 6 weeks following myocardial infarction¹</p> <p>References:</p> <ol style="list-style-type: none"> 1. Fleisher L, et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. J. Nucl. Cardiol. (2015) 22: 162. 2. Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD. Third Universal Definition of Myocardial Infarction. Circulation. 2012;126:2035.
Logic	<p>Preoperative/Postoperative Troponin Values (MPOG Concept ID 5011)</p> <p>MPOG Site-Specific Troponin reference range</p> <p>Obtain most recent valid troponin level (MPOG Concept ID 5011) within 42 days* of anesthesia start¹</p> <ol style="list-style-type: none"> 1. Valid 0-50,000 ng/ml 2. If data missing or invalid → Output = -999 3. If data valid → Output = (numeric value in g/dL) <p>Reference Values:</p> <ul style="list-style-type: none"> • Different per assay • Either Troponin T or Troponin I is measured – this is registered for every institution separately. <p>Conversion not necessary when mcg/l is used.</p> <p>Conversion of mcg/ml to ncg/ml:</p> <p>amount mcg/ml x 1000 =amount in ng/ml</p>
Granularity	One value per case
Value Type	int
Limitation	Differences exist in units (ng/ml, mcg/ml) between institutions. Most recent value is reported, not the highest. This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Preop WBC
Description	Most recent preoperative white blood count (WBC) within 365 days
Logic	Values collected under MPOG ID 5056 (Formal lab - White Blood Cell Count) Range: 0-100 Invalid or missing values = -999
Granularity	One value per case
Value Type	int
Limitation	This collation does not set “normal” ranges for the values. Valid ranges account only for data collection extremes.

Phenotype	Procedure Room Duration
Description	This phenotype returns the duration of time a patient is in a procedure room. Returns time in minutes.
Logic	Difference in time between Patient In Room and Patient Out of Room phenotypes.
Granularity	One value per case
Value Type	int
Limitation	Dependent on proper documentation of in room and out of room.

Phenotype	Procedure Text
Description	This phenotype returns a descriptor of the performed or if unavailable planned surgical procedure as documented in the source documentation.
Logic	<p>Aim: Return a textual description of the surgical procedure.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1. If the case has an actual procedure text, it is shown prepended by “(Actual)” (e.g. “(Actual)CABG”) 2. If the case does not have an actual procedure text but has a scheduled procedure text, the scheduled procedure text is shown prepended by “(Scheduled)” (e.g. “(Scheduled)ECT”) 3. If the case has neither an actual procedure text nor a scheduled procedure text, then no row is created for the case. <ol style="list-style-type: none"> 1. (Note: If the row is not created, how this shows to end users can vary. For example, if a query is written in such a way that a case must be in this collation to be included in the results, then all cases missing actual procedure text and scheduled procedure text will be missing. However queries can be written to include these cases, in which case the result will appear as NULL)
Granularity	One value per case
Value Type	varchar
Limitation	<p>Preferentially chooses any documented procedure performed.</p> <p>Indicated by the phrase (scheduled) if a procedure was planned.</p> <p>Returns one row per case.</p> <p>No row may be returned if text is unavailable.</p>

Phenotype

Procedure Type: Cardiac

Description

This phenotype determines if a case is considered a cardiac procedure and identifies the type of cardiac procedure performed.

Logic

Start with all cases. Compile a list of all procedure types that the case may qualify for using steps 1-5.

Step 1: Determine if case fits Open Cardiac criteria

- **Exclude if:**
 - Arterial line is not present (Arterial Line Used phenotype)
 - Case duration <120 minutes
 - Anesthesia CPT: 00500-00540 thoracic procedures for non-cardiac surgeries
 - Anesthesia CPT: 00550 sternal debridement
 - Anesthesia CPT: 00796 for liver transplant
 - Anesthesia CPT: 01990 for organ harvest
 - Anesthesia CPT: 00700-00797 for upper abdominal procedures (unless a predicted anesthesia CPT is 00560-00580 is also present)
 - Procedural service is:
 - 80016 Medical-Cardiology
 - 80044 Pediatric Cardiology
 - 80003: neurosurgery
 - 80009: orthopedics
 - 80023: urology
 - 80033: pediatric neurosurgery
 - 80034: pediatric orthopedics
 - 80035: pediatric urology
- **Include if:**
 1. One of these surgical CPTs are present

Surgical CPT Code	Text description of Surgical CPT code (CPT Code Range 33016- 33999)
33020-33100	Surgical Procedures on the Pericardium **except 33025**
33120-33130	Excision Procedures of Cardiac Tumor
33140-33141	Transmyocardial Revascularization Procedures
33300-33315	Surgical Procedures on the Heart (Including Valves) and Great Vessels
33321-33322	Surgical Procedures on the Heart (Including Valves) and Great Vessels
Continued	
33335	Surgical Procedures on the Heart (Including Valves) and Great Vessels
Continued	
33390-33417	Surgical Procedures on Cardiac Valves Cont.
33422-33471	Surgical Procedures on Cardiac Valves Cont.

33474-33476	Surgical Procedures on Cardiac Valves Cont.
33478	Surgical Procedures on Cardiac Valves Cont.
33496	Other Cardiac Valvular Procedures
33500-33507	Coronary Artery Anomaly Procedures
33508	Endoscopy Procedures on the Heart and Pericardium
33510-33516	Venous Grafting Only for Coronary Artery Bypass
33517-33530	Combined Arterial-Venous Grafting for Coronary Bypass
33533-33548	Arterial Grafting for Coronary Artery Bypass
33572	Coronary Endarterectomy Procedures
33600-33622	Repair Procedures for Single Ventricle and Other Complex Cardiac Anomalies
33641-33697	Repair Procedures for Septal Defect
33702-33722	Repair Procedures for the Sinus of Valsalva
33724-33732	Repair Procedures for Venous Anomalies
33735-33768	Shunting Procedures on the Heart and Pericardium
33770-33783	Repair Procedures for Transposition of the Great Vessels
33786-33788	Repair Procedures for Truncus Arteriosus
33800-33853	Repair Procedures for Aortic Anomalies
33858-33877	Repair Procedures for Thoracic Aortic Aneurysm
33910-33926	Surgical Procedures on the Pulmonary Artery
33927-33945	Heart/Lung Transplantation Procedures
33975-33983	Cardiac Assist Procedures

- If the above surgical CPTs are NOT present, consider the following anesthesia CPT codes with associated parameters

1. Anesthesia CPTs:

- 00560 - Anesthesia for procedures on heart, pericardial sac, and great vessels of chest; without pump oxygenator
 - IF surgical CPTs are not present, include IF the anesthesia CPT is a cardiac case without a pump (00560) AND these procedure text items without use of bypass notes are NOT present:
 - Procedure text: "transcatheter", "TAVR", "MitraClip", "Mitra Clip", "Mitral Clip", "Mitral Valve Clip"
 - Without:
 - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
 - 50409 Cardiopulmonary bypass (full/partial/left-heart) terminated
 - 50410 Cardiopulmonary bypass initiated (full/partial/left-heart)
 - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
 - 50417 Cardiopulmonary bypass -- Access cannula removed note
 - 50714 Cardiopulmonary bypass - Full/partial/left-heart bypass start / stop event
- 00561 - Anesthesia for procedures on heart, pericardial sac, and great vessels of chest; with pump oxygenator, younger than 1 year of age
- 00562 - Anesthesia for procedures on heart, pericardial sac, and great vessels of chest; with pump oxygenator, age 1 year or older, for all non-coronary bypass procedures or for re-operation for coronary bypass more than 1 month after original operation
- 00563 - heart Surg W/ circulatory arrest
- 00566 - cabg w/o pump
- 00567 - Anesthesia for direct coronary artery bypass grafting; with pump oxygenator
- 00580 - Anesthesia for heart transplant or heart/lung transplant

1. IF none of the above anesthesia CPTs, if at least TWO of the following notes were documented AND procedure text does NOT include “intracran” or “crani” or “liver transplant” or “hepatic transplant”

- 50399 Cardiopulmonary bypass -- aortic clamp on/off note
- 50409 Cardiopulmonary bypass (full/partial/left-heart) terminated
- 50410 Cardiopulmonary bypass initiated (full/partial/left-heart)
- 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
- 50417 Cardiopulmonary bypass -- Access cannula removed note
- 50714 Cardiopulmonary bypass - Full/partial/left-heart bypass start / stop event
- Performed under the cardiac surgical service (MPOG Concept ID: 80005, 80031, 80036, 80088, 80118)

Step 2: Determine if the case meets EP/Cath criteria

• Exclude if:

- Anesthesia CPT: 00500-00529 or 00540-00548 thoracic procedures for non-cardiac surgeries
- Anesthesia CPT: 00550 sternal debridement
- Anesthesia CPT: 00796 for liver transplant
- Anesthesia CPT: 01990 for organ harvest
- Surgical service is:
 - 80003: neurosurgery
 - 80009: orthopedics
 - 80023: urology
 - 80033: pediatric neurosurgery
 - 80034: pediatric orthopedics
 - 80035: pediatric urology

• Include if:

1. These Anesthesia CPTs are present:

- 00530 pacemaker insertion
- 00534 cardioverter/defib
- 00537 cardiac electrophys
- 01920 catheterize heart
- If Anesthesia 01926 or 01922 CPTs are present, include if procedure text includes “Transesophageal echo” or “ECHO TEE” UNLESS procedure text includes (“endovascular” AND (“aortic” or “aorta” or “TAA”)) OR “valve” OR “TAVR” or “transcatheter aortic” or “TEVAR” or “Mitral Clip” or “Mitral Valve Clip” or “Mitral Valve Clip” or “Mitral Valve Clip” or “Tricuspid Clip” or “Tricuspid Valve Clip”

1. If these surgical CPTs are present:

Cardiac Surgical CPT Code	Text Description of CPT Code
33016-33019	pericardiocentesis and pericardial drainage with insertion of indwelling catheter
33202-33275	Pacemaker or Implantable Defibrillator Procedures
33285-33286	Introduction or Removal of Subcutaneous Cardiac Rhythm Monitor
33289	Implantation of Hemodynamic Monitor
92920-92979	Therapeutic Cardiovascular Services and Procedures on the Coronary Vessels
92950-92985	Other Therapeutic Cardiovascular Services and Procedures
92998	Other Therapeutic Cardiovascular Services and Procedures
93451- 93533	Cardiac Catheterization and Associated Procedures
93600-93662	Intracardiac Electrophysiological Procedures/Studies

2. Procedure text:

- “PEDCATH” - can be an ICD implantation or a transcatheter, but should be EP/Cath still

1. Procedural service:

- 80016 - medical, cardiology
- 80044 - pediatric cardiology

Step 3: Determine if the case meets Transcatheter/Endovascular criteria

• Exclude if:

- Anesthesia CPT: 00550 sternal debridement
- Anesthesia CPT: 00796 for liver transplant
- Anesthesia CPT: 01990 for organ harvest
- Surgical Services:
 - 80003: neurosurgery
 - 80009: orthopedics
 - 80023: urology
 - 80033: pediatric neurosurgery
 - 80034: pediatric orthopedics
 - 80035: pediatric urology

• Include if:

1. Anesthesia CPTs 01926 or 01922 are present, AND procedure text includes (“endovascular” AND (“aortic” or “aorta” or “TAA”)) or “valve” or “TAVR” or “transcatheter aortic” or “TEVAR” or “Mitral Clip” or “MitraClip” or “Mitral Valve Clip” or “Mitral Clip” or “Tricuspid Clip” or “Tricuspid Valve Clip”, “percutaneous mitral valve”, “percutaneous tricuspid valve”
2. Surgical CPTs are present, include

Cardiac Surgical CPT Code	Text Description of Surgical CPT Code
33340	Surgical Procedures on the Heart (Including Valves) and Great Vessels Continued (perc. LAA)
33361-33364	Surgical Procedures on Cardiac Valves (Transcatheter aortic valve)
33418-33420	Surgical Procedures on Cardiac Valves Cont. (Transcath mitral valves)
33477	Surgical Procedures on Cardiac Valves Cont. (transcath pulmonic valve)
33880-33891	Endovascular Repair Procedures of the Descending Thoracic Aorta
33990-33993	Cardiac Assist Procedures (perc. Assist device)
92986	Balloon aortic valvuloplasty CPT code and balloon aortic valvuloplasty work RVU / balloon aortic valvuloplasty
92987	Balloon mitral valvuloplasty CPT code and balloon mitral valvuloplasty work RVU / balloon mitral valvuloplasty
92990	Balloon pulmonary valvuloplasty CPT code and balloon pulmonary valvuloplasty work RVU / balloon mitral valvuloplasty
93580-93592	Repair Procedures of Structural Heart Defect

3. IF surgical CPTs are not present, include IF the anesthesia CPT is a cardiac case without a pump (00560) AND these procedure text items without use of bypass notes:

- Procedure text: “transcatheter”, “TAVR”, “MitraClip”, “Mitra Clip”, “Mitral Clip”, “Mitral Valve Clip”, “Tricuspid Clip”, “Tricuspid Valve Clip”, “percutaneous mitral valve”, “percutaneous tricuspid valve”

- Without:

- 50399 Cardiopulmonary bypass -- aortic clamp on/off note
- 50409 Cardiopulmonary bypass (full/partial/left-heart) terminated
- 50410 Cardiopulmonary bypass initiated (full/partial/left-heart)
- 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
- 50417 Cardiopulmonary bypass -- Access cannula removed note
- 50714 Cardiopulmonary bypass - Full/partial/left-heart bypass start / stop event

Step 4: Determine if the case meets Other Cardiac criteria

- **Exclude if:**

- Arterial line is not present (Arterial Line Used phenotype) **unless if the anesthesia CPT is 05600 and no a line is present, bin under cardiac other
- Anesthesia duration <90 minutes, unless procedure text includes, “pericardial window” “pericardial drainage” “pericardial effusion”
- Anesthesia CPT: 00796 for liver transplant
- Anesthesia CPT: 01990 for organ harvest
- Anesthesia CPT: 00500-00540 thoracic procedures for non-cardiac surgeries
- Anesthesia CPT: 00700-00797 for upper abdominal procedures
- Surgical Services:
 - 80003: neurosurgery
 - 80009: orthopedics
 - 80023: urology
 - 80033: pediatric neurosurgery
 - 80034: pediatric orthopedics
 - 80035: pediatric urology

- **Include if:**

1. Anesthesia CPT: 00550 sternal debridement
2. If **predicted** CPT is 00550, include in other cardiac (overriding any primary CPT)
3. These surgical CPTs are present:

Cardiac Surgical CPT Code	Text description of Surgical CPT code (CPT Code Range 33016- 33999)
33016-33019	Pericardiocentesis and pericardial drainage with insertion of indwelling catheter
33025	Creation of pericardial window or partial resection for drainage
35820	Exploration for postoperative hemorrhage, thrombosis or infection
35840	Exploration for postoperative hemorrhage, thrombosis or infection
33365-3369	Surgical Procedures on Cardiac Valves (transcatheter AVR via open approach with and without bypass)
33320	Surgical Procedures on the Heart (Including Valves) and Great Vessels (suture repair w/o shunt or bypass)
33330	Surgical Procedures on the Heart (Including Valves) and Great Vessels Continued (graft without shunt or bypass)
33946-33959	Extracorporeal Membrane Oxygenation or Extracorporeal Life Support Services and Procedures
33962-33974	Cardiac Assist Procedures (ECMO and IABP)
33984-33989	Cardiac Assist Procedures (ECMO and IABP)
33999	Other Cardiac Surgery Procedures

4. IF the anesthesia CPT is 00560, and a cardiac surgical service was documented, AND procedure text does NOT include “intracran” or “crani” or “liver transplant” or “hepatic transplant”

- Performed under the cardiac surgical service (MPOG Concept ID: 80005, 80031, 80036, 80088, 80118)

Step 5: Determine if the case meets Non-cardiac criteria

• **Exclude if:**

- Any of the other designations are true (EP/Cath, Transcatheter/Endovascular, Open Cardiac or Other cardiac)
- Any services involved:
 - 80005 - Cardiac
 - 80016 - Medical - cardiology
 - 80031 - Pediatric Cardiac Surgery
 - 80036 - Pediatric Cardiothoracic Surgery
 - 80044 - Pediatric Cardiology

• **Include if:**

- The CPT is 01922 or 01926 and there is no other indication of a cardiac procedure

Final Step: Determine the final category based on the hierarchy below (apply rules in this order). If a case meets criteria for more than one category, assign it to the category closest to the top of the list.

1. Open Cardiac
2. EP/Cath
3. Transcatheter/Endovascular
4. Other Cardiac
5. Non-Cardiac

Granularity One value per case

Value Type categorical

Limitation Lung Transplant cases will be categorized as 'Open Cardiac.'
 All Pericardial Window cases will be categorized as 'Other Cardiac' per Cardiac Subcommittee recommendations.
 Though the procedure text for a given case may not specify a cardiac procedure, the case may still be included based on the CPT codes on the case - see logic section for more details regarding inclusion criteria.

Phenotype	Procedure Type: Liver Transplant
Description	This phenotype determines whether the case is a liver transplant using logic based upon a combination of anesthesia CPT codes, surgical CPT codes, procedure text and surgical service. This phenotype considers both actual CPT codes and predicted CPT codes (when actual CPT is missing for a case). The phenotype returns a Yes/No value code; for cases flagged as a Yes, the phenotype will also return the associated source text that triggered the Yes value.
Logic	<p>Case MUST have at least ONE of the following:</p> <p>Anesthesia CPT Codes:</p> <p>00796 - Anesthesia for intraperitoneal procedures in upper abdomen including laparoscopy; liver transplant (recipient)</p> <p>Note: if 00796 is predicted then the case must have at least one other supporting item (surgical CPT code, text value, or surgical service)</p> <p>Surgical CPT Codes:</p> <p>47135 - Liver allotransplantation; orthotopic, partial or whole, from cadaver or living donor, any age</p> <p>47136 - Liver allotransplantation; heterotopic, partial or whole, from cadaver or living donor, any age</p> <p>Procedure Text:</p> <p>Contains 'liver' and either 'transplant' or 'txp'</p> <p>Case MUST also be ONE of the following Surgical Service Concept IDs:</p> <p>0 - Unknown Concept</p> <p>80000 - Surgical Service - Not Specified</p> <p>80001 - Surgical Service - other</p> <p>80002 - Vascular</p> <p>80005 - Cardiac</p> <p>80006 - General</p> <p>80014 - Surgical service - other, not listed</p> <p>80017 - Medical - gastroenterology</p> <p>80023 - Urology</p> <p>80027 - Transplant</p> <p>80088 - Cardiothoracic</p> <p>80118 - Cardiothoracic-Vascular</p>
Granularity	One value per case
Value Type	categorical
Limitation	This phenotype may flag cancelled cases.

Phenotype	Procedure Type: Lung Transplant
Description	This phenotype determines whether the case is a lung transplant using logic based upon a combination of surgical CPT codes, procedure text and surgical service. The phenotype returns a Yes/No value code; for cases flagged as a Yes, the phenotype will also return the associated source text that triggered the Yes value.
Logic	<p>Case MUST have at least ONE of the following:</p> <p>Surgical CPT Codes:</p> <p>32851 - Lung transplant, single; without cardiopulmonary bypass</p> <p>32852 - Lung transplant, single; with cardiopulmonary bypass</p> <p>32853 - Lung transplant, double (bilateral sequential or en bloc); without cardiopulmonary bypass</p> <p>32854 - Lung transplant, double (bilateral sequential or en bloc); with cardiopulmonary bypass</p> <p>Procedure Text:</p> <p>Contains 'lung' and either 'transplant' or 'txp'</p> <p>Case MUST also be ONE of the following Surgical Service Concept IDs:</p> <p>Surgical Service Concept ID:</p> <p>0 - Unknown Concept</p> <p>80000 - Surgical Service - Not Specified</p> <p>80001 - Surgical Service - other</p> <p>80005 - Cardiac</p> <p>80013 - Thoracic</p> <p>80014 - Surgical service - other, not listed</p> <p>80027 - Transplant</p> <p>80088 - Cardiothoracic</p> <p>80118 - Cardiothoracic-Vascular</p> <p>Case CANNOT be ASA Class 6 or 6E</p>
Granularity	One value per case
Value Type	categorical
Limitation	This phenotype may flag cancelled cases.

Phenotype	Procedure Type: MRI
Description	This phenotype is used in measures to exclude anesthesia procedures for diagnostic imaging.
Logic	<p>This phenotype considers the following conditions. If any are present on a case, phenotype returns 'Yes'. Otherwise returns 'No'. One value per case is returned.</p> <ul style="list-style-type: none"> • CPT of 01922 - Anesthesia for non-invasive imaging or radiation therapy based on AnesthesiaCptsForMeasures phenotype result • Has following MRI keywords in procedure text <ul style="list-style-type: none"> • MRI • MR Head • MR Brain • MR Chest • MR Torso • MR Abdomen • MR Lumbar • MR Spine • MR Knee • MR Femur • MR Abd • OFFSITE - RADIOLOGY PROCEDURE • Room mapped to location tag “Radiology – MRI”
Granularity	One value per case
Value Type	categorical
Limitation	This phenotype is limited by accuracy of procedure text and variable mappings.

Phenotype	Propofol Infusion
Description	<p>Determines if the propofol infusion was a meaningful part of the anesthesia technique for the case. Includes both a dose based requirement (≥ 40 mcg/kg/min or equivalent) and a time based requirement ($\geq 50\%$ of case duration).</p> <p>Returns 1 (Yes) / 0 (No)</p> <p>This does not imply a Total Intravenous Anesthetic Technique was used.</p>
Logic	<ol style="list-style-type: none"> 1. Convert to mcg/kg/min 2. Obtain Case Duration 3. Calculate total propofol infusion duration. 4. Compare propofol infusion duration to case duration.
Granularity	One value per case
Value Type	categorical
Limitation	<p>Only examines propofol charted in mcg/kg/min</p> <p>Other units are considered non-valid and not used. A propofol infusion must be documented in mcg/kg/min to be counted.</p> <p>Requires propofol to be administered at a dose ≥ 40 mcg/kg/min.</p> <p>Total duration of infusion must be $\geq 50\%$ of Case Duration (mins)</p> <p>Does NOT imply the absence of volatile anesthetic or nitrous oxide.</p> <p>Does NOT imply a general anesthetic was employed.</p>

Phenotype

Race

Description

Race or Ethnicity of the patient.

Logic

A new race_ethnicity value will be created as a categorical variable will be made per the following logic:

- 0 = Unknown race (MPOG Concept ID = 4000)
- 1 = Hispanic, White (MPOG Concept ID = 4001)
- 2 = Hispanic, Black (MPOG Concept ID = 4002)
- 3 = Hispanic, Color Unknown (MPOG Concept ID = 4003)
- 4 = Black, not of Hispanic Origin (MPOG Concept ID = 4004)
- 5 = White, not of Hispanic Origin (MPOG Concept ID = 4005)
- 6 = American Indian or Alaska Native (MPOG Concept ID = 4006)
- 7 = Asian or Pacific Islander (MPOG Concept ID = 4007)
- 8 = Bi or Multiracial (MPOG Concept ID = 4008)
- 9 = Middle Eastern (MPOG Concept ID = 4009)
- 10 = Other race not listed (MPOG Concept ID = 4050)

Granularity

One value per case

Value Type

categorical

Limitation

The quality of data associated with this phenotype is dependent upon correct mappings from contributing sites to the various concept IDs listed in the logic section of this spec.

Phenotype

Sex

Description

Provides the documented sex of the patient in a given case at the time of the case.

Logic

This collation looks at the pre-op note and determines if the patient is identified as a “M” (returns a 0) or a “F” (1).

If there is alphanumeric entry but does not identify as “male” or “female” this collation returns an “unknown” (-1)

Granularity

One value per case

Value Type

categorical

Limitation

Does not reflect gender as much as the sex of the individual. The distinction between sex and gender differentiates sex (the anatomy of an individual's reproductive system and secondary sex characteristics) from gender, which can refer to either social roles based on the sex of the person (gender role) or personal identification of one's own gender based on an internal awareness.

Phenotype	Surgery End
Description	Return the documented date/time of documented procedure/surgery end.
Logic	This phenotype looks for the Procedure End Date/Time (MPOG Concept ID: 50007) documented in the case starting from anesthesia start (MPOG Concept ID: 50002) and looks until anesthesia end (MPOG Concept ID:50009) as long as the documentation was not deleted. If multiple Procedure End Date/Times exist, will return the latest.
Granularity	One value per measure result
Value Type	datetime
Limitation	Dependent on proper documentation.

Phenotype	Surgery Start
Description	This phenotype returns the documented date/time of procedure start for each case. One value per case.
Logic	This phenotype assesses the case for documentation mapped to Procedure Start Date/Time (MPOG Concept ID: 50006) and Surgical Incision Time (MPOG Concept ID: 50235) and returns the earliest date/time as long as the documentation was not deleted. Concepts between Anesthesia Start (MPOG Concept ID: 50002) and Anesthesia End (MPOG Concept ID:50009) are considered. Only the observed date/time will be used; entered time is not considered for this phenotype.
Granularity	One value per case
Value Type	datetime
Limitation	<p>Sites must map to specific MPOG concepts to be identified by this phenotype. See logic section for concepts included in this phenotype.</p> <p>This phenotype only results "observed" dates and times. "Observed" dates and times are those that are explicitly entered or documented in the record and must be documented as part of the note. MPOG will not default to the "time entered" to determine case start. "Time entered" reflects the time that the documentation was written, and not necessarily the time that care was provided.</p>

Phenotype	Surgical CPTs (All)
Description	Returns all of the surgical CPTs listed for each individual operative case.
Logic	Gathers all Surgical CPT for each operative case. Crosswalks all Surgical CPTs to Anesthesiology CPTs. Returns all surgical CPTs in the value column. The rownum is the priority of the surgical CPT ordered by crosswalk MPOG anesthesia CPT base units.
Granularity	Many values per case
Value Type	not set
Limitation	Not all procedures are reported with CPT codes. There exist errors in CPT reporting from individual sites.

Phenotype	Tidal Volume Actual (Median)
Description	Returns a single value as the median for the Tidal Volume Actual (MPOG concept id: 3190) for a case, among valid tidal volumes.
Logic	<p>Median for the Tidal Volume Actual (MPOG concept id: 3190) for a case, among valid tidal volumes. A tidal volume is noted to be valid, if the following conditions are true:</p> <ol style="list-style-type: none"> 1) ETCO2 \geq 5 mmHg 2) Peak Inspiratory Pressure \geq 5 cm H2O 3) Tidal Volume Actual \geq 100 mL and \leq 2000 4) The above conditions are true for 3 consecutive minutes, following the time of measurement.
Granularity	One value per case
Value Type	int
Limitation	There is no age limitations for this collation, but there are bounds on valid values as described in the logic section. The number of recordings are not limited, so the mean can represent a lot of data points, or few, for a given case.

Phenotype	Tidal Volume Set (Median)
Description	Median for the Tidal Volume Set (MPOG concept id: 3192) for a case, among valid tidal volumes.
Logic	Median for the Tidal Volume Set (MPOG concept id: 3192) for a case, among valid tidal volumes. A SET tidal volume is noted to be valid, if ≥ 100 mL and ≤ 2000 mL
Granularity	One value per case
Value Type	int
Limitation	There is no age limitations for this collation, but there are bounds on valid values as described in the logic section. The number of recordings are not limited, so the mean can represent a lot of data points, or few, for a given case.

Phenotype	Tobacco Smoking Classification
Description	Classification to determine non, former, or current smoker. Vaping is considered smoking.
Logic	<p>Current logic for smoking classification (combining individual note values from the SmokingNotes_Cleaned collation, there may be multiple notes per case). The SmokingNotes_Cleaned collation returns a value for each note, this collation determines if there is a note which falls into the CurrentSmoker, NonSmoker, and FormerSmoker and will return a 1 in each category for which a cleaned note exists and a 0 if no note exists. Then it applies the following logic:</p> <ul style="list-style-type: none"> · WHEN CurrentSmoker = 1 AND NonSmoker = 0 AND FormerSmoker = 0 THEN 'Current Smoker' and '2' is returned for this case. · WHEN CurrentSmoker = 0 AND NonSmoker = 1 AND FormerSmoker = 0 THEN 'Non-Smoker' and '0' is returned for this case. · WHEN CurrentSmoker = 0 AND NonSmoker = 0 AND FormerSmoker = 1 THEN 'Former Smoker' and '1' is returned for this case. · WHEN CurrentSmoker + FormerSmoker > 1 THEN 'History of Smoking, Status Unknown' and '3' is returned for this case. · WHEN CurrentSmoker + NonSmoker + FormerSmoker > 1 THEN 'Conflicting Documentation' and '-997' is returned for this case · WHEN CurrentSmoker + NonSmoker + FormerSmoker = 0 and any notes are "invalid", then 'Invalid' and '-998' is returned for this case. · ELSE 'Missing' and '-999' is returned for this case.
Granularity	One value per case
Value Type	categorical
Limitation	This collation relies upon the SmokingNotes_Cleaned collation which utilizes mapping. Mapping values and constraints are updated periodically and thus subject to change

Phenotype	Total blood administered as PRBC, Derived (ml)
Description	This phenotype returns a total volume (in mL) of PRBCs given for a particular case. It applies to cases where PRBCs are charted in mL OR units Or both. A fixed conversion factor is used to convert PRBCs from units to mL. Homologous and Autologous packed red blood cells are both included.
Logic	<p>Aim: Return volume (in mL) of PRBCs administered during case.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Look for data in MPOG Concept ID: 10489, 10490 and 10616 with an administration start or stop time during the Anesthesia Start - Anesthesia End 2) Convert time based charting to non-time based. ie multiply rates by administration time to determine amount transfused. <p>*** Start Time is the later of charted admin Start Time or Anesthesia Start.</p> <p>*** End Time is the earlier of charted admin End Time or Anesthesia End</p> <ol style="list-style-type: none"> 3) Convert unit based charting to mL's by multiplying # units (as calculated above) by 350ml. 4) Add derived result of unit based charting to volume conversion and volume based charting to give total volume administered in mL.
Granularity	One value per case
Value Type	int
Limitation	<p>Applies only to patients ≥ 8 yrs in age - Cases below this age have issues with partial units given and not documented accurately, and therefore have not been addressed.</p> <p>Addresses blood product charted in Units OR mls.</p> <p>Time based values are included but are subjected to additional logic to account only for product delivered between the bounds of Anesthesia Start/Stop.</p> <p>Uses a fixed conversion rate for unit based volumes: 1u PRBCs = 350ml</p> <p>Excludes negative values or values charted as 0 mL.</p>

Phenotype	Total Cryoprecipitate Administered, Derived (ml)
Description	This phenotype returns a total volume (in mL) of cryoprecipitate given for a particular case. It applies to cases where cryoprecipitate are charted in mL OR units Or both. A fixed conversion factor is used to convert Cryo from units to mL. Logic is applied to detect cases where a single pooled unit has been charted to reflect the multiple component source units
Logic	<p>Aim: Return volume (in mL) of cryoprecipitate administered during case.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Look for data in MPOG Concept ID: 10495 with an administration start or stop time during the Anesthesia Start - Anesthesia End 2) Convert time based charting to non-time based. ie multiply rates by administration time to determine amount transfused. <ul style="list-style-type: none"> *** Start Time is the later of charted admin Start Time or Anesthesia Start. *** End Time is the earlier of charted admin End Time or Anesthesia End 3) Convert 10-pack and 5-pack charting to single unit methodology by: <ul style="list-style-type: none"> - if all charting elements specified in units are exactly divisible by 10, then divide by 10. - if all charting elements specified in units are exactly divisible by 5 then divide all by 5. 4) Convert unit based charting to mL's by multiplying # units (as calculated above) by 100ml. 5) Add derived result of unit based charting to volume conversion and volume based charting to give total volume administered in mL.
Granularity	One value per case
Value Type	int
Limitation	<p>Applies only to patients ≥ 12 yrs in age - Cases below this age have issues with partial units given and not documented accurately, and therefore have not been addressed.</p> <p>Addresses blood product charted in Units OR mls.</p> <p>Time based values are included but are subjected to additional logic to account only for product delivered between the bounds of Anesthesia Start/Stop.</p> <p>Uses a fixed conversion rate for unit based volumes: 1u Cryo = 100ml</p> <p>Assumes conversion of 5-pack or 10-pack charting ambiguity. Any charting increment of 10 or a multiple of 10 is divided by 10 (as we assume clinician was charting as "10-pack". Any charting increment of 5 (and not of 10) or a multiple of 5 is divided by 5 (as we assume clinician was charting as "5-pack")</p> <p>Excludes negative values or charted as 0 mL.</p>

Phenotype	Total Estimated Blood Loss (EBL)
Description	This returns in mL the sum of all recorded Estimated Blood Loss for the case as charted in the Intraoperative Record for a given case.
Logic	<p>Aim: Calculate Total Volume of EBL During a Case using values charted in MPOG Concept ID 10499</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Convert all values to mL 2) Sum all values in Concept 10499 and report.
Granularity	One value per case
Value Type	int
Limitation	<p>Converts mL and returns between 0mL and 250,000 mL.</p> <p>Applies to all ages.</p> <p>Captures EBL documented as occurring between anesthesia start and anesthesia stop.</p> <p>Excludes negative values or charted as 0 mL.</p>

Phenotype	Total FFP Administered, Derived (ml)
Description	This phenotype returns a total volume (in mL) of FFP given for a particular case. It applies to cases where FFP are charted in mL OR units Or both. A fixed conversion factor is used to convert FFP from units to mL
Logic	<p>Aim: Return volume (in mL) of FFP administered during case.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Look for data in MPOG Concept ID: 10493 with an administration start or stop time during the Anesthesia Start - Anesthesia End 2) Convert time based charting to non-time based. ie multiply rates by administration time to determine amount transfused. <p>*** Start Time is the later of charted admin Start Time or Anesthesia Start.</p> <p>*** End Time is the earlier of charted admin End Time or Anesthesia End</p> <ol style="list-style-type: none"> 3) Convert unit based charting to mL's by multiplying # units (as calculated above) by 250ml. 4) Add derived result of unit based charting to volume conversion and volume based charting to give total volume administered in mL.
Granularity	One value per case
Value Type	int
Limitation	<p>Applies only to patients ≥ 8 yrs in age - Cases below this age have issues with partial units given and not documented accurately, and therefore have not been addressed.</p> <p>Addresses blood product charted in Units OR mls.</p> <p>Time based values are included but are subjected to additional logic to account only for product delivered between the bounds of Anesthesia Start/Stop.</p> <p>Uses a fixed conversion rate for unit based volumes: 1u FFP = 250ml</p> <p>Excludes negative values or values charted as 0 mL.</p>

Phenotype	Total Platelets Administered, Derived (ml)
Description	This phenotype returns a total volume (in mL) of Platelets given for a particular case. It applies to cases where Platelets are charted in mL OR units Or both. A fixed conversion factor is used to convert Platelets from units to mL. Logic is applied to detect cases where a single pooled unit has been charted to reflect the multiple component source units.
Logic	<p>Aim: Return volume (in mL) of Platelets administered during case.</p> <p>Methods:</p> <ol style="list-style-type: none"> 1) Look for data in MPOG Concept ID: 10494 with an administration start or stop time during the Anesthesia Start - Anesthesia End 2) Convert time based charting to non-time based. ie multiply rates by administration time to determine amount transfused. <ul style="list-style-type: none"> *** Start Time is the later of charted admin Start Time or Anesthesia Start. *** End Time is the earlier of charted admin End Time or Anesthesia End 3) Convert 5-pack charting to single unit methodology by: <ul style="list-style-type: none"> - if all charting elements specified in units are exactly divisible by 5 then divide all by 5. 3) Convert unit based charting to mL's by multiplying # units (as calculated above) by 250ml. 4) Add derived result of unit based charting to volume conversion and volume based charting to give total volume administered in mL.
Granularity	One value per case
Value Type	int
Limitation	<p>Applies only to patients ≥ 12 yrs in age - Cases below this age have issues with partial units given and not documented accurately, and therefore have not been addressed.</p> <p>Addresses blood product charted in Units OR mls.</p> <p>Time based values are included but are subjected to additional logic to account only for product delivered between the bounds of Anesthesia Start/Stop.</p> <p>Uses a fixed conversion rate for unit based volumes: 1u Platelets = 250ml</p> <p>Assumes the only multiple conversion required is for "5-Pack" of platelets. If the insitution uses a different term or number of pooled units AND charts in this multiple dose, then this will not be accounted for.</p> <p>Excludes negative values or values charted as 0 mL.</p>

Phenotype	Total Urine Output
Description	Converts values to mL and sums to total. Returns is capped to values between 0 - 20,000 mL.
Logic	Sums all reported urine output for a case. Converted to mL. Returns -999 if missing or implausible values.
Granularity	One value per case
Value Type	int
Limitation	Urine > 20,000mL is considered non-valid Uses only values charted in mL's. Excludes negative values or values charted as 0 mL.

Phenotype	Waiting For Transport Duration
Description	This phenotype returns the duration (minutes) from procedure end to when a patient is transported out of the procedure room.
Logic	This phenotype calculates the difference between Patient out of room (MPOG concept ID 50008) and Procedure End (MPOG concept ID 50007).
Granularity	One value per case
Value Type	int
Limitation	Depends on proper documentation.

Phenotype	Weekend
Description	Returns a 1 if case occurred on a Weekend. Definition of weekend is Anesthesia Start Date occurred on a Saturday or Sunday. Returns a 0 if these conditions are not met.
Logic	Examines Anesthesia Start Date/Time. If this occurs on a Saturday or Sunday, then returns 1 else 0.
Granularity	One value per case
Value Type	categorical
Limitation	Takes no account of Anesthesia End or Surgical Times, Out of Normal Hours (ie Nighttime surgery), or Holiday Status.

Phenotype	Weight (kg)
Description	Cleaned AIMS Weight and converted to kilograms (if needed)
Logic	<p>Valid weight range is considered 0.5-250kg</p> <ol style="list-style-type: none"> 1. If case only reported weight in kilograms, use AIMS_Weight_kg and only include values [0.5-250]. If outside that range returns NULL value 2. If case only reported weight in pounds, use AIM_Weight_lb and multiply by 2.205 to convert to MPOG_Weight_kg. Valid ranges will be considered [0.5-250]. If outside that range returns NULL value [] = inclusive (meaning including 0.5 and 250 kg values) <p>Age is determined in weeks (boundaryies are interpolated linerally from CDC growth charts) up to one month. After one month, the age is converted to months and the average of the surrounding months are averaged and used. For patients 20+ years of age, the 20-year-old bounds are used.</p> <p>We omit all entries that are outside the CDC bounds based on age. Then, we take the latest weight in the period of one hour before and one hour after anesthesia start. If there are no valid entries in this time, we look 12 hours prior and 12 hours after anesthesia start and we take the closest valid entry to anesthesia start. Finally, if there were no entries in either of these windows, we look 30 days prior to anesthesia start and take the closest valid entry. If still no entries, we return NULL.</p>
Granularity	One value per case
Value Type	int
Limitation	none

Phenotype	WHO BMI Classification
Description	<p>This collation is used to determine the body mass index (BMI) based on the World Health Organization classification</p> <p>References:</p> <p>1. http://apps.who.int/bmi/index.jsp?introPage=intro_3.html</p>
Logic	<p>This collation returns the WHO Classification for BMI. It takes the result of the BMI collation (a numerical value or a NULL) and categorizes it into the WHO classifications:</p> <p>Underweight - BMI [10, 18.5) Normal Weight - BMI [18.5, 25) Pre-obese - BMI [25, 30) Obese class 1 - BMI [30, 35) Obese class 2 - BMI [35, 40) Obese class 3 - BMI [40, 80]</p>
Granularity	One value per case
Value Type	categorical
Limitation	Only available when both height and weight are non-missing and valid (from the BMI collation)