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Chapter 1 - SPL

SPL Resources

One of the primary benefits of QualityAdvisor is the ability to analyze and compare resource consumption from one hospital/hospital system to any user-selected hospital peer group. However, in order to compare resource consumption across many different hospitals, each hospital's charge master must be mapped to the same standard charge master.

QualityAdvisor provides access to Standard Product List (SPL) resource reporting via the following:

- Facility and Peer SPL Resource Analysis
- Facility SPL Daily Resource Analysis
- SPL attributes/metrics in Standard Analysis outcomes reporting and Custom Query reporting

Access Requirements

SPL Resource analyses are available for all members. Your facility's Charge Description Master (CDM) must be mapped to Premier's Standard Product List (SPL) in order to run reports using the SPL Resource hierarchy.

SPL Resource Data Availability

SPL Resource data is available on the SPL Resource analyses in Standard Analyses as well as in Custom Query or Custom Comparison. SPL Resource data can also be drilled to from any analysis. The Medical Record Report is based on SPL resources.

Risk-Adjustment

SPL Resource analyses are not risk-adjusted. This means that the SPL Resource analyses:

- Do not have Expected values for resource consumption and
- Are always available regardless of the Risk Method selected in My Admin (*Admin* > *My Admin*)

Note: 3M APR DRG must be selected as the Risk Method in order for APR DRGs to be available in the prompts.

SPL Resource Methodology

Premier's Standard Product List (SPL) incorporates the following features:

- In-depth reporting capabilities
- Five comparative reporting levels (hierarchies)
- SPL Modifiers and intravenous (IV) to oral (PO) medications
- Detailed mapping philosophy for key departments
- Current Procedural Terminology CPT®4 detail and methodologies

In-Depth Reporting Capabilities

The Perspective Standard Charge Master is the core of all SPL Resource analyses. The more than 56,000 line items form the basis for in-depth reporting capabilities of comparative resource consumption.

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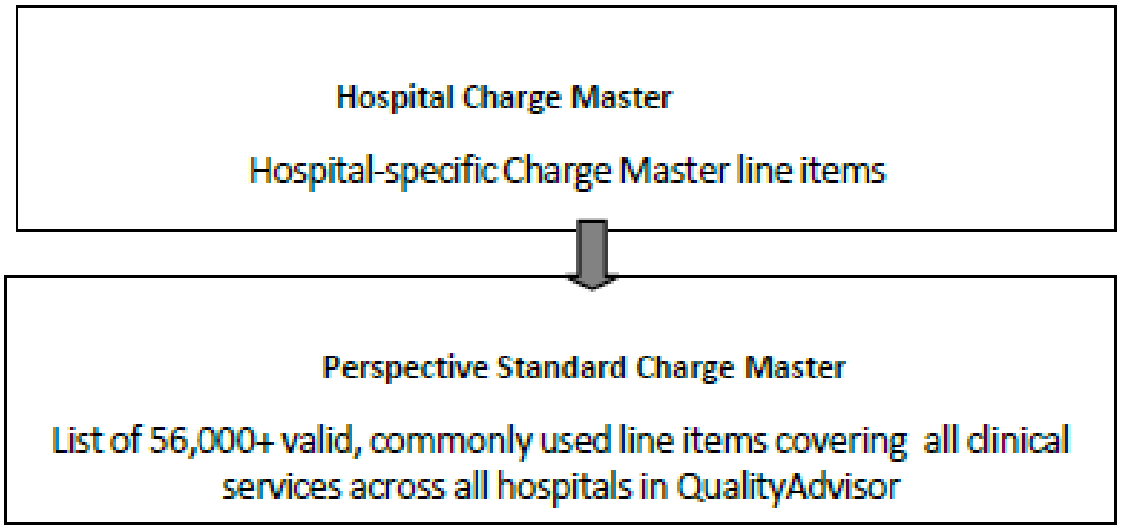


Premier's clinical staff maps every hospital's charge master to the Standard Charge Master.

Hospital charge master line items are mapped to Perspective Standard Charge Master line items within the same comparative departments. The only exceptions are pharmaceuticals and supplies:

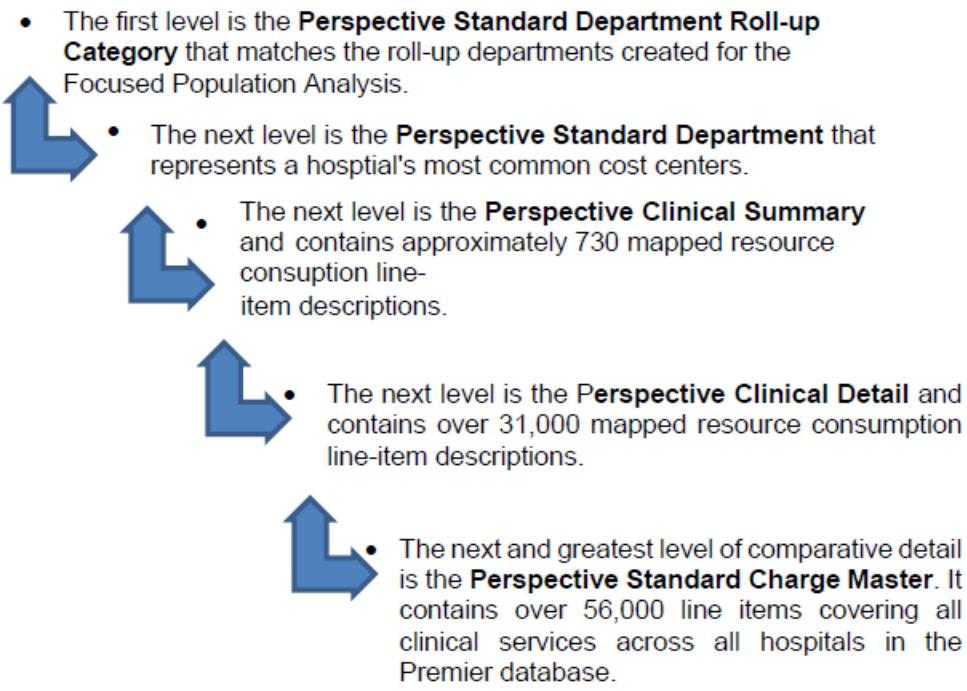
- All pharmaceuticals are mapped to the Premier Standard Department called "Pharmacy."
- All supplies are mapped to the Premier Standard Department called "Central Supply." For example, Emergency Room supplies are mapped to Central Supply.

The Perspective Standard Charge Master provides the greatest level of comparative detail available. The ability to capture this level of detail when mapping a hospital's charge master forms the basis for more appropriate departmental aggregation.

5 Comparative Reporting Levels for Analysis

SPL Resource analyses use the resources in the comparative reporting levels in the SPL hierarchy.

SPL contains five Comparative Reporting Levels (hierarchies). Each level provides greater clinical comparative detail and greater detailed comparative resource consumption descriptions.



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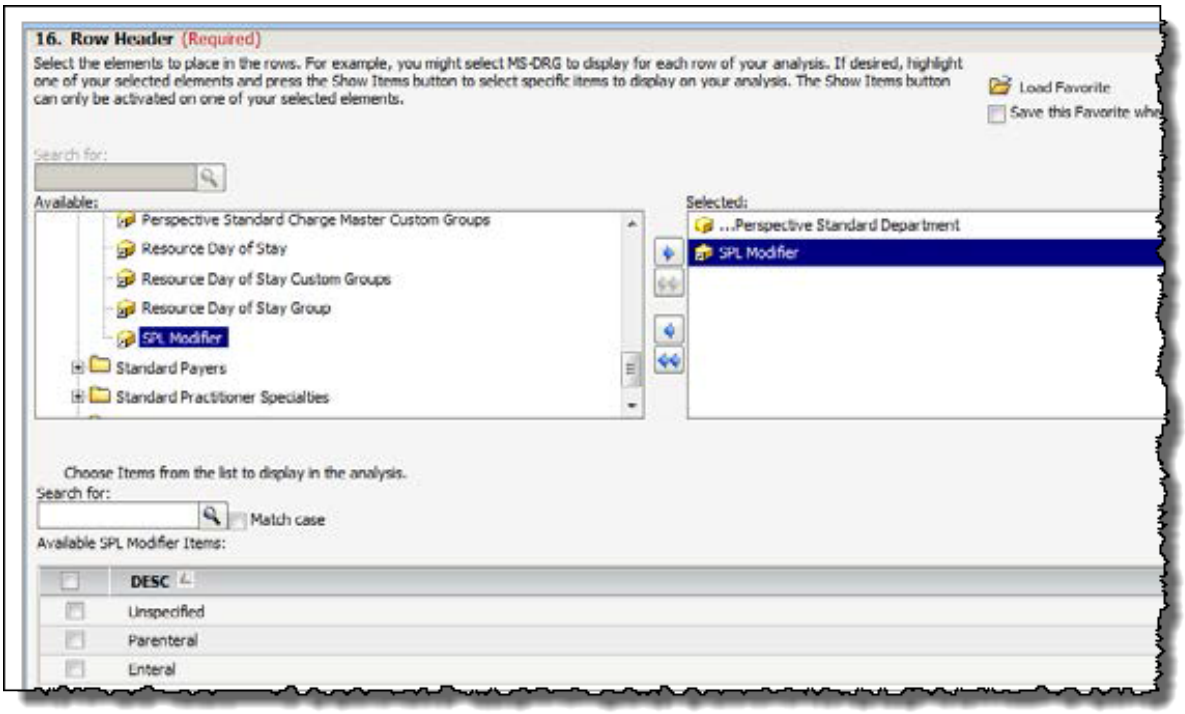
SPL Modifiers

SPL modifiers are available in both Standard Analyses* and Custom Query. The following headings identify the SPL modifier groupings:

- Enteral (Oral designation items)
- Parenteral
- Unspecified (Pharmacy items that are not Enteral/Parenteral and non-Pharmacy items will be assigned 'Unspecified')



Detailed Mapping Philosophy for Key Departments

Mapping philosophy refers to the manner in which elements in one reporting level are grouped into a singular category in the next higher reporting level. Premier's SPL provides four Comparative Reporting Levels (Hierarchies). The first level, the Perspective Standard Department, represents a hospital's most common cost centers. The examples in this section illustrate the mapping philosophy in detail.

Mapping Example 1: Pharmacy

The Perspective Standard Department Pharmacy includes approximately 469 Clinical Summary and over 4,962 Clinical Detail mapped resource consumption line-item descriptions. The Perspective Clinical Summary breaks out each pharmaceutical by therapeutic class, while the Perspective Clinical Detail further breaks out each therapeutic class by its drug name and strengths.

The chart below depicts several actual mapping examples.

- First, each hospital's pharmaceuticals are mapped to the Perspective Standard Charge Master.
- Then, the Perspective Standard Charge Master line items are successively mapped to each higher Comparative Reporting Level (Hierarchy).

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Hospital Charge Master Description	Perspective Standard Charge Master	Perspective Clinical Detail (By Drug Name & Strength)	Perspective Clinical Summary (By Therapeutic Class)	Perspective Standard Department	Perspective Standard Department Roll-up Category
Morphine 10MG INJ	Morphine INJ 10MG/ML 1ML	Morphine INJ 10MG/ML 1ML	Opiate Agonists Parenteral	Pharmacy	Pharmacy
Tylenol 325MG Tablet	Acetam Tylenol Tab 325MG (EA)	Acetam Tab 325MG (EA)	Misc Analgesics & Antipyretics Oral	Pharmacy	Pharmacy
Captopril Tab 50MG	Captopril Tab 50MG	Captopril Tab 25MG	Ace Inhibitors Oral	Pharmacy	Pharmacy
Famciclovir Tab 250MG	Famciclovir Tab 250MG	Famciclovir Tab 500MG	Antivirals Oral	Pharmacy	Pharmacy
Famciclovir Tab 500MG	Famciclovir Tab 500MG	Famciclovir Tab 500MG	Antivirals Oral	Pharmacy	Pharmacy

Mapping Example 2: Central Supply

The Perspective Standard Department Central Supply includes approximately 21 Clinical Summary and almost 4,773 Clinical Detail mapped resource line-item descriptions. The Perspective Clinical Summary breaks out each supply item by department/function, while the Perspective Clinical Detail further breaks out each department/function item by supply item description.

The chart below depicts several actual mapping examples.

- First, each hospital's pharmaceuticals are mapped to the Perspective Standard Charge Master.
- Then, the Perspective Standard Charge Master line items are successively mapped to each higher Comparative Reporting Level (Hierarchy).

Hospital Charge Master Description	Perspective Standard Charge Master	Perspective Clinical Detail (By Supply Item Description)	Perspective Clinical Summary (By Department/ Function)	Perspective Standard Department	Perspective Standard Department Roll-up Category
Hip Component Femoral	Implant Hip Femoral Component	Implant Hip Femoral Component	Implants Ortho Hardware	Central Supply	Central Supply
Ankle Brace Left	Brace Ankle	Brace Ankle	Orthopedic/Soft Goods	Central Supply	Central Supply
Renal Stent	Stent Renal	Stent Renal	Med/Surg Supplies	Central Supply	Central Supply
Chromic 5-0	Suture Chromic 5-0	Suture Chromic 5-0	Med/Surg Supplies	Central Supply	Central Supply

Mapping Example 3: Laboratory

The Perspective Standard Department Laboratory includes approximately 15 Clinical Summary and over 1,492 Clinical Detail mapped resource consumption line-item descriptions. The Perspective Clinical Summary breaks out each laboratory item by lab sub-department, while the Perspective Clinical Detail further breaks out each lab department by test type/methodology.

The chart below depicts several actual mapping examples.

- First, each hospital's pharmaceuticals are mapped to the Perspective Standard Charge Master.
- Then, the Perspective Standard Charge Master line items are successively mapped to each higher Comparative Reporting Level (Hierarchy).

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Hospital Charge Master Description	Perspective Standard Charge Master	Perspective Clinical Detail (By Test Type/ Methodology)	Perspective Clinical Summary (By Lab Sub-department)	Perspective Standard Department	Perspective Standard Department Roll-up Category
Glucose Urine 82945	Glucose Urine	Glucose	Chemistry Profiles & Components	Laboratory	Laboratory
Glucose CSF 82945	Glucose CSF	Glucose	Chemistry Profiles & Components	Laboratory	Laboratory
Glucose 82946	Glucose Blood	Glucose	Chemistry Profiles & Components	Laboratory	Laboratory
LDH ISO	LDH w/Isoenyzmes	LDH w/Isoenyzmes	Cardiac Enzyme Profiles & Components	Laboratory	Laboratory

Mapping Example 4: Diagnostic Imaging

The Perspective Standard Department Diagnostic Imaging includes Diagnostic Radiology, CT, and MRI. The standard department includes approximately 17 Clinical Summary and 583 Clinical Detail mapped resource consumption line- item descriptions. The Perspective Clinical Summary breaks out each diagnostic imaging item by anatomical location, while the Perspective Clinical Detail further breaks out each anatomical location by test type/site.

The chart below depicts several actual mapping examples.

- First, each hospital's pharmaceuticals are mapped to the Perspective Standard Charge Master.
- Then, the Perspective Standard Charge Master line items are successively mapped to each higher Comparative Reporting Level (Hierarchy).

Hospital Charge Master Description	Perspective Standard Charge Master	Perspective Clinical Detail (By Test Type/Site)	Perspective Clinical Summary (By Anatomical Location)	Perspective Standard Department	Perspective Standard Department Roll-up Category
Skull Comp	XR Skull Complete 4+ Views	XR Skull 4+ Views	Diagnostic Imaging/ Head or Neck	Diagnostic Imaging	Diagnostic Imaging
Chest w/o	CT Chest w/o Contrast	CT Chest w/o Contrast	Diagnostic Imaging/ Chest	Diagnostic Imaging	Diagnostic Imaging
Lumbar w/wo	MRI L-Spine w & w/o Contrast	MRI L-Spine w & w/o Contrast	Diagnostic Imaging/ Spine/Pelvis	Diagnostic Imaging	Diagnostic Imaging
Myocard PET	PET Myocard Imaging Metabolic Eval	PET Myocard Imaging Metabolic Eval	Diagnostic Imaging/ Misc	Diagnostic Imaging	Diagnostic Imaging

CPT®4 Detail and Methodology

The Perspective Standard Charge Master and all Comparative Reporting Levels (Hierarchies) incorporate Current Procedural Terminology CPT®4 detail and methodologies. CPT®4 codes are individually mapped to specific Perspective Standard Charge Master line items versus a range of standard charge codes that are mapped to one CPT®4 code.

The reporting levels also incorporate the CPT®4 methodology. For example, the Premier Standard Department Diagnostic Imaging includes Diagnostic Radiology, CT, and MRI. Additionally, physical and occupational therapy are combined into one Premier Standard Department called Physical Medicine/PT/OT/Rehab.

Resource Consumption Calculation Overview

In order to compare resource consumption across multiple hospitals, common or comparative quantities must be calculated for each hospital. In QualityAdvisor, this process occurs behind the scenes before the data is loaded into the database and at two comparative levels:

- Perspective Standard Charge Master
- Perspective Clinical Detail

The quantity unit conversion process consists of the following three steps:

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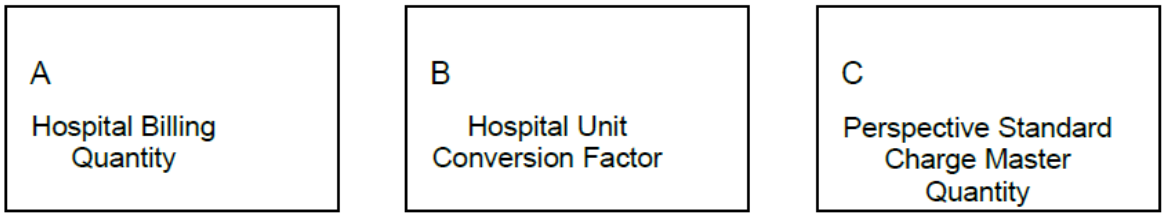
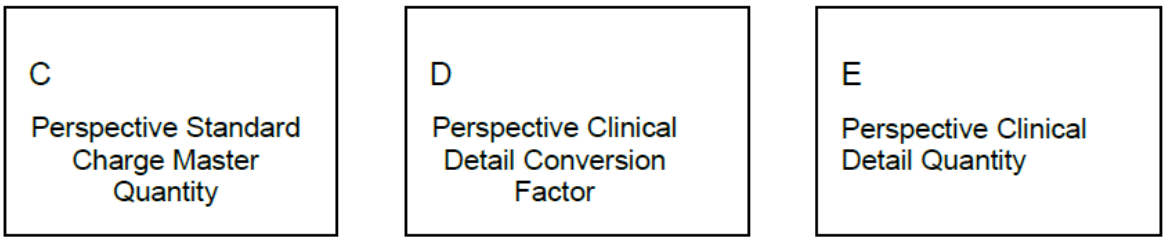
1. Hospital Billing Quantity is converted to Perspective Standard Charge Master Quantity.



2. Perspective Standard Charge Master Quantity is then converted to Perspective Clinical Detail Quantity.



3. Total Converted Quantity is calculated for each comparative level by summing the converted quantities for each mapped line item *(see example below Step 3: Calculating Total Converted Quantity)*.

Steps 1 & 2: Calculating Converted Quantity Example

A		B	C		D	E	
Hospital Charge Master		Hospital Unit Conversion Factor	Perspective Standard Charge Master		Perspective Clinical Detail Conversion Factor	Perspective Clinical Detail	
Description	Billing Quantity		Description	Converted Quantity		Description	Converted Quantity
Piperacillin IM/IV 3 GM	792	1	Piperacillin, Pipracil VL 3GM	792	1.5	Piperacillin, Pipracil VL 2 GM	1188
Piperacillin IM/IV 4 GM	143	1	Piperacillin, Pipracil VL 4GM	143	2	Piperacillin, Pipracil VL 2 GM	286

Step 3: Calculating Total Converted Quantity

Total Converted Quantity for Perspective Standard Charge Master:

In the example below, the hospital has a Total Converted Quantity of 792 for Piperacillin, Pipracil VL 3 GM, and 143 for Piperacillin, Pipracil VL 4 GM at the Perspective Standard Charge Master Resource Consumption Comparative level.

Piperacillin, Pipracil VL 3 GM	792
Piperacillin, Pipracil VL 4 GM	143

In the next example, the hospital has a Total Converted Quantity of 1,474 for Piperacillin, Pipracil VL 2 GM at the Perspective Clinical Detail level.

Total converted Quantity Perspective Clinical Detail:	
Piperacillin, Pipracil VL 2 GM	143

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Total Converted Quantity Use within QualityAdvisor

Hospital-specific Total Converted Quantities are stored for each mapped Perspective Standard Charge Master and Perspective Clinical Detail line item within the Perspective Database, where it is called Quantity.

Total Converted Quantity = Quantity in QualityAdvisor

Quantity in QualityAdvisor SPL Resource analyses is included in the Quantity / Resource Case metric. This metric represents the exact resource consumption descriptive line item provided to a specified number of patients over a specified amount of time.

Example: Perspective Clinical Detail Quantity Conversion

For example, a hospital ran an SPL Resources analysis for APR DRG 139 (Other Pneumonia) for the year 2010 that included 24 cases:

Perspective Clinical Detail Quantity Conversion
Quantity = 1,474
Resource Cases = 24
Quantity / Resource Case = (1,474/24) = 61.42

This means that 61.42 units (2 GM vials) of Piperacillin were provided to resource cases with APR DRG 139 for year 2010.

Example : Perspective Standard Charge Master Quantity Conversion

In the following example, the hospital ran a QualityAdvisor analysis for APR DRG 139 for the year 2010 at the Perspective Standard Charge Master level and

found that there were two line items mapped to the Piperacillin VL 2GM drug.

Total converted Quantity Perspective Clinical Detail:	
Piperacillin, Pipracil VL 3 GM	Piperacillin, Pipracil VL 4 GM
Quantity = 792	Quantity = 143
Resource Cases = 19	Resource Cases = 5
Quantity / Resource Case = (792/19) = 41.68	Quantity / Resource Case = (143/5) = 28.60

This means that 41.68 units of Piperacillin VL 3GM and 28.60 units of Piperacillin 4GM were provided to Premier Memorial's cases with APR DRG 139 for year 2000.

SPL Resource Unit Descriptions by Department

Following are the SPL Department and Resource Unit Descriptions.

Department	Resource Unit Description
Ambulance	Ambulance transports and services
Anesthesia	Anesthesia by the procedure. Anesthesia time in various increments.
Audiology	Audiology procedures
Blood Bank	Blood products Processing of blood products Procedures associated with blood administration (type/cross-match)
Cardiology	Cardiology procedures and services

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Department	Resource Unit Description
Central Supply	All supplies (no matter where they are in the hospital charge description master, they default back to here) Oxygen in various increments of time
Chemotherapy	Chemotherapy infusions in various increments of time Standard time at the Clinical Detail Level is 1 hour
Clinic	Clinic visits Immunizations
Diagnostic Imaging	X-rays, CT scans, MRI scans, and any injection procedures associated with injection of contrast media
Dialysis	Dialysis procedures ESRD services
Durable Medical Equipment	Reusable equipment. Specialty beds are here.
EKG	EKG procedures Halter monitor
Emergency Room (ER)	ER visits ER procedures
Endoscopy	Endoscopic procedures
Home Health	Home health visits
Hospice	Hospice visits
IV Therapy	IV infusions in various increments of time. Standard time at the Clinical Detail Level is 1 hour. Also IV starts
Lab	Lab tests
Labor and Delivery	Labor room in various time increments Standard time increment at the Clinical Detail Level is 1 hour
Neurodiagnostics	Neurological (nervous system) tests and monitoring
No Standard Department	Non-revenue items. Payments and adjustments
Nuclear Medicine	Nuclear Medicine scans Isotopes
Nursing Labor	RN assist procedures Nursing acuity levels RN nursing care at various time increments Standard time at the Clinical Detail Level is 15 minutes
Observation/Treatment Room	Observation in various increments of time Use of treatment room in various increments of time
Other Diagnostic Services	Diagnostic services not defined elsewhere (eye exams, allergy tests)

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Department	Resource Unit Description
Other Therapeutic Services	Therapeutic services not defined elsewhere (diet consults, chemical dependency)
Outpatient Surgery	Ambulatory day surgery in various time increments Standard time increment at the Clinical Detail Level is 1 hour
Pathology	Pathology procedures (performed by a pathologist)
Peripheral Vascular Lab	Doppler studies Duplex scans
Pharmacy	All Drugs (no matter where they are in the hospital charge description master, they default back to here) Anesthesia gases are in various time increments Standard time at the Clinical Detail Level is 1 hour
Physical Medicine/PT/OT/Rehab	Physical Therapy procedures and evaluations Occupational Therapy procedures and evaluations
Professional Fees	All professional fees (procedures, visits, consults)
Psychiatry	Psychotherapy treatments Psychotherapy evaluations
Pulmonary Function	Pulmonary function tests
Radiation Therapy	Radiation therapy treatments
Recovery Room	Recovery room time in various increments Standard time increment at the Clinical Detail Level is 1 hour
Respiratory Therapy	Respiratory procedures Mechanical ventilators are here (by day or shift)
Room and Board	Room charges measured in days
Speech Therapy	Speech treatments and evaluations
Surgery	OR time in various increments of time Standard time at the Clinical Detail Level is 1 hour
Ultrasound	Ultrasound procedures
Unknown	Unmapped SPL codes Available in all SPL levels

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Chapter 2 - Values on Risk-Adjusted Analyses

Outcome Case Methodology

On risk-adjusted analyses (both 3M™ and CareScience Analytics versions), there are two values for cases: Total Cases and Outcome Cases.

Total Cases

This is the number of cases in the population that match the selections at the prompts. These cases qualified for the analysis.

Outcome Cases

This is the number of inpatient cases that qualified for risk adjustment.

Outcome Cases are the Total Cases minus the cases that did not qualify for risk adjustment. As a result, the number of Outcome Cases may be smaller than the number of Total Cases.

To qualify for risk-adjustment, the case:

- Must include the information required to risk-adjust such as age, discharge status, gender, etc.
- Must not include the exclusionary criteria specific to each outcome.

Information Utilized for Risk-Adjustment

The following required data elements are verified during the standard data validation process that all data goes through before being accepted by QualityAdvisor. For both the 3M™ and CareScience Analytics versions of the risk-adjusted analyses, a case must have valid values for these data elements to be included in the Outcome Cases.

*Indicates a data element that may be derived (if no specific data is sent) based on other submitted data elements.

**Indicates a data element not required for risk adjustment; however, if submitted to Premier, will be used for risk-adjustment

- Admission Type
- Admission Date
- Date of Birth
- Discharge Date
- Discharge Status
- Full ICD diagnosis and procedure coding set (principal and secondary)
  - Principal Diagnosis
  - Secondary Diagnosis**
  - Present on Admission (POA) accompanying Secondary Diagnosis
  - Procedures**
  - Procedure Dates accompanying Procedures
- Gender
- Length of Stay
- Point of Origin (Admission Source)
- Race (can be assigned to "unknown")**
- Standard Primary Payer (Premier-mapped)/Payor Class*
- Zip Code (If not provided, the system uses the facility’s zip code.)

Outcome Case Exclusion Criteria

Each outcome has exclusionary criteria that are specific to that outcome:

- Charge
- Cost
- Complications
- LOS

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- Mortality
- Readmissions (CareScience Analytics only)

The exclusionary criteria for each outcome apply only to that outcome. For example, a patient that is transferred to another facility would be excluded from the outcome cases for mortality and readmissions but not be excluded from the outcome cases for charge, cost, LOS, or complications.

Outpatients are always excluded from the outcome cases.

The following table describes the exclusionary criteria for each outcome.

Outcome	Cases are eliminated from this outcome if…
Mortality*	The patient was transferred out of the facility with one of the following discharge statuses: • 02 - Discharged/Transferred to Other Facility • 05 - Discharged/Transferred to Cancer Center or Children's Hospital • 43 - Discharged/Transferred to Federal Hospital • 66 - Discharged/Transferred to a Critical Access Hospital (CAH) • 82 - Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 85 - Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 88 - Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 94 - Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) **Note**: Patients transferred to another facility are disqualified for risk-adjustment because their status is undetermined.
LOS*	The CareScience Analytics Expected LOS is greater than the 99th percentile for each of the 291 disease strata in the Perspective data distribution. **Note**: Cases with an Expected LOS below the 1st percentile are not excluded because patients can be reasonably admitted for one day.
Charge*	The CareScience Analytics Expected Charge is less than the 1st percentile or greater than the 99th percentile for each of the 291 disease strata in the Perspective data distribution.
Cost*	The CareScience Analytics Expected Cost is less than the 1st percentile or greater than the 99th percentile for each of the 291 disease strata in the Perspective data distribution.
Complications	There are no exclusionary criteria specific to the complications outcomes. Cases are excluded only if they do not have the information required to risk-adjust.

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Outcome	Cases are eliminated from this outcome if…
Readmissions (CareScience Analytics version only)	The patient: • Had a Patient Type other than Inpatient (08) • Expired • Was transferred out of the facility • Left against medical advice (AMA) Patients with one of the following discharge statuses: • 02 - Discharged/Transferred to Other Facility • 05 - Discharged/Transferred to Cancer Center or Children's Hospital • 7 - Left Against Medical Advice or Discontinued Care • 20 - Expired • 40 - Expired at Home (For Medicare and Trivare claims for Hospice) • 41 - Expired in Medical Facility • 42 - Expired, Place Unknown (For Hospice) • 43 - Discharged/Transferred to Federal Hospital • 66 - Discharged/Transferred to a Critical Access Hospital (CAH) • 82 - Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 85 - Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 88 - Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) • 94 - Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges) It is important to note that the Outcomes Cases metric includes only patients with the Patient Type of Inpatient (08); all other Patient Types are excluded. This is the only risk-adjusted outcome where the Outcomes Cases metric is restricted to one Patient Type. Note: Patients transferred to another facility are disqualified for risk-adjustment because their status is undetermined.

***Exclusions Based on Expected Values – LOS, Cost, and Charge**

In general, it is rare that Mortality, LOS, Cost, and Charge outcomes have Expected values this far outside the normal range. These out of range outlier values are excluded from outcome cases because they would have disproportionate influence on the average of the expected value.

Outcome Cases on Both Versions of the Analyses

Outcome Cases are calculated the same way in both the CareScience Analytics and 3M™ versions of the risk-adjusted analyses. Once an outcome case is identified, the same case will appear on both the CareScience Analytics and 3M™ versions of the analysis.

The following graphics show a Mortality Comparison with Attending Practitioner placed on the rows for the same facility for the same timeframe in the 3M™ version and then the CareScience Analytics version. Note that the number of Total

Cases and, more importantly, the number of Outcome Cases is the same on both analyses.

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Mortality Comparison - 3M™ Version

Attending Practitioner		Total Cases	Outcome Cases	Observed	Expected	Variation	O/E
Total		**125,781**	**123,414**	**2.72%**	**2.50%**	**0.22%**	**1.09**
11111111	Practitioner 1	2	2	0.00%	1.16%	-1.16%	0.00
22222222	Practitioner 2	21	21	0.00%	0.09%	-0.09%	0.00
33333333	Practitioner 3	215	208	8.17%	3.48%	4.69%	2.35
44444444	Practitioner 4	70	70	11.43%	7.07%	4.36%	1.62
55555555	Practitioner 5	8	8	12.50%	11.22%	1.29%	1.11
66666666	Practitioner 6	144	137	5.11%	3.00%	2.11%	1.70
77777777	Practitioner 7	1	1	0.00%	0.20%	-0.20%	0.00

Mortality Comparison - CareScience Analytics Version

Attending Practitioner		Total Cases	Outcome Cases	Observed	Expected	Variation	O/E
Total		**125,781**	**123,414**	**2.72%**	**2.87%**	**-0.16%**	**0.95**
11111111	Practitioner 1	2	2	0.00%	1.09%	-1.09%	0.00
22222222	Practitioner 2	21	21	0.00%	0.46%	-0.46%	0.00
33333333	Practitioner 3	215	208	8.17%	4.80%	3.37%	1.70
44444444	Practitioner 4	70	70	11.43%	10.26%	1.16%	1.11
55555555	Practitioner 5	8	8	12.50%	6.59%	5.91%	1.90
66666666	Practitioner 6	144	137	5.11%	4.72%	0.39%	1.08
77777777	Practitioner 7	1	1	0.00%	0.37%	-0.37%	0.00

On risk-adjusted analyses, the Observed, Expected, Variation, O/E, and Statistical Significance values are based on the Outcome Cases not the Total Cases.

Observed and Expected Metrics

Observed and Expected values are calculated based on the number of Outcome Cases not the number of Total Cases.

Observed

Observed is the outcome's (Mortality, LOS, Cost/Case, etc.) rate. Observed values are always based on the Outcome Cases and the data submitted by your facility.

Expected

The Expected value (Mortality, LOS, Cost/Case, etc.) is calculated by the risk adjustment methodology – 3M™ APR DRG or CareScience Analytics - and the historical data in the Premier Perspective Database.

- The Expected values on 3M™ analyses are calculated based on the normative values in the Perspective Database. Normative values are averages calculated at the APR DRG SOI subclass level for metrics such as average LOS, charges, and cost.
- The Expected values on CareScience Analytics analyses are generated from a multi-variate regression model using data from the Premier Perspective Database. CareScience Expected values are calculated at two levels: Standard Practice and Select Practice.

O/E

O/E is the Observed value (O) divided by the Expected value (E).

- Outcomes with an O/E less than 1.0 are performing better than expected.
- Outcomes with an O/E greater than 1.0 are performing worse than expected.

Variation

Variation is the Observed value minus the Expected value.

- Outcomes with a negative variation are performing better than expected.
- Outcomes with a positive variation are performing worse than expected. Variation has three levels of Statistical Significance: 75%, 95%, and 99%.

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Geometric and Arithmetic Values

The risk-adjusted analyses contain both arithmetic and geometric values for the following outcomes:

- Charge
- Cost
- LOS

The 3M™ versions display arithmetic values in the grids by default and the CareScience Analytics versions display geometric values in the grids by default.

It is highly recommended to use the default setting for arithmetic or geometric value because they are coherent to the respective risk-adjustment method.

Calculation Overview

Arithmetic values are calculated with the arithmetic mean and the geometric values are calculated with the geometric mean. Arithmetic and geometric refers to the way the average value is calculated. The main difference between arithmetic and geometric values is the way outliers in the data are handled.

Arithmetic mean calculations are a simple aggregation of the outcomes for all patients in an identified population divided by the total number of patients. As a result, the extreme outliers can have a significant impact on the resulting mean value. In contrast, the geometric mean applies a logarithmic function to the data that constrains the effect of outliers on the mean value.

The geometric mean in QualityAdvisor analyses is typically less than the number returned by the arithmetic mean because of the natural lower bound of zero for cost and LOS data and the reduction in the effect of the extreme outliers on the unbounded upper end of the distribution. Because of the adjustment for extreme values, geometric values are often closer to the center of the mass of data, which can reveal a more representative average outcome of the population.

Why Use the Geometric Mean?

The main advantage to using the geometric mean is that negating extreme values can produce more stable numbers that are more representative of the population because outliers are not impacting the reported values. This can help when identifying variations in care that represent opportunities for improvement.

Comparing Arithmetic and Geometric Values

One of the biggest benefits of the risk-adjusted analyses is that both arithmetic and geometric values are pulled for the same analysis. This can have the effect of revealing the impact of outliers on your data as well as helping you understand the average value more clearly.

In general, the greater the difference between arithmetic and geometric values, the greater the likelihood of outliers in the analysis population. Additionally, if you know that you tend to have dramatic swings in outcomes within a specific population due to outliers, the geometric mean can help in producing a more stable estimate of the outcomes over time that allows the user to identify systematic variations that may be opportunities for improvement.

For example, on a risk-adjusted analysis, if you notice a big difference between the arithmetic and geometric value for the same outcome, you can drilldown into the details to discover extreme values, which enables valuable analysis for specific outcomes.

Opportunity Metrics

Opportunity metrics are those metrics that show the opportunity for improvement. These metrics are as follows:

- Opportunity (Mortality)
- Opportunity (Arith LOS)
- Opportunity (Geo LOS)
- Opportunity (Arith Cost)
- Opportunity (Geo Cost)
- Opportunity (Arith Charge)
- Opportunity (Geo Charge)

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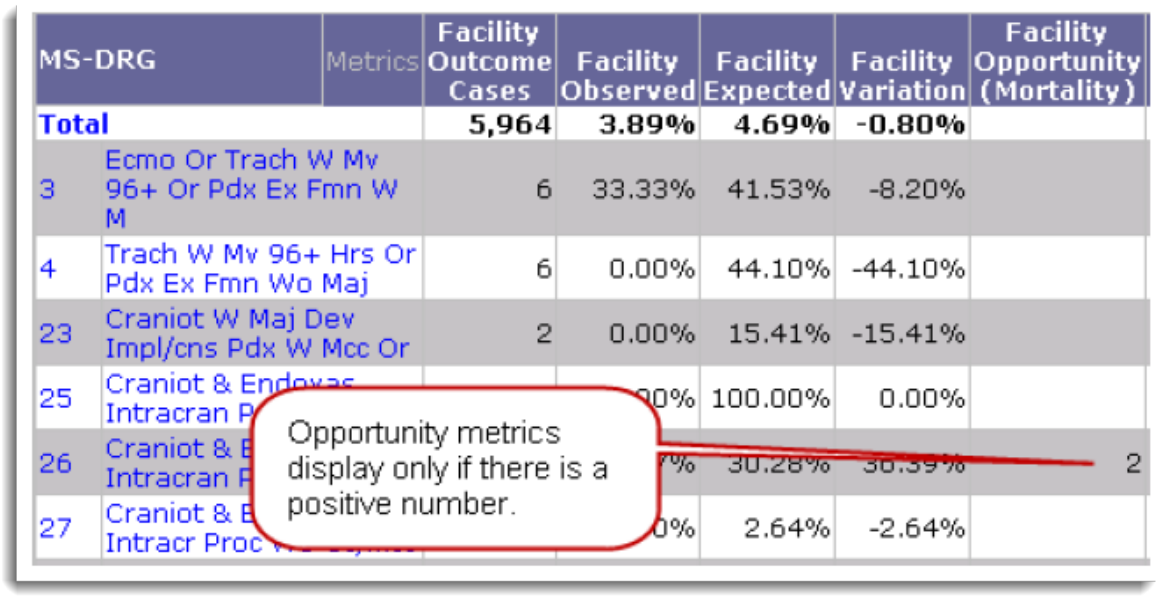
The values that display for opportunity metrics in each row are calculated based on the Variation multiplied by Outcome Cases for that row only. The Total line represents the total opportunity for the analysis population and is calculated based on the Variation multiplied by Outcome Cases for the whole analysis. The Total line for opportunity metrics is not a summation of the individual rows in the column.

The opportunity value is rounded to the nearest whole number for mortality, cost, and charge and rounded to the nearest hundredth for LOS. Opportunity metrics only display values above zero. If the value is below zero, the outcome is performing better than expected, which the system identifies as no opportunity.



MS-DRG	Metrics	Facility Outcome Cases	Facility Observed	Facility Expected	Facility Variation	Facility Opportunity (Mortality)
Total		**5,964**	**3.89%**	**4.69%**	**-0.80%**	
3	Ecmo Or Trach W Mv 96+ Or Pdx Ex Fmn W M	6	33.33%	41.53%	-8.20%	
4	Trach W Mv 96+ Hrs Or Pdx Ex Fmn Wo Maj	6	0.00%	44.10%	-44.10%	
23	Craniot W Maj Dev Impl/cns Pdx W Mcc Or	2	0.00%	15.41%	-15.41%	
25	Craniot & Endovas Intracran P		00%	100.00%	0.00%	
26	Craniot & E Intracran P		7%	30.28%	38.39%	2
27	Craniot & E Intracr Proc W		0%	2.64%	-2.64%	

In the example above, Facility Opportunity (Mortality) displays no value in the Total row because the system identified no opportunity for the analysis population. Note that the system still identifies areas of opportunity in the individual rows.

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Chapter 3 - CS Analytics Risk-Adj Methodology

CareScience Analytics Risk-Adjustment Methodology Overview

The CareScience Analytics risk adjustment methodology applies to the following Facility and Peer analyses in QualityAdvisor:

- Facility Charge Comparison Analysis - CareScience Analytics
- Facility Complications Comparison Analysis - CareScience Analytics
- Facility Cost Comparison Analysis - CareScience Analytics
- Facility Disease Strata by Outcome - CareScience Analytics
- Facility LOS Comparison Analysis - CareScience Analytics
- Facility Mortality Comparison Analysis - CareScience Analytics
- Facility Opportunity Analysis - CareScience Analytics
- Facility Outcome Comparison Analysis - CareScience Analytics
- Facility Outcome Profile Analysis - CareScience Analytics
- Facility Risk-Adjusted 30-day Readmission Analysis - CareScience Analytics
- Peer Charge Comparison Analysis - CareScience Analytics
- Peer Complications Comparison Analysis - CareScience Analytics
- Peer Cost Comparison Analysis - CareScience Analytics
- Peer LOS Comparison Analysis - CareScience Analytics
- Peer Mortality Comparison Analysis - CareScience Analytics
- Peer Outcome Comparison Analysis - CareScience Analytics
- Peer Risk-Adjusted 30-day Readmission Analysis - CareScience Analytics

Accessing CareScience Analyses

1. Make sure that **CareScience Analytics** is selected as the risk- adjustment methodology in **My Admin** (Navigate to ***Admin > My Admin***).
2. Navigate to **Analysis > Standard Analyses > Select Analysis** and then from the list, click **Risk-Adjusted Analyses**.
3. **Facility** is selected by default. To see the **Peer** analyses, select **Peer** to the right of the **Select Analysis** list.

Purpose of CareScience Risk-Adjustment

The purpose of CareScience Analytics risk-adjustment is to isolate patient contributions to outcomes (or how patient outcomes are affected by what factors they bring with them to each facility encounter). What makes this methodology unique is that the risk adjustment is done at a patient level based on their characteristics at the time they are admitted as an inpatient. This methodology uses a multi-variate regression model that adjusts actual outcomes to control for variations in the severity of illness for each patient.

Basically, the model risk-adjusts each patient's outcomes based on patient characteristics. Adjusting observed outcomes to control for variations in patient severity this way puts the observed numbers in the context of patient care, which, in effect, provides you with a more accurate read of how you're doing.

QualityAdvisor Database

The CareScience Analytics risk adjustment model begins with the Premier QualityAdvisor Database. This database contains the data from all participating facilities which are then risk-adjusted according to the CareScience Analytics risk-adjustment methodology. The benefit of the database is that it contains data from hundreds of facilities that has been standardized to the same format, allowing direct comparisons to peers or other facilities' expected outcomes.

From this portion of the database, beta scores (coefficients) are derived from a regression model, which are used to risk adjust for each patient for the following outcomes:

- Charges
- Complications

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- Cost
- LOS
- Mortality
- Readmissions

Basically, the beta scores generated for each patient characteristic (or variable) represent the incremental effect of each specific variable (for example, age) on the outcome measure (for example, mortality). Each of the 517 disease strata has its unique set of beta scores for each patient characteristic.

Essentially, facilities submit their data, that data is risk-adjusted at the patient level (using the beta scores derived from the historic data in the Premier QualityAdvisor Database), and the risk value for each outcome is generated for each patient.

As a reminder, if a patient is an outcome case, for length of stay, charges and cost, there is logic used in the CareScience model to determine if the patients calculated risk falls within the allowable range (trim point values or CSA outlier logic). Every year the min / max values are updated with new ranges to account for changes in care practice

Generating Beta Scores

At a high level, three main components are incorporated into the generation of the beta scores:

1. 517 Unique Disease Strata
2. Independent Variables
3. Dependent Variables (Outcomes)

Each independent variable is used to predict the dependent variable (outcome) for a specific disease stratum. When the model is created it produces the incremental effect that one unit increase in the independent variable has on the dependent variable (outcome). That incremental effect represents the beta score.

It is important to note that:

- Beta values may evolve in each year's calibration along with coding practice evolvement and model specification changes.
- The same set of beta scores are applied to patients within the same disease stratum and unique characteristics regardless of the facility they are in. This enables comparison between facilities or other groupings.

Example of a Regression Model

A multi-variate regression model is employed to create beta scores for patients. A regression analysis looks at how one variable (the independent variable) affects another variable (the dependent variable, or outcome in this case).

For illustration purpose, the following is a simplified example of a regression analysis using a principal diagnosis of Pneumonia:

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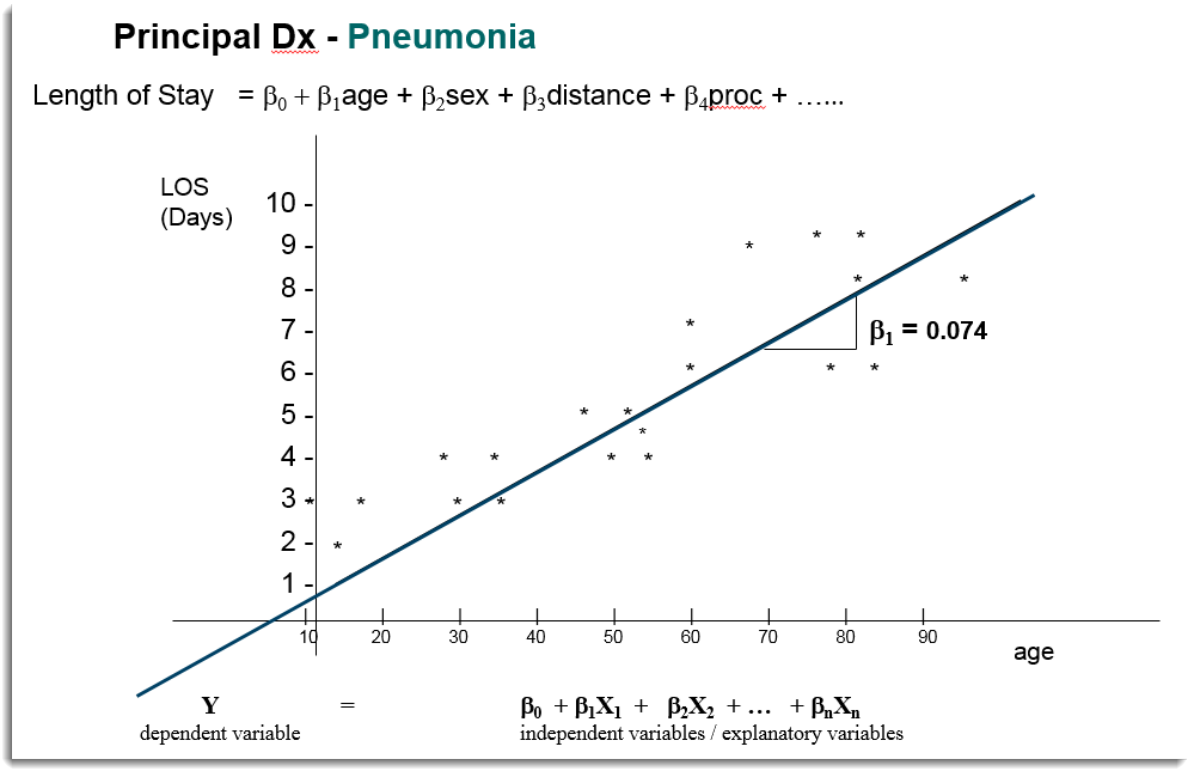

517 Unique Disease Strata

A PDF document that includes the 517 unique disease strata according to which every patient is risk-adjusted is available in the QualityAdvisor Web Help. These groupings are all based on Clinical Classification Software Refined (CCSR), which was developed by Agency for Healthcare Research and Quality. The list includes five additional strata specific for newborn population.

Independent Variables

There are sixteen independent variables that tend to fall into three categories:

1. Clinical Factors – Clinical conditions that are related to outcomes.
2. Patient Selection Factors – Non-clinical patient characteristics that determine delivery of care.
3. Demographic Factors – Patient demographic factors that affect outcomes of care.

Clinical Factors

Clinical Factor	Notes
Comorbid conditions and Disease History	Some common comorbid conditions: • Chronic bronchitis • COPD • Hypertension • Diabetes • Chronic renal failure Comorbid conditions are disease and outcomes specific. The weight a comorbid condition receives is related to the principal diagnosis and the outcome.

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Clinical Factor	Notes
Comorbidity Composite Scores	Severity weighted sum of secondary diagnoses present on admission (POA flag Y or W). If a diagnosis code is on the list of POA exempt, it is also included in the calculation. Weight is outcome specific.
Principal Diagnosis (the terminal digit at which this code is risk-adjusted is determined by clinical and statistical relevance)	Most disease strata are defined by CCSR category of principal diagnosis. However, individual ICD codes within the same CCSR category could have different clinical implications. If clinically relevant, the diagnosis is risk-adjusted at the terminal digit. For example, consider two patients within the same disease stratum: CCSR_DX_CIR017 (Cardiac Dysrhythmias). This is abnormal heart rhythm, which could mean a minor or major risk. Therefore, it is clinically relevant to risk-adjust these patients at the more descriptive terminal digit level of ICD-10 principal diagnosis code. For example, the terminal digit ICD-10 code of I49.9 (unspecified Cardiac Dysrhythmias) whereas the terminal digit ICD-10 code of I49.01 (Ventricular Fibrillation) means the patient has a fast unorganized heart rhythm that can result in collapse and sudden cardiac death in minutes, unless medical help is provided immediately.
Valid Procedures	Valid procedures are used as a proxy for unobserved patient factors, establishing a relationship between the procedure and patient characteristics or how sick the patient is on admission. Procedures are considered to be valid if: • They are clinically relevant to the principal diagnosis • There is sufficient volume to determine significance For 37 procedures or CCSR procedure groupings, a timing limitation is added or, where appropriate, certain procedures are included as risk factors only if they occur early enough during the stay (for example, mechanical ventilation in non-COVID patients).
Urgency of Admission (Admit Type)	As an example, a patient who is admitted as an "Emergent" admission may have a higher risk score than a patient who is admitted as a "Elective" admission.
Neonate Gestational age/ Birth	Babies who have a shorter gestational age and lower birth weight are generally associated with higher risk. This is used instead of age because the age (in years) variable is not relevant for this population.
Cancer Status	They are derived from secondary diagnoses. As an example, A patient with a malignant diagnosis of cancer is often associated with a higher risk than with benign cancer or one without the diagnosis of cancer.

Note: All procedures are candidates for risk assessment, not just principal procedures.

Patient Selection Factors

Patient Selection Factor	Notes
Travel Distance	Travel distance is the centroid to centroid distance between the zip code of the household and the zip code of the hospital or provider, represented as the relative term (relative to other patients from the same hospital). Patients who travel further are potentially bypassing other facilities to obtain "specialized" care.
Point of origin	As an example, patients who were transferred from another acute hospital tend to have higher risk than patients from Non-healthcare Facility Point of origin.

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Patient Selection Factor	Notes
Payer Class	Depending on the payer class, a patient's risk score will vary. For example, patients with no insurance receive a higher risk score than a patient with insurance (Patients with insurance are more likely to receive preventative care and seek medical care earlier if there is a problem).
Discharge Status	Discharge Status is not used to calculate the outcome of Mortality or Complication. **Examples** • Patients transferred to a skilled nursing facility tend to have higher readmission risk than a patient who is discharged to home. • Patients transferred to another acute care facility receive a lower-weighted score for length of stay (than a patient who is discharged home).
Patient Type	Patient Type provides additional information about expected treatment and outcome of patients. For example, patients in Skilled Nursing Facilities (SNF) are treated differently from patients in an Acute care setting. Their expected outcomes are also different.

Demographic Factors

Demographic Factor	Notes
Age	Age is a factor for nearly all principal diagnoses and is required to risk-adjust a patient. It is one of the most significant factors in predicting outcomes. Typically, the older a patient is the higher risk score they receive.
Gender	Gender is a significant factor for many disease strata. As an example, Male patients often have higher mortality risk than Female patients with similar conditions.
Household Income	The patient's income is determined by the average household income for their home zip code. This information is obtained from the census data. A patient with a lower income typically has a higher risk because they are less likely to receive preventative or timely care.
Race Note: Race was dropped as a risk factor starting with the 2023 CareScience Risk-Adjustment Model Update (for both Inpatients and Outpatients)	Race is used as a proxy for access to care along with income and payer class. The following categories are included: • White • Black • Asian/Pacific Islander • Native American • Other

Dependent Variables (Outcomes)

The outcomes that use CareScience Analytics risk adjustment are as follows:

- Charge
- Complications
- Cost
- LOS
- Mortality
- Readmission

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Complications

Complications are defined as certain clinical conditions that occurred after patients were admitted into the facility. Those clinical conditions often cause higher mortalities, extended length of stay, and spiked treatment costs. There are 114 such clinical conditions: 14 conditions are defined by CMS as Hospital Acquired Conditions (HACs) and 100 conditions have been identified by Premier.

For a complete list of all the Potential Inpatient Complications (which includes CMS HACs), see Chapter 8 of the Methodologies Guide.

POA Flag Requirement

In order to qualify as a complication, the POA flag must be set to N or U on any one of the secondary diagnoses to ensure that the condition was not present when the patient was admitted.

- N (No: Diagnosis was not present at the time of inpatient admission.)
- U (Unknown: Documentation is insufficient to determine if the condition was present at the time of inpatient admission)

Expected Values for Outcomes

On the CareScience Analytics version of the risk-adjusted analyses, Expected values are calculated from the Premier QualityAdvisor Database.

The new beta values are calculated based on two years of data, across all QualityAdvisor facilities. Below is a table that shows the discharge time period used for calibrations for CareScience Analytics and calculating normative values for 3M™ APR DRGs:

Calibration Year	Calibration Source Data	Calibration Time Period
2025	4Q22 - 3Q24	4Q24 -
2024	4Q21 - 3Q23	4Q23 - 3Q24
2023	4Q20 - 3Q22	4Q22 - 3Q23
2022	4Q19 - 3Q21	4Q21 - 3Q22
2021	*4Q18 - 3Q20 *see below	*4Q20 - 3Q21 *see below

***Important**: The 2021 calibration updates include risk model updates that necessitate calibration timeframe differences from the normal timeframe schedule.

- Eight quarters of data, inclusive of 4Q 2018 — 3Q 2020 data, will be used to calculate the 2021 calibration updates; however, **patients from 4Q 2020 with COVID-19 as the Principal Diagnosis will also be included**

***2020 - 2021 Calibration Model Timeframe**

Timeframe	Non-COVID Cases	COVID as Principal Diagnosis	COVID as Secondary Diagnosis
April 1, 2020 to September 30, 2020	2020 Model	2021 Model, within COVID-19 disease stratum	2021 Model, within other disease strata based in principal diagnosis or procedure
October 1, 2020 and Forward	2021 Model	2021 Model, within COVID-19 disease stratum	2021 Model, within other disease strata based in principal diagnosis or procedure

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Removing Extreme Values in the Model Calibration

We have established threshold criteria to exclude patients with extreme values from CareScience model calibration and 3M normative value calculation for charge, cost, and LOS outcomes. The threshold criteria are based on the distribution of charge, cost and LOS among 517 disease strata, which have been adopted by the regression model of CareScience Analytics (CSA). Those same patients with extreme values are also removed from the calculation of 3M normative values. In this setting, 3M™ APR DRG and CSA are calibrated on the same set of data.

For both charges and costs, values within a certain disease stratum that are below the 1st percentile (P1) threshold or above the 99th percentile (P99) threshold are removed from the CSA model calibration. For LOS, we remove all values greater than the 99th percentile (P99) threshold.

Taking Heart Failure as an example, the P1 and P99 in the distribution of total cost are found to be $1,711 and $61,008 respectively. Patients within this cost range are included in model calibration for cost. Total cost of $120,000 would be considered as an extreme value and removed. In a high-cost stratum, like Heart Transplant, the P1 and P99 of total cost change to $117,364 and $1,676,594 respectively. The same amount $120,000 would be within the range, therefore included in the model calibration.

The trim point methodology for removing extreme values described in this section has been applied to each year's calibration data set. CareScience Analytics and 3M™ normative values are calibrated on the same set of patients.

For this outcome	The following patients are excluded...
Charge*	Patients with values below the first percentile and above the 99th percentile in each of the 517 disease strata.
Cost*	
LOS*	Patients with values greater than the 99th percentile in each of the 517 disease strata
Mortality	Patients who were transferred to another acute facility (Discharge Status = 2 or 02)

*The threshold criteria for Charge, Cost, and Length of Stay (LOS) outcomes are based on the distribution of each of these outcomes among the 517 disease strata used by the CareScience Analytics regression model. A complete list of the 517 disease strata is available.

Expected Charge

Description

Expected charges are the charges a patient is predicted to have for their inpatient visit. The CareScience Analytics risk adjustment methodology determines the unique risk for charges for each patient based on the specific characteristics and conditions they presented with when they were admitted. When patient-level risks are combined for a facility, practitioner, or other grouping, they create an average charge, which is interpreted as the predicted charge, controlling for patient severity. Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

Methodology

Expected Charge is determined by a regression model that examines patient characteristics and conditions they presented with when they were admitted. Rather than a linear regression model, to address the skewed distribution that is commonly seen in charge data, a semi-log model is implemented to reduce the disproportionate influence of outliers for Expected charges.

Note: Charge Expected values are available on CareScience analyses only when Standard Practice is selected. Expected values are not generated for Select Practice. For more information, see Standard and Select Practice.

Interpretation

For example, when a particular physician's outcomes were evaluated for heart failure, the Observed Charge was $14,848 and the Expected Charge was $9,636; the Variation was $5,212. This indicates that this physician's charges were $5,212 more than predicted based on his/her patients' characteristics, when they

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were compared to similar patients in the comparative group. Results are presented as geometric mean Observed and Expected Charge values, which is used to reduce the effect of outliers. The geometric mean is an equivalent value to the semi-log regression model and should be used with the Expected Charge values.

Expected Cost

For CareScience Analytics analyses, Expected Cost is derived using procedural cost. Observed Cost is always based on the cost method submitted.

Description

Expected Cost is the predicted cost per patient stay. The CareScience Analytics risk adjustment methodology determines the unique risk for costs for each patient based on the specific characteristics and conditions they presented with when they were admitted. When patient level risks are combined for a facility, physician, or other grouping, they create a mean expected cost, which is interpreted as the predicted cost, controlling for patient severity. Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

Methodology

Expected Cost is determined by a regression model that examines patient characteristics and conditions they presented with when they were admitted. Rather than a linear regression model, to address the skewed distribution that is commonly seen in cost data, a semi-log model is implemented to reduce the disproportionate influence of outliers for Expected Cost.

Interpretation

For example, when a particular physician's outcomes were evaluated for heart failure, the Observed Cost was $8,510 and the Expected Cost was $6,735; the Variation was $1,775. This indicates that this physician's cost were $1,775 more than predicted based on his/her patients' characteristics, when they were compared to similar patients in the comparative group. Results are presented as geometric mean Observed and Expected Cost values, which is used to reduce the effect of outliers. The geometric mean is an equivalent value to the semi-log regression model and should be used with the Expected Cost values.

Expected LOS

Description

Expected length of stay (LOS) is the number of days a patient is predicted to be in the facility for an inpatient stay. The risk adjustment methodology determines the unique risk for length of stay for each patient based on their specific characteristics and condition when they were admitted. When patient level risks are combined for a facility, practitioner, or other grouping, they create a mean expected length of stay, which is interpreted as the predicted length of stay, controlling for patient severity. Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

Methodology

Expected LOS is determined by a regression model that examines patient characteristics and conditions they presented with when they were admitted. Rather than a linear regression model, to address the skewed distribution that is commonly seen in LOS data and reduce the disproportionate influence of outliers, a semi-log model is used in the methodology for LOS.

Interpretation

For example, when a particular physician's outcomes were evaluated for heart failure, the Observed LOS was 7.7 days and the Expected LOS was 7.2 days; the Variation amount was +0.5 days. This indicates that this physician's LOS was a half-day worse than predicted based on his/her patients' characteristics. Results are presented as geometric mean Observed and Expected LOS values, which is used to reduce the effect of outliers. The geometric mean is an equivalent value to the semi-log regression model and should be used with the Expected LOS values.

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Expected Mortality

Description

Expected Mortality is the percentage of patients who were predicted to die during their inpatient stay. The risk adjustment methodology determines the unique risk of death for each patient based on their specific characteristics and condition when they were admitted. When patient level risks are combined for a facility, physician, or other grouping, they create a mean expected mortality rate for this group of patients, which is interpreted as the predicted mortality rate, controlling for patient severity.

Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

Methodology

Expected mortality is determined by a logistic regression model (aka logit model) which examines patient characteristics and conditions they presented with when they were admitted. A logistic regression model is commonly used for binary outcomes. The log-odds transformation in the model ensures the Expected mortality value falls between 0% and 100%.

Interpretation

For example, examining a particular physician's outcomes for heart failure, the Observed Mortality rate was 3.2% and the Expected mortality was 2.6%; the Variation amount was +0.6%. This indicates that this physician had more patients who died than predicted based on his/her patients' characteristics.

Expected Complications

Description

Expected Complication is the percentage of patients who were predicted to develop at least one complication during their inpatient stay. The risk adjustment methodology determines the unique risk for complications for each patient based on their specific characteristics and condition when they were admitted. When patient level risks are combined for a facility, physician, or other grouping, they create a mean expected complication rate, which is interpreted as the predicted complication rate, controlling for patient severity. Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

Methodology

Expected Complication is determined by a logistic regression model (aka logit model) which examines patient characteristics and conditions they presented with when they were admitted. A logistic regression model is commonly used for binary outcomes. The log-odds transformation in the model ensures the Expected complication value falls between 0% and 100%.

Interpretation

For example, examining a particular physician's outcomes for heart failure, the Observed Complication rate was 8.2% and the Expected Complication rate was 7.6%; the Variation amount was +0.6%. This indicates that this physician had more patients who developed complications than predicted based on his/her patients' characteristics.

Expected Readmission

Description

Expected Readmission is the percentage of patients who were predicted to be readmitted to the same hospital in 30 days regardless of the cause. The risk adjustment methodology determines the unique risk of readmission for each patient based on their specific characteristics and condition when they were admitted. When patient level risks are combined for a facility, physician, or other grouping, they create a mean expected readmission rate, which is interpreted as the predicted readmission rate, controlling for patient severity. Performance measures are determined by comparing Observed and Expected values, which result in the following metrics on risk-adjusted analyses: O/E, Variation, and Statistical Significance.

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Methodology

Expected Readmission is determined by a logistic regression model (aka logit model) which examines patient characteristics and conditions they presented with when they were admitted. A logistic regression model is commonly used for binary outcomes. The log-odds transformation in the model ensures the Expected complication value falls between 0% and 100%.

Interpretation

For example, examining a particular physician's outcomes for heart failure, the Observed Readmission rate was18% and the Expected Readmission rate was 21%; the Variation amount was -3%. This indicates that this physician had less patients who were readmitted than predicted based on his/her patients' characteristics.

Data Vintage Factors

The Data Vintage Factor (DVF) is the ratio of the expected value based on the previous calibration over that based on the current calibration given the same set of patients. For example, a DVF for mortality = 1.10 means that the expected value based on the last calibration was 10% higher than that based on the current calibration. The DVF is calculated for each outcome for each disease stratum. The DVF is also calculated for the aggregation of all inpatients.

The DVF exists because the QualityAdvisor (QA) database evolves over time. Each calibration update is based on the most recent QA data which are different from that the previous calibrations were based on. The differences include, and are not limited to, the following factors:

- Outcome performance improvement over time, for example, "Mortality rate of AMI patients has decreased from 6-7% several years ago to 5-6%."
- Case Mix changes due to expansion of QualityAdvisor Membership.
- Documentation improvement of patient conditions, for example, "The number of secondary diagnosis codes per case has increased from 5-6 several years ago to 10-11."
- Coding system changes, for example, "ICD-10 coding system took effect from Oct. 1, 2015."
- Coding guideline changes, for example, "CMS required POA to be coded for Palliative Care from Oct. 1, 2016 until Oct. 1, 2021, and now it is exempt from POA coding."

Computing

QualityAdvisor data is updated with the expected values annually.

The assumption when using the DVF is that the new expected values were calculated as if the annual calibrations for the current year had been applied to the previous year's data.

Applying the Factors

Example One

A hypothetical hospital system set a goal to reduce the mortality O/E ratio to 0.95 or below within six quarters.

Converting 2023 Q1 data to comparable 2022 data with a DVF of 1.12:

- The converted expected value = 2.18% * 1.12 = 2.44%
- The converted O/E ratio = 2.20%/2.44% = 0.90

	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q1	2023 Q1 DVF
Obs.	2.40%	2.15%	2.05%	2.17%	2.20%	2.20%	2.20%
Exp.	2.35%	2.20%	2.12%	2.30%	2.18%	2.18%	2.44%
O/E	1.02	0.98	0.97	0.94	1.01	1.01	0.90

Example Two

A hypothetical hospital system wants to project its mortality O/E ratio in 2017 with a DVF of 1.12.

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Average O/E ratio in 2022 = 0.92

Projection of 2023: 0.92 * 1.12 = 1.03

	2022Q1	2022Q2	2022Q3	2022Q4	2023 Projection
Obs.	2.23%	2.04%	1.95%	2.01%	
Exp.	2.35%	2.20%	2.12%	2.30%	
O/E	0.95	0.93	0.92	0.87	1.03

Limitations

- The current benchmark matters the most in a competitive market; converting to an older standard may lead to an “inflated” performance level.
- Because individual hospitals have different case mix and coding documentation from the QA database, the calibration effect could vary significantly across hospitals.
- The lower the patient count, the less relevant Data Vintage Factors become. At the patient level, DVFs are absolutely irrelevant.

Automated DVF Computing

The Data Vintage Factor Adjusted Outcome Analysis was introduced in QualityAdvisor in June 2019. The purpose of the report is to provide automated Data Vintage Factor (DVF) adjustment across calibration years, so that the data is stabilized for the continuation of trending after the annual database calibration update occurs in QualityAdvisor.

Prior to this analysis being added, members were manually calculating DVFs after the annual calibration update, because the calibration process caused data expected values for the QualityAdvisor risk-adjusted outcomes to shift in a manner which affected trending when reporting on multi-year cycles. Members were manually adjusting their data backwards to extend their trending timeframes. This analysis eliminates the need for the manual adjustment by providing automated DVF adjustment across calibration years.

For more detailed information please review DVF Adjusted Outcome Analysis Methodology and Use Case Examples.

Standard and Select Practice

The CareScience Analytics analyses have two risk-adjustment modes: Standard Practice and Select Practice. The basic difference between the modes is the Expected value, which, in turn, affects all the metrics that use the Expected value, except Charges.

Risk Calculation Mode	Description
Standard Practice	Standard Practice compares your performance (based on your case mix) to the average performance of similar patients in the Premier QualityAdvisor Database at the outcome-specific level for each disease strata.
Select Practice	Select Practice compares your performance against QualityAdvisor facilities whose performance is considered to be in a "select" or superior group for the respective disease groups. These facilities perform in the top two quintiles on both quality (mortality, complications, and readmission) and efficiency (length of stay, and cost) measures. They represent about 16% of hospitals in the database for the respective disease group.

Working with Standard and Select Practice

For CareScience Analytics analyses, there is a Page-By that contains the **Risk Calc Mode**list. Use this list to toggle between Expected values for **Standard** and **Select** practices.

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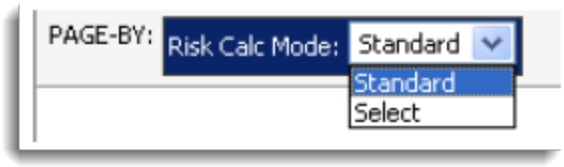


When you toggle between these risk calculation modes, the system processes your request by re-running the analysis according to the same prompts, using different risk-calculation criteria for the Expected values.

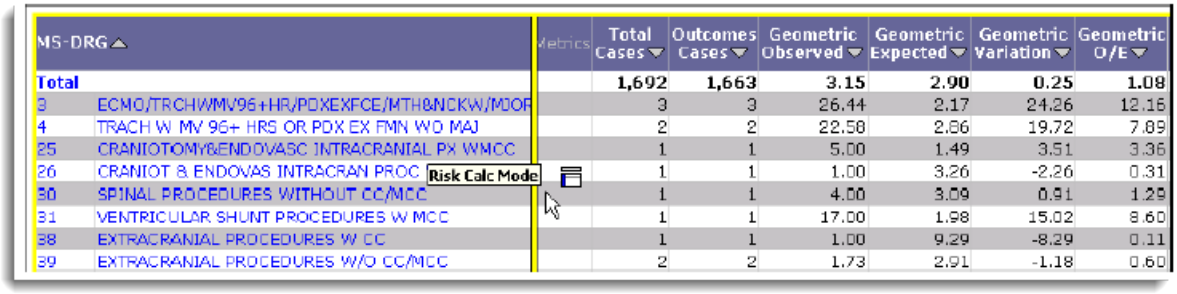
By default, CareScience Analytics analyses return in Standard risk calculation mode. The exception is the Opportunity Analysis where **Risk Calculation Method** is a required prompt, which means you need to select either **Standard** or **Select** practice before you run the analysis.

You can also add **Standard** or **Select** values to the grid so that you can see the **Standard** and **Select** values side-by-side. There are two options: placing **Standard** and **Select v**alues on rows *or* columns.

To do so, complete these steps:

1. Run a CareScience Analytics analysis. The analysis returns displaying **Select** values and the **Risk Calc Mode Page-By**.
2. Click and hold on the **Page-By** box (click in the box but outside the list). The box turns dark blue when selected.

3. Drag the **Page-By** over to the row or the column until you see a vertical yellow line with black edges.



Note: Make sure that plain, yellow lines surround the row heading. The plain, yellow lines indicate that the **Page-By** is being added to the grid. The yellow line with the black edges indicates where the values will be placed.

4. Release the left-click on the mouse, and wait as the analysis refreshes. When complete, **Standard** and **Select** values appear on the row or the column depending on where you dropped it.

   Standard and **Select** on the row: A Risk Calc Mode column is added and each row is broken into two sub-rows one shows the **Standard** value and the other shows the **Select** value.

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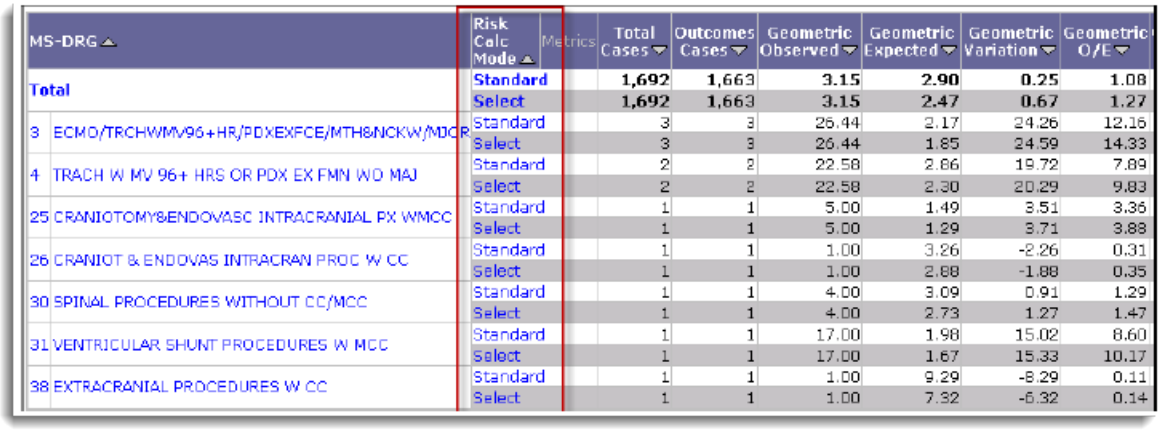
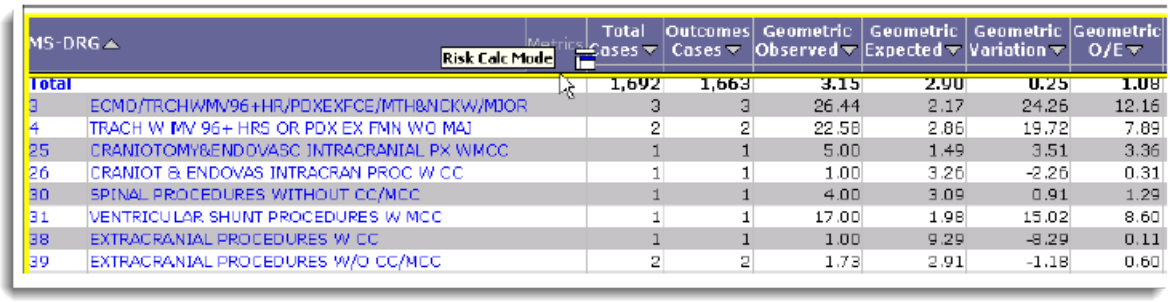


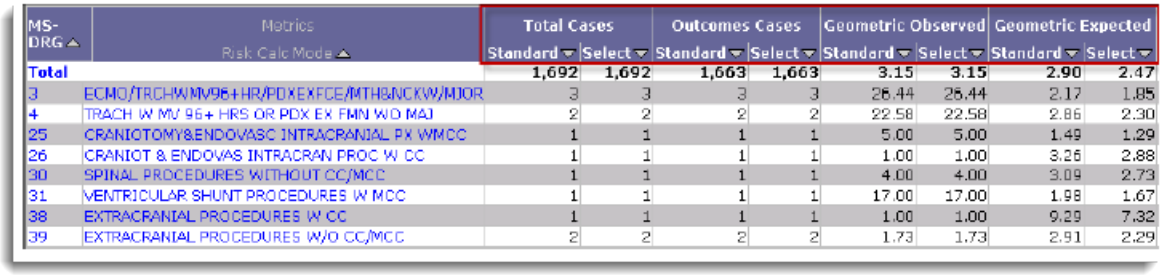
MS-DRG		Risk Calc Mode (Metrics)	Total Cases	Outcomes Cases	Geometric Observed	Geometric Expected	Geometric Variation	Geometric O/E
Total		**Standard**	**1,692**	**1,663**	**3.15**	**2.90**	**0.25**	**1.08**
		Select	**1,692**	**1,663**	**3.15**	**2.47**	**0.67**	**1.27**
3	ECMO/TRCHWMV96+HR/PDXEXFCE/MTH&NCKW/MJOR	Standard	3	3	26.44	2.17	24.26	12.16
		Select	3	3	26.44	1.85	24.59	14.33
4	TRACH W MV 96+ HRS OR PDX EX FMN WO MAJ	Standard	2	2	22.58	2.86	19.72	7.89
		Select	2	2	22.58	2.30	20.29	9.83
25	CRANIOTOMY&ENDOVASC INTRACRANIAL PX WMCC	Standard	1	1	5.00	1.49	3.51	3.36
		Select	1	1	5.00	1.29	3.71	3.88
26	CRANIOT & ENDOVAS INTRACRAN PROC W CC	Standard	1	1	1.00	3.26	-2.26	0.31
		Select	1	1	1.00	2.88	-1.88	0.35
30	SPINAL PROCEDURES WITHOUT CC/MCC	Standard	1	1	4.00	3.09	0.91	1.29
		Select	1	1	4.00	2.73	1.27	1.47
31	VENTRICULAR SHUNT PROCEDURES W MCC	Standard	1	1	17.00	1.98	15.02	8.60
		Select	1	1	17.00	1.67	15.33	10.17
38	EXTRACRANIAL PROCEDURES W CC	Standard	1	1	1.00	9.29	-8.29	0.11
		Select	1	1	1.00	7.32	-6.32	0.14

Standard and **Select** on the columns: Drag and drop the **Risk Calc Mode Page-By** just under the column headings. Wait until the yellow line with black edges appears just under the column heading names.



MS-DRG (Metrics)		Risk Calc Mode	Total Cases	Outcomes Cases	Geometric Observed	Geometric Expected	Geometric Variation	Geometric O/E
Total			**1,692**	**1,663**	**3.15**	**2.90**	**0.25**	**1.08**
3	ECMO/TRCHWMV96+HR/PDXEXFCE/MTH&NCKW/MJOR		3	3	26.44	2.17	24.26	12.16
4	TRACH W MV 96+ HRS OR PDX EX FMN WO MAJ		2	2	22.58	2.86	19.72	7.89
25	CRANIOTOMY&ENDOVASC INTRACRANIAL PX WMCC		1	1	5.00	1.49	3.51	3.36
26	CRANIOT & ENDOVAS INTRACRAN PROC W CC		1	1	1.00	3.26	-2.26	0.31
30	SPINAL PROCEDURES WITHOUT CC/MCC		1	1	4.00	3.09	0.91	1.29
31	VENTRICULAR SHUNT PROCEDURES W MCC		1	1	17.00	1.98	15.02	8.60
38	EXTRACRANIAL PROCEDURES W CC		1	1	1.00	9.29	-8.29	0.11
39	EXTRACRANIAL PROCEDURES W/O CC/MCC		2	2	1.73	2.91	-1.18	0.60

After the system is refreshed, each column is split into two: one showing **Standard** values and the other **Select** values.



MS-DRG	Metrics / Risk Calc Mode	Total Cases		Outcomes Cases		Geometric Observed		Geometric Expected	
		Standard	Select	Standard	Select	Standard	Select	Standard	Select
Total		**1,692**	**1,692**	**1,663**	**1,663**	**3.15**	**3.15**	**2.90**	**2.47**
3	ECMO/TRCHWMV96+HR/PDXEXFCE/MTH&NCKW/MJOR	3	3	3	3	26.44	26.44	2.17	1.85
4	TRACH W MV 96+ HRS OR PDX EX FMN WO MAJ	2	2	2	2	22.58	22.58	2.86	2.30
25	CRANIOTOMY&ENDOVASC INTRACRANIAL PX WMCC	1	1	1	1	5.00	5.00	1.49	1.29
26	CRANIOT & ENDOVAS INTRACRAN PROC W CC	1	1	1	1	1.00	1.00	3.26	2.88
30	SPINAL PROCEDURES WITHOUT CC/MCC	1	1	1	1	4.00	4.00	3.09	2.73
31	VENTRICULAR SHUNT PROCEDURES W MCC	1	1	1	1	17.00	17.00	1.98	1.67
38	EXTRACRANIAL PROCEDURES W CC	1	1	1	1	1.00	1.00	9.29	7.32
39	EXTRACRANIAL PROCEDURES W/O CC/MCC	2	2	2	2	1.73	1.73	2.91	2.29

Note: After you add **Standard** or **Select** values to the rows or columns, you cannot remove the **Standard** or **Select** sub-column from any of the columns manually. If you to remove a column using Report Objects, for instance, the whole column is removed, including both **Standard** and **Select** sub-columns.

If you want to undo the addition of **Standard** or **Select** values, click the **Undo** button on the toolbar  .

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Frequently Asked Questions (FAQ): CareScience Risk Adjustment Methodology

August 2024

1. **Why are calibrations done annually and why can't I access the same calibration for multiple years?**

   Premier strongly believes that it is very important for members to compare their performance to current practices. Therefore, we update the calibration database every year to include new ICD 10 codes, new algorithm updates, new supply innovations and to stay current with trends in healthcare outcomes.

   If an organization is comparing themselves to peers in old data, then they will fall behind in their performance as healthcare is constantly innovating and improving. We do provide the option of using a Data Vintage Factor report in QualityAdvisor™ which allows you to adjust the expected values to be comparable across multiple calibration time frames.

2. **How do the data updates affect my corporate goals?**

   That would depend on what you measure for your corporate goals. We know that some conditions are affected more than others with the calibration update. Overall, we see a small change with the new algorithms and methods we are using, however, as you drill into specific MS-DRGs or service lines there will likely be some greater changes. Additionally, the palliative care code became exempt from Present-On-Admission (POA) coding as of October 1, 2021, and given the 2021 calibration was based on the use of the POA code for palliative care, the risk for palliative care patients using the 2021 calibration will be higher for those patients that started palliative care during their stay.

   The inflated risk will be brought into line with the true risk with the 2022 calibration update. That change will be applied from October 1, 2021, forward. Therefore, if your organization includes palliative care patients in your corporate goals, you should plan to use the Data Vintage Factor to help address this change.

3. **What are the biggest contributors to increased risk?**

   There is no list of the biggest contributors because the risk factors differ by disease group and outcome. To that end we request that organizations comprehensively document and code all patient conditions. However, there are some conditions that tend to be important in the risk models such as Palliative care, Sepsis and Septicemia, Do-Not-Resuscitate (DNR) and other common serious conditions.

4. **Why do you require the POA = Y for a condition to be included?**

   The CareScience risk adjustment starts with the assumption that we only want to include information about the patient's risk of an outcome at the time they are admitted to the hospital. We do this because we do not want to confound our results when evaluating outcomes for the patient. If we were to include information about a patient stay that was a

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result of care processes that the providers or patients decided to follow, then we wouldn't be able to effectively assess whether the care processes resulted in a good outcome.

5. **Why doesn't "x" comorbid condition get included in this model?**

   We try to incorporate comorbid conditions in multiple ways within the CareScience risk adjustment methodology; however, there are many comorbid conditions that do not end up staying in the final risk models. There can be many reasons for this. It could be that the condition is so rare in the population the model was developed for that there were not enough patients with the condition that would have the statistical model detect it as a statistically significant factor for the outcome of interest. Another reason is that often there are comorbid conditions that are highly correlated with the principal or other secondary diagnoses that commonly occur among the specific patients in the respective model. Therefore, there is no marginal gain when including the comorbid condition in the model and therefore it is dropped. Another possible reason is that the comorbid condition simply is not a significant predictor of the outcome for the disease strata. There are other possible reasons as well.

6. **Why don't you use the exact same methodology as CMS?**

   CMS developed their methodology to be a point in time estimate of performance designed to penalize organizations for payment purposes. To that end, it only tries to find the extreme outliers and treat most facilities as being within the normal range of performance. The CareScience risk adjustment methodology was designed to be used for quality improvement purposes, so the methodology was designed so that you can track performance over time and drill down into any specific population to determine how well the organization is performing relative to peers.

   The CMS model uses a hierarchical model that only allows the user to evaluate performance at the hospital level, which is the random effect in the model. CMS uses a Predicted/Expected ratio rather than an Observed/Expected ratio. The effect of that ratio is that there is very little change over time with the CMS measure and it skews the observed value toward the national mean as the volume of a facility decreases. Lastly, the CareScience methodology looks at every visit, but CMS may randomly select visits if a patient has had multiple visits in the past 12 months which limits visibility into performance at every visit.

7. **Do your results correlate with CMS results?**

   Yes, the CareScience results do correlate with the CMS Observed values and the CMS Expected values. In addition, there is correlation between the O/E and P/E, however, the indices are not as highly correlated (R squared is a measure of correlation/association, where the closer to 1 the more correlated and the closer to 0 the less correlated).

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Mortality measure observed, expected and O/E vs PE correlations with CMS readmission:

Component	R-squared	Beta Coefficient	Std. Error	P value
30-Day Expected vs Inpatient Expected	0.6258	1.90741	0.06512	< .0001
30-Day Predicted vs Inpatient Observed	0.6601	1.97023	0.06242	< .0001
30-Day P/E vs Inpatient O/E	0.1745	0.10474	0.01006	< .0001

Readmission measure observed, expected and O/E vs PE correlations with CMS readmissions:

Component	R-squared	Beta Coefficient	Std. Error	P value
30-Day Expected vs Inpatient Expected	0.6258	1.90741	0.06512	< .0001
30-Day Predicted vs Inpatient Observed	0.6601	1.97023	0.06242	< .0001
30-Day P/E vs Inpatient O/E	0.1745	0.10474	0.01006	< .0001

8. Why did this patient have such a low expected mortality when we know they died?

The risk models generate a risk of mortality between 0-100%, and we know that all patients that died have a 100% observed rate of dying. Selecting only patients that died will always result in an underestimate of risk because it is very rare that a patient will be assigned a 100% expected chance of dying. This is called an analysis using biased sample selection. The CareScience (and APR-DRG) risk models are population-based models, and we know that there are times when we overestimate risk and there are times when we underestimate risk but, in the aggregate, a sufficient sample size will allow us to determine if the population is performing above or below expected performance, particularly when you use the statistical significance flags to guide you. What we are saying is that if a patient only had a 4.1% expected mortality rate, the data is saying if 100 patients had these exact same characteristics, we would have expected only 4 patients to die. We cannot say which category this patient would fall in, those who would survive or those who would die.

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9. **How can I find the weight associated with each comorbidity?**

   This is available in the Risk Calculator

10. **Where can I find the factors that go into the comorbidity composite score?**

    Currently, the comorbidity composite score conditions are not in the Risk Calculator tool; however, we plan to add the list within the risk calculator help menu in the future. Until it is added, if a member needs the list, please contact John Martin or Michael Duan as we have a file with the list of comorbid conditions and their weights.

11. **How does the select practice methodology compare to the overall top performer methodology?**

    The Select Practice methodology is like the methodology that establishes the Overall Top Performer CareScience Peer group. However, there is a difference on how the methodology is applied. Overall Top Performers are based on facility level outcome performance, and Select Practice is based on disease level outcome performance by individual hospitals.

12. **Why do unspecified ICD codes result in a higher expected mortality than the more specific ICD code?**

    Specified codes do not necessarily carry more weight than the unspecified codes for two reasons. First, unspecified codes often have much higher volume than specified codes. For example, A41.9 (Sepsis, unspecified organism) is much more often documented than any other sepsis codes. In a statistical model, higher volume is often associated with higher statistical significance. Consequently, a code with higher volume is more likely to be identified by the model as a statistically significant risk factor in a given disease stratum/outcome. Second, a series of specified codes often have different severity. An unspecified code is often like a mix of severity. So, an unspecified code may indicate higher severity than some specified codes, but lower severity than other specified codes. For example, N18.9 (CKD, unspecified) is often shown as higher severity than N18.1 (CKD, stage 1) and N18.2 (stage 2), but lower severity than N18.5 (stage 5) and N18.6 (end stage).

13. **Does the inclusion of a Do-Not-Resuscitate code status in the diagnosis list impact the expected rate?**

    Yes, but only if DNR diagnosis code is present on admission or the patient is discharged within 2 days of admission (the latter instance was updated with the 2022 calibration).

14. **Do complications that the patient incurs during the hospital stay have an impact on the expected mortality rate?**

    CareScience considers co-morbid conditions only if they are present on admission (POA). Therefore, complications incurred during hospitalization do not have impact on the expected value.

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15. **If a patient has an ICD10 Diagnosis Code of Z51.5, encounter for palliative care, does this impact the expected rate of mortality?**

    Yes, it is one of the most influential risk factors. It will be factored in the expected value only if it is statistically associated with the outcome for a particular disease stratum (it is POA exempt as of Oct. 1 2021).

16. **Why aren't Discharge Status Codes of 05 (Transfer to Cancer Center or Children's Hospital) or 62 (Transfer to Rehab Hospital) excluded from mortality outcome cases?**

    The exclusion is intended to filter out patients who were transferred to other acute care facilities, and 62 (rehab) and 65 (psych) do not belong to the list. 05 is an unusual category. Children's hospitals can be considered as acute; therefore it can be added to the filter list. But this category also includes cancer center, which may not be acute**.**

17. **Why doesn't the data vintage factor (DVF) report fully convert my expected values in my data from the 2022 calibration back to the 2021 calibration?**

    In 2021, risk models were developed including the palliative care patients only if they had a Present on Admission (POA) flag of Yes. Patients with palliative care present on admission were sicker than patients who received palliative care during their hospital stay. When CMS moved the palliative care code to exempt, those patients who would have been POA No had an inflated risk of mortality applied to them. The 2022 calibration corrected that issue, however, the DVF's do not adjust the results enough to account for the inflated expected values from Oct. 1, 2021 forward when using the 2021 calibration. A general adjustment factor of 1.07 can be used to account for both the DVF and palliative care effect; however, each hospital had different impacts with the palliative care POA flag issue, and you may want to reach out to your Customer Success representative to get a more specific conversion factor if the general adjustment is not sufficient.

    An Example using mortality outcome (CS DVF=1.055)

    The adjusted expected value for 2021q4=2.18%*1.07=2.33%

    The adjusted O/E ratio for 2021q4=2.21%/2.33%=0.95

	2020q4	2021q1	2021q2	2021q3	2021q4	2021q4 (adjusted)
Obs.	2.40%	2.15%	2.05%	2.17%	2.21%	
Exp.	2.35%	2.20%	2.12%	2.30%	2.18%	2.33%
O/E	1.02	0.98	0.97	0.94	1.01	0.95

18. **Can I create an overall facility (or system) opportunity analysis by including only individual patients that have the observed value greater than the expected value and then summing the results from the respective individual patients?**

    No, because that would lead to overestimation of the 'opportunities' due to the omission of the cases with Observed < Expected. This issue would become more evident in binary outcomes, such as mortality. By model design, the expected value of mortality would always be a number between

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0% and 100%. The observed outcome, on the other hand, is always either 100% or 0%. Using the criterion of Observed > Expected would result in 'opportunities' in all death cases. For example, if there were three death cases with the expected value at 20%, 30% and 50% respectively, the proposed calculation would generate an opportunity of 2 deaths. However, the expected value (20%) actually means that out of 100 patients with similar conditions as Patient A, 20 are 'expected' to die given the historical data. The difference between the observed (100%) and the expected (20%) does not imply Patient A's death was preventable. If a hospital had 100 such cases and 25 of them died, the difference between 25 (Observed) and 20 (Expected) would truly represent opportunities. But the model and the underlying data do not possess the clinical details to identify 'preventable' deaths at patient level. We have consistently conveyed to our members that the risk-adjustment model is population-based and should be used accordingly.

19. Why was race dropped from the CareScience Risk-Adjustment model?

As discussed in the NQF Risk Adjustment Technical Guidance Final Report – Phase 2 (https://www.qualityforum.org/Publications/2022/12/Risk_Adjustment_Technical_Guidance_Final_Report_-_Phase_2.aspx) and the CMS Risk Adjustment in Quality Measurement publication, race as a risk factor should be used with caution and only where it has been clinically shown to be a true risk factor for an outcome. There is a concern amongst experts that using race in risk adjustment could "effectively set lower standards for minority populations" and "perpetuate long-standing disparities." Conversely, experts who are advocates of using race believe it is an effective way to proxy for social determinants of health and avoid penalizing facilities in value-based purchasing programs that care for a greater number of marginalized patients.

Premier and Premier's Measurement Advisory Board have determined that from the 2023 calibration and moving forward, we will no longer include race in our risk adjustment to avoid potential inequity in measurement. There is minimal effect to the risk models as comorbid conditions commonly present in marginalized communities will capture a significant portion of the additional risk race added to the model.

In future calibration updates, Premier will be incorporating social determinants of health (SDoH) data into a new risk adjustment model as an index, representing the vulnerability of patients. We will continue to keep risk adjustment models without this variable included. This will allow members to evaluate outcomes from an equity perspective without this data and evaluate outcomes from a value-based payment perspective with the variable included.

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Chapter 4 - 3M APR DRG Risk-Adjustment Methodology

3M™ APR DRG Risk-Adjustment Methodology Overview

The 3M™ APR DRG risk adjustment methodology applies to the following analyses in QualityAdvisor:

- Facility Charge Comparison Analysis - 3M™
- Facility Cost Comparison Analysis - 3M™
- Facility LOS Comparison Analysis - 3M™
- Facility Mortality Comparison Analysis - 3M™
- Facility Opportunity Analysis - 3M™
- Facility Outcome Comparison Analysis - 3M™
- Facility Outcome Profile Analysis - 3M™
- Peer Charge Comparison Analysis - 3M™
- Peer Cost Comparison Analysis - 3M™
- Peer LOS Comparison Analysis - 3M™
- Peer Mortality Comparison Analysis - 3M™
- Peer Outcome Comparison Analysis- 3M™

Note: The risk-adjusted readmission analyses use 3M™ Expected values for the readmission rate.

Accessing 3M™ APR DRG Analyses

To access theses analyses:

1. Make sure that **3M™ APR DRG** is selected as the risk- adjustment methodology in **My Admin** (Navigate to ***Admin > My Admin***).
2. Navigate to **Analysis > Standard Analyses > Select Analysis** and then from the list, click **Risk-Adjusted Analyses**.
3. **Facility** is selected by default. To see the **Peer** analyses, select **Peer** to the right of the **Select Analysis** list.

Grouper Methodology

The APR DRG grouper categorizes patients into similar disease categories and then stratifies them into four subclasses for SOI and four subclasses for ROM. There are 316 base APR DRGs in version 33. The 316 APR DRGs are divided into 4 SOI and ROM subclasses, except for the two error APR DRGs (955 and 956), which are not subdivided.

SOI adjusted data focuses on explaining differences in length of stay, resource utilization or costs by adjusting for the interaction of diagnoses, procedures, and age. Resource use and outcomes are similar for patients in each severity of illness level, providing more accurate comparisons.

APR DRG Grouper Classifications

Patients fall into a base APR DRG according to the following variables:

- Age
- Procedure
- Principal Diagnosis

They are further classified into one of four severity of illness (SOI) levels based on the following variables:

- Base APR DRG
- Age
- Non-operating room procedures
- Additional diagnosis
- Combinations of all the above

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The following are examples of the four SOI levels:

- **Minor (Level 1)** - Benign hypertension (401.1)
- **Moderate (Level 2)** - Chronic renal failure (585)
- **Major (Level 3)** - CHF (428.0)
- **Extreme (Level 4)** - AMI Anterolateral (410.01)

Expected Values

QualityAdvisor calculates 3M™ Expected values for

- Charge
- Cost (Total, Fixed, and Variable)
- LOS
- Mortality
- Readmission Rates (only on the risk-adjusted readmission analyses)

The Expected value is the average charge, cost, LOS, or mortality rate that would result if the facility's mix of patients by APR DRG SOI or ROM level had been treated as the average in the normative database. These Expected values are calculated based on a statistical formula - indirect rate standardization. The Observed average charge, total cost, LOS or mortality rate for a facility by APR DRG is compared to the expected, computed value.

> **Note**: Opportunity is not specific to individual patients. For instance, mortality opportunity is intended to be used at the population level and is not an indicator of whether a specific patient should have lived or died. Rather, this is the potential number of fewer mortalities you would have seen had your facility performed at the expected value. Similarly, LOS opportunity represents the potential number of days saved, and cost opportunity represents the potential dollars saved had your facility performed at the expected value rather than the Observed.

For QualityAdvisor, the normative database is the Premier QualityAdvisor Database. The normative value is applied to the number of patients in each APR DRG SOI level for an end-result of an SOI-adjusted APR DRG Expected value. Although the normative values do not change, the Expected values are unique to each facility because indirect rate standardization takes into account the facility's SOI or ROM distribution within each APR DRG.

Normative (Indirect Rate Standardization) Calculation Example

The following example shows how the average charge/discharge by SOI level is calculated for the normative database, using APR DRG 140 (COPD):

SOI Level	Total Charge		Number of Discharges in Normative Database		Average Charge/Discharge for Normative Database (PCD)
APR DRG 140 Level 1	10,000,000	/	2,000	=	$5,000
APR DRG 140 Level 2	24,000,000	/	4,000	=	$6,000
APR DRG 140 Level 3	35,000,000	/	5,000	=	$7,000

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Expected Value Calculation Example

The following example shows how the normative information from the indirect rate standardization calculation is used to derive an Expected Charge for APR DRG 140:

SOI Level	Facility Patient Volume		Normative Value		Expected Total Charge
APR DRG 140 Level 1	10	X	$5,000	=	$50,000
APR DRG 140 Level 2	20	X	$6,000	=	$120,000
APR DRG 140 Level 3	40	X	$7,000	=	$280,000
APR DRG 140 Level 4	30	X	$10,000	=	$300,000
	100				$750,000

Expected Charge = $750,000/100 patients or $7,500/patient

Note: For Expected Cost, only facilities using the procedural method to calculate cost are used in the average. Ratio of cost to charges (RCC)-derived costs are not included in the calculation of cost normative values. See Cost Methodology for more information.

Normative Values Calculation Updates

Normative values are averages calculated at the APR DRG severity of illness (SOI) or risk of mortality (ROM) subclass level for the following outcomes:

- Charge
- Cost (Total, Fixed, and Variable)
- LOS
- Readmission Rates (only on the risk-adjusted readmission analyses)
- Mortality

Normative values are used to calculate the Expected values for these outcomes each time an analysis is run that includes an Expected value for one of these outcomes.

3M™ APR DRG Normative Values

The following table describes which APR DRG version is applied to each timeframe and describes which discharge time period was used to calculate the normative calculations.

Discharge Year	Discharge Time Period for Normative Calculation	APR DRG Grouper Version
2017	4Q 2015 - 4Q 2016	V34
2016	4Q 2014 - 3Q 2015 4Q 2013 - 3Q 2014	V33 V32
2015	4Q 2013 - 3Q 2014 4Q 2012 - 3Q 2013	V32 V31
2014	4Q 2012 - 3Q 2013 4Q 2011 - 3Q 2012	V31 V30

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Discharge Year	Discharge Time Period for Normative Calculation	APR DRG Grouper Version
2013	4Q 2010 - 3Q 2012	V30
2012	4Q 2010 - 3Q 2011 4Q 2009 - 3Q 2010	V28 V27

Note: With the yearly updates, the normative values were applied to only discharges during the accompanying discharge calendar year. Patients discharged prior to that year will maintain their prior risk scores (thus eliminating any “changes” in outcomes if reports are re-run on older time frames). With 2013, the normative values were applied to discharges starting October 1, 2012 through calendar year 2013. This exception was done because version 30 is substantially different from version 28 and 29 of the grouper. Version 30 was released on October 1 and we wanted to ensure that observed values from version 30 were matched with expected values of version 30.

Removing Extreme Values

We have established threshold criteria for generating normative values as a means to identify patients to include in the normative values calculation. It is used to remove excessively high or low values for charge, cost, and LOS outcomes when calculating Expected values. The threshold criteria are based on the distribution of charge, cost and LOS among 291 disease strata, which have been adopted by the regression model of CareScience Analytics (CSA). In this setting, 3M™ APR DRG and CSA will be calibrated on the same set of data.

For both charges and costs, values within a certain disease stratum that are below the 1st percentile (P1) threshold or above the 99th percentile (P99) threshold are removed from the database used to calculate normative values. For LOS, we remove all values greater than the 99th percentile (P99) threshold.

Taking Heart Failure as an example, the P1 and P99 in the distribution of total cost are found to be $1,331 and $66,221 respectively. Patients within this cost range are included in normative value calculation for cost. Total cost of $80,000 would be considered as an extreme value and removed. In a high-cost stratum, like Heart Transplant, the P1 and P99 of total cost change to $33,072 and

$1,005,873 respectively. The same amount $80,000 would be well within the range, therefore included in the calculation.

Removing Extreme Values for Normatives

The trim point methodology for removing extreme values described in this section has been applied to the two years of patient data used to calculate 3M™ Expected values. CareScience Analytics and 3M™ are calculated from the same group of patients.

For this outcome	The following patients are excluded...
Charge*	Patients with values below the first percentile and above the 99th percentile in each of the 291 disease strata
Cost*	
LOS*	Patients with values greater than the 99th percentile in each of the 291 disease strata
Mortality	Patients who were transferred to another acute facility (Discharge Status = 2 or 02).

*The threshold criteria for Charge, Cost, and Length of Stay (LOS) outcomes are based on the distribution of each of these outcomes among the 291 disease strata used by the CareScience Analytics regression model. A complete list of the 291 disease strata is available.

Severity of Illness-Adjusted Indices

QualityAdvisor calculates a severity of illness (SOI) adjusted index for

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- LOS
- Charges
- Cost (Total, Fixed, and Variable)
- Readmission Rates (only on the risk-adjusted readmission analyses)

The SOI-adjusted index allows facilities to compare their performance to expected performance. These indices are calculated by dividing the facility's Observed value by the Expected value. An index value of 1.0 indicates that the facility and normative database values are equal. If the index is greater than 1, the index shows poor performance for the facility compared to the normative database facilities. If the index is less than 1, the facility is performing better than the normative facilities for that measure.

SOI indices are not available at the specific APR DRG SOI level, as the index is meant to be used with a heterogeneous population. However, each discharge does have an adjustment applied at the SOI level. because values in each APR DRG SOI level are considered when calculating the expected APR DRG value.

Severity of Illness-Adjusted Example

The following is an example of how QualityAdvisor calculates an SOI adjustment:

Facility Actual Cost Per Patient for APR DRG 140 = $6,700

Expected Cost Per Patient for APR DRG 140 = $7,500

Facility Cost/Expected Cost ($6,700/$7,500) = 0.89

This facility is performing 11% better than expected for Cost in this APR DRG

Risk of Mortality (ROM)

Mortality in QualityAdvisor is defined as patients with a discharge status of 20, 40, 41, or 42. QualityAdvisor uses the risk of mortality (ROM) subclass in the calculation of Expected Mortality Rates. In the APR DRG Grouper, 3M™ provides for the designation of severity of illness (SOI) and ROM subclasses.

Similar to the APR DRG SOI, the patient discharge level ROM will be retained in the database. The mortality rate method uses the patient-specific 3M™ APR DRG ROM score to calculate Expected mortality rates. The current indirect rate standardization process is maintained.

In the 3M™ APR DRG methodology, the risk of mortality (ROM) represents the likelihood of dying while in the facility. Therefore one method of evaluating patient mortality in QualityAdvisor is the use of the APR DRG and the risk of mortality subclass. Mortality rates for each ROM subclass within each APR DRG can be computed for a facility. These rates can be compared to the QualityAdvisor Database or Peer Expected rates in order to identify differences that warrant further review. For elective procedures at ROM level 1 or 2 virtually no mortality is expected. Any deaths for these patients warrant further review.

The underlying clinical principle of APR DRG ROM is that the ROM subclass of a patient is highly dependent on the patient's underlying problem and that patients with high SOI or ROM are characterized by multiple serious diseases.

Similar to the determination of the SOI subclass, the ROM subclass assignment goes through a series of steps.

APR DRG Risk of Mortality (ROM) Subclass Assignment Logic

The assignment logic follows this process:

Phase I – Determine the Risk of Mortality Level of Each Secondary Diagnosis

1. Eliminate all secondary diagnoses that are associated with the principal diagnosis of the patient.
2. Assign each secondary diagnosis its standard risk of mortality level.
3. Modify the standard risk of mortality level of each secondary diagnosis based on the age of the patient.
4. Modify the standard risk of mortality level of each secondary diagnosis based on the APR DRG to which the patient is assigned.

Phase II – Determine the Base Risk of Mortality Subclass of the Patient

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5. Eliminate all secondary diagnoses that are in the same category with the highest risk of mortality level.
6. Compute the base patient risk of mortality subclass as the maximum of all the secondary diagnosis risk of mortality.
7. Reduce the base patient risk of mortality subclass unless there are multiple secondary diagnoses at a significant risk of mortality.

Phase III – Determine the Final Risk of Mortality Subclass of the Patient

8. Establish a minimum risk of mortality subclass based on the principal diagnosis.
9. Establish a minimum patient subclass based on the presence of a specific combination of secondary diagnoses.
10. Establish a final patient risk of mortality subclass as the maximum across the base patient severity of illness subclass from Step 7 and the minimum patient severity of illness subclasses from Steps 8-9.

**Adapted from 3M™ Health Information Systems All Patient Refined Diagnosis Related Groups (APR DRGs)*

Wage Index Adjusted Cost and Charges

Wage index adjustment removes the effect of your facility's prevailing wage rates when measuring your facility's costs and charges against QualityAdvisor Database- calculated expected values.

Methodology Summary

The wage index methodology consists of adjusting the facility's expected values by:

1. Identifying the portion of costs that are related to labor
2. Adjusting the portion of costs related to labor by the facility's wage index
3. Identifying what portion of the costs are not related to labor
4. Adding labor adjusted portion with non-labor adjusted portion of costs

Assumptions

The following assumptions apply to the wage index adjustment methodology:

Each facility's wage index is obtained annually from CMS and is used to adjust the labor portion of the expected cost or charges.

Each facility's labor portion (labor cost ratio) of expected costs is calculated based on the facility's salary expenses over total facility expenses as reported on the facility's most recent Medicare Cost Report (MCR).

Eighteen regional labor costs ratios are calculated for all facilities located within the 50 states. Any facility that does not have an MCR for a specified time frame will be assigned to a regional labor cost ratio based on its region and whether it is located within an urban or rural area. The table below outlines each of the 9 regions:

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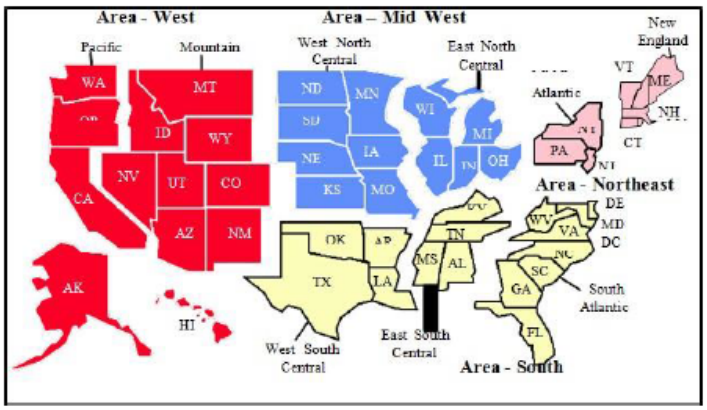
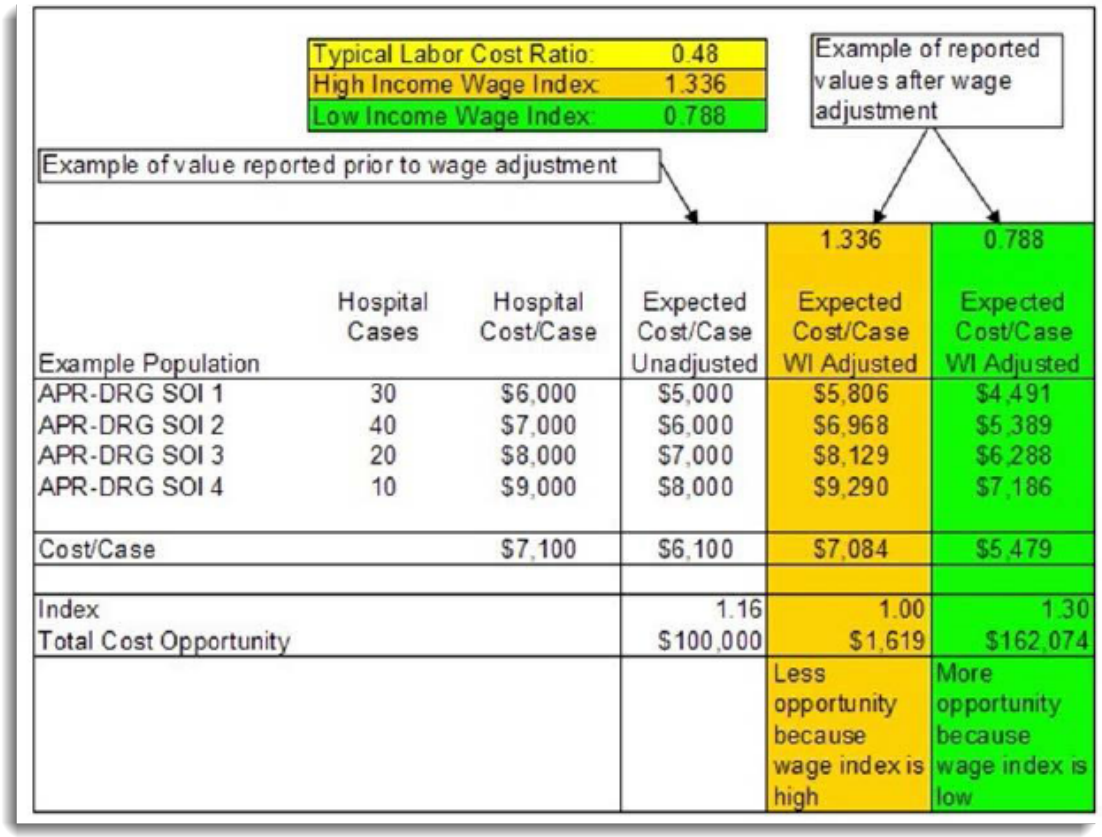
9 Regions	Urban/Rural
Pacific	Urban/Rural
Mountain	Urban/Rural
West North Central	Urban/Rural
East North Central	Urban/Rural
West South Central	Urban/Rural
East South Central	Urban/Rural
South Atlantic	Urban/Rural
Middle Atlantic	Urban/Rural
New England	Urban/Rural



Wage Adjustment Impact Example

The following example illustrates the effect that the wage adjustment may have on the reported Expected Cost and Charge values and the corresponding indexes within QualityAdvisor analyses. In the example below, a typical labor cost ratio of 48%, and a high income wage index and low income wage index are illustrated to show the potential impact on the Cost/Case, Index, and Cost Opportunity metrics within QualityAdvisor.



Typical Labor Cost Ratio: 0.48
High Income Wage Index: 1.336
Low Income Wage Index: 0.788

Example of reported values after wage adjustment

Example of value reported prior to wage adjustment

Example Population	Hospital Cases	Hospital Cost/Case	Expected Cost/Case Unadjusted	1.336 Expected Cost/Case WI Adjusted	0.788 Expected Cost/Case WI Adjusted
APR-DRG SOI 1	30	$6,000	$5,000	$5,806	$4,491
APR-DRG SOI 2	40	$7,000	$6,000	$6,968	$5,389
APR-DRG SOI 3	20	$8,000	$7,000	$8,129	$6,288
APR-DRG SOI 4	10	$9,000	$8,000	$9,290	$7,186
Cost/Case		$7,100	$6,100	$7,084	$5,479
Index			1.16	1.00	1.30
Total Cost Opportunity			$100,000	$1,619	$162,074
				Less opportunity because wage index is high	More opportunity because wage index is low

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Chapter 5 - Comparing Risk-Adjustment Methodologies

Comparing CareScience and 3M™ Methodologies

There are two versions of each risk-adjusted analysis: one that uses the 3M™ APR DRG risk adjustment methodology and one that uses the CareScience Analytics risk adjustment methodology.

The basic difference in the methods is the original intent and the inputs into the methods. The 3M™ method was developed for financial analyses to calculate reimbursement whereas the CareScience model was developed for clinical analyses to evaluate clinical and efficiency outcomes.

3M™ APR DRG

The 3M™ APR DRG risk method was developed by 3M™ using their APR DRG categorization algorithms. 3M™ APR DRGs are essentially algorithms that account for variations in diagnoses, demographics, and procedures to adjust for the severity of illness and the impact of that severity on the expected outcomes of healthcare.

The 3M™ APR DRG model measures risk on two types of classifications:

- Severity of Illness (SOI)
- Risk of Mortality (ROM)

Both classifications have four classes of severity applied at the patient level and will almost always increase the risk as the level of severity increases. When using the ROM the model is set to always have an increase in expected values (i.e., monotonic increase):

- Minor
- Moderate
- Major
- Extreme

Premier recalibrates the risk each year with new data to generate normative/average values across the Premier customer database, which in turn, are used as the Expected values in the 3M™ risk-adjusted analyses.

CareScience Analytics

CareScience Analytics risk adjustment, on the other hand, was developed by clinicians for clinicians. It uses a multi-variate regression analysis that incorporates the marginal contributions of specific patient characteristics, clinical conditions, and facility operational factors to measure the Expected outcomes for each patient on a continuous scale. The following outcomes are measured:

- Charge
- Complications
- Cost
- Mortality
- Length of Stay
- Readmissions

Premier recalibrates the regression model each year with new data to generate outcome-specific and disease-specific coefficients (beta scores), which in turn, are used to calculate the Expected values in CareScience risk-adjusted analyses.

An Example of Three Patients in Both Models

Below is an example showing three patients that have been risk-adjusted according to each model – 3M™ APR DRG (where patients are categorized into certain risk groups) and CareScience Analytics (where patients are measured on a continuous scale).

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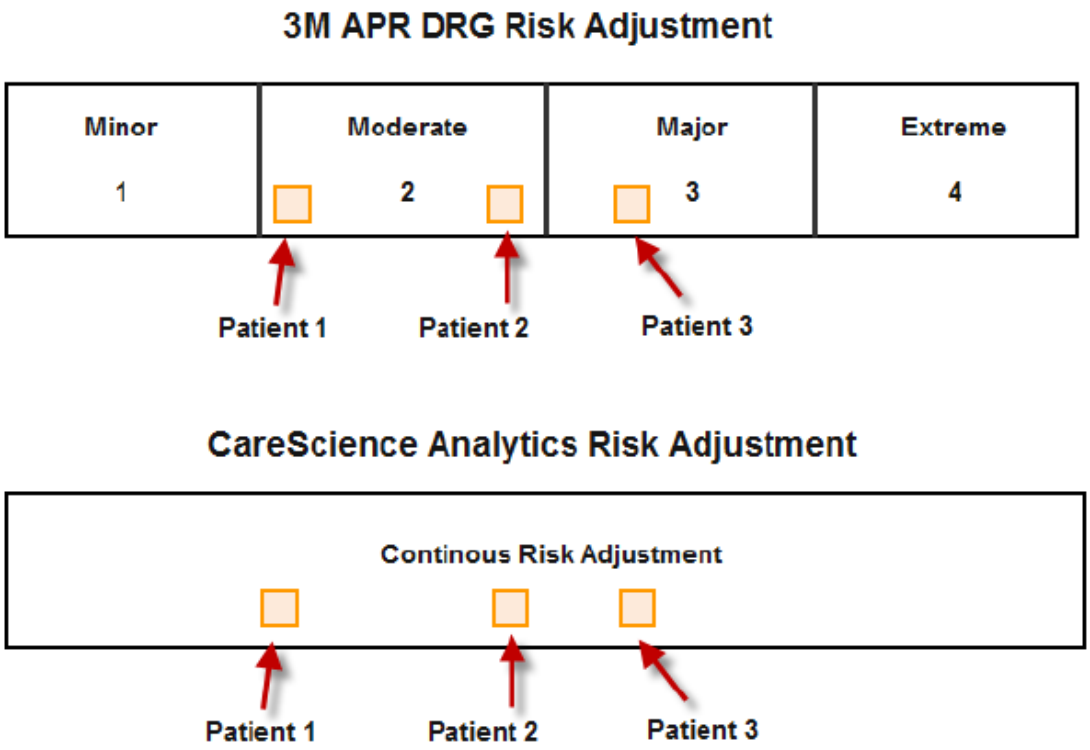

In the 3M™ risk model, Patient 2 and Patient 3 are closer together than Patient 2 and Patient 1. However, Patient 2 and Patient 1 are in the same risk category whereas Patient 2 and Patient 3 are in different risk categories. Patient 3 would receive a higher risk score than Patient 2 even though their actual risk of mortality is closer together. Also, Patient 2 and Patient 1 would receive the same risk score even though their actual risk of mortality is further apart.

In the CareScience Analytics risk model, Patient 1, Patient 2, and Patient 3 are in a continuous risk adjustment model, which allows each patient an individual Expected risk score. Therefore, the risk for Patients 2 and 3 would be much closer than that for Patients 1 and 2.

Detailed Comparison

The following table provides an example of the differences that might occur when running analyses and demonstrates how the different methods would risk adjust patients. Notice that, although the APR DRG ROM continues to increase with each patient along with the ROM subclass, the CareScience Analytics risk of mortality varies across the patients depending upon their specific patient factors.

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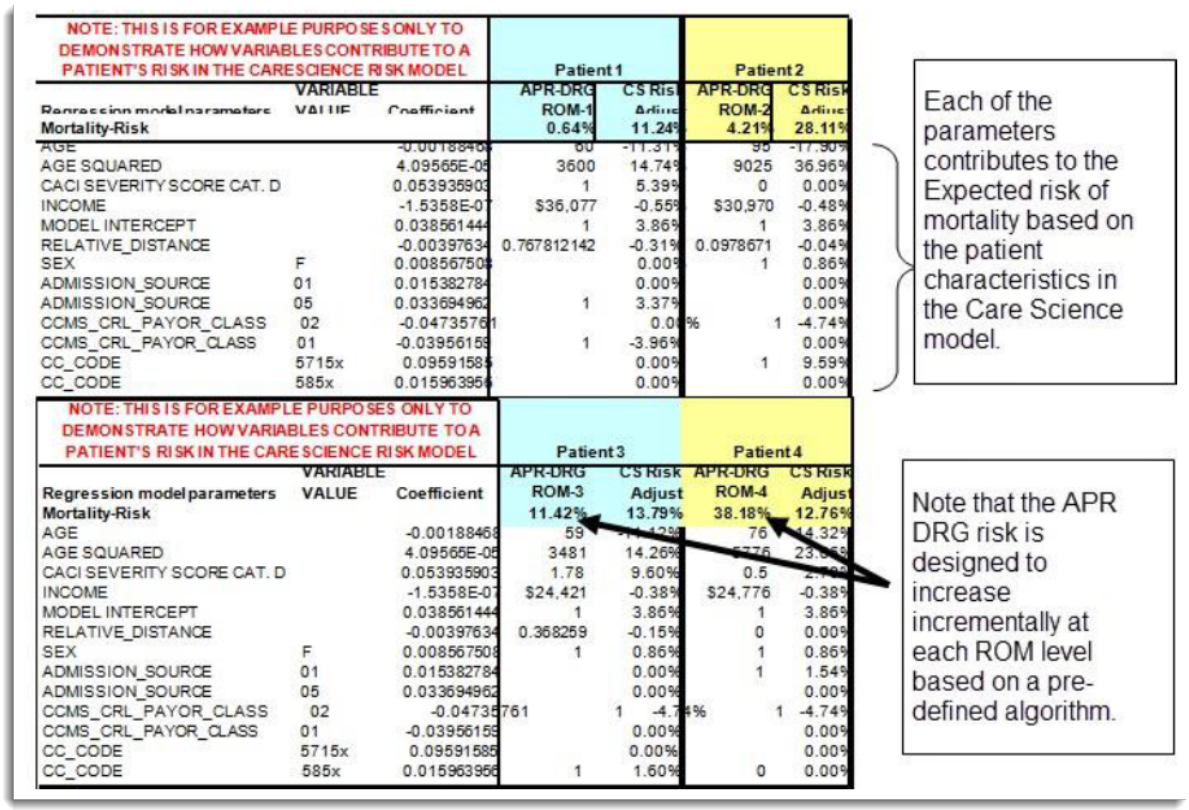

Risk Factors Comparison

The following table lists the risk factors for both models (risk factors in **Bold** show the overlapping variables):

3M™ APR DRG	CareScience Analytics
Age	Age
Gender	Gender
Discharge Status	Discharge Status
Neonatal Birth Weight	Gestational Age/ Neonatal Birth Weight
Principal Diagnosis (terminal digit)	Principal Diagnosis (terminal digit)
Procedures	Procedures
Secondary Diagnosis	Secondary Diagnosis (Severity Weighted Comorbid Conditions calculated with Secondary Diagnoses) Urgency of Admission Household Income Cancer Status Race Point of Origin (e.g., Transfer in) Payer Class Travel Distance
	Patient Type

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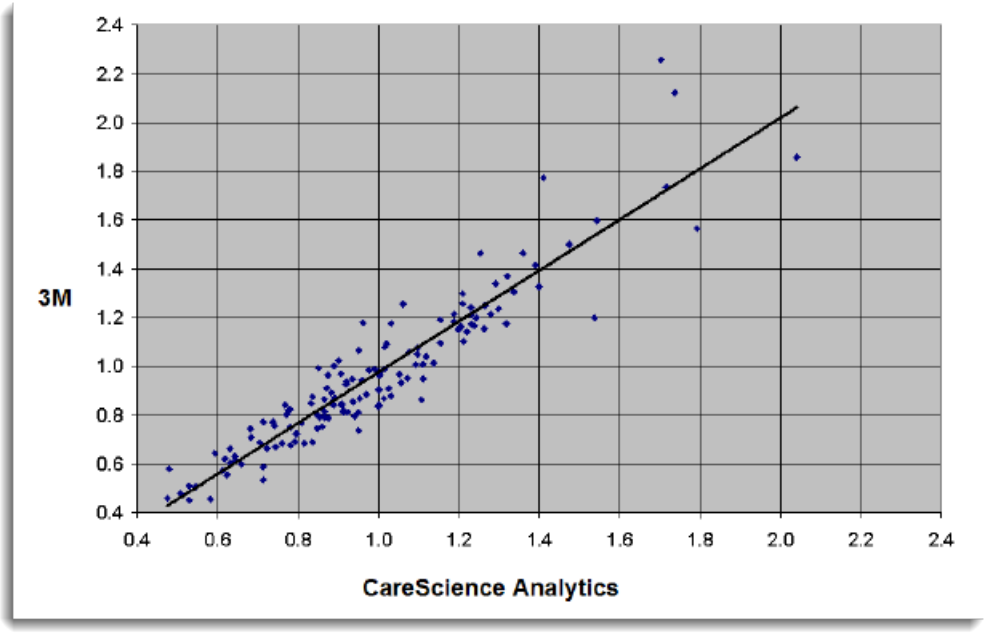
All variables included in CareScience Analytics were found to have statistically significant influence on outcomes. Also of note, 3M™ APR DRG includes only a portion of secondary diagnoses in their calculations whereas CareScience Analytics includes all.

Baseline Comparison of Hospital Level O/E Mortality Ratios



This baseline comparison of O/E mortality ratios using CareScience Analytics and 3M™ APR DRG risk-adjustment methodologies includes 161 hospitals (using data from 2006 Q3—2007 Q2). There was a 94% correlation between O/E ratios produced by the two risk-adjustment methodologies.

The cross-facility range was 0.50 to 2.00.

- All 12 hospitals with O/E ratios > 1.35 are relatively small (smallest third in size)
- Not so for 16 hospitals with O/E ratios < 0.65

Level	CareScience Analytics	3M™ APR DRG
Mean	0.99	0.96
Median	0.95	0.90
Top Quartile	0.82	0.77

When looking across the facility level O/E mortality ratios, we find that the two models are highly correlated. It confirms that when these models are used at an aggregated level (which is to say, the facility rather than patient level) the results for both are generally very similar.

Which Model Do You Choose?

This decision ultimately is one each facility has to make based on their culture and their needs. Analysis at the facility level has shown there is not much difference between the two in terms of calculating risk, so we do not endorse one over the other.

Which model you choose depends on why you're using QualityAdvisor. For financial analysis, 3M™ APR DRG may be the preferred option because it looks at the relationship between the severity of illness and the cost of healthcare. For clinical analyses, CareScience Analytics may be the preferred option because it incorporates more clinical variables and was developed by clinicians.

You may choose to use both or make an executive decision to only use one model for all analyses. However, it is recommended that if you plan to perform regular analyses of patient groups over time, you should stick with one method to ensure you are identifying true variation in outcomes rather than a difference between the methods.

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Chapter 6 - Statistical Significance

Statistical Significance

All risk-adjusted outcome measures have a test of statistical significance. Statistical significance is the probability that a difference between the Observed value and the Expected value for an outcome is not due to random chance.

Note: MDC is Major Diagnosis Category, DRG is Diagnosis Related Group, and CTC is Common Treatment Category as defined in D.J. Brailer and E.A. Kroch, “Member Risk Adjustment,” Health Care Management Science, 1999: 125-136.

Factors Determining Statistical Significance

Three interrelated factors determine whether the variation between the Observed value and the Expected value is statistically significant:

- The number of observations (cases) in the population. A minimum of 25 cases is required to calculate statistical significance.
- The magnitude of the difference between the Observed and Expected value
- The variability in the provider and the Perspective Database comparative norm.

Total Lines

Statistical Significance displays as dashes on Total lines. This is because Statistical Significance is calculated individually for each row and cannot be summed for a Total line.

Calculation Formula for 3M™ APR DRG Risk Adjustment

On 3M™ analyses, statistical significance is calculated with a Z-test, which is as follows:

Continuous Variable:

$$Z = \frac{X - \mu}{\sigma/\mathrm{sqrt}(n)}$$

Where:

X = Observed Mean σ = Observed Standard Deviation

μ = Population Mean n = Observed Sample Size

Note: This level of test is consistent with the Z-ratio employed in the TJC ORYX program and assumes that all variables are normally distributed.

Calculation Formula for CareScience Analytics Risk Adjustment

On CareScience Analytics analyses, statistical significance is calculated with a T- test wherein the model error and Perspective variation are considered. The T-test calculation is as follows:

1. The analytics calculate the standard error for each outcome at the patient level predicted value

$$sep(\hat{y}_{ijkl}) = s\sqrt{x_{ijkl}(X_{kl}'X_{kl})^{-1}x_{ijkl}' + 1}$$

2. It then performs the mathematics to aggregate the standard errors for the provider or other grouping such as MDC, DRG, or CTC] *. The calculations used are:
   a. calculate an average variance: $V(\hat{y}_{jl})$, and
   b. calculate each deviation score, d_{jl}.
3. For the deviation score on the analyses, the front end uses the non- rounded Observed and Expected values to calculate the deviation (Observed- Expected). Analyses then round the Observed, Expected and deviation scores to the first decimal place.
4. These values – the deviation (computed from the non-rounded Observed and Expected values), observed standard error and number of observations (n) – generate a T statistic which will be compared to a critical value to determine significance.
5. The T statistic is calculated for each deviation score using the following method:

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$$T = \frac{n - deviation}{\Sigma(sep)^2}$$

6. In determining n for the T statistic calculation, only Observed values not equal to zero are used. A table displays with critical values for a two-tail T test.

   If the calculated T statistic exceeds the critical value, it will be considered statistically significant.

   If any score has a reported rounded deviation of 0.0, this observation will not receive a significance flag.

Confidence Levels

Statistical significance is calculated at various confidence levels. The confidence level is the percentage of confidence that the variation between the Observed value and the Expected value was not due to chance.

Readmission Analyses: One Confidence Level

The risk-adjusted readmission analyses are as follows:

- Facility Readmission – 3M™
- Peer Readmission – 3M™

Note: These analyses use the 3M™ APR DRG risk adjustment methodology to calculate the Expected value. For these analyses, statistical significance is identified at 99% confidence that the variation is not due to chance.

If there is 99% confidence that the variation is not due to chance, then the black diamond ◆ appears in the rows of the SS column of the analyses. If the statistical significance column is blank, either there is no significant difference between the average and the Expected value or that there were fewer than 25 cases.

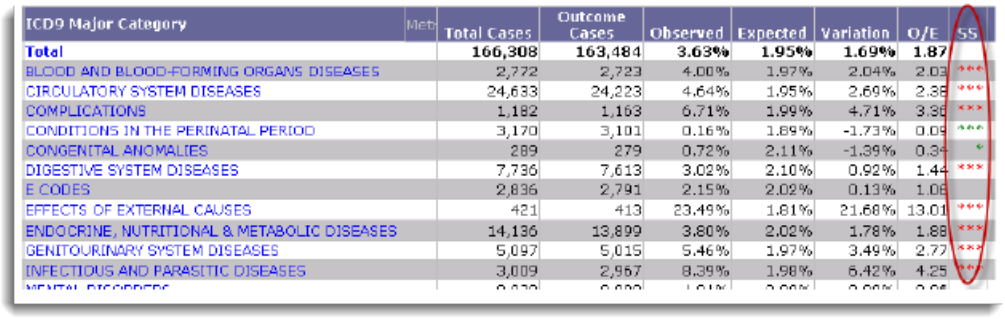
Risk-Adjusted Analyses: Three Confidence Levels

On all risk-adjusted analyses, statistical significance is identified at three confidence levels: 75%, 95%, and 99% and indicated by the number of asterisks as follows:

- 1 asterisk = 75%
- 2 asterisks = 95%
- 3 asterisks = 99%

In addition, these asterisks are color-coded as follows:

- Green asterisks = the outcome's variance is statistically better than expected
- Red asterisks = the outcome's variance is statistically worse than expected These asterisks appear in the **SS** column on risk-adjusted analyses



ICD9 Major Category	Total Cases	Outcome Cases	Observed	Expected	Variation	O/E	SS
Total	**166,308**	**163,484**	**3.63%**	**1.95%**	**1.69%**	**1.87**	
BLOOD AND BLOOD-FORMING ORGANS DISEASES	2,772	2,723	4.00%	1.97%	2.04%	2.03	***
CIRCULATORY SYSTEM DISEASES	24,633	24,223	4.64%	1.95%	2.69%	2.38	***
COMPLICATIONS	1,182	1,163	6.71%	1.99%	4.71%	3.36	***
CONDITIONS IN THE PERINATAL PERIOD	3,170	3,101	0.16%	1.89%	-1.73%	0.09	***
CONGENITAL ANOMALIES	289	279	0.72%	2.11%	-1.39%	0.34	*
DIGESTIVE SYSTEM DISEASES	7,736	7,613	3.02%	2.10%	0.92%	1.44	***
E CODES	2,836	2,791	2.15%	2.02%	0.13%	1.06	
EFFECTS OF EXTERNAL CAUSES	421	413	23.49%	1.81%	21.68%	13.01	***
ENDOCRINE, NUTRITIONAL & METABOLIC DISEASES	14,136	13,899	3.80%	2.02%	1.78%	1.88	***
GENITOURINARY SYSTEM DISEASES	5,097	5,015	5.46%	1.97%	3.49%	2.77	***
INFECTIOUS AND PARASITIC DISEASES	3,009	2,967	8.39%	1.98%	6.42%	4.25	***

If no asterisks appear in the rows of the **SS** column, the outcome's Variation is either not statistically significant or there were not 25 cases in the population. Asterisks never appear in the Total line for the **SS** column.

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Chapter 7 - Readmissions Methodology

Comparing Readmissions Reporting in QualityAdvisor and CMS

Each analysis uses a different readmission methodology; however, all Premier readmission analyses (and their methodologies) are different from CMS in the following ways:

	Patient Population*	Disease Categories
CMS	• Medicare Patients who are readmitted to any facility	• Restricted to three diseases: AMI, Heart Failure, and Pneumonia
Premier	• **All acute inpatients** readmitted to the same facility *(for All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2023 and All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2024)* • **All inpatient patient types** readmitted to the same facility *(for All-Cause 30-Day Readmission for all Inpatients)*	• Not restricted to specific diseases and more broadly based across all acute inpatients • Not restricted to specific diseases and more broadly based across all inpatients

*Due to the differences in data sets provided to Premier and CMS, there may be differences in the calculated Readmissions rates between Premier and CMS.

Comparing All Readmission Analyses

The following section provides a detailed side-by-side comparison of all readmission options in QualityAdvisor.

Question: Is the reason for readmission visible?	
Reason for Readmission (Total Readmissions)	If a diagnosis is on the row, you can see the reason for the readmission because this analysis focuses on readmission visits. If a diagnosis is not on the row, you can drill to the patient visit detail reports to see diagnoses for the readmission visits.
Reason for Readmission (Planned vs. Unplanned)	If a diagnosis is on the row, you can see the reason for the readmission because this analysis focuses on readmission visits. If a diagnosis is not on the row, you can drill to the patient visit detail reports to see diagnoses for the readmission visits.
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	The reason for readmission is not visible on this analysis, regardless of what is on the row because the analysis focuses on index admissions. You can drill to the patient visit detail report to see diagnoses for readmission visits.
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	The reason for readmission is not visible on this analysis, regardless of what is on the row because the analysis focuses on index admissions. You can drill to the patient visit detail report to see diagnoses for readmission visits.
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	The reason for readmission is not visible on this analysis, regardless of what is on the row because the analysis focuses on index admissions. You can drill to the patient visit detail report to see diagnoses for readmission visits.
Readmission (3M™)	The reason for readmission is not visible on this analysis, regardless of what is on the row because the analysis focuses on index admissions. You can drill to the patient visit detail report to see diagnoses for readmission visits.

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Question: Is this analysis risk-adjusted?	
Reason for Readmission (Total Readmissions)	No
Reason for Readmission (Planned vs. Unplanned)	No
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Yes (CareScience Standard and Select Practice)
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Yes (CareScience Standard and Select Practice)
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Yes (CareScience Standard and Select Practice)
Readmission (3M™)	Yes (3M™ Normatives)

Question: Is the analysis All-Cause?	
Reason for Readmission (Total Readmissions)	Yes (by default) Can be limited at the Numerator Selections prompt
Reason for Readmission (Planned vs. Unplanned)	Yes (by default) Can be limited at the Numerator Selections prompt
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Yes
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Yes
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Yes
Readmission (3M™)	Yes

Question: Is there a Peer version?	
Reason for Readmission (Total Readmissions)	Yes
Reason for Readmission (Planned vs. Unplanned)	Yes
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Yes

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Question: Is there a Peer version?	
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Yes
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Yes
Readmission (3M™)	Yes

Question: What timeframe can be used for this reporting methodology?	
Reason for Readmission (Total Readmissions)	All timeframes available in the QualityAdvisor database
Reason for Readmission (Planned vs. Unplanned)	All timeframes available in the QualityAdvisor database
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	All timeframes available in the QualityAdvisor database
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	All timeframes available in the QualityAdvisor database
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	All timeframes available in the QualityAdvisor database
Readmission (3M™)	All timeframes available in the QualityAdvisor database

Question: What patients are excluded?	
Reason for Readmission (Total Readmissions)	Patients who: • Expired • Were transferred to another acute care facility • Left against medical advice
Reason for Readmission (Planned vs. Unplanned)	Patients who: • Expired • Were transferred to another acute care facility • Left against medical advice

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Question: What patients are excluded?	
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Patients who: • Expired • Were transferred to another acute care facility • Left against medical advice • Do not qualify for one of the 5 specialty cohorts that make up the Hospital-Wide Readmission cohort, including: • Psychiatric patients • Rehab patients • Cancer patients • Non-Surgical Obstetric population (neonates and mothers who do not have a procedure qualifying them for the surgical specialty cohort) • Have a principal diagnosis code of COVID-19 or with a secondary diagnosis code of COVID-19 coded as present on admission (POA) on the index admission claim
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Patients who: • Expired • Were transferred to another acute care facility • Left against medical advice • Do not qualify for one of the 5 specialty cohorts that make up the Hospital-Wide Readmission cohort, including: • Psychiatric patients • Rehab patients • Cancer patients • Non-Surgical Obstetric population (neonates and mothers who do not have a procedure qualifying them for the surgical specialty cohort) • Have a principal diagnosis code of COVID-19 or with a secondary diagnosis code of COVID-19 coded as present on admission (POA) on the index admission claim
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Patients who: • Expired • Were transferred to another acute care facility • Left against medical advice
Readmission (3M™)	Patients who are: • Skilled Nursing Facility patients (SKN, Patient Type = 10) • False Labor patients with principal, admitting or secondary ICD codes of: **ICD-10** O47.00, O47.9, O47.02, O47.03, O47.1, O60.00, O60.02, O60.03

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Question: Are same-day readmissions included?	
Reason for Readmission (Total Readmissions)	Included (by default) Can be excluded at the Readmission Details prompt
Reason for Readmission (Planned vs. Unplanned)	Included, same-day readmissions are considered planned readmissions
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Included
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Included
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Included
Readmission (3M™)	Excluded if there are no additional visits within 30 days

Question: How do I see the readmission rate?	
Reason for Readmission (Total Readmissions)	Readmission Rate: • Readmitted Cases divided by Total Denominator Cases
Reason for Readmission (Planned vs. Unplanned)	Readmission Rate: • Readmitted Cases divided by Total Denominator Cases Unplanned Readmissions Rate Value: • Unplanned Readmitted Cases divided by Total Denominator Cases Planned Readmissions Rate Value: • Planned Readmitted Cases divided by Total Denominator Cases
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Observed, which is derived from the following equation: • Unplanned Readmissions divided by Eligible (Outcome) Cases
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Observed, which is derived from the following equation: • Unplanned Readmissions divided by Eligible (Outcome) Cases
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Observed, which is derived from the following equation: • Outcome Cases with Readmissions divided by Eligible (Outcome) Cases

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Question: How do I see the readmission rate?	
Readmission (3M™)	Readmission Rate: • Readmitted Cases divided by Cases

Question: How are readmitted cases stratified?	
Reason for Readmission (Total Readmissions)	By diagnoses or other selected characteristics
Reason for Readmission (Planned vs. Unplanned)	By diagnoses or other selected characteristics
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	By diagnoses or other selected characteristics
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	By diagnoses or other selected characteristics
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	By diagnoses or other selected characteristics
Readmission (3M™)	By diagnoses or other selected characteristics

Question: What Patient Types are included?	
Reason for Readmission (Total Readmissions)	All Patient Types (by default) User-defined at the Readmission Details and Patient Type Prompts
Reason for Readmission (Planned vs. Unplanned)	Inpatient Type only (08)
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Inpatient Type only (08)
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Inpatient Type only (08)
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	All Inpatient Types (by default)
Readmission (3M™)	All Patient Types except Skilled Nursing Patients (SKN, Patient Type = 10)

Question: Does this analysis exclude planned readmissions?	
Reason for Readmission (Total Readmissions)	No

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Question: Does this analysis exclude planned readmissions?	
Reason for Readmission (Planned vs. Unplanned)	No
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Yes
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Yes
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	No
Readmission (3M™)	No

Question: What version of the Planned Readmission Algorithm is utilized?	
Reason for Readmission (Total Readmissions)	N/A
Reason for Readmission (Planned vs. Unplanned)	Either Planned Readmission Algorithm v4.0 2023 or Planned Readmission Algorithm v4.0 2024 can be selected for this analysis
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Planned Readmission Algorithm v4.0 2023
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Planned Readmission Algorithm v4.0 2024
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	N/A
Readmission (3M™)	N/A

Question: What is the interval between the index visit and the readmission visit?	
Reason for Readmission (Total Readmissions)	User defined at the Readmission Days prompt
Reason for Readmission (Planned vs. Unplanned)	User defined at the Readmission Days prompt
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Within 30 Days
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Within 30 Days

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Question: What is the interval between the index visit and the readmission visit?	
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Within 30 Days
Readmission (3M™)	Within 30 Days

Question: Which visit has the readmission flag?	
Reason for Readmission (Total Readmissions)	Readmitted Visit
Reason for Readmission (Planned vs. Unplanned)	Readmitted Visit
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	Index Visit
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	Index Visit
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	Index Visit
Readmission (3M™)	Index Visit

Question: What returns for the attribute on the row?	
Reason for Readmission (Total Readmissions)	The readmission visit that had the attribute
Reason for Readmission (Planned vs. Unplanned)	The readmission visit that had the attribute
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	The index visit that had the attribute
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	The index visit that had the attribute
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	The index visit that had the attribute
Readmission (3M™)	The index visit that had the attribute

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Question: What does "show items" show?	
Reason for Readmission (Total Readmissions)	All cases and readmitted cases for the selected attribute
Reason for Readmission (Planned vs. Unplanned)	All cases and readmitted cases for the selected attribute
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	All cases for the selected attribute
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	All cases for the selected attribute
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	All cases for the selected attribute
Readmission (3M™)	All cases for the selected attribute

Question: What admissions are eligible?	
Reason for Readmission (Total Readmissions)	For each index admission, only the first subsequent admission is considered when defining a readmission visit
Reason for Readmission (Planned vs. Unplanned)	For each index admission, only the first subsequent Acute Inpatient admission is considered when defining a readmission visit
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2022 (CareScience)	For each index admission, only the first subsequent Acute Inpatient unplanned admission is considered when defining a readmission visit Note: COVID-19 index admissions are removed from the specialty cohorts
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	For each index admission, only the first subsequent Acute Inpatient unplanned admission is considered when defining a readmission visit Note: COVID-19 index admissions are removed from the specialty cohorts
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	For each index admission, only the first subsequent Acute Inpatient unplanned admission is considered when defining a readmission visit Note: COVID-19 index admissions are removed from the specialty cohorts
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	For each index admission, only the first subsequent Inpatient admission is considered when defining a readmission visit
Readmission (3M™)	For each index admission, only the first subsequent admission is considered when defining a readmission visit

Question: Which detail analyses are available?	
Reason for Readmission (Total Readmissions)	• Facility Readmission Patient Detail Analysis • Facility Readmission Patient Visit Detail Analysis

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Question: Which detail analyses are available?	
Reason for Readmission (Planned vs. Unplanned)	• Facility Readmission Patient Detail Analysis • Facility Readmission Patient Visit Detail Analysis
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2023 (CareScience)	• Facility Risk-Adjusted Readmission Patient Detail Analysis • Facility Risk-Adjusted Readmission Patient Visit Detail Analysis • Facility All Patient Detail Analysis
Risk-Adjusted All-Cause Hospital-Wide 30-Day Readmission PRA v4.0 2024 (CareScience)	• Facility Risk-Adjusted Readmission Patient Detail Analysis • Facility Risk-Adjusted Readmission Patient Visit Detail Analysis • Facility All Patient Detail Analysis
Risk-Adjusted All-Cause 30-Day Readmission - All Inpatients (CareScience)	• Facility Risk-Adjusted Readmission Patient Detail Analysis • Facility Risk-Adjusted Readmission Patient Visit Detail Analysis • Facility All Patient Detail Analysis
Readmission (3M™)	• Facility All Patient Detail Analysis

All-Cause Hospital-Wide 30-Day Readmission Methodology (CareScience Risk-Adjusted)

Based on the Planned Readmission Algorithm (PRA) version 4.0 2024

For patient discharges 10/1/2020 and forward

This methodology is available via the following Standard Analyses:

- CareScience Risk-Adjusted 30-Day Readmission - Facility and Peer
- System 30-Day Readmission - Facility
- CareScience Outcome Profile - Facility
- CareScience Custom Comparison Analysis - Facility and Peer
- CareScience Index Opportunity - Facility
- Disease Strata by Outcome - Facility

Overview

This section provides an overview of the All-Cause Hospital-Wide 30-Day Readmission Methodology:

- **Interval**: Within 30 days
- **All-Cause**: Patients readmitted with any diagnosis
- **Patient Type**: Only inpatients (Inpatient Patient Type 08)
- **Same-Day Readmissions**: Included
- **Readmission Rate**: The Observed value is the readmission rate. Planned readmissions are excluded from the observed value as defined by the CMS Planned Readmission Algorithm v4.0 2024. For CMS documentation on this algorithm, refer to the 2024 Hospital-Wide All Cause Readmission Measure Updates and Specifications Report (Version 13.0)
- **Risk Method**: CareScience Standard and Select Practice

The CMS Hospital-Wide 30-Day Readmission Methodology Based on PRA version 4.0 2024 defines a HWR cohort made up of 5 mutually exclusive “specialty cohorts”:

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- Surgery/Gynecology
- Cardiorespiratory
- Cardiovascular
- Neurology
- Medicine

All 5 cohorts share a common list of codes that define a given rule. That is to say that tables PR1 through PR4 that make up the PRA are all the same for the entire measure. These definitions are also in alignment with the rule definitions that are used by the AMI/HF/PN/COPD/STK cohorts in the CMS condition specific methodology.

Patients that do not qualify for one of these 5 cohorts above are excluded from the HWR measure. These patients generally fall into the following cohorts:

- Psych
- Rehab
- Cancer

Note: COVID-19 patients have been removed from all specialty cohorts and are not eligible for the readmission outcome.

Important!
If the patient case is considered a surgical Obstetric case and includes a qualifying procedure, the patient would group to the Hospital-Wide Readmission cohort based on the Surgery Gynecology specialty cohort. However, if the patient case is considered a medical Obstetric case and does not include a qualifying procedure, the patient would not group to the Hospital-Wide Readmission cohort as the case would not be considered part of the Surgery Gynecology specialty cohort as the principal diagnosis indicating an OB medical encounter alone does not qualify a patient for the Hospital-Wide Readmission cohort.

Numerator and Denominator Exclusions

Cases excluded from the numerator are the cases that are not considered readmissions or are determined to be planned readmissions.

Cases excluded from the denominator are the cases that are not considered eligible index admissions. The denominator cases are the outcome cases.

These are excluded from the...	Numerator	Denominator
Patient Types other than Inpatient (08)	X	X
Planned readmission	X	
Outcome Cases exclusions		X
COVID-19 Patients (U07.1)	X	X

Important Terms for Risk-Adjusted Readmissions

These are the key concepts for working with risk-adjusted readmissions.

Index Admission

As defined by CMS, an index admission is the hospitalization considered for the readmission outcome.

The CareScience Analytics Risk-Adjusted Readmissions methodology focuses on index admissions that have readmissions. Tracking index admissions can indicate opportunities for improvement in hospital readmissions.

Readmission

A readmission is an inpatient admission of the same patient within 30 days of a previous admission to the same facility, regardless of the admission cause. For each index admission, the first subsequent admission for the same patient is eligible to be a readmission. The CMS Planned Readmission Algorithm v4.0 2023 has been incorporated into the existing readmission methodology to exclude planned readmissions from observed values.

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Note: According to the CMS Hospital-Wide All-Cause Unplanned Readmission Measure (Final Technical Report), a readmission is defined as an admission to an acute care hospital within 30 days of discharge from an acute care hospital. The definition also indicates that a readmission may in turn serve as an index admission. The measure notes that a readmission within 30-days will also be eligible as an index admission, if it meets all other eligibility criteria. Based on this information, the QualityAdvisor all-cause readmission methodology, where a readmitted visit can also be an index visit, does mimic the CMS specifications.

Readmission Risk Score

A risk score is the estimated probability that a readmission to the same facility may occur within 30 days from the discharge date. A readmission risk score is calculated for each index admission.

Interval

The interval is the number of days between the index admission's Discharge Date and readmission visit's Admission Date. For 30 Day readmissions, the interval is within 30 days. For example:

Index Visit Discharge Date = December 20, 2023
Readmission Visit Admission Date = December 27, 2023
Interval = 7 Days

Timeframe

The timeframe is the period of time included in the analysis determined by selections at the Time prompt.

The timeframe selected within the analysis is for the index visit only. In order to capture all readmitted visits, move your "Through" date back 30 days from what has been Facility Published.

CareScience Analytics Risk-Adjustment for Readmissions

CareScience Analytics is used to calculate Observed and Expected values. CareScience Analytics is the risk-adjustment methodology defined by researchers within Premier based on in-depth clinical and analytical research techniques that is currently used to calculate mortality, cost, charge, LOS, and complications. This same team developed CareScience Analytics risk adjustment for the readmissions outcome.

Index Admissions

The readmissions risk-adjustment process starts with identifying the eligible index admissions and readmissions. Index admissions and readmissions are defined by how the admissions relate to each other within the parameters selected at the prompts (such as Facilities and Time).

After the index admissions and readmissions are identified, a risk score is calculated for each index admission using the same risk factors that CareScience Analytics uses to calculate risk scores for other outcomes such as mortality, LOS, and cost. The risk scores for the index admissions are then aggregated to calculate the Expected value on the analysis.

Risk scores are calculated for index admissions (as opposed to readmissions) because Expected values measure the likelihood that a patient will be readmitted based on the circumstances of the index admission. When a patient is readmitted, there is no likelihood of readmission to measure because the readmission has already occurred. Therefore, when calculating the Expected value, only the risk scores for the index admissions are included in the calculation.

In the following example of Patient A for the month of June 2023, only the risk scores from the index admissions are used to calculate the Expected value.

Patient	Admission Date	Discharge Date	Admission Type	Risk Score?
Patient A	6/2/23	6/4/23	Index	Y
Patient A	6/10/23	6/15/23	Readmission/Index*	Y
Patient A	6/20/23	6/26/23	Readmission/Index*	Y
Patient A	6/30/23	7/7/23	Readmission (patient expired)	N

*A readmission can be linked to only one previous index admission. As a result, for patients with multiple admissions within the timeframe of one analysis, one admission can count as both an index admission and a readmission.

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On the Risk-Adjusted 30-Day Readmission analysis:

- The Outcome Cases are the index admissions that qualified for the analysis and the denominator in the Observed value.
- The attribute on the row represents the index admissions that had that attribute.
- You can drill to the Risk-Adjusted Readmissions Patient Visit Detail analysis to see which visits are index admissions. Index admissions are indicated by an “I” in the Readmission Visit column.

Logistic Regression Model

For the Length of Stay outcome, CareScience Analytics uses a semi-log regression model to derive the risk score. For the Readmission and Mortality outcomes, CareScience Analytics uses a logistic regression model (aka logit model) to derive the risk score.

Logistic regression is highly effective at estimating the odds that an event will occur given a set of conditions. For readmissions, it’s the odds that a readmission will occur based on the clinical, patient selection, and demographic characteristics of the index admission.

Logistic regression is best suited for binary outcomes, which means the outcome can be only one of two options: did occur (1) or did not occur (0). The readmissions outcome is a binary outcome because an unplanned readmission either did occur (1) or did not occur (0) after an index admission.

The readmission risk score estimates the odds that an unplanned readmission will occur (1) given the variables of the index admission. Due to the log-odds transformation of the logit model applied when calculating the risk score, the readmission risk score is guaranteed to be within the bound of 0 and 1.

If there is an unplanned readmission after an index admission, the index admission is set to 1 and the Observed value is 100%. If there is no readmission, or the readmission is considered planned, the outcome is set to 0 and the Observed value is 0%.

Risk-Adjusted Readmission Metrics

This section describes the risk-adjusted readmission metrics.

Same-Day Readmissions

Since same-day readmissions are defined as being admitted and discharged on the same calendar day, the Admit and Discharge times can distinguish each unique visit, even when taking place on the same calendar day.

- CMS considers patients as “readmitted” if they had an eligible readmission to the same hospital on the same day but for a different condition/procedure. Patients are not considered “readmitted” if the readmission was to the same hospital for the same condition/procedure and on the same calendar day.
- Premier uses admission dates and times to determine the sequence of patient visits, and does not consider conditions/procedures to determine readmissions. This is because by the time Premier receives final billing, it is assumed that all claims considered as the "same condition" have already been merged.

CareScience Standard and Select Practice

QualityAdvisor offers two risk-adjustment calculation modes for analyses using CareScience Analytics: Standard Practice and Select Practice.

The algorithm for both Standard and Select Practice is based on Premier’s database, which identifies readmissions to the same facility in the database.

Total Cases

The total cases are the inpatient index admissions that qualified for the analysis.

It is important to note that Total Cases includes only patients with the Patient Type of Inpatient (08). This is the only risk-adjusted outcome where the Total Cases metric is restricted to one Patient Type.

Outcome Cases

The outcome cases are the inpatient index admissions that qualified for the analysis and qualified for risk-adjustment.

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It is important to note that the Outcomes Cases metric includes only patients with the Patient Type of Inpatient (08). This is the only risk-adjusted outcome where the Outcomes Cases metric is restricted to one Patient Type.

Outcome Case Exclusions – General

Cases are excluded from the outcome cases if the information required to risk- adjust a patient such as age, admission type, charges, etc. is missing from the case.

Outcome Case Exclusions – Specific to the Readmissions Outcome

Patients with the following discharge statuses are excluded from the outcome cases:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

Additional Outcome Case Exclusions specific to the All-Cause Hospital-Wide 30-Day Readmission methodology:

In addition to the above Readmission Outcome Case exclusions, the All-Cause Hospital-Wide 30-day Readmission outcome defines a Hospital-Wide Readmission (HWR) cohort which indicates that each eligible admission is assigned to one of five mutually exclusive specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology.

The cohorts that make up the HWR cohort mutually exclusive, and a given inpatient will only ever have one planned vs. unplanned status for a readmission under this implementation.

This measure excludes index admissions for patients:

- **Admitted for primary psychiatric diagnoses**

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric or rehabilitation centers that are not comparable to short-term acute care hospitals.

- **Admitted for rehabilitation**

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care.

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- **Admitted for medical treatment of cancer**

Rationale: These admissions have a different mortality and readmission profile than the rest of the Medicare population, and outcomes for these admissions do not correlate well with outcomes for other admissions. Patients with cancer admitted for other diagnoses or for surgical treatment of their cancer remain in the measure.

Note: Neonatal, gestational, and perinatal populations are also excluded from the HWR cohort group. This can be largely attributed to the fact that the Medicare claims data that Yale uses as its source for building its models does not contain many, if any, instances of these populations. COVID-19 patients have also been excluded from all 5 specialty cohorts.

The following HWR flow diagram details cohort inclusion and exclusion criteria and assignment:

Note: While the All-Cause Hospital-Wide 30-Day Readmission methodology implemented in QualityAdvisor is based on the CMS specification, Premier's implementation does not limit the Hospital-Wide Readmission cohort to Medicare patients age 65 and over. Premier's methodology evaluates all acute inpatients with no payer or age exclusions.

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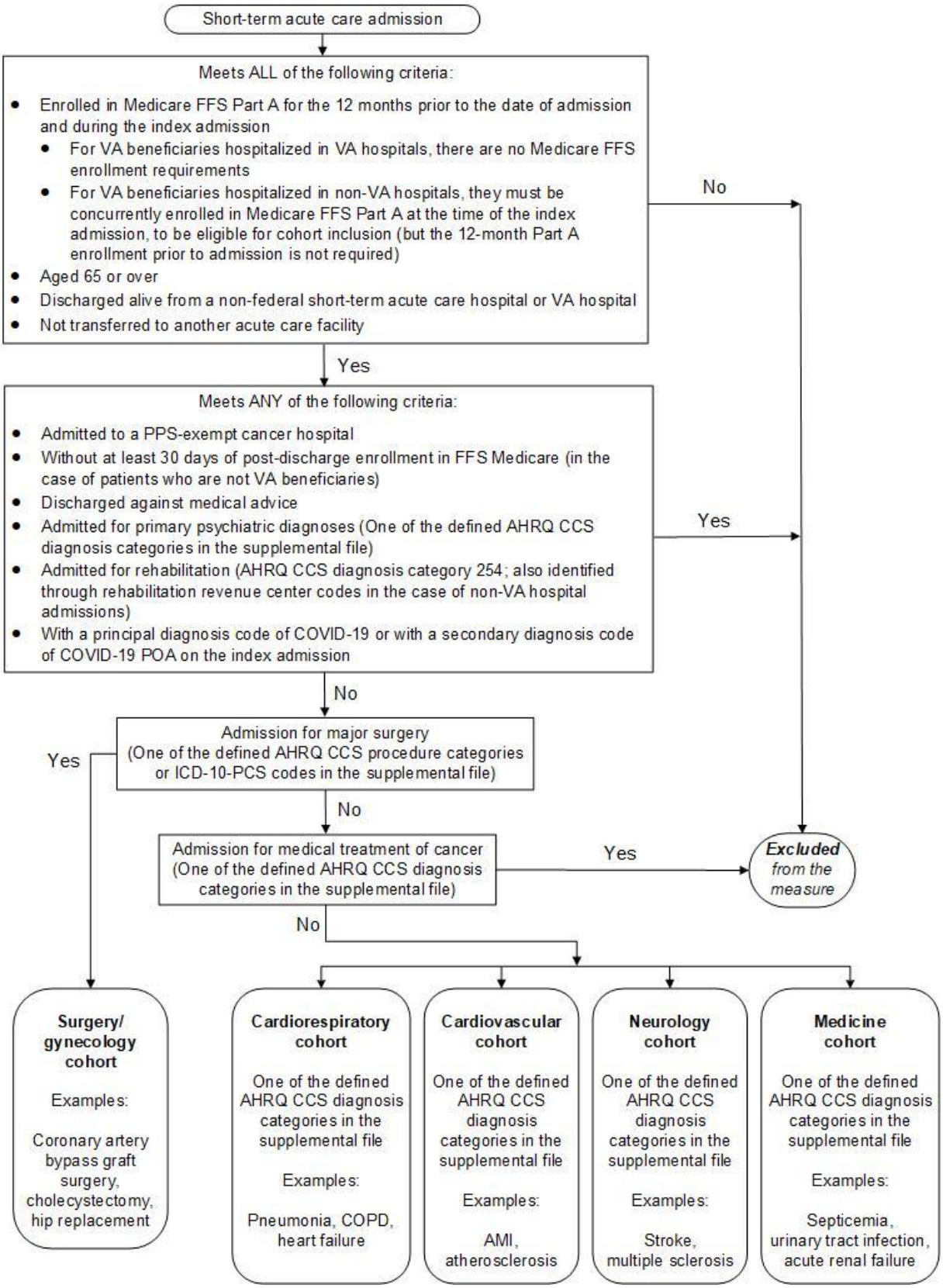
Figure D.1 — HWR Flow Diagram of Inclusion and Exclusion Criteria and Specialty Cohort Assignment for the Index Admission



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CMS Supplemental File - All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2024

Please review the Supplemental File spreadsheet for the full Cohort tables for:

- HWR Specialty Cohort Inclusions - Procedure and Diagnosis CCS groups
- HWR Surgery/Gynecology Specialty Cohort Inclusions - ICD-10-PCS Codes
- HWR Cohort Exclusions
- Also included are tables PR.1, PR.2, PR.3, and PR.4

Observed

This is the observed readmission rate for the outcome cases. The calculation is as follows:

Numerator The number of readmissions within 30 days of an index admission
Denominator The number of outcome cases (index admissions)

Both the numerator and denominator have exclusions.

If there is an unplanned readmission after an index admission, the Observed value is 100%.

MS-DRG		Total Cases	Outcome Cases	Observed
29	Spinal PX wCC or spinal neurostimulators	1	1	100.00%

If there is no unplanned readmission after an index admission, or the readmission is considered planned, the Observed value is 0%.

MS-DRG		Total Cases	Outcome Cases	Observed
30	Spinal procedures w/o CC/MCC	1	1	0.00%

Note: The Observed value for the Mortality outcome works the same way; 100% if the patient expired and 0% if the patient did not expire.

Expected

The Expected Readmission rate measures the likelihood that a readmission may occur within 30 days of the discharge date. Each patient encounter is an index admission and receives a readmission risk score based on certain characteristics of the admission and the condition of the patient upon discharge. The Expected Readmission rate is the average of the readmission risk scores of the index admissions.

Observed/Expected (O/E)

O/E is the Observed value (O) divided by the Expected value (E).

- Outcomes with an O/E less than 1.0 are performing better than expected.
- Outcomes with an O/E greater than 1.0 are performing worse than expected.

Statistical Significance

Statistical Significance for risk-adjusted readmissions is calculated with a Z-test.

Asterisks display for Statistical Significance if the variation between the Observed and Expected values is statistically significant and not due to random chance.

There are three confidence levels: 75%, 95%, and 99%, represented by asterisks.

Variation

Variation is the Observed value minus the Expected value.

- Outcomes with a negative variation are performing better than expected.
- Outcomes with a positive variation are performing worse than expected.

Variation has three levels of Statistical Significance: 75%, 95%, and 99%.

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Opportunity (Readmissions)

Variation multiplied by the Outcome Cases. There must be at least one readmission opportunity for a value to display. Readmission opportunities are rounded to the nearest whole number. *The metric is available at the facility level only.*

Planned Readmission Algorithm (PRA) Version 4.0 2024 - Overview and Population Tables

Planned Readmission Algorithm (PRA) version 4.0 2024

For patient discharges 10/1/2020 and forward

Additional Reference Documents:

Planned Readmission Algorithm v4.0 2024 - ICD-10 to CCS category crosswalk (MS Excel File)

CMS Supplemental File - All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2024 (MS Excel File)

Readmission Overview

Readmission measures are intended to capture unplanned readmissions that arise from acute clinical events requiring urgent re-hospitalization within 30 days of discharge.

While *planned* readmissions generally do not reflect quality of care, *unplanned* readmissions generally do. Therefore the Centers for Medicare and Medicaid Services (CMS) worked with experts in the medical community as well as other stakeholders to develop **Planned Readmission Algorithms** (PRA) that identify planned readmissions for procedures and treatments, and excludes them from readmission measures.

The planned readmission algorithm is a set of criteria for classifying readmissions as planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The planned readmission algorithm has three fundamental principles:

1. A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);
2. Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and,
3. Admissions for acute illness or for complications of care are never planned.

The planned readmission algorithm uses a flowchart and four tables of specific procedure categories and discharge diagnosis categories to classify readmissions as planned (Appendix E). As illustrated in Figure PR.1, readmissions are considered planned if any of the following occurs during the readmission:

1. A procedure is performed that is in one of the procedure categories that are always planned regardless of diagnosis;
2. The principal diagnosis is in one of the diagnosis categories that are always planned; or,
3. A procedure is performed that is in one of the potentially planned procedure categories and the principal diagnosis is not in the list of acute discharge diagnoses.

In order to accurately evaluate planned and unplanned readmissions, QualityAdvisor™ accommodates two CareScience Risk-Adjusted Readmission methodologies based on separate PRA versions:

- All-Cause Hospital-Wide 30-Day Readmission Methodology based on Planned Readmission Algorithm version 4.0 **2023** (applicable for discharges beginning October 1, 2020 and forward)
- All-Cause Hospital-Wide 30-Day Readmission Methodology based on Planned Readmission Algorithm version 4.0 **2024** (applicable for discharges beginning October 1, 2020 and forward)

You will be prompted to select a Readmission Methodology to apply to an analysis (if needed).

The CMS Planned Readmission Algorithm Version 4.0 2024 has been incorporated into Premier's CareScience risk-adjusted 2024 version of the All-Cause Hospital-Wide 30-day readmission measure.

Affected Analyses

The Planned Readmission Algorithm version 4.0 2024 is available to use for the following analyses:

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Readmission Analyses

- CareScience Risk-Adjusted 30-Day Readmission (Facility and Peer)
- System 30-Day Readmission (Facility)
- Reason for Readmission – Planned vs Unplanned (Facility and Peer)

Standard Analyses

- Outcome Profile (Facility)
- Custom Comparison Analysis (Facility and Peer)
- Non Risk-Adjusted Outcomes Analysis (Facility)
- Index Opportunity Analysis (Facility)
- Disease Strata by Outcome (Facility)

Note: The HWR PRA v4.0 2024 metrics are included in these analyses

Notes:

- The Reason for Readmission (Total Readmissions) - Facility and Peer does not incorporate the planned readmission methodology.

In both Custom Query and Custom Comparison, the 2024 version of the HWR 30-day CareScience risk-adjusted readmission metrics have been added along with the existing 2023 version of the HWR All-Cause 30-Day CareScience risk-adjusted readmission metrics that also exclude planned readmissions.

Outcome Case Exclusions - Specific to the Readmissions Outcome

Patients with the following discharge statuses are excluded from the outcome cases:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

In addition to these exclusions, in order to be an outcome case, a patient must also fall into the HWR cohort, which is made up of 5 mutually exclusive “specialty cohorts”:

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- Surgery/Gynecology
- Cardiorespiratory
- Cardiovascular
- Neurology
- Medicine

Patients that do not qualify for one of these 5 specialty cohorts are excluded from the HWR methodology. This includes patients that fall into the following cohorts:

- Psych
- Rehab
- Cancer

The above cohorts are identified by specific CCS codes included within the supplemental file mentioned within the CMS All-Cause Hospital-Wide Readmission specification.

The following HWR flow diagram details cohort inclusion and exclusion criteria and assignment:

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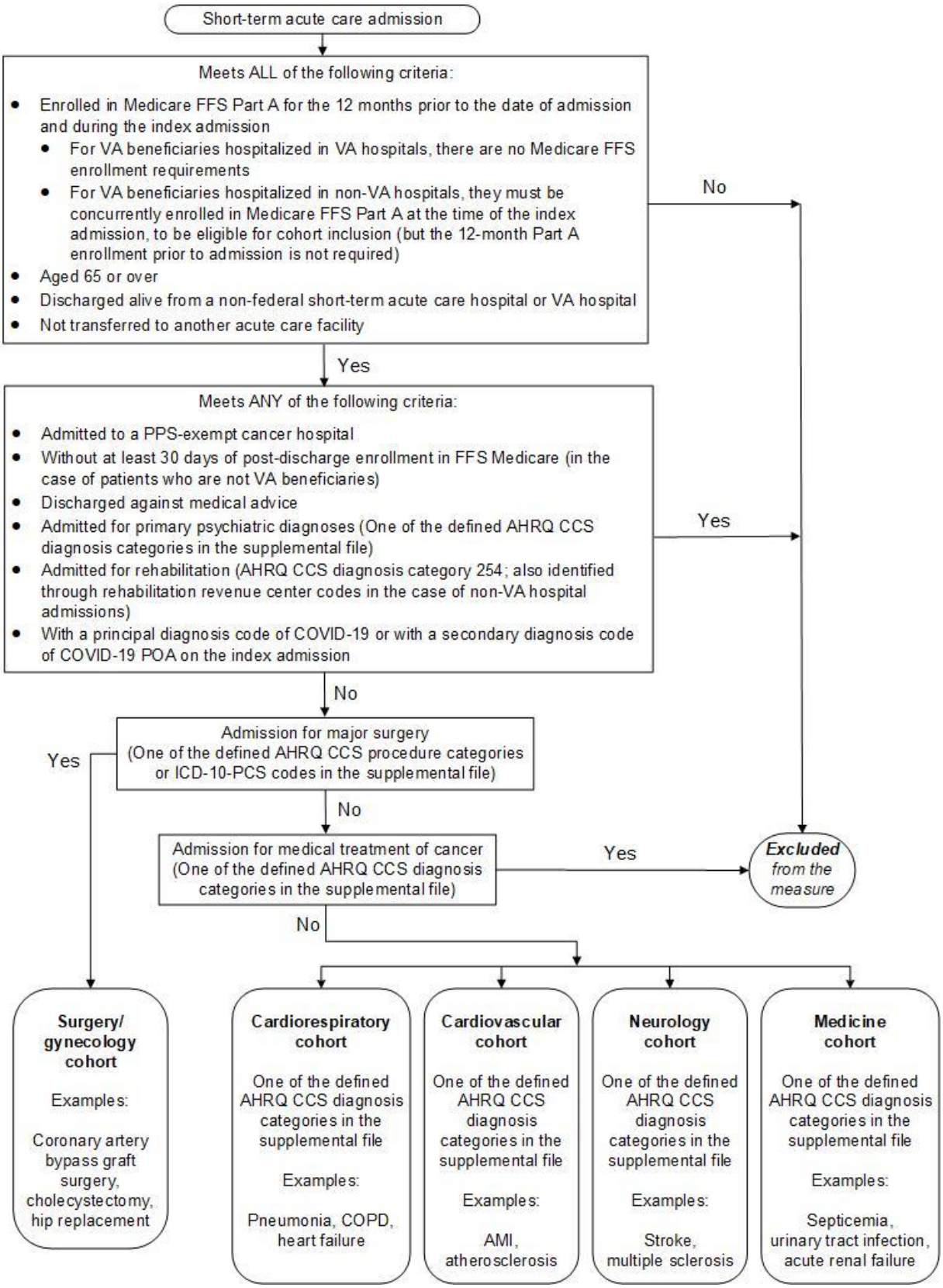
Figure D.1 — HWR Flow Diagram of Inclusion and Exclusion Criteria and Specialty Cohort Assignment for the Index Admission



All 5 of the included specialty cohorts share a common list of codes that define a given rule (i.e. Tables PR1-PR4 that make up the Planned Readmission Algorithm).

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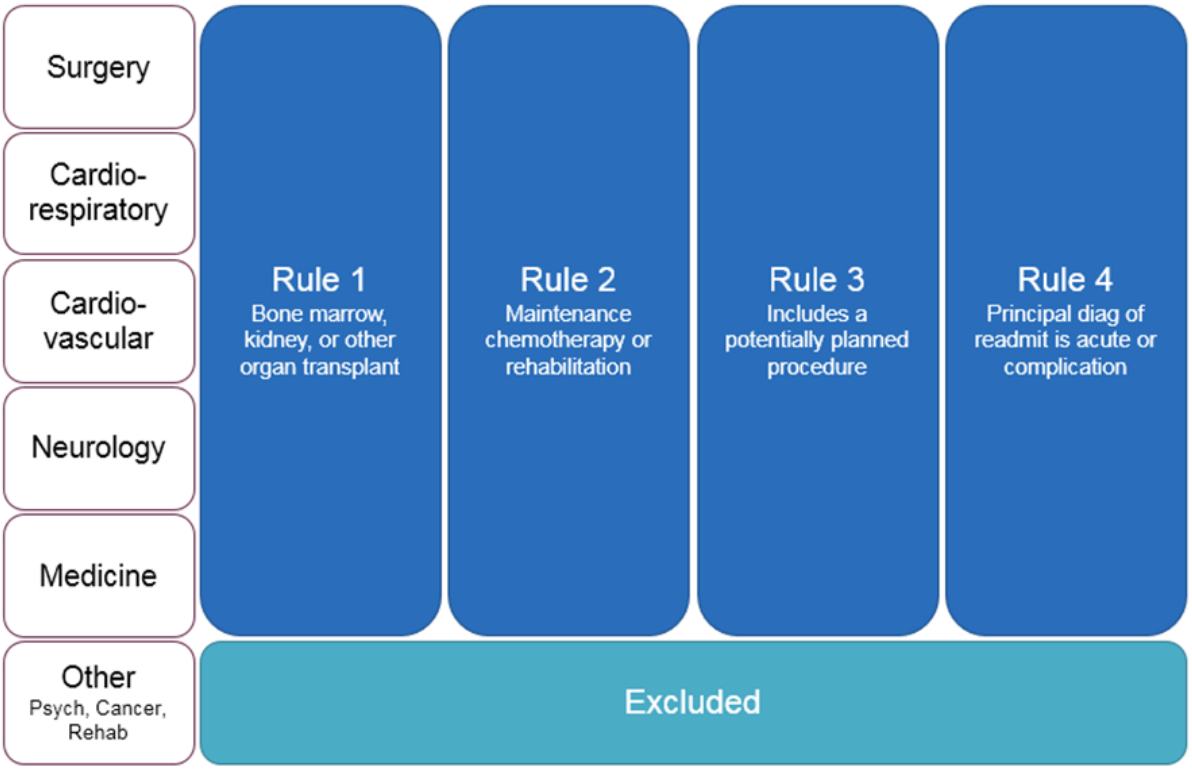

Note: These definitions are also in alignment with the rule definitions that are used by the AMI / HF / PN / COPD / STK cohorts in the CMS Condition-Specific Readmission methodology.

About the Algorithm

The HWR methodology is based entirely on ICD-10 coding, meaning that both Observed and Expected values are calculated using submitted ICD-10 codes.

The following is the PRA v4.0 2024 flowchart:

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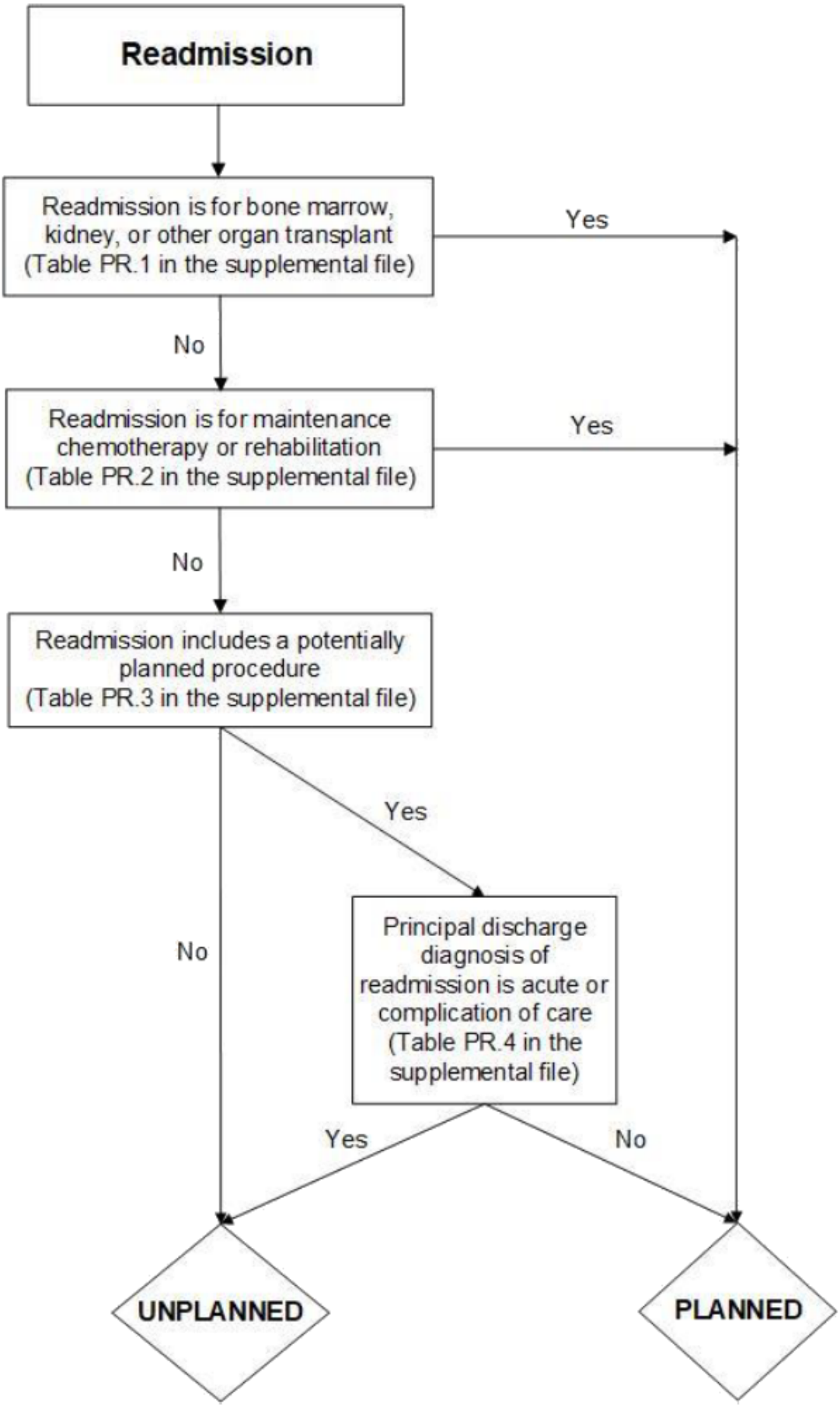
Figure E.1 — Planned Readmission Algorithm Version 4.0 2024 Flowchart



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Planned Readmission Algorithm Version 4.0 2024 (ICD-10) Tables - HWR Measure

Table PR.1 – Procedure Categories That Are Always Planned (Version 4.0 2024 [ICD-10])

AHRQ CCS Procedure	Description
64	Bone marrow transplant
105	Kidney transplant
176	Other organ transplantation (other than bone marrow corneal or kidney)

Table PR.2 – Diagnosis Categories That Are Always Planned (Version 4.0 2024 [ICD-10])

AHRQ CCS Diagnosis	Description
45	Maintenance chemotherapy; radiotherapy
254	Rehabilitation care; fitting of prostheses; and adjustment of devices

Table PR.3 – Potentially Planned Procedures (Version 4.0 2024 [ICD-10])

Procedure Category / ICD-10-PCS Codes	Description
AHRQ CCS Procedure Categories	
1	Incision and excision of CNS
2	Insertion; replacement; or removal of extracranial ventricular shunt
3	Excision destruction or resection of intervertebral disc
5	Insertion of catheter or spinal stimulator and injection into spinal canal
9	Other OR therapeutic nervous system procedures
10	Thyroidectomy; partial or complete
12	Therapeutic endocrine procedures
33	Other OR procedures on mouth and throat
36	Lobectomy or pneumonectomy
38	Other diagnostic procedures on lung and bronchus
40	Other diagnostic procedures on the respiratory system and mediastinum
42	Other OR Rx procedures on respiratory system and mediastinum

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Procedure Category / ICD-10-PCS Codes	Description
43	Heart valve procedures
44	Coronary artery bypass graft (CABG)
45	Percutaneous transluminal coronary angioplasty (PTCA) with or without stent placement
51	Endarterectomy; vessel of head and neck
52	Aortic resection; replacement or anastomosis
53	Varicose vein stripping; lower limb
55	Peripheral vascular bypass
56	Other vascular bypass and shunt; not heart
59	Other OR procedure on vessels of head and neck
66	Procedures on spleen
67	Other procedures; hemic and lymphatic systems
74	Gastrectomy; partial and total
78	Colorectal resection
79	Excision (partial) of large intestine (not endoscopic)
84	Cholecystectomy and common duct exploration
85	Inguinal and femoral hernia repair
86	Other hernia repair
94	Other OR upper GI therapeutic procedures
96	Other OR upper GI therapeutic procedures
99	Other OR gastrointestinal therapeutic procedures
104	Nephrectomy; partial or complete
106	Genitourinary incontinence procedures
107	Extracorporeal lithotripsy; urinary
109	Procedures on the urethra
113	Transurethral resection of prostate (TURP)
114	Open prostatectomy
118	Other OR therapeutic procedures; male genital
119	Oophroectomy; unilateral and bilateral
120	Other operations on ovary

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Procedure Category / ICD-10-PCS Codes	Description
123	Other operations on fallopian tubes
124	Hysterectomy; abdominal and vaginal
125	Other excision of cervix and uterus
129	Repair of cystocele and rectocele; obliteration of vaginal vault
132	Other OR therapeutic procedures; female organs
142	Partial excision bone
147	Fracture treatment including reposition with or without fixation; lower extremity fracture or dislocation (other than hip or femur)
148	Fracture treatment including reposition with or without fixation of other fracture or or dislocation
152	Arthroplasty knee
153	Hip replacement; total and partial
154	Arthroplasty other than hip or knee
158	Spinal fusion
159	Other diagnostic procedures on musculoskeletal system
160	Other therapeutic procedures on muscles and tendons
161	Other OR therapeutic procedures on bone
162	Other OR therapeutic procedures on joints
163	Other non-OR therapeutic procedures on musculoskeletal system
164	Other OR therapeutic procedures on musculoskeletal system
166	Lumpectomy; quadrantectomy of breast
167	Mastectomy
172	Skin graft
175	Other OR therapeutic procedures on skin subcutaneous tissue fascia and breast
211	Radiation therapy
224	Cancer chemotherapy

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Procedure Category / ICD-10-PCS Codes	Description
ICD-10-PCS Codes Table PR.3: Potentially Planned Procedures (General Readmission) (ICD-10 PCS codes) (PRA v4.0_2024)	

Table PR.4 – Acute Diagnoses (Version 4.0 2024 [ICD-10])

Diagnosis Category / ICD-10-CM Codes	Description
AHRQ CCS Diagnosis Categories	
2	Septicemia (except in labor)
3	Bacterial infection; unspecified site
4	Mycoses
5	HIV infection
7	Viral infection
8	Other infections; including parasitic
9	Sexually transmitted infections (not HIV or hepatitis)
54	Gout and other crystal arthropathies
55	Fluid and electrolyte disorders
60	Acute posthemorrhagic anemia
61	Sickle cell anemia
63	Diseases of white blood cells
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
78	Other CNS infection and poliomyelitis
82	Paralysis
83	Epilepsy; convulsions
84	Headache; including migraine
85	Coma; stupor; and brain damage
87	Retinal detachments; defects; vascular occlusion; and retinopathy
89	Blindness and vision defects

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Diagnosis Category / ICD-10-CM Codes	Description
90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)
91	Other eye disorders
92	Otitis media and related conditions
93	Conditions associated with dizziness or vertigo
99	Hypertension with complications and secondary hypertension
100	Acute myocardial infarction
102	Nonspecific chest pain
104	Other and ill-defined heart disease
107	Cardiac arrest and ventricular fibrillation
109	Acute cerebrovascular disease
112	Transient cerebral ischemia
116	Aortic and peripheral arterial embolism or thrombosis
118	Phlebitis; thrombophlebitis and thromboembolism
120	Hemorrhoids
122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)
123	Influenza
124	Acute and chronic tonsillitis
125	Acute bronchitis
126	Other upper respiratory infections
127	Chronic obstructive pulmonary disease and bronchiectasis
128	Asthma
129	Aspiration pneumonitis; food/vomitus
130	Pleurisy; pneumothorax; pulmonary collapse
131	Respiratory failure; insufficiency; arrest (adult)
135	Intestinal infection
137	Diseases of mouth; excluding dental

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Diagnosis Category / ICD-10-CM Codes	Description
139	Gastroduodenal ulcer (except hemorrhage)
140	Gastritis and duodenitis
142	Appendicitis and other appendiceal conditions
145	Intestinal obstruction without hernia
146	Diverticulosis and diverticulitis
148	Peritonitis and intestinal abscess
153	Gastrointestinal hemorrhage
154	Noninfectious gastroenteritis
157	Acute and unspecified renal failure
159	Urinary tract infections
165	Inflammatory conditions of male genital organs
168	Inflammatory diseases of female pelvic organs
172	Ovarian cyst
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
210	Systemic lupus erythematosus and connective tissue disorders
237	Complication of device; implant or graft
245	Syncope
246	Fever of unknown origin
247	Lymphadenitis
249	Shock
250	Nausea and vomiting
251	Abdominal pain
252	Malaise and fatigue
259	Residual codes; unclassified
650	Adjustment disorders
651	Anxiety disorders
652	Attention-deficit conduct and disruptive behavior disorders

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Diagnosis Category / ICD-10-CM Codes	Description
653	Delirium dementia and amnestic and other cognitive disorders
656	Impulse control disorders NEC
658	Personality disorders
660	Alcohol-related disorders
661	Substance-related disorders
663	Screening and history of mental health and substance abuse codes
670	Miscellaneous mental health disorders
ICD-10-CM Codes Table PR.4: Acute Diagnoses (General Readmission) (ICD-10 CM codes) (PRA v4.0_2024)	

All-Cause Hospital-Wide 30-Day Readmission Methodology (CareScience Risk-Adjusted)

Based on the Planned Readmission Algorithm (PRA) version 4.0 2023

For patient discharges 10/1/2020 and forward

This methodology is available via the following Standard Analyses:

- CareScience Risk-Adjusted 30-Day Readmission - Facility and Peer
- System 30-Day Readmission - Facility
- CareScience Outcome Profile - Facility
- CareScience Custom Comparison Analysis - Facility and Peer
- CareScience Index Opportunity - Facility
- Disease Strata by Outcome - Facility

Overview

This section provides an overview of the All-Cause Hospital-Wide 30-Day Readmission Methodology:

- **Interval**: Within 30 days
- **All-Cause**: Patients readmitted with any diagnosis
- **Patient Type**: Only inpatients (Inpatient Patient Type 08)
- **Same-Day Readmissions**: Included
- **Readmission Rate**: The Observed value is the readmission rate. Planned readmissions are excluded from the observed value as defined by the CMS Planned Readmission Algorithm v4.0 2022. For CMS documentation on this algorithm, refer to the 2023 Hospital-Wide All Cause Readmission Measure Updates and Specifications Report (Version 12.0)
- **Risk Method**: CareScience Standard and Select Practice

The CMS Hospital-Wide 30-Day Readmission Methodology Based on PRA version 4.0 2023 defines a HWR cohort made up of 5 mutually exclusive “specialty cohorts”:

- Surgery/Gynecology
- Cardiorespiratory

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- Cardiovascular
- Neurology
- Medicine

All 5 cohorts share a common list of codes that define a given rule. That is to say that tables PR1 through PR4 that make up the PRA are all the same for the entire measure. These definitions are also in alignment with the rule definitions that are used by the AMI/HF/PN/COPD/STK cohorts in the CMS condition specific methodology.

Patients that do not qualify for one of these 5 cohorts above are excluded from the HWR measure. These patients generally fall into the following cohorts:

- Psych
- Rehab
- Cancer

Note: COVID-19 patients have been removed from all specialty cohorts and are not eligible for the readmission outcome.

Important!
If the patient case is considered a surgical Obstetric case and includes a qualifying procedure, the patient would group to the Hospital-Wide Readmission cohort based on the Surgery Gynecology specialty cohort. However, if the patient case is considered a medical Obstetric case and does not include a qualifying procedure, the patient would not group to the Hospital-Wide Readmission cohort as the case would not be considered part of the Surgery Gynecology specialty cohort as the principal diagnosis indicating an OB medical encounter alone does not qualify a patient for the Hospital-Wide Readmission cohort.

Numerator and Denominator Exclusions

Cases excluded from the numerator are the cases that are not considered readmissions or are determined to be planned readmissions.

Cases excluded from the denominator are the cases that are not considered eligible index admissions. The denominator cases are the outcome cases.

These are excluded from the...	Numerator	Denominator
Patient Types other than Inpatient (08)	X	X
Planned readmission	X	
Outcome Cases exclusions		X
COVID-19 Patients (U07.1)	X	X

Important Terms for Risk-Adjusted Readmissions

These are the key concepts for working with risk-adjusted readmissions.

Index Admission

As defined by CMS, an index admission is the hospitalization considered for the readmission outcome.

The CareScience Analytics Risk-Adjusted Readmissions methodology focuses on index admissions that have readmissions. Tracking index admissions can indicate opportunities for improvement in hospital readmissions.

Readmission

A readmission is an inpatient admission of the same patient within 30 days of a previous admission to the same facility, regardless of the admission cause. For each index admission, the first subsequent admission for the same patient is eligible to be a readmission. The CMS Planned Readmission Algorithm v4.0 2023 has been incorporated into the existing readmission methodology to exclude planned readmissions from observed values.

> **Note**: According to the CMS Hospital-Wide All-Cause Unplanned Readmission Measure (Final Technical Report), a readmission is defined as an admission to an acute care hospital within 30 days of discharge from an acute care hospital. The definition also indicates that a readmission may in turn serve as an index

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admission. The measure notes that a readmission within 30-days will also be eligible as an index admission, if it meets all other eligibility criteria. Based on this information, the QualityAdvisor all-cause readmission methodology, where a readmitted visit can also be an index visit, does mimic the CMS specifications.

Readmission Risk Score

A risk score is the estimated probability that a readmission to the same facility may occur within 30 days from the discharge date. A readmission risk score is calculated for each index admission.

Interval

The interval is the number of days between the index admission's Discharge Date and readmission visit's Admission Date. For 30 Day readmissions, the interval is within 30 days. For example:

Index Visit Discharge Date = December 20, 2022
Readmission Visit Admission Date = December 27, 2022
Interval = 7 Days

Timeframe

The timeframe is the period of time included in the analysis determined by selections at the Time prompt.

The timeframe selected within the analysis is for the index visit only. In order to capture all readmitted visits, move your "Through" date back 30 days from what has been Facility Published.

CareScience Analytics Risk-Adjustment for Readmissions

CareScience Analytics is used to calculate Observed and Expected values. CareScience Analytics is the risk-adjustment methodology defined by researchers within Premier based on in-depth clinical and analytical research techniques that is currently used to calculate mortality, cost, charge, LOS, and complications. This same team developed CareScience Analytics risk adjustment for the readmissions outcome.

Index Admissions

The readmissions risk-adjustment process starts with identifying the eligible index admissions and readmissions. Index admissions and readmissions are defined by how the admissions relate to each other within the parameters selected at the prompts (such as Facilities and Time).

After the index admissions and readmissions are identified, a risk score is calculated for each index admission using the same risk factors that CareScience Analytics uses to calculate risk scores for other outcomes such as mortality, LOS, and cost. The risk scores for the index admissions are then aggregated to calculate the Expected value on the analysis.

Risk scores are calculated for index admissions (as opposed to readmissions) because Expected values measure the likelihood that a patient will be readmitted based on the circumstances of the index admission. When a patient is readmitted, there is no likelihood of readmission to measure because the readmission has already occurred. Therefore, when calculating the Expected value, only the risk scores for the index admissions are included in the calculation.

In the following example of Patient A for the month of June 2023, only the risk scores from the index admissions are used to calculate the Expected value.

Patient	Admission Date	Discharge Date	Admission Type	Risk Score?
Patient A	6/2/23	6/4/23	Index	Y
Patient A	6/10/23	6/15/23	Readmission/Index*	Y
Patient A	6/20/23	6/26/23	Readmission/Index*	Y
Patient A	6/30/23	7/7/23	Readmission (patient expired)	N

*A readmission can be linked to only one previous index admission. As a result, for patients with multiple admissions within the timeframe of one analysis, one admission can count as both an index admission and a readmission.

On the Risk-Adjusted 30-Day Readmission analysis:

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- The Outcome Cases are the index admissions that qualified for the analysis and the denominator in the Observed value.
- The attribute on the row represents the index admissions that had that attribute.
- You can drill to the Risk-Adjusted Readmissions Patient Visit Detail analysis to see which visits are index admissions. Index admissions are indicated by an “I” in the Readmission Visit column.

Logistic Regression Model

For the Length of Stay outcome, CareScience Analytics uses a semi-log regression model to derive the risk score. For the Readmission and Mortality outcomes, CareScience Analytics uses a logistic regression model (aka logit model) to derive the risk score.

Logistic regression is highly effective at estimating the odds that an event will occur given a set of conditions. For readmissions, it’s the odds that a readmission will occur based on the clinical, patient selection, and demographic characteristics of the index admission.

Logistic regression is best suited for binary outcomes, which means the outcome can be only one of two options: did occur (1) or did not occur (0). The readmissions outcome is a binary outcome because an unplanned readmission either did occur (1) or did not occur (0) after an index admission.

The readmission risk score estimates the odds that an unplanned readmission will occur (1) given the variables of the index admission. Due to the log-odds transformation of the logit model applied when calculating the risk score, the readmission risk score is guaranteed to be within the bound of 0 and 1.

If there is an unplanned readmission after an index admission, the index admission is set to 1 and the Observed value is 100%. If there is no readmission, or the readmission is considered planned, the outcome is set to 0 and the Observed value is 0%.

Risk-Adjusted Readmission Metrics

This section describes the risk-adjusted readmission metrics.

Same-Day Readmissions

Since same-day readmissions are defined as being admitted and discharged on the same calendar day, the Admit and Discharge times can distinguish each unique visit, even when taking place on the same calendar day.

- CMS considers patients as “readmitted” if they had an eligible readmission to the same hospital on the same day but for a different condition/procedure. Patients are not considered “readmitted” if the readmission was to the same hospital for the same condition/procedure and on the same calendar day.
- Premier uses admission dates and times to determine the sequence of patient visits, and does not consider conditions/procedures to determine readmissions. This is because by the time Premier receives final billing, it is assumed that all claims considered as the "same condition" have already been merged.

CareScience Standard and Select Practice

QualityAdvisor offers two risk-adjustment calculation modes for analyses using CareScience Analytics: Standard Practice and Select Practice.

The algorithm for both Standard and Select Practice is based on Premier’s database, which identifies readmissions to the same facility in the database.

Total Cases

The total cases are the inpatient index admissions that qualified for the analysis.

It is important to note that Total Cases includes only patients with the Patient Type of Inpatient (08). This is the only risk-adjusted outcome where the Total Cases metric is restricted to one Patient Type.

Outcome Cases

The outcome cases are the inpatient index admissions that qualified for the analysis and qualified for risk-adjustment.

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It is important to note that the Outcomes Cases metric includes only patients with the Patient Type of Inpatient (08). This is the only risk-adjusted outcome where the Outcomes Cases metric is restricted to one Patient Type.

Outcome Case Exclusions – General

Cases are excluded from the outcome cases if the information required to risk- adjust a patient such as age, admission type, charges, etc. is missing from the case.

Outcome Case Exclusions – Specific to the Readmissions Outcome

Patients with the following discharge statuses are excluded from the outcome cases:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

Additional Outcome Case Exclusions specific to the All-Cause Hospital-Wide 30-Day Readmission methodology:

In addition to the above Readmission Outcome Case exclusions, the All-Cause Hospital-Wide 30-day Readmission outcome defines a Hospital-Wide Readmission (HWR) cohort which indicates that each eligible admission is assigned to one of five mutually exclusive specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology.

The cohorts that make up the HWR cohort mutually exclusive, and a given inpatient will only ever have one planned vs. unplanned status for a readmission under this implementation.

This measure excludes index admissions for patients:

- **Admitted for primary psychiatric diagnoses**

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric or rehabilitation centers that are not comparable to short-term acute care hospitals.

- **Admitted for rehabilitation**

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care.

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- **Admitted for medical treatment of cancer**

Rationale: These admissions have a different mortality and readmission profile than the rest of the Medicare population, and outcomes for these admissions do not correlate well with outcomes for other admissions. Patients with cancer admitted for other diagnoses or for surgical treatment of their cancer remain in the measure.

Note: Neonatal, gestational, and perinatal populations are also excluded from the HWR cohort group. This can be largely attributed to the fact that the Medicare claims data that Yale uses as its source for building its models does not contain many, if any, instances of these populations. COVID-19 patients have also been excluded from all 5 specialty cohorts.

The following HWR flow diagram details cohort inclusion and exclusion criteria and assignment:

Note: While the All-Cause Hospital-Wide 30-Day Readmission methodology implemented in QualityAdvisor is based on the CMS specification, Premier's implementation does not limit the Hospital-Wide Readmission cohort to Medicare patients age 65 and over. Premier's methodology evaluates all acute inpatients with no payer or age exclusions.

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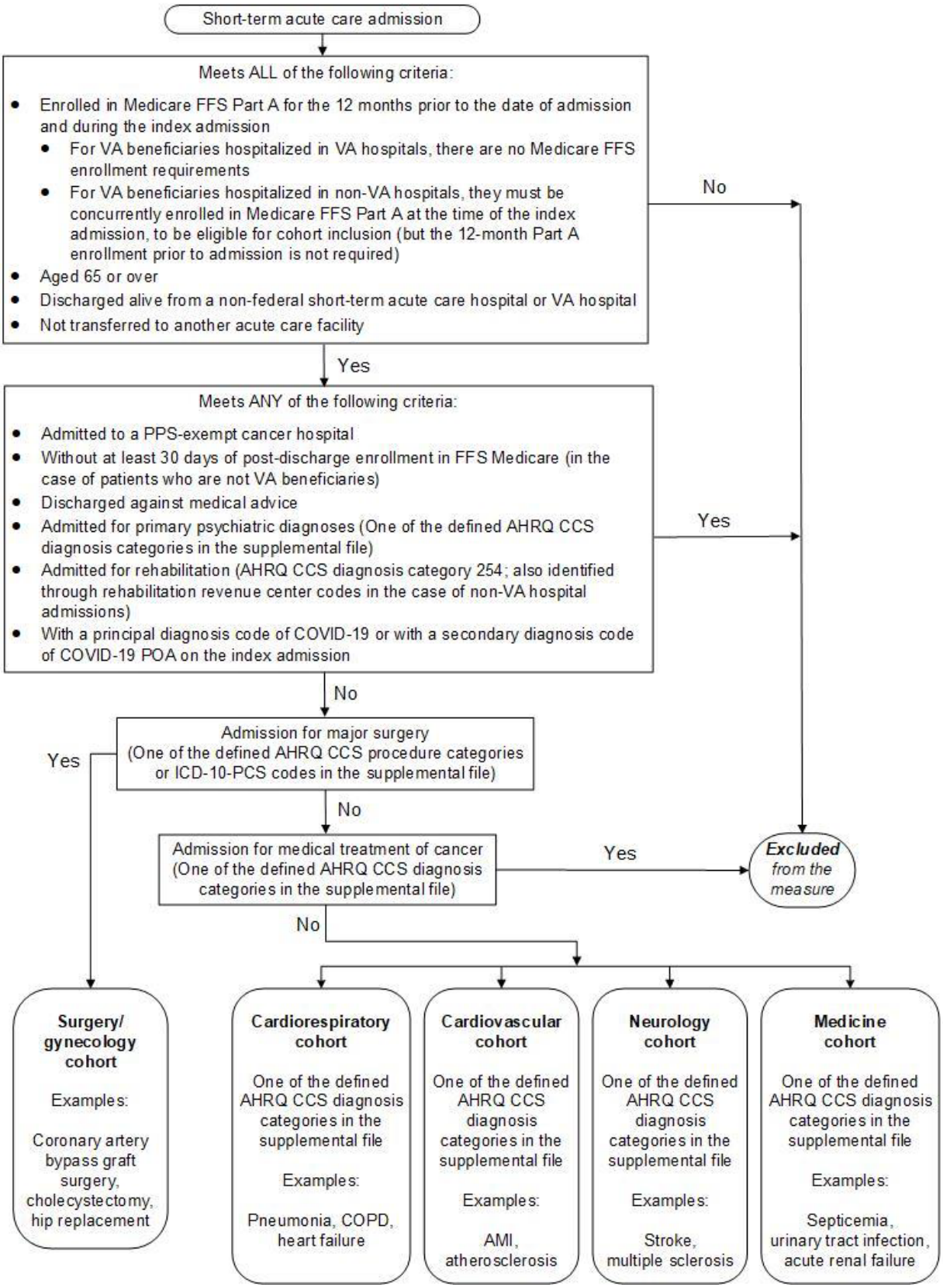
Figure D.1 — HWR Flow Diagram of Inclusion and Exclusion Criteria and Specialty Cohort Assignment for the Index Admission



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CMS Supplemental File - All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2023

Please review the Supplemental File spreadsheet for the full Cohort tables for:

- HWR Specialty Cohort Inclusions - Procedure and Diagnosis CCS groups
- HWR Surgery/Gynecology Specialty Cohort Inclusions - ICD-10-PCS Codes
- HWR Cohort Exclusions
- Also included are tables PR.1, PR.2, PR.3, and PR.4

Observed

This is the observed readmission rate for the outcome cases. The calculation is as follows:

Numerator The number of readmissions within 30 days of an index admission
Denominator The number of outcome cases (index admissions)

Both the numerator and denominator have exclusions.

If there is an unplanned readmission after an index admission, the Observed value is 100%.

MS-DRG		Total Cases	Outcome Cases	Observed
29	Spinal PX wCC or spinal neurostimulators	1	1	100.00%

If there is no unplanned readmission after an index admission, or the readmission is considered planned, the Observed value is 0%.

MS-DRG		Total Cases	Outcome Cases	Observed
30	Spinal procedures w/o CC/MCC	1	1	0.00%

Note: The Observed value for the Mortality outcome works the same way; 100% if the patient expired and 0% if the patient did not expire.

Expected

The Expected Readmission rate measures the likelihood that a readmission may occur within 30 days of the discharge date. Each patient encounter is an index admission and receives a readmission risk score based on certain characteristics of the admission and the condition of the patient upon discharge. The Expected Readmission rate is the average of the readmission risk scores of the index admissions.

Observed/Expected (O/E)

O/E is the Observed value (O) divided by the Expected value (E).

- Outcomes with an O/E less than 1.0 are performing better than expected.
- Outcomes with an O/E greater than 1.0 are performing worse than expected.

Statistical Significance

Statistical Significance for risk-adjusted readmissions is calculated with a Z-test.

Asterisks display for Statistical Significance if the variation between the Observed and Expected values is statistically significant and not due to random chance.

There are three confidence levels: 75%, 95%, and 99%, represented by asterisks.

Variation

Variation is the Observed value minus the Expected value.

- Outcomes with a negative variation are performing better than expected.
- Outcomes with a positive variation are performing worse than expected.

Variation has three levels of Statistical Significance: 75%, 95%, and 99%.

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Opportunity (Readmissions)

Variation multiplied by the Outcome Cases. There must be at least one readmission opportunity for a value to display. Readmission opportunities are rounded to the nearest whole number. *The metric is available at the facility level only.*

Planned Readmission Algorithm (PRA) Version 4.0 2023 - Overview and Population Tables

Planned Readmission Algorithm (PRA) version 4.0 2023

For patient discharges 10/1/2020 and forward

Additional Reference Document:

Planned Readmission Algorithm v4.0 2023 - ICD-10 to CCS category crosswalk (MS Excel File)

CMS Supplemental File - All-Cause Hospital-Wide 30-Day Readmission based on PRA v4.0 2023 (MS Excel File)

Readmission Overview

Readmission measures are intended to capture unplanned readmissions that arise from acute clinical events requiring urgent re-hospitalization within 30 days of discharge.

While *planned* readmissions generally do not reflect quality of care, *unplanned* readmissions generally do. Therefore the Centers for Medicare and Medicaid Services (CMS) worked with experts in the medical community as well as other stakeholders to develop **Planned Readmission Algorithms** (PRA) that identify planned readmissions for procedures and treatments, and excludes them from readmission measures.

The planned readmission algorithm is a set of criteria for classifying readmissions as planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The planned readmission algorithm has three fundamental principles:

1. A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);
2. Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and,
3. Admissions for acute illness or for complications of care are never planned.

The planned readmission algorithm uses a flowchart and four tables of specific procedure categories and discharge diagnosis categories to classify readmissions as planned (Appendix E). As illustrated in Figure PR.1, readmissions are considered planned if any of the following occurs during the readmission:

1. A procedure is performed that is in one of the procedure categories that are always planned regardless of diagnosis;
2. The principal diagnosis is in one of the diagnosis categories that are always planned; or,
3. A procedure is performed that is in one of the potentially planned procedure categories and the principal diagnosis is not in the list of acute discharge diagnoses.

In order to accurately evaluate planned and unplanned readmissions, QualityAdvisor™ accommodates two CareScience Risk-Adjusted Readmission methodologies based on separate PRA versions:

- All-Cause Hospital-Wide 30-Day Readmission Methodology based on Planned Readmission Algorithm version 4.0 **2023** (applicable for discharges beginning October 1, 2020 and forward)
- All-Cause Hospital-Wide 30-Day Readmission Methodology based on Planned Readmission Algorithm version 4.0 **2024** (applicable for discharges beginning October 1, 2020 and forward)

You will be prompted to select a Readmission Methodology to apply to an analysis (if needed).

The CMS Planned Readmission Algorithm Version 4.0 2023 has been incorporated into Premier's CareScience risk-adjusted 2023 version of the All-Cause Hospital-Wide 30-day readmission measure.

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Affected Analyses

The Planned Readmission Algorithm version 4.0 2023 is available to use for the following analyses:

Readmission Analyses

- CareScience Risk-Adjusted 30-Day Readmission (Facility and Peer)
- System 30-Day Readmission (Facility)
- Reason for Readmission – Planned vs Unplanned (Facility and Peer)

Standard Analyses

- Outcome Profile (Facility)
- Custom Comparison Analysis (Facility and Peer)
- Non Risk-Adjusted Outcomes Analysis (Facility)
- Index Opportunity Analysis (Facility)
- Disease Strata by Outcome (Facility)

Note: The HWR PRA v4.0 2023 metrics are included in these analyses

Notes:

- The Reason for Readmission (Total Readmissions) - Facility and Peer does not incorporate the planned readmission methodology.

In both Custom Query and Custom Comparison, the 2023 version of the HWR 30-day CareScience risk-adjusted readmission metrics have been added along with the existing 2022 version of the HWR All-Cause 30-Day CareScience risk-adjusted readmission metrics that also exclude planned readmissions.

Outcome Case Exclusions - Specific to the Readmissions Outcome

Patients with the following discharge statuses are excluded from the outcome cases:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

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In addition to these exclusions, in order to be an outcome case, a patient must also fall into the HWR cohort, which is made up of 5 mutually exclusive “specialty cohorts”:

- Surgery/Gynecology
- Cardiorespiratory
- Cardiovascular
- Neurology
- Medicine

Patients that do not qualify for one of these 5 specialty cohorts are excluded from the HWR methodology. This includes patients that fall into the following cohorts:

- Psych
- Rehab
- Cancer

The above cohorts are identified by specific CCS codes included within the supplemental file mentioned within the CMS All-Cause Hospital-Wide Readmission specification.

The following HWR flow diagram details cohort inclusion and exclusion criteria and assignment:

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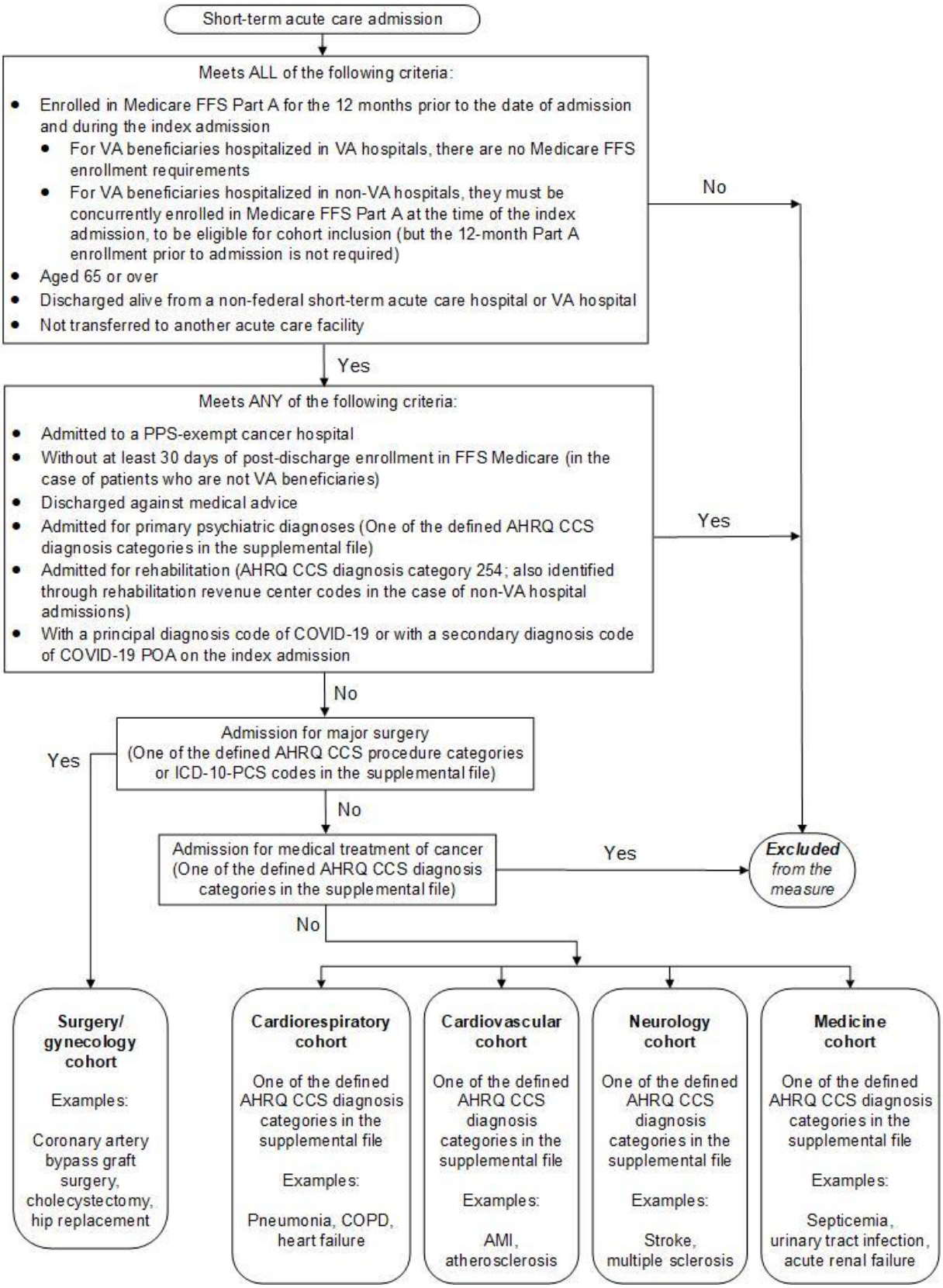
Figure D.1 — HWR Flow Diagram of Inclusion and Exclusion Criteria and Specialty Cohort Assignment for the Index Admission



All 5 of the included specialty cohorts share a common list of codes that define a given rule (i.e. Tables PR1-PR4 that make up the Planned Readmission Algorithm).

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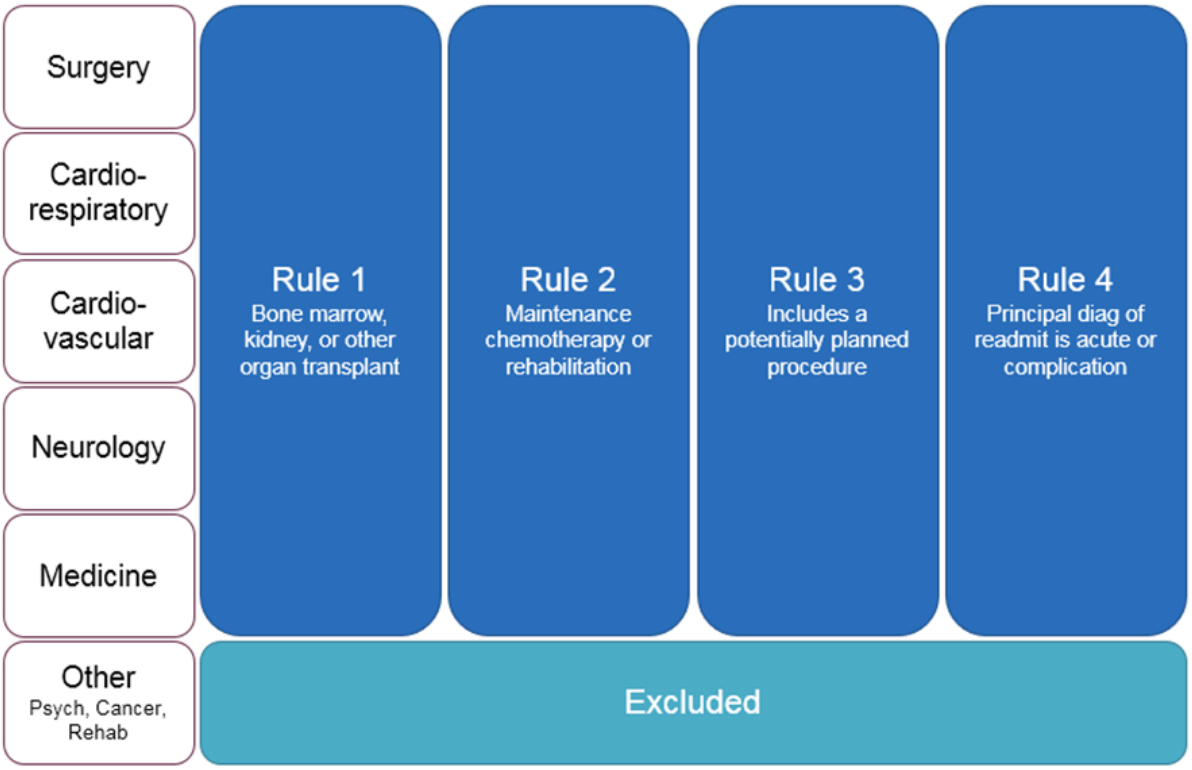

Note: These definitions are also in alignment with the rule definitions that are used by the AMI / HF / PN / COPD / STK cohorts in the CMS Condition-Specific Readmission methodology.

About the Algorithm

The HWR methodology is based entirely on ICD-10 coding, meaning that both Observed and Expected values are calculated using submitted ICD-10 codes.

The following is the PRA v4.0 2023 flowchart:

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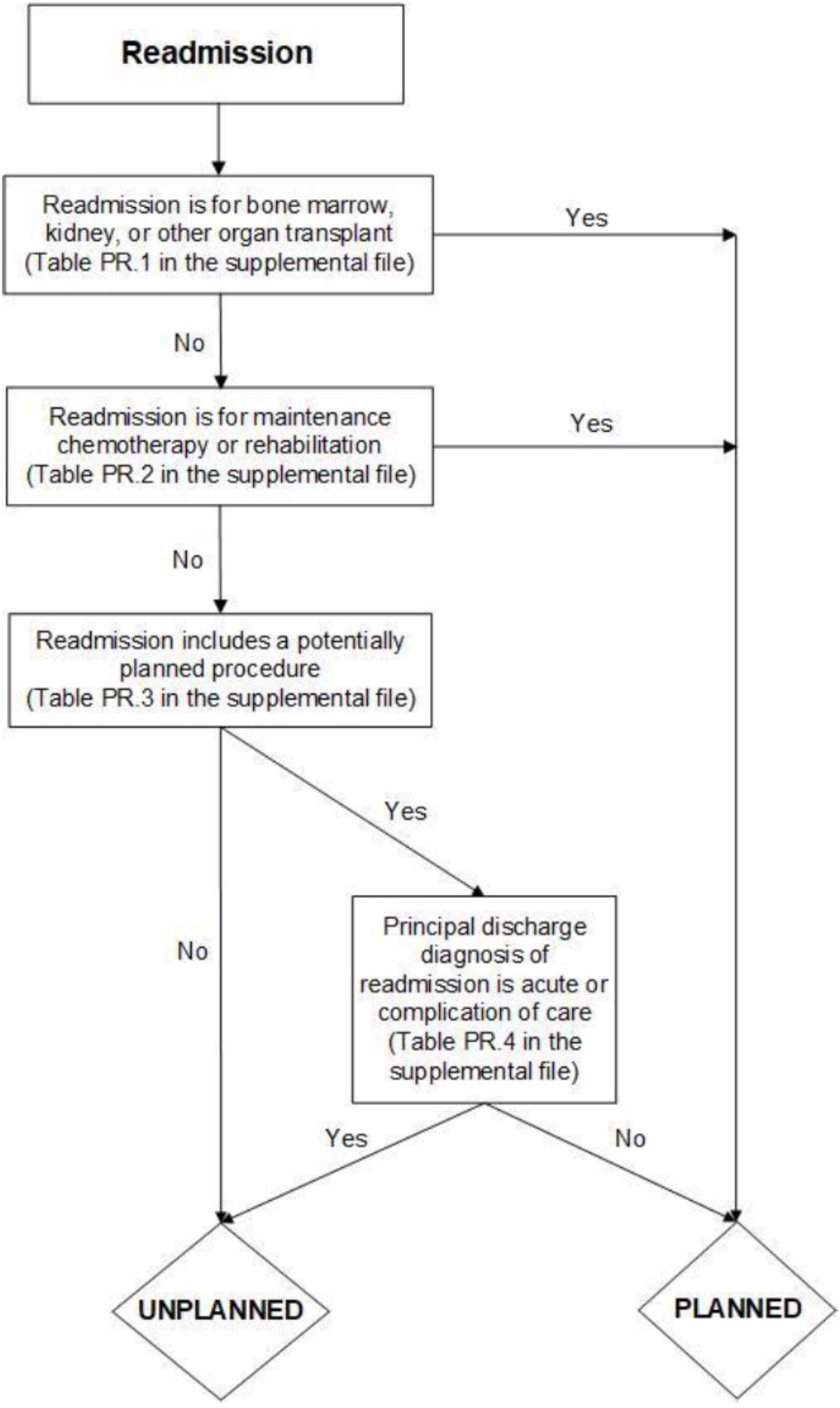
Figure PR.1 — Planned Readmission Algorithm Version 4.0 2023 Flowchart



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Planned Readmission Algorithm Version 4.0 2023 (ICD-10) Tables - HWR Measure

Table PR.1 – Procedure Categories That Are Always Planned (Version 4.0 2023 [ICD-10])

AHRQ CCS Procedure	Description
64	Bone marrow transplant
105	Kidney transplant
176	Other organ transplantation (other than bone marrow corneal or kidney)

Table PR.2 – Diagnosis Categories That Are Always Planned (Version 4.0 2023 [ICD-10])

AHRQ CCS Diagnosis	Description
45	Maintenance chemotherapy; radiotherapy
254	Rehabilitation care; fitting of prostheses; and adjustment of devices

Table PR.3 – Potentially Planned Procedures (Version 4.0 2023 [ICD-10])

Procedure Category / ICD-10-PCS Codes	Description
AHRQ CCS Procedure Categories	
1	Incision and excision of CNS
2	Insertion; replacement; or removal of extracranial ventricular shunt
3	Excision destruction or resection of intervertebral disc
5	Insertion of catheter or spinal stimulator and injection into spinal canal
9	Other OR therapeutic nervous system procedures
10	Thyroidectomy; partial or complete
12	Therapeutic endocrine procedures
33	Other OR procedures on mouth and throat
36	Lobectomy or pneumonectomy
38	Other diagnostic procedures on lung and bronchus
40	Other diagnostic procedures on the respiratory system and mediastinum
42	Other OR Rx procedures on respiratory system and mediastinum

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Procedure Category / ICD-10-PCS Codes	Description
43	Heart valve procedures
44	Coronary artery bypass graft (CABG)
45	Percutaneous transluminal coronary angioplasty (PTCA) with or without stent placement
51	Endarterectomy; vessel of head and neck
52	Aortic resection; replacement or anastomosis
53	Varicose vein stripping; lower limb
55	Peripheral vascular bypass
56	Other vascular bypass and shunt; not heart
59	Other OR procedure on vessels of head and neck
66	Procedures on spleen
67	Other procedures; hemic and lymphatic systems
74	Gastrectomy; partial and total
78	Colorectal resection
79	Excision (partial) of large intestine (not endoscopic)
84	Cholecystectomy and common duct exploration
85	Inguinal and femoral hernia repair
86	Other hernia repair
94	Other OR upper GI therapeutic procedures
96	Other OR upper GI therapeutic procedures
99	Other OR gastrointestinal therapeutic procedures
104	Nephrectomy; partial or complete
106	Genitourinary incontinence procedures
107	Extracorporeal lithotripsy; urinary
109	Procedures on the urethra
113	Transurethral resection of prostate (TURP)
114	Open prostatectomy
118	Other OR therapeutic procedures; male genital
119	Oophroectomy; unilateral and bilateral
120	Other operations on ovary

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Procedure Category / ICD-10-PCS Codes	Description
123	Other operations on fallopian tubes
124	Hysterectomy; abdominal and vaginal
125	Other excision of cervix and uterus
129	Repair of cystocele and rectocele; obliteration of vaginal vault
132	Other OR therapeutic procedures; female organs
142	Partial excision bone
147	Fracture treatment including reposition with or without fixation; lower extremity fracture or dislocation (other than hip or femur)
148	Fracture treatment including reposition with or without fixation of other fracture or or dislocation
152	Arthroplasty knee
153	Hip replacement; total and partial
154	Arthroplasty other than hip or knee
158	Spinal fusion
159	Other diagnostic procedures on musculoskeletal system
160	Other therapeutic procedures on muscles and tendons
161	Other OR therapeutic procedures on bone
162	Other OR therapeutic procedures on joints
163	Other non-OR therapeutic procedures on musculoskeletal system
164	Other OR therapeutic procedures on musculoskeletal system
166	Lumpectomy; quadrantectomy of breast
167	Mastectomy
172	Skin graft
175	Other OR therapeutic procedures on skin subcutaneous tissue fascia and breast
211	Radiation therapy
224	Cancer chemotherapy

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Procedure Category / ICD-10-PCS Codes	Description
ICD-10-PCS Codes Table PR.3: Potentially Planned Procedures (General Readmission) (ICD-10 PCS codes) (PRA v4.0_2023)	

Table PR.4 – Acute Diagnoses (Version 4.0 2022 [ICD-10])

Diagnosis Category / ICD-10-CM Codes	Description
AHRQ CCS Diagnosis Categories	
2	Septicemia (except in labor)
3	Bacterial infection; unspecified site
4	Mycoses
5	HIV infection
7	Viral infection
8	Other infections; including parasitic
9	Sexually transmitted infections (not HIV or hepatitis)
54	Gout and other crystal arthropathies
55	Fluid and electrolyte disorders
60	Acute posthemorrhagic anemia
61	Sickle cell anemia
63	Diseases of white blood cells
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
78	Other CNS infection and poliomyelitis
82	Paralysis
83	Epilepsy; convulsions
84	Headache; including migraine
85	Coma; stupor; and brain damage
87	Retinal detachments; defects; vascular occlusion; and retinopathy
89	Blindness and vision defects

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Diagnosis Category / ICD-10-CM Codes	Description
90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)
91	Other eye disorders
92	Otitis media and related conditions
93	Conditions associated with dizziness or vertigo
99	Hypertension with complications and secondary hypertension
100	Acute myocardial infarction
102	Nonspecific chest pain
104	Other and ill-defined heart disease
107	Cardiac arrest and ventricular fibrillation
109	Acute cerebrovascular disease
112	Transient cerebral ischemia
116	Aortic and peripheral arterial embolism or thrombosis
118	Phlebitis; thrombophlebitis and thromboembolism
120	Hemorrhoids
122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)
123	Influenza
124	Acute and chronic tonsillitis
125	Acute bronchitis
126	Other upper respiratory infections
127	Chronic obstructive pulmonary disease and bronchiectasis
128	Asthma
129	Aspiration pneumonitis; food/vomitus
130	Pleurisy; pneumothorax; pulmonary collapse
131	Respiratory failure; insufficiency; arrest (adult)
135	Intestinal infection
137	Diseases of mouth; excluding dental

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Diagnosis Category / ICD-10-CM Codes	Description
139	Gastroduodenal ulcer (except hemorrhage)
140	Gastritis and duodenitis
142	Appendicitis and other appendiceal conditions
145	Intestinal obstruction without hernia
146	Diverticulosis and diverticulitis
148	Peritonitis and intestinal abscess
153	Gastrointestinal hemorrhage
154	Noninfectious gastroenteritis
157	Acute and unspecified renal failure
159	Urinary tract infections
165	Inflammatory conditions of male genital organs
168	Inflammatory diseases of female pelvic organs
172	Ovarian cyst
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
210	Systemic lupus erythematosus and connective tissue disorders
237	Complication of device; implant or graft
245	Syncope
246	Fever of unknown origin
247	Lymphadenitis
249	Shock
250	Nausea and vomiting
251	Abdominal pain
252	Malaise and fatigue
259	Residual codes; unclassified
650	Adjustment disorders
651	Anxiety disorders
652	Attention-deficit conduct and disruptive behavior disorders

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Diagnosis Category / ICD-10-CM Codes	Description
653	Delirium dementia and amnestic and other cognitive disorders
656	Impulse control disorders NEC
658	Personality disorders
660	Alcohol-related disorders
661	Substance-related disorders
663	Screening and history of mental health and substance abuse codes
670	Miscellaneous mental health disorders
ICD-10-CM Codes Table PR.4: Acute Diagnoses (General Readmission) (ICD-10 CM codes) (PRA v4.0_2023)	

All-Cause 30-Day Readmissions Methodology for All Inpatients

For patient discharges 10/1/2020 and forward

This methodology evaluates readmissions within 30 days of an index visit (including same-day readmissions) for all Inpatient patient types.

This methodology is available via the following Analyses:

- Risk-Adjusted 30-Day Readmission - Facility and Peer (CareScience)
- System 30-Day Readmission - Facility (CareScience)
- CareScience Outcome Profile - Facility (CareScience)
- Custom Comparison Analysis - Facility and Peer (CareScience)
- Non Risk-Adjusted Outcomes - Facility
- Custom Query

Overview

This section provides an overview of the All-Cause 30-Day Readmission Methodology for All Inpatients:

- **Interval**: Within 30 days
- **All-Cause**: Patients readmitted with any diagnosis
- **Patient Type**: All inpatient types
- **Same-Day Readmissions**: Included
- **Readmission Rate**: The Observed value is the readmission rate
- **Risk Method**: CareScience Standard Practice or Select Practice
- **Planned Readmission Algorithm**: None

Numerator and Denominator Exclusions

Cases excluded from the numerator are the cases that are not considered readmissions.

Cases excluded from the denominator are the cases that are not considered eligible index admissions. The denominator cases are the outcome cases.

These are excluded from the...	Numerator	Denominator
Outcome Cases exclusions		X

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Important Terms for Risk-Adjusted Readmissions

These are the key concepts for working with risk-adjusted readmissions.

Index Admission

As defined by CMS, an index admission is the hospitalization considered for the readmission outcome.

The CareScience Analytics Risk-Adjusted Readmissions methodology focuses on index admissions that have readmissions. Tracking index admissions can indicate opportunities for improvement in hospital readmissions.

Readmission

A readmission is an inpatient admission of the same patient within 30 days of a previous admission to the same facility, regardless of the admission cause. For each index admission, the first subsequent admission for the same patient is eligible to be a readmission.

Readmission Risk Score

A risk score is the estimated probability that a readmission to the same facility may occur within 30 days from the discharge date. A readmission risk score is calculated for each index admission qualifying for outcome cases.

Interval

The interval is the number of days between the index admission's Discharge Date and readmission visit's Admission Date. For 30 Day readmissions, the interval is within 30 days. For example:

Index Visit Discharge Date = December 20, 2024
Readmission Visit Admission Date = December 27, 2024
Interval = 7 Days

Timeframe

The timeframe is the period of time included in the analysis determined by selections at the Time prompt.

The timeframe selected within the analysis is for the index visit only. In order to capture all readmitted visits, move your "Through" date back 30 days from what has been Facility Published.

CareScience Analytics Risk-Adjustment for Readmissions

CareScience Analytics is used to calculate Observed and Expected values. CareScience Analytics is the risk-adjustment methodology defined by researchers within Premier based on in-depth clinical and analytical research techniques that is currently used to calculate mortality, cost, charge, LOS, and complications. This same team developed CareScience Analytics risk adjustment for the readmissions outcome.

Index Admissions

The readmissions risk-adjustment process starts with identifying the eligible index admissions and readmissions. Index admissions and readmissions are defined by how the admissions relate to each other within the parameters selected at the prompts (such as Facilities and Time).

After the index admissions and readmissions are identified, a risk score is calculated for each index admission using the same risk factors that CareScience Analytics uses to calculate risk scores for other outcomes such as mortality, LOS, and cost. The risk scores for the index admissions are then aggregated to calculate the Expected value on the analysis.

Risk scores are calculated for index admissions (as opposed to readmissions) because Expected values measure the likelihood that a patient will be readmitted based on the circumstances of the index admission. When a patient is readmitted, there is no likelihood of readmission to measure because the readmission has already occurred. Therefore, when calculating the Expected value, only the risk scores for the index admissions are included in the calculation.

In the following example of Patient A for the month of June 2021, only the risk scores from the index admissions are used to calculate the Expected value.

Patient	Admission Date	Discharge Date	Admission Type	Risk Score?
Patient A	6/2/21	6/4/21	Index	Y
Patient A	6/10/21	6/15/21	Readmission/Index*	Y

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Patient	Admission Date	Discharge Date	Admission Type	Risk Score?
Patient A	6/20/21	6/26/21	Readmission/Index*	Y
Patient A	6/30/21	7/7/21	Readmission (patient expired)	N

*A readmission can be linked to only one previous index admission. As a result, for patients with multiple admissions within the timeframe of one analysis, one admission can count as both an index admission and a readmission.

On the Risk-Adjusted 30-Day Readmission analysis:

- The Outcome Cases are the index admissions that qualified for the analysis and the denominator in the Observed value.
- The attribute on the row represents the index admissions that had that attribute.
- You can drill to the Risk-Adjusted Readmissions Patient Visit Detail analysis to see which visits are index admissions. Index admissions are indicated by an “I” in the Readmission Visit column.

Logistic Regression Model

For the Length of Stay outcome, CareScience Analytics uses a semi-log regression model to derive the risk score. For the Readmission and Mortality outcomes, CareScience Analytics uses a logistic regression model (aka logit model) to derive the risk score.

Logistic regression is highly effective at estimating the odds that an event will occur given a set of conditions. For readmissions, it’s the odds that a readmission will occur based on the clinical, patient selection, and demographic characteristics of the index admission.

Logistic regression is best suited for binary outcomes, which means the outcome can be only one of two options: did occur (1) or did not occur (0). The readmissions outcome is a binary outcome because an unplanned readmission either did occur (1) or did not occur (0) after an index admission.

The readmission risk score estimates the odds that an unplanned readmission will occur (1) given the variables of the index admission. Due to the log-odds transformation of the logit model applied when calculating the risk score, the readmission risk score is guaranteed to be within the bound of 0 and 1.

If there is an unplanned readmission after an index admission, the index admission is set to 1 and the Observed value is 100%. If there is no readmission, or the readmission is considered planned, the outcome is set to 0 and the Observed value is 0%.

Risk-Adjusted Readmission Metrics

This section describes the risk-adjusted readmission metrics.

Same-Day Readmissions

Since same-day readmissions are defined as being admitted and discharged on the same calendar day, the Admit and Discharge times can distinguish each unique visit, even when taking place on the same calendar day.

- CMS considers patients as “readmitted” if they had an eligible readmission to the same hospital on the same day but for a different condition/procedure. Patients are not considered “readmitted” if the readmission was to the same hospital for the same condition/procedure and on the same calendar day.
- Premier uses admission dates and times to determine the sequence of patient visits, and does not consider conditions/procedures to determine readmissions. This is because by the time Premier receives final billing, it is assumed that all claims considered as the "same condition" have already been merged.

CareScience Standard and Select Practice

QualityAdvisor offers two risk-adjustment calculation modes for analyses using CareScience Analytics: Standard Practice and Select Practice.

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The algorithm for both Standard and Select Practice is based on Premier's database, which identifies readmissions to the same facility in the database.

Total Cases

The total cases are the inpatient index admissions that qualified for the analysis.

Outcome Cases

The outcome cases are the inpatient index admissions that qualified for the analysis and qualified for risk-adjustment.

Outcome Case Exclusions – General

Cases are excluded from the outcome cases if the information required to risk-adjust a patient such as age, admission type, charges, etc. is missing from the case.

Outcome Case Exclusions – Specific to the Readmissions Outcome

Patients with the following discharge statuses are excluded from the outcome cases:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

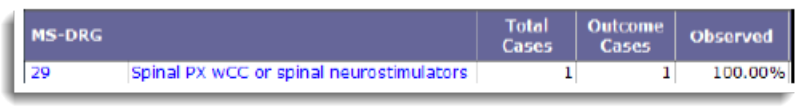
Observed

This is the observed readmission rate for the outcome cases. The calculation is as follows:

Numerator The number of readmissions within 30 days of an index admission
Denominator The number of outcome cases (index admissions)

Both the numerator and denominator have exclusions.

If there is a readmission after an index admission, the Observed value is 100%.



MS-DRG		Total Cases	Outcome Cases	Observed
29	Spinal PX wCC or spinal neurostimulators	1	1	100.00%

If there is no readmission after an index admission, the Observed value is 0%.

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MS-DRG		Total Cases	Outcome Cases	Observed
30	Spinal procedures w/o CC/MCC	1	1	0.00%

Note: The Observed value for the Mortality outcome works the same way; 100% if the patient expired and 0% if the patient did not expire.

Expected

The Expected Readmission rate measures the likelihood that a readmission may occur within 30 days of the discharge date. Each patient encounter is an index admission and receives a readmission risk score based on certain characteristics of the admission and the condition of the patient upon discharge. The Expected Readmission rate is the average of the readmission risk scores of the index admissions.

Observed/Expected (O/E)

O/E is the Observed value (O) divided by the Expected value (E).

- Outcomes with an O/E less than 1.0 are performing better than expected.
- Outcomes with an O/E greater than 1.0 are performing worse than expected.

Statistical Significance

Statistical Significance for risk-adjusted readmissions is calculated with a Z-test.

Asterisks display for Statistical Significance if the variation between the Observed and Expected values is statistically significant and not due to random chance.

There are three confidence levels: 75%, 95%, and 99%, represented by asterisks.

Variation

Variation is the Observed value minus the Expected value.

- Outcomes with a negative variation are performing better than expected.
- Outcomes with a positive variation are performing worse than expected.

Variation has three levels of Statistical Significance: 75%, 95%, and 99%.

Opportunity (Readmissions)

Variation multiplied by the Outcome Cases. There must be at least one readmission opportunity for a value to display. Readmission opportunities are rounded to the nearest whole number. *The metric is available at the facility level only.*

Readmissions Methodology (3M™ Risk-Adjusted)

Analyses

This methodology applies to the following analyses:

- Facility Readmission – 3M™
- Peer Readmission – 3M™

Overview

The denominator timeframe is tied to the case that had a readmission. The readmission flag is denoted on the first visit.

This analysis is risk-adjusted. Expected values are calculated using the 3M™ APR DRG risk adjustment methodology.

Readmission Rate Definition

These analyses calculate readmission rates by identifying patients readmitted within 30 days regardless of the APR DRG. The readmission flag is denoted on the first admission.

For example, a patient discharged on 01/01/02 for APR DRG 302 (Knee Joint Replacement) and then admitted on 01/15/02 for APR DRG 139 (Other Pneumonia) will be flagged as a readmission on the first admission of 01/01/02. Therefore, the readmission rate will be calculated based on the APR DRG 302 (Knee Joint Replacement) admission.

Exclusions

The following patients are excluded from the readmission rate calculation:

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- Skilled Nursing Facility Patients (Patient Type = 10)
- False Labor Patients – Patients with False Labor principal, admitting or secondary ICD Codes of:

ICD-10
O47.00 - FALSE LABOR BEFORE 37 COMPLETED WEEKS OF GESTATION, UNSPECIFIED TRIMESTER O47.9 - FALSE LABOR, UNSPECIFIED
O47.02 - FALSE LABOR BEFORE 37 COMPLETED WEEKS OF GESTATION, SECOND TRIMESTER O47.03 - FALSE LABOR BEFORE 37 COMPLETED WEEKS OF GESTATION, THIRD TRIMESTER O47.1 - FALSE LABOR AT OR AFTER 37 COMPLETED WEEKS OF GESTATION
O60.00 – PRETERM LABOR WITHOUT DELIVERY, UNSPECIFIED TRIMESTER O60.02 – PRETERM LABOR WITHOUT DELIVERY, SECOND TRIMESTER O60.03 – PRETERM LABOR WITHOUT DELIVERY, THIRD TRIMESTER

Same-Day Readmissions

Same-day readmissions are excluded from the readmission rate calculations if there are no additional visits within 30 days.

Same Day Readmissions are defined as being admitted and discharged on the same day.

For example, Patient A is admitted on 1/01/02 and readmitted within 24 hours of discharge on 1/01/02. The same-day readmission is not included in readmission rate calculations.

However, if the patient is readmitted on the same day and there are additional visits within 30 days, same-day readmissions are included in the readmission rate calculations.

Readmissions are included as shown in the following scenarios:

Scenario 1

The following scenario shows the same-day readmissions included when there are additional visits within 30 days

Patient Medical Record Number	Admission Dated	Discharge Date	Readmission Included in Calculation
999999999	3/28/2016	3/29/2016	✓
	3/29/2016	3/30/2016	✓
	4/6/2016	4/12/2016	

Scenario 2

The following scenario shows the same-day readmissions included when there are two contiguous same-day readmissions within 30 days.

Patient Medical Record Number	Admission Dated	Discharge Date	Readmission Included in Calculation
999999999	11/22/2016	11/24/2016	✓
	11/24/2016	11/28/2016	
	11/28/2016	12/5/2016	

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Scenario 3

The following scenario shows the same-day readmissions included when there are three contiguous same-day readmissions within 30 days.

Patient Medical Record Number	Admission Dated	Discharge Date	Readmission Included in Calculation
999999999	04/26/2016	05/03/2016	✓
	05/03/2016	05/06/2016	✓
	05/06/2016	05/11/2016	
	05/11/2016	05/23/2016	

Scenario 4

The following scenario shows the same-day readmissions included when there are four contiguous same-day readmissions within 30 days.

Patient Medical Record Number	Admission Dated	Discharge Date	Readmission Included in Calculation
999999999	10/03/2016	10/06/2016	✓
	10/06/2016	10/08/2016	✓
	10/08/2016	10/20/2016	✓
	10/20/2016	10/23/2016	
	10/23/2016	10/20/2016	

Readmission Methodology - Reason for Readmission (Total Readmissions) - Non Risk-Adjusted

Analysis

This methodology applies to the Facility Reason for Readmission (Total Readmissions) Analysis. With this methodology and analysis, you can:

1. Define the number of days used to calculate the readmission rate (at the Readmission Days required prompt).
2. Identify readmitted cases stratified by diagnoses or other selected characteristics.

Overview

This section provides an overview of the Reason for Readmission (Total Readmissions) Analysis.

- **Interval**: You define the interval at the Readmission Days prompt (0–365 days can be selected). 30 days is the default.
- **All-Cause**: Readmissions are for patients readmitted with any diagnosis.
- **Patient Type**: Readmissions include all inpatient Patient Types by default. You can choose to restrict the analysis to the Inpatient Patient Type at the Readmission Details prompt.
- **Readmission Rate**: The Readmission Rate is represented by the Readmission Rate value on the analysis.
- **Same-Day Readmissions**: Same-day readmissions are included by default.
- **Risk Method**: This analysis is not risk-adjusted.

Readmission Rate

The readmission rate calculation is as follows:

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Numerator Readmitted cases to the same facility for a selected population*
Denominator Total cases included in a selected population. Each denominator case can have only one readmission

*The numerator includes same-day readmissions unless they are excluded in the Numerator Selections prompt.

Denominator Exclusions

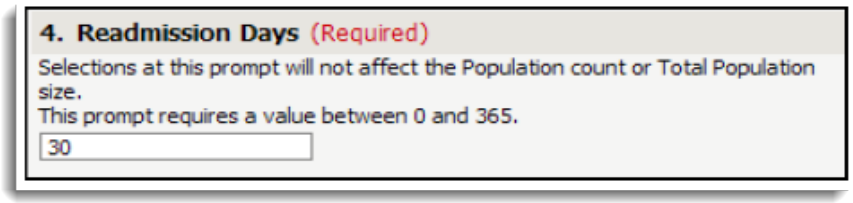
The denominator exclusions match the discharge status outcome case exclusions from the Risk-Adjusted 30-Day Readmission Analysis.

The following patients are excluded from the denominator:

Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

Readmission Days Prompt

In the Readmission Days prompt on the Select Population tab, you define the readmission interval, which identifies the readmitted cases to include in the analysis. “30 Days” is entered by default.



The system looks forward from the Discharge Date for each patient included in the denominator and identifies each readmitted case that is less than or equal to the Readmission Days selected. The system identifies readmitted cases beyond the selected population’s timeframe up to the Readmission Days selected.

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Population Selection and Patient Types

All prompt selections, except Patient Type, determine the population for which the system will report readmissions (numerator cases).

The selected Patient Type applies to both the denominator and numerator cases.

- If more than one Patient Type is selected (such as Inpatient (08), Rehabilitation (23), Psychiatric (24), and Chemical Dependency (26)), the denominator and numerator cases could have any of the values selected.
- If one Patient Type is selected (such as Inpatient (08)), the selected value applies to both denominator and numerator cases.

Only the Patient Type prompt may be used to exclude certain patient types from both the population (denominator cases) and readmissions (numerator cases).

Index Admissions and Readmissions Comparison

This section uses an example to help explain the relationship between index admissions and readmissions.

In the following example, June 2010 is selected at the time prompt.

Patient	Admission Date	Discharge Date	Interval	Visit	Index Visit Count	Readmission Visit Count
Patient A	5/22/10	6/2/10		Index	1	
			8 days			
Patient A	6/10/10	6/15/10		Readmission/Index	1	1
			5 days			
Patient A	6/20/10	6/26/10		Readmission/Index	1	1
			4 days			
Patient A	6/30/10	7/27/10		Readmission		1

Two visits count as both an index admission and a readmission.

- Only admissions with Discharge Dates in June 2010 are included in the population, because the index visit is evaluated for readmission on the first subsequent inpatient admission that occurs within 30 days of index discharge.
- If the last readmission is outside the timeframe, it will be counted as a readmission.

Risk-Adjusted 30-Day Readmission Analysis

- If the interval between the Discharge Date and the subsequent Admission Date is within 30 days, the next Acute Inpatient unplanned admission counts as a readmission.
- The data is based on the index visits included in the analysis. In the example above, only the first three patient visits would be included in the patient population for the analysis.

Reason for Readmission (Total Readmissions) Analysis

- If the interval between the last discharge date and the next admission is within the number of days defined at the Readmission Days prompt, the next admission counts as a readmission.
- The data is based on the readmission visits included in the analysis. In the example above, only the last three patient visits would be included in the patient population for the analysis, because they occur within the selected “Readmission Days” of the discharge dates for the corresponding index admissions.

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Reason for Readmission (Planned vs Unplanned) Analysis

- If the interval between the last discharge date and the next admission is within the number of days defined at the Readmission Days prompts, the next Acute Inpatient admission counts as a readmission.
- The data is based on the readmission visits included in the analysis. In the example above, only the last three patient visits would be included in the patient population for the analysis, because they occur within the selected “Readmission Days” of the discharge dates for the corresponding index admissions.

Readmission Methodology - Reason for Readmission (Planned vs. Unplanned) - Non Risk-Adjusted

This methodology applies to the Facility Reason for Readmission (Planned vs. Unplanned) Analysis.

1. Define the number of days used to calculate the readmission rate (at the Readmission Days required prompt).
2. Identify readmitted cases stratified by diagnoses or other selected characteristics.

Overview

- **Interval**: You define the interval at the Readmission Days prompt (0–365 days can be selected). 30 days is the default.
- **All-Cause**: Readmissions are for patients readmitted with any diagnosis.
- **Patient Type**: Only acute inpatients (Patient Type 08).
- **Readmission Rate**: This analysis is based on PRA v4.0 and includes the values for Readmission Rate, Unplanned Readmission Rate, and Planned Readmission Rate.
- **Same-Day Readmissions**: Same-day readmissions are considered planned and included in the planned readmissions.
- **Risk Method**: This analysis is not risk-adjusted.

Readmission Rate

The readmission rate calculation is as follows:

Numerator Readmitted cases to the same facility for a selected population*
Denominator Total cases included in a selected population. Each denominator case can have only one readmission

*The numerator includes same-day readmissions, since they are considered planned readmissions.

Unplanned Readmission Rate

The Unplanned Readmission Rate calculation is as follows:

Numerator Unplanned Readmitted cases to the same facility for a selected population
Denominator Total cases included in a selected population. Each denominator case can have only one readmission

Planned Readmission Rate

The Planned Readmission Rate calculation is as follows:

Numerator Planned Readmitted cases to the same facility for a selected population*
Denominator Total cases included in a selected population.

*The numerator includes same-day readmissions, since they are considered planned readmissions.

Note: The Planned Readmission Rate excludes patients that do not qualify for the All-Cause Hospital Wide 30-Day Readmission (PRA v4.0) cohort

Denominator Exclusions

The following patients are excluded from the denominator:

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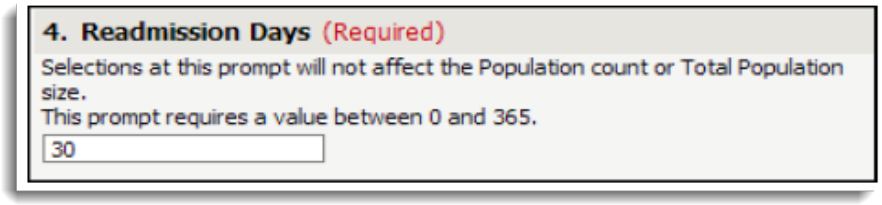
Code	Description
02	Discharged/Transferred to Other Facility
05	Discharged/Transferred to Cancer Center or Children's Hospital
07	Left Against Medical Advice or Discontinued Care
20	Expired
40	Expired at Home (For Medicare and Tricare claims for Hospice)
41	Expired in Medical Facility
42	Expired, Place Unknown (For Hospice)
43	Discharged/Transferred to Federal Hospital
66	Discharged/Transferred to a Critical Access Hospital (CAH)
82	Discharged/Transferred to a short term general hospital for inpatient care with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
85	Discharged/Transferred to a Designated Cancer Center or Children's Hospital with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
88	Discharged/Transferred to a federal health care facility with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)
94	Discharged/Transferred to a Critical Access Hospital (CAH) with a planned acute care hospital inpatient readmission (effective 10/1/2013 discharges)

Readmission Days Prompt

In the Readmission Days prompt on the Select Population tab, you define the readmission interval, which identifies the readmitted cases to include in the analysis. “30 Days” is entered by default.



The system looks forward from the Discharge Date for each patient included in the denominator and identifies each readmitted case that is less than or equal to the Readmission Days selected. The system identifies readmitted cases beyond the selected population’s timeframe up to the Readmission Days selected.

Population Selection and Patient Types

All prompt selections, except Patient Type, determine the population for which the system will report readmissions (numerator cases).

This analysis considers only acute inpatients (Patient Type 08).

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Chapter 8 - Complications

Complications Methodologies

Methodology 1: Potential Inpatient Complications

Complications are defined as certain clinical conditions that occurred after patients were admitted into the facility. Those clinical conditions often cause higher mortalities, extended length of stay, and spiked treatment costs. There are 114 such clinical conditions: 14 conditions are defined by CMS as Hospital Acquired Conditions (HACs) and 100 conditions have been identified by Premier.

This methodology is applied on the following analyses:

- Complications Distribution (Facility)(3M™ and CS)
- Complications Distribution (Peer) (3M™ and CS)
- Complications Comparison CareScience (Facility)
- Complications Comparison CareScience (Peer)

These reports utilize the appropriate fiscal year version for Potential Inpatient Complications (PIC) based on the timeframe selected for the report:

- Patients discharged from 10/1/19 to 9/30/2020 group to the FY20 PIC list
- Patients discharged from 10/1/20 to 9/30/2021 group to the FY21 PIC list
- Patients discharged from 10/1/21 to 9/30/2022 group to the FY22 PIC list
- Patients discharged from 10/1/22 to 9/30/2023 group to the FY23 PIC list
- Patients discharged from 10/1/23 to 9/30/2024 group to the FY24 PIC list
- Patients discharged from 10/1/24 and forward group to the FY25 PIC list
- Reports run for time periods that cross over multiple fiscal years (i.e., 10/1/2019, 10/1/2020, 10/1/2021, 10/1/2022, 10/1/2023, and/or 10/1/2024) will see a mix of the different PIC FY versions.

The complications in this methodology were defined similarly to the CMS Hospital Acquired Conditions (HAC) methodology where one or more ICD-10 CM code(s) are grouped together and paired with present-on-admission (POA) flags to identify if the event occurred after admission.

Premier Research Services reviewed CareScience Analytics high volume complications to develop the disease groupings. The POA (present-on-admit) flags of **N** (No: not present on admission) or **U** (Unknown: documentation insufficient) are used to delineate if the condition occurred after admission.

In order for the condition to be measured, the POA flag must be set to N or U for any one diagnosis in the condition.

- **Numerator**: The secondary diagnosis code(s) for each complication creates the numerator populations
- **Denominator**: The total population for the analysis.

Only complications with volume are included in the rows. This means that if there are no cases for a complication that complication will not appear on the analyses.

POA Flags in the System

The following POA flags are in the system. The POA flag on secondary diagnoses identifies a comorbidity or a complication for CareScience Analytics.

Flag	Description	Identifies a Comorbidity	Identifies a Complication
Y	Diagnosis was present at the time of the inpatient admission	Yes	No

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Flag	Description	Identifies a Comorbidity	Identifies a Complication
W	Clinically undetermined. Provider unable to clinically determine whether the condition was present at the time of the inpatient admission	Yes	No
N	Diagnosis was not present at the time of the inpatient admission	No	Yes
U	Documentation is insufficient to determine if the condition was present at the time of the inpatient admission	No	Yes
I	Unreported / Not used Exempt from POA reporting. This code is equivalent to a blank on the UB-04®	N/A	N/A

POA Flags and Comorbidity

The Present on Admission (POA) flag determines which conditions were already present when the patient arrived at the facility, regardless of the patient's principal diagnosis for the visit. Conditions already present when the patient arrives are considered comorbidities and impact the care administered for the principal diagnosis as well as the overall outcome.

For example, if a patient arrives at the facility with a principal diagnosis of Heart Failure (HF) and is also a diabetic, diabetes is considered a comorbidity because it impacts how care is administered to that patient. In addition, diabetics are more likely to develop certain complications due to their condition. As a result, comorbidities are very important in assessing overall patient care.

Defining Comorbidity

In order to qualify as a comorbidity, the POA flag must be set to Y or W on any one of the secondary diagnoses to ensure that the condition is present when the patient was admitted.

- **Y** (Yes: Diagnosis was present at time of the inpatient admission)
- **W** (Clinically undetermined: Provider unable to clinically determine whether the condition was present at the time of the inpatient admission)

For each federal fiscal year, CMS publishes a list of ICD diagnosis codes that are exempt from POA coding. Many of them are status codes, e.g. history of tobacco use. In CareScience Analytics, those ICD diagnosis codes are regarded as comorbidity.

Comorbidity Composite Scores

CareScience Analytics calculates a comorbidity composite score for the conditions that were present on admission for the following outcomes:

- Complications
- Cost and Charge
- Length of Stay
- Mortality
- Readmission

The comorbidity composite score is one of the independent variables like age, gender, or chronic disease that contribute to the risk score calculation for each outcome at the patient level. Risk scores determine the Expected values for risk- adjusted outcomes. In fact, the Expected value column is the average of all the patient-level risk scores for an outcome. Therefore, comorbidity composite scores are an important contributing factor to the Expected values of these outcomes.

In order to determine the impact of comorbidities on risk scores calculated for outcomes, CareScience Analytics has developed a series of regression models. A patient's secondary diagnosis codes are mapped to a Comorbidity Weight Index table, which is populated with coefficients from these regression models. The sum of the weight of all secondary diagnoses, present on admission or on the list of POA exempt, is the comorbidity composite score of the patient. The more severe a comorbid condition is, the higher the weight applied when calculating the risk score for the patient.

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Potential Inpatient Complications

Note: To be a complication, the POA flag must be set to N or U on at least one of the secondary diagnoses.

The Excel spreadsheet posted here includes the full list of CMS HACs and PICs, including the associated methodology for each:

- CMS HAC and PIC Methodology

  Note: When trying to identify CMS HACs, filter on the specific HAC you are looking for in column C

Complications with "(CMS)" after their name are CMS HACs.

Methodology 2: CMS Hospital Acquired Conditions (HAC)

This methodology provides a snapshot of your facility's performance on the CMS- defined HACs that CMS deems ineligible for reimbursement if they occur after admission.

This methodology enables you to:

- Compare costs and charges for cases where the secondary diagnosis is not present on admission versus cases where the secondary diagnosis is present on admission.
- Review detail information for cases of facility-acquired pressure ulcers, urinary tract infections, and injuries, including specific diagnosis codes and the rate of occurrences after admission.
- Review patient-level detail for each case after admission.

Analysis

This methodology is applied on the Facility CMS Hospital Acquired Conditions Analysis. Each row on this analysis is a CMS HAC. For information about the columns on this analysis, please review CMS Hospital Acquired Conditions.

CMS HAC Fact Sheet

The Excel spreadsheet posted here includes the full list of CMS HACs and PICs:

- CMS HAC and PIC List

  Note: When trying to identify CMS HACs, filter on the specific HAC you are looking for in column C

Use the Effective Date and Expiration Date filters to see specific fiscal year lists.

Patients discharged:

- Patients discharged from 10/1/19 to 9/30/2020 group to the FY20 PIC list
- Patients discharged from 10/1/20 to 9/30/2021 group to the FY21 PIC list
- Patients discharged from 10/1/21 to 9/30/2022 group to the FY22 PIC list
- Patients discharged from 10/1/22 to 9/30/2023 group to the FY23 PIC list
- Patients discharged from 10/1/23 to 9/30/2024 group to the FY24 PIC list
- Patients discharged from 10/1/24 and forward group to the FY25 PIC list
- Reports run for time periods that cross over multiple fiscal years (i.e., 10/1/2019, 10/1/2020, 10/1/2021, 10/1/2022, 10/1/2023, and/or 10/1/2024) will see a mix of the different PIC FY versions.

Note: Reports run for time periods that cross over multiple fiscal years will see a mix of the different CMS HAC versions.

The CMS HACs included in the Facility CMS Hospital Acquired Conditions Analysis are based on the CMS HAC Fact Sheet, which is located in the Downloads section of the CMS.gov Web site.

CMS HAC Categories on the Rows

The main analysis has a main row for each CMS HAC category and a sub- category row for each CMS HAC in that category:

- Hospital Acquired Infections
- Serious Preventable Events
- Manifestations of Poor Glycemic Control
- Falls and Trauma

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When this analysis returns, only those CMS HACs that occurred at the selected facilities for the timeframe appear on the analysis. If a CMS HAC does not appear, that means that the selected facilities did not have an occurrence of that CMS HAC during the timeframe.

A patient can qualify for more than one HAC, however, a patient is counted only once for a particular HAC even though a patient may have multiple diagnosis codes to qualify for that HAC.

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Chapter 9 - Data Validation

Data Validation

Data Submission

Your facility will typically submit data to Premier in monthly or quarterly increments. However, even if you choose to submit data to Premier quarterly, you can publish that data to QualityAdvisor by the month. For example, if you submit data for the first quarter of 2015 to Premier, and January's data has met all the data validation requirements for Facility publish but February and March have not, you can choose to publish only January's data to QualityAdvisor.

Data Publish Schedule

Premier processes scheduled data publish jobs for QualityAdvisor twice per week. In general, you can expect to see new data appear in QualityAdvisor four to seven days after you schedule it for Facility or Comparative publish.

Data Publish Frequency

Facilities decide when Facility Data is ready to be published and there is no restriction on the number of times Facility publish can be scheduled while waiting to complete the Comparative validation process.

Premier works with facilities to prepare their data for Comparative publish. This chapter provides an overview of that process. As facilities publish Comparative Data for a time period, they obtain access to the Peer database for that period. The Peer database is updated as facilities publish Comparative data.

QualityAdvisor Data Validation

The validation report also lists data that is missing or invalid for data publish to QualityAdvisor. As additions and corrections are made to your data, patient records reach a state of completion and validity that qualifies them for publish to QualityAdvisor. There are two levels of validation available for QualityAdvisor data:

1. **Facility Data validation** prepares your data for use in QualityAdvisor Facility analyses only. This gives you the opportunity to analyze certain aspects of your data, such as Complications or Outcomes, while you are waiting for the more comprehensive Comparative validation process to be complete.

   This process can take anywhere from five to ten business days from the date of submission, depending on how much time your facility requires to correct the data.

   Note: Publishing Facility Data is optional. Your facility may decide to publish only Comparative Data.
2. **Comparative Data validation** continues beyond Facility Data validation and includes complete mapping of resources to standard code languages, financial reconciliation and clinical quality assurance by Premier staff. When your data reaches this level of validation, you can use it for resource and cost analyses, as well as accurate comparison to peer data.

   This process can take approximately 45 business days from the date of submission due to the additional validations for Comparative Data, such as financial reconciliation and clinical quality assurance, which includes Standard Product List (SPL) mapping of resource data.

   Facility and Comparative data validation can happen simultaneously, which means that the validation level of Facility Data can actually fall anywhere between the minimum Facility Data validation standards and the completed Comparative Data validation process.

Data Validation Process

While the data validation process is slightly different for former Quality Manager and ClinicalAdvisor facilities, it generally accomplishes the following tasks:

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1. Your facility's data technician reviews the validation report. Each validation report includes data for a specified time frame, which is usually a month.
2. **Errors** that keep a patient from being published to QualityAdvisor, such as missing or invalid data elements, are corrected.
3. **Warnings**, which are missing or invalid data elements that do not keep a patient from being published, may be corrected.
4. When the validation process is complete, your data technician schedules the data to be published to QualityAdvisor for reporting.

Facility data validation catches data Errors that would impede patient risk adjustment. Correcting the Errors ensures that the data is suitable for Facility analyses. Facility data Warnings are generally escalated to Comparative data Errors. These must be corrected to ensure consistency throughout all customer data for Peer analyses. For example, a patient whose Admitting Practitioner is not mapped to a Practitioner Specialty would pass Facility Data validation with a Warning but fail Comparative Data validation as an Error.

Validating Facility Data

Facility Data is subject to many of the same validation rules as Comparative Data, but is generally available to publish sooner.

When a new month of Facility data is published to QualityAdvisor, the Facility analyses date range on the Facilities prompt is updated to include it.

Validating Comparative Data

Comparative Data validation is a continuation of Facility Data validation. The process requires that additional missing and invalid data elements be corrected by your data technician, and Premier also performs the following tasks.

1. Maps all new Facility charge master codes to standard language codes.
2. Reconciles financial data totals with facility-provided financial information.
3. Checks data for clinical discrepancies, such as C-section charges for vaginal births.

All Premier facilities go through the same validation process for Comparative Publish, which enables accurate and consistent Peer reporting.

When a new month of Comparative data is published to QualityAdvisor, the Peer analyses date range on the Facilities prompt is updated to include it.

Financial Reconciliation

Premier works with your facility to reconcile submitted data with facility summary information before and after the validation process. The purpose of reconciliation is to detect excessive variances in patient counts, costs and charges between submitted data and facility summary information. While variance can sometimes be a normal reflection of resource consumption and patient discharge occurring in different periods, it can also indicate missing or invalid data.

Financial reconciliation occurs to .5% for cases, 2% for charges, and 2% for costs.

Clinical Quality Assurance

Clinical Quality Assurance occurs during Comparative Data validation to validate the accuracy of resource mapping. Premier generates an aggregated report of charges for patients grouped into various diagnoses for the specified time period (e.g., one month of data), then verifies that the charges are reasonable for the care the patient received. For example, there should not be a charge for hip hardware on a patient who received a knee replacement.

Data Validation Rules

There are a number of business rules that determine whether a patient record can be published to QualityAdvisor as Facility or Comparative data.

If a rule displays W (for Warning) in the Facility column, the patient record can be published as Facility Data without correcting that problem. We are simply letting you know there is a warning on this record that you should be aware of.

If a rule displays E (for Error) in either column, the data must be corrected before the patient record can be published as the indicated type of data, Facility or Comparative.

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“Required” means that the data element must be submitted to Premier. “Valid” means that the data must meet one or more of the following criteria:

- Is in the correct data format; e.g. date or numeric.
- Is an allowable value; e.g., all submitted Practitioners must also be included in the Practitioner master table.
- Is mapped to a Premier standard value; e.g., all Facility-defined Practitioner Specialties must be mapped to Premier Standard Practitioner Specialties.

The following table is a sample listing of data validations for Facility and Comparative publish:

Category	Message Description	Facility	Comparative
Patient	Date of Birth is required and must be valid; age must be valid	E	E
Patient	Birth weight cannot be less than zero	E	E
Patient	Race and Sex codes are required and must be valid	E	E
Patient	Medical Record Number, Marital Status, Smoker, Zip and State Codes are required and must be valid	W	E
Patient	Patient Type must be valid for the Patient Class	W	E
Encounter	Admission and Discharge Dates are required and must be valid	E	E
Encounter	Admission Type and Source of Admission are required and must be valid	E	E
Encounter	Present on Admission flag is required and must be valid. Procedure Date cannot be after Discharge Date	E	E
Encounter	Procedure Type code is required and must be valid	E	E
Encounter	Patient Class is required and must be valid (I/O)	E	E
Encounter	Discharge Status is required and must be valid	E	E
Encounter	Procedure Date is required and must be valid	W	E
ICD	Principal Diagnosis code is required and must be valid	E	E
ICD	Admitting Diagnosis code is required and must be valid	W	E
Payer	Payer Code and Class are required and must be valid	E	E
Practitioner	Practitioner codes may be required and must be valid	W	E
Billing	Billing Data is required and must be valid	W	E
Cost	Billing total charges and Discharge total charges must be greater than $0, equal, and have a variance less than the permitted %	W	E
Cost	Billing total cost and Discharge total cost must be equal and have a variance less than the permitted %	W	E
Cost	Ratio of Cost to Charge (RCC) data is required and must be valid (RCC Facilities only)	W	E

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Chapter 11 - Peer Groups

Standard Peer Groups

Listed below are the Standard Peer groups in QualityAdvisor. Most of the groups are updated automatically in July of each year, however some peer groups may be updated at different times. If this occurs, the update will be included in the Release Notes.

Standard Peer Groups

- 100 Top Benchmark Hospitals
- Academic
- Area
- Bed Size
- Birth Volume
- Blood Utilization & Data Optimization
- Clinical
- Community Status
- Cost Type
- Council of Teaching Hospitals
- Critical Access
- Data Submitted
- Facility Services
- Intensive Care & Care Levels
- Magnet
- Payer
- Region
- State
- Urban, Academic, & Level I Trauma (UALOT)

100 Top Benchmark Hospitals

This peer group includes the Quality Enterprise and QualityAdvisor members that receive the 100 Top Hospitals award at Premier's annual Breakthroughs conference each summer.

This is a static list and hospitals only populate if they are an active QualityAdvisor subscriber that has published data to the comparative warehouse.

Academic

The Academic peer group only includes active members of the Association of American Medical Colleges (AAMC), who are published on the AAMC website. To be included in the peer group, a facility must be an active QualityAdvisor facility and publish data to the comparative warehouse.

Birth Volume

The Birth Volume peer group includes active member with comparatively published volumes meeting the current CDC birth volume denominator definition.

This list include hospital assignments within 1 of the following birth volume ranges (per hospital):

- 1 - 99 birth per year
- 100 - 499 births per year
- 500 - 999 births per year
- 1000 - 1999 births per year

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- 2000 - 3999 births per year
- >= 4000 births per year

Critical Access

A Critical Access Hospital (CAH) is certified under a set of Medicare Conditions of Participation (CoP), which are structured differently from the acute care hospital Conditions of Participation. Some of the requirements for CAH certification include:

- Having no more than 25 inpatient beds
- Maintaining an annual average length of stay of no more than 96 hours for acute inpatient care
- Offering 24-hour, 7-day-a-week emergency care
- Location in a rural area, at least a 35-mile drive (less, in some circumstances) from any other hospital or CAH

The limited size and short length of stay let CAHs focus on providing care for common conditions and outpatient care, while referring other conditions to larger hospitals. Certification allows CAHs to receive cost-based reimbursement from Medicare, instead of standard fixed reimbursement rates. This reimbursement has been shown to enhance the financial performance of small rural hospitals that were losing money prior to CAH conversion and thus reduce hospital closures.

Magnet

Magnet facilities have been recognized for their excellence in nursing services by the American Nurses Credentialing Center (ANCC) through the ANCC Magnet Recognition Program®. For more details about this program, please visit the following web site: http://www.nursecredentialing.org/Magnet.aspx.

The Magnet peer group includes the Premier facilities in QualityAdvisor that achieved Magnet status as of November 2012. The list of Magnet facilities is updated annually.

Safety Net Hospitals

A safety net hospital is a type of medical center (in the United States) that by legal obligation or mission provides healthcare for all individuals regardless of their insurance status or ability to pay.

The Safety Net Hospitals peer group at Premier, includes active members of the America's Essential Hospitals (AEH) trade group that helps ensure access to care for America's medically under-served and uninsured populations, and are published on the AEH Website.

To be included in the peer group, a facility must also be an active QualityAdvisor subscriber and publish data to the comparative warehouse.

Urban, Academic, & Level I Trauma (UALOT) Peer Group

The UALOT peer group includes **Academic** hospitals that are also part of an **urban community** and have a **Level I Trauma center**.

The UALOT list is based on the most recent Academic hospital list included in Premier's spring release, and the facility self-identified "Community Status" and "Trauma Level" data from the QA Facility Profile. This peer group is part of the annual peer group update each year.

The ready made list of peer facilities can be manually built using the "Academic", "Urban", and "Level 1 Trauma" peer group selections or if filtering from the QA Facility Profile.

Peer Groups

Peer groups are available for selection in the Peer prompt and Peer Facility Custom Groups.

Peer Prompt Peer Facility Custom Group

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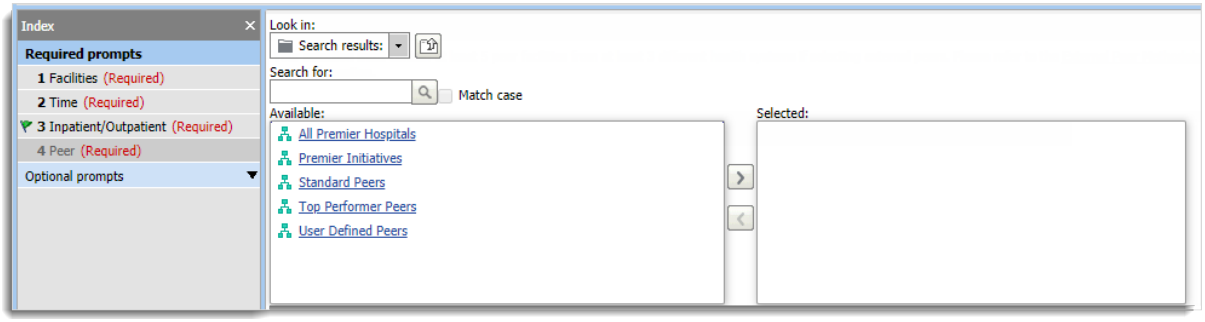

Note: Peer groups are also available on analyses where the Peer Provider hierarchy is available.

Peer Categories

Peer Group	Description
All Premier Hospitals	This is a complete list of all Premier hospitals
Premier Initiatives	This is a list of Premier Initiatives
Standard Peer	This is a list of standard peers
Top Performer Peers	This is a list of top performing peers
User Defined Peers	This is a list of peer groups created in Custom Groups

Selecting Peers for Peer Analyses

You can manually select peers for an analysis using the Peer prompt, or you can use the Smart Peer Builder to pre-create a peer group that you can select as a whole to use for an analysis. The Smart Peer Builder is part of the Custom Group feature and it helps you to select those peer facilities that closely align to your own facility by patient mix, geography, and facility structure. Using the Smart Peer Builder you create a ready made peer group that you can select from the Peer prompt.

Five Facility Rule

A peer group selected for an analysis must contain at least five facilities in order for peer data to appear on Peer analyses. If you receive an analysis that doesn't contain peer data, that could mean that there were less than five facilities in the categories you selected at the Peer prompt.

To ensure that you are selecting at least five facilities at the Peer prompt, drill down to the facility level in each category before running the analysis. Otherwise, you may not realize that the mandatory five facilities do not exist in the category you selected until your Peer analysis returns without peer data.

It may be necessary to select more than one category to satisfy the five facility rule. The following tips may be useful in selecting your peer facilities:

- Before you select a category for your analysis, drilldown to the facility level to see whether the category contains the required five peer facilities.
- If the category you want does not contain five facilities, supplement your selection by choosing an additional category. You may also select individual facilities within a category, for example, two facilities from one category and three from another.

External Peer Methodology

In order to prevent over-representation of any two health systems in an external peer group, Premier has implemented the Peer Disclosure Limitation Methodology (PDLM).

The PDLM uses an industry-accepted practice called the (n,k) rule, where n is the number of health systems that will be considered when summing the inpatient case count and k is the acceptable percentage of data that those health systems are able to represent within a peer selection.

The (n,k) rule has been set to (2, 75) to meet Premier's standards.

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As a result, when selecting a peer group that contains facilities that belong to a health system to which you do not have access, the peer group must include at least five facilities that belong to at least three health systems outside of your own, and no **two** health systems can comprise **more than 75.0%** of the total inpatient case count of the peer selection.

If the facilities in your peer selection have comparatively published data within the last year, then the inpatient case count is based on the most recent 12 months that each of the facilities comparatively published data.

Note: A peer group selection must always contain at least five facilities in order to calculate external peer data.

The following tips may be useful in selecting your peer facilities:

- The Health System name has been appended to the facility names in the Peer prompt to help you select at least 3 Health Systems outside of your own.
- Before you select a peer group for your analysis, check whether the category contains the required five peer facilities. If the peer group you want does not contain five facilities, supplement your selection by choosing additional peers.

When making your peer group selection, the selection will be validated to determine if it meets the n, k rule requirement. Peer groups that are deemed **"sensitive"** do not meet the requirement, and must be updated before they can be used. Peer groups that are determined to be **"safe"** meet the n, k rule standards.

The following is an example of a "sensitive" peer group selection, meaning the peer analysis will not return:

Example #1:

The following is an example of a sensitive peer group selection, meaning the peer analysis will not return:

Facility	Health System	Facility Case Count	Health System Case Count
Facility 1	A	2500	5000
Facility 2	A	2500	
Facility 3	B	150	150
Facility 4	C	75	75
Facility 5	D	50	50

1. Sums of the top 2 Health Systems, A and B: 5000 + 150= **5150**
2. Sums of all the peer Health Systems, A, B, C, and D: 5000 + 150 + 75 + 50 = **5275**
3. Checks for sensitivity: 5150 / 5275 = **97.6%**
4. Because 97.6% is greater than 75%, the peer selection is considered **sensitive**, and the analysis will not return any results

Example #2:

The following is an example of a safe peer group selection, meaning the peer analysis will return:

Facility	Health System	Facility Case Count	Health System Case Count
Facility 1	A	2500	5000
Facility 2	A	2500	
Facility 3	B	2500	2500
Facility 4	C	2500	2500
Facility 5	D	2500	2500

1. Sums the top 2 Health Systems, A and B: 5000 + 2500 = **7500**

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2. Sums all the peer Health Systems, A, B, C, and D: 5000 + 2500 + 2500 + 2500 = **12500**

3. Checks for sensitivity: 7500 / 12500 = **60%**

4. Because 60% is not greater than 75%, this peer selection is considered **safe**, and the analysis will return results

Top Performer Peer Groups

QualityAdvisor enables you to compare your facility's performance with that of top performers in a particular clinical focus area. You can also compare your facility performance to that of top performing facilities for risk adjusted outcomes such as Mortality, LOS, Cost, Complications (CareScience), and Readmissions.

This section describes the methodology used to identify top performers by clinical focus area as well as risk adjusted outcomes.

Top Performers - Overall by Focused Population

The Top Performer - Overall by Focused Population peers are calculated using the **Current** CMS defined focused population definitions.

Background - As of September 2019, QualityAdvisor began maintaining both **Current** and **Historical** versions of the CMS defined focused populations. Each year, typically in the October timeframe, when the new CMS defined focused population definitions are implemented in the application, the previous focused population definitions are relabeled as the "Historical" focused populations and remain available in the application for reporting purposes.

As the new CMS defined focused population definitions are added to QualityAdvisor each year, the new definitions become the "Current" focused populations definitions, the existing "Current" populations become the "Historical" populations, and the existing "Historical" populations are removed from the application.

When the Top Performer - Overall by Focused Population peers are updated each year, they are calculated using the "Current" focused population definitions.

Active Submitters Rule

Each year in the spring timeframe, updated Top Performers are provided within QualityAdvisor. In March 2016, existing Top Performer Methodology was enhanced to ensure that the most up-to-date comparisons are provided, and only reliably active submitters are included in the groups. Top Performing hospitals are evaluated for the previous calendar year, and for having comparatively published data for all months during July-June of the current Top Performer year.

The following table demonstrates the timeframe used to identify Top Performers, and the timeframe evaluated for active submissions for each Top Performer Year:

Top Performer Peer	Top Performer Timeframe	Active Submitter Evaluation Timeframe
2021	January – December 2020	July 2020 – June 2021
2022	January – December 2021	July 2021 – June 2022
2023	January – December 2022	July 2022 – June 2023
2024	January – December 2023	July 2023 – June 2024

Negative Cost Rule

For annual updates, any facility that has negative costs at the department aggregate level will be removed from Top Performer eligibility.

Five Facility Rule

The five facility rule must also be satisfied when selecting Top Performers. Depending on facility data submissions, not every category in every clinical focus area will contain five facilities in the Top Performer category. For that reason, when selecting a Top Performer, drilldown to the facility level to make sure that it contains at least five facilities.

Top Performer Hierarchy

The Top Performer peer groups are as follows:

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By Outcome

- (Calendar Year) Top Decile 3M™
- (Calendar Year)Top Decile CS
- (Calendar Year)Top Quartile 3M™
- (Calendar Year)Top Quartile CS

Overall By Focused Population

- (Calendar Year) Core Measures 3M™
- (Calendar Year) Core Measures CS
- (Calendar Year) CMS Readmission 3M™
- (Calendar Year) CMS Readmission CS
- (Calendar Year) Premier-Defined 3M™
- (Calendar Year) Premier-Defined CS

Overall

- (Calendar Year) Overall Top Performer 3M™
- (Calendar Year) Overall Top Performer CS

New groups will be created each year that contain an entire year of the data from the previous year. The new groups will be named for the year that they are created and released, for example the 2017 Top Decile and Top Quartile groups contain data from January 2016 - December 2016.

Methodology for Identifying Top Decile and Top Quartile Peers for Risk Adjusted Outcomes

There are Top Decile and Top Quartile Top Performers peer groups for the following outcomes:

- Mortality
- LOS
- Cost
- Complications (CareScience)
- Readmissions

The facilities in these peer groups are identified by finding the facilities in the top 10% (decile) and top 25% (quartile), using the observed-to-expected (O/E) rate for each measure. Only acute inpatients (Inpatient Patient Type = 08) are included.

Facilities must perform well in multiple outcomes and not just the one in which they are a top performer. For example, facilities are excluded from the cost outcome if they are performing in the bottom two deciles for mortality and complications and so on. This ensures that only the highest performing facilities are included in the top quartile and top decile groups for each outcome.

These peer groups are updated annually on a six-month delay to allow data for a sufficient number of facilities to be included in the database.

General Inclusions/Exclusions

- Only acute inpatients are included
- Facilities with fewer than 100 cases in a year are excluded

Cost Exclusions

Facilities are excluded if:

- Their percentage of patients with a one-day LOS (excluding mortalities) is greater than three standard deviations from the mean.
- Their percentage of patients with $0 cost is greater than three standard deviations from the mean.
- They are in the bottom two deciles for mortality and complications.

CareScience Complications

Facilities are excluded if they are in the bottom two deciles for mortality and LOS.

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Length of Stay (LOS) Exclusions

Facilities are excluded if:

- Their percentage of patients with a one-day LOS (excluding mortalities) is greater than three standard deviations from the mean.
- They are in the bottom two deciles for mortality and complications.

Mortality Exclusions

Facilities are excluded if they are in the bottom two deciles for LOS and complications.

Readmission Exclusions

Mortalities are excluded.

Top Performer Peers Methodology

The Overall Top Performer Peer group and Overall by Focused Population Top Performer Peer groups allow you to compare your healthcare organization to top performing peers in Observed to Expected measures across all outcomes. Comparing against the overall top performers enables your facility to set high standards for quality care and cost efficiency.

Methodology

To identify Overall Top Performers and Overall by Focused Population Top Performers, the Select Practice algorithm has been applied for both 3M™® APR DRG™ and CareScience® Analytics. In the algorithm, Mortality, Complications, and Readmissions are chosen as quality measures, and Length of Stay and Cost as efficiency measures.

Patient level data is aggregated and a risk-adjusted score is created for each hospital and each measure. Each hospital is then ranked based on the risk- adjusted score per measure and classified into ten categories or deciles.

Hospitals receive points based on the decile to which they belong; hospitals in the top decile receive nine points and those in the bottom receive zero points.

A quality score is created for each hospital by summing points across Mortality, Complications, and Readmissions, and an efficiency score is created by adding points in Length of Stay and Cost.

> ***CareScience Readmissions Methodology Updated (as of March 2019)***
>
> *Since the ICD-9 / ICD-10 conversion in October 2015, new versions of the Planned Readmission Algorithms have been introduced in QualityAdvisor in 2017 and 2018.*
>
> *In March 2018, the formula for determining Overall Top Performers factored in both PRA v2.1 and PRA v4.0, to include both ICD-9 and ICD-10.*
>
> *The 2018 Overall Top Performer formula:*

- *Mortality * ⅓ + Complications * ⅓ + Readmissions * ⅓ (PRA v2.1 * ½ + HWR v4.0 *½)*

> *In March 2019 the formula was revised again, removing ICD-9 so that Overall Top Performers are now entirely based on ICD-10.*
>
> *The 2019 Overall Top Performer formula:*

- *Mortality * ⅓ + Complications * ⅓ + Readmissions * ⅓ (HWR v4.0 2020)*

The Overall Top Performers are defined as those hospitals in the top two quintiles in quality and efficiency, which identifies about 15 to 20 percent of all hospitals that excel in both. This percentage represents a desirable range to ensure a diverse mix of hospitals.

- A minimum volume requirement of 2000 cases per hospital is required for Overall Top Performer peer group selection methodology.
- A minimum volume requirement of 25 cases for each focused population per hospital is required for Overall by Focused Population Top Performer peer group selection methodology.

Note: For 3M™ APR DRG™, the quality score will be created by summing only Mortality and Readmissions, as the Complications outcome is based on CareScience Analytics only.

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Overall Top Performer population inclusions and exclusions:

- **Inclusions** - Acute inpatients only (Patient Type 08)
- **Exclusions** - Hospitals with fewer than 2000 cases in a year

Overall by Focused Population Top Performer population inclusions and exclusions:

- **Inclusions** - Acute inpatients only (Patient Type 08)
- **Exclusions** - Hospitals with fewer than 25 cases per focused population in a year

Top Performer Peer Methodology Example

1. A risk-adjusted score is assigned to each measure at each facility. Below is a table displaying the Readmissions Observed to Expected ratio for each facility:

Facility	Length of Stay O/E Value
A	0.71
B	1.30
C	1.16
D	1.41
E	0.43
F	0.60
G	1.52
H	0.24
I	0.00
J	1.00

2. The Facilities are ranked and placed into deciles based on their risk-adjusted scores:

Facility	Length of Stay O/E Value	Decile	Points
I	0.00	1	9
H	0.24	2	8
E	0.43	3	7
F	0.60	4	6
A	0.71	5	5
J	1.00	6	4
C	1.16	7	3
B	1.30	8	2
D	1.41	9	1
G	1.52	10	0

3. The methodology described in step 2 is performed for all risk-adjusted outcomes. The quality and efficiency points for each facility are then totaled:

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Facility	Readmissions	Mortality	Complications	Quality Points	Cost	LOS	Efficiency Points
A	5	7	7	**19**	6	0	**6**
B	2	4	3	**9**	9	8	**17**
C	3	2	2	**7**	1	2	**3**
D	1	3	1	**5**	3	5	**8**
E	7	8	5	**21**	2	3	**5**
F	6	5	6	**17**	0	1	**1**
G	0	1	0	**1**	7	9	**16**
H	8	9	8	**25**	8	7	**15**
I	9	6	9	**24**	4	6	**10**
J	4	0	4	**8**	5	4	**9**

4. The facilities are ranked based on their quality and efficiency points. The facilities that are in the top 2 quintiles (15-20%) for both quality and efficiency in this example are H and I:

Facility	Quality Points	Quintile	Facility	Efficiency Points
H	**25**	1	B	**17**
I	**24**		G	**16**
E	**21**	2	H	**15**
A	**19**		I	**10**
F	**17**	3	J	**9**
B	**9**		D	**8**
J	**8**	4	A	**6**
C	**7**		E	**5**
D	**5**	5	C	**3**
G	**1**		F	**1**

Separate Groups for 3M™ APR DRG and CareScience Analytics

Each outcome has a separate group for 3M™ and CareScience Analytics. Facilities are included in these Top Performer peer groups based on their Observed/Expected (O/E) rates for each outcome. Remember, O/E rates below one are performing better than expected. Therefore, the top performing facilities have the lowest O/E rates for the selected outcome. Facilities in the Top Decile peer group have O/E rates in the top 10%. Facilities in the Top Quartile peer group have O/E rates in the top 25%.

> **Note**: 3M™ and CareScience groups may not contain the same facilities because the different risk-adjustment methodologies produce different Expected values for each outcome. This means that their O/E rates will be different. As a result, some facilities will be in the top 25% for CareScience Analytics that would not be in the top 25% for 3M™ APR DRG and vice versa.

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Smart Peer Builder - Similarity Score Methodology

Patent Pending — Premier's Smart Peer Methodology September 2020

A hospital's quality and utilization benchmarking can be biased due to differences in patient mix, structural characteristics and geographic factors between peer facilities. Premier's Smart Peer Builder is a data-driven method to better-identify peer facilities across these three criterion domains.

The Smart Peer methodology evaluates peer similarity across clinical, structural, and geographic domains through a k-nearest neighbor (k-NN) algorithm. This approach dynamically identifies peers that are most similar across those domains through an overall measure of similarity referred to as Euclidean distance. So that each domain carries equal weight in the k-NN model, all domain characteristics are normalized between 0 and 1, with the lower value indicating greater similarity. The methods for normalizing within each domain are provided below.

Clinical Domain (Patient Mix)

This domain measures the similarity between the evaluated facility and peer facility MS-DRG business line distributions. Peer candidates with greater alignment across the distribution of patient conditions will be identified as having greater similarity. The MS-DRG business line distributions are represented in percentages to account for volume differences and the similarity metric itself is calculated as the mean absolute error (MAE) between the two distributions. The MAE value is naturally bounded by 0 and 1.

- Cardiac Surgery
- Cardiology
- ENT
- General Medicine
- Gynecology
- Hematology/Oncology
- Invalid
- Medical Oncology
- Neonatology
- Neurology
- Neurosurgery
- Obstetrics
- Ophthalmology
- Organ Transplant and Vent Assist Devices
- Orthopedics
- Psychiatry
- Radiation Oncology
- Rehabilitation
- Surgical Oncology
- Thoracic Surgery
- Trauma
- Urology/Nephrology
- Vascular Surgery

Structure Domain

This domain is comprised of facility-level characteristics. For the purposes of normalization, the structural characteristics are treated as either binary or continuous.

Binary indicators within this domain include Cost Type, AHA COTH, AHA certified trauma center, teaching hospital indicator, urban/rural status, and academic indicator. The similarity between facilities for each of these characteristics is not simply a difference in the binary indicator itself, but instead is calculated as the difference in inverse likelihoods of the indicators. The benefit of this method is that two facilities sharing a less common characteristic (e.g. rural indicator) will receive a greater weight than facilities sharing a common characteristic (urban indicator).

As is shown in the below example, 32% of the facilities within the Premier database are rural while 68% are urban. As such, two facilities sharing a rural indicator will receive a similarity score of .32 for the urban/rural characteristic, while two facilities sharing an urban indicator will receive a .68 similarity score. Mismatched indicators will result in a value of 1, indicating the least amount of similarity.

Match Type	Urban	Rural
Urban	.68	1
Rural	1	.32

Structural characteristics can also be continuous in nature as is seen with total beds, adult ICU beds, cardiac ICU beds, psych care beds, neonatal ICU beds, pediatric ICU beds, OB care beds, and case mix index (CMI).

Given that many of the distributions for the continuous characteristics are skewed, the method to normalize the similarity value between 0 and 1 relies on the log difference in the cumulative probability for each characteristic between the two facilities.

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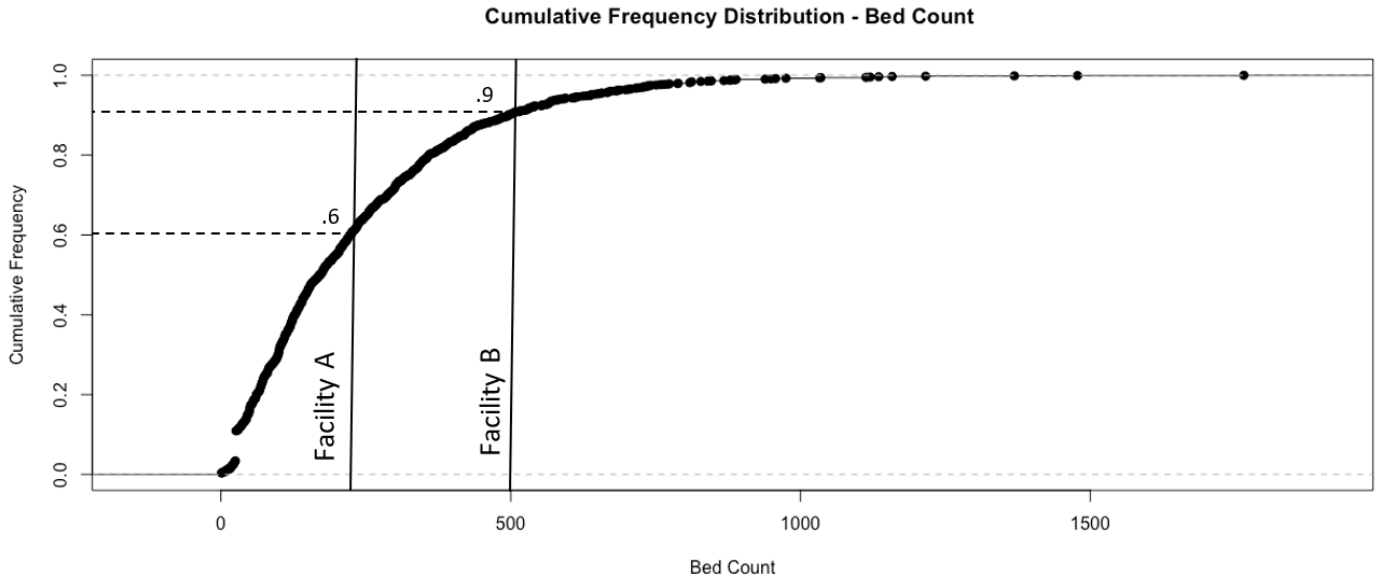
As shown in the below graphic, Facility A, with 250 beds, will have a cumulative probability of .6, indicating that it has more beds than 60% of the hospitals in the QualityAdvisor database, while Facility B having 500 beds will receive a probability of .9. The similarity between these facilities is .3, as it relates to the bed count characteristic. Note that the non-logged values are shown here for demonstration purposes.



The normalized values for each structural characteristic are averaged into an overall structural domain score (also between 0 and 1).

Geographic Domain

As with the continuous structural characteristics, the geographic domain is calculated as the difference in log cumulative probabilities in miles between zip codes for the two compared facilities. The mile calculation uses the United States Postal Service latitude and longitude center point for the zip-code associated with each facility. The distance between the latitude and longitude coordinates is calculated through Euclidean difference (a calculation separate than the k-NN algorithm itself).

Data Sources

Data used for the Structural and Geographic domains data was sourced from the American Hospital Association (AHA), while the MS-DRG business line distributions for the clinical domain were sourced from the Premier Healthcare Database.

Candidate peer facilities in the algorithm are limited to facilities that have comparatively published data within the previous 365 days.

For additional information regarding comparative publish rules for Top Performers, please refer to the **Active Submitters Rule** within the Top Performer Peer Groups methodology documentation.

Algorithm

The K-Nearest-Neighbors (k-NN) is an algorithm that searches for the K most similar facilities (peers) relative to a facility of interest. The similarity metric employed in the Smart Peer uses Euclidean distance where *d(i,j)* is defined as the distance between d *i* and *j*, across *k* domains.

$$d(i,j) = d(j,i) = \sqrt{\sum_{k=1}^{n} (i_k - j_k)^2}$$

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N,K Peer Discloser Limitation

The k-NN method will identify an initial set of 200 peer candidates and further validate that the peer candidate list is in compliance with Premiers Data Disclosure Limitation methodology (i.e., the “N,K rule”). The N,K rule is designed protect the data privacy at the facility and system level by ensuring a balanced peer selection. If the initial peer group fails to comply with the N,K rule, the algorithm iteratively excludes the least-similar facility from the overweighted health system, and replaces it with the next most similar facility within the superset of peer facilities. This iteration occurs until the N,K rule is satisfied.

Domain Weighting

Weights w can be assigned to each of the three k domains to strengthen or weaken an individual domain’s influence on the total Euclidean distance. The user application allows relative weights to be set between 0 and 10; however, the algorithm will support any real number. To normalize the relative weights assigned by the user, each relative domain weight is divided by the sum of all relative domain weights. At this point, the transformed weights sum to 1; however, in order to maintain the scale of the resulting Euclidean distance, the weights are further divided by an equal fraction based on the number of evaluated domains (i.e. 1/3).

$$w'_k = \frac{w_k / \sum_j^n w_j}{1/n}$$

The resulting weights w'_k will sum to the number of evaluated domains (i.e. 3).

$$n = \sum_{k=1}^{n} w'_k$$

Point Values in the User Application

For greater user interpretability, the measure of Euclidean distance and the raw domain scores themselves are converted into point values ranging between 1 and 10, with a higher number indicating greater similarity. The method to convert domain scores and Euclidean distance to points uses min/max scaling:

$$point\ value = \ ceiling\left(\frac{\max domain\ score\ value - domain\ score}{\max domain\ score\ value - \min domain\ score\ value}\right) \times 10$$

To account for potential outliers, the max score is the 95th percentile score value based on a dataset of all QualityAdvisor facilities and their closest 200 peers. Given that the most important variation exists within those facilities in closest Euclidean proximity, an artificial limit of 200 is applied to the data distribution, allowing the application user to better distinguish variation within the most similar peers.

External Peer Methodology

In order to prevent over-representation of any two health systems in an external peer group, Premier has implemented the Peer Disclosure Limitation Methodology (PDLM).

The PDLM uses an industry-accepted practice called the (n,k) rule, where n is the number of health systems that will be considered when summing the inpatient case count and k is the acceptable percentage of data that those health systems are able to represent within a peer selection.

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The (n,k) rule has been set to (2, 75) to meet Premier's standards.

As a result, when selecting a peer group that contains facilities that belong to a health system to which you do not have access, the peer group must include at least five facilities that belong to at least three health systems outside of your own, and no **two** health systems can comprise **more than 75.0%** of the total inpatient case count of the peer selection.

If the facilities in your peer selection have comparatively published data within the last year, then the inpatient case count is based on the most recent 12 months that each of the facilities comparatively published data.

Note: A peer group selection must always contain at least five facilities in order to calculate external peer data.

The following tips may be useful in selecting your peer facilities:

- The Health System name has been appended to the facility names in the Peer prompt to help you select at least 3 Health Systems outside of your own.
- Before you select a peer group for your analysis, check whether the category contains the required five peer facilities. If the peer group you want does not contain five facilities, supplement your selection by choosing additional peers.

When making your peer group selection, the selection will be validated to determine if it meets the n, k rule requirement. Peer groups that are deemed **"sensitive"** do not meet the requirement, and must be updated before they can be used. Peer groups that are determined to be **"safe"** meet the n, k rule standards.

The following is an example of a "sensitive" peer group selection, meaning the peer analysis will not return:

Example #1:

The following is an example of a sensitive peer group selection, meaning the peer analysis will not return:

Facility	Health System	Facility Case Count	Health System Case Count
Facility 1	A	2500	5000
Facility 2	A	2500	
Facility 3	B	150	150
Facility 4	C	75	75
Facility 5	D	50	50

1. Sums of the top 2 Health Systems, A and B: 5000 + 150= **5150**
2. Sums of all the peer Health Systems, A, B, C, and D: 5000 + 150 + 75 + 50 = **5275**
3. Checks for sensitivity: 5150 / 5275 = **97.6%**
4. Because 97.6% is greater than 75%, the peer selection is considered **sensitive**, and the analysis will not return any results

Example #2:

The following is an example of a safe peer group selection, meaning the peer analysis will return:

Facility	Health System	Facility Case Count	Health System Case Count
Facility 1	A	2500	5000
Facility 2	A	2500	
Facility 3	B	2500	2500
Facility 4	C	2500	2500
Facility 5	D	2500	2500

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1. Sums the top 2 Health Systems, A and B: 5000 + 2500 = **7500**
2. Sums all the peer Health Systems, A, B, C, and D: 5000 + 2500 + 2500 + 2500 = **12500**
3. Checks for sensitivity: 7500 / 12500 = **60%**
4. Because 60% is not greater than 75%, this peer selection is considered **safe**, and the analysis will return results

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Chapter 12 - Distinct Case Counts at the Row Level

Distinct Case Count at the Row Level

The case count for each row is a distinct case count based on patient ID where one patient equals one case. The following is an example of an analysis without a distinct case count on the rows:

Procedure (All) Surgeon	Total	Total	Total	Observed	Observed Mortality
Total	53	423		7.98	32.08%
Practitioner 1	22	173		7.86	13.62%
Practitioner 2	26	225		8.65	34.62%
Practitioner 3		25		5.00	100.00%

If you drill down on Practitioner 1, you'll find that Practitioner 1 had only 9 individual patients, not 22. The system is counting each procedure as a case, which is why the row total for Practitioner 1 is 22 instead of 9. Because the same patient can count multiple times in the Total Cases for the row, you are not seeing the number of total cases (where one case equals one patient) so much as the number of procedures or codes.

The same table would look like this:

Procedure (All) Surgeon	Total Cases	Total Days	Total Deaths	Observed ALOS	Observed Mortality Rate
Total	17	131		7.71	29.41%
Practitioner 1		80		8.89	33.33%
Practitioner 2		46		6.57	14.29%
Practitioner 3				5.00	100.00%

The Total Cases metric for Practitioner 1 reflects the number of individual patients Practitioner 1 treated, the Total Days, Total Deaths, Observed LOS, and Observed Mortality Rate metrics for Practitioner 1 have changed as well.

While one patient cannot count more than once in the same row, one patient can count in more than one row of the analysis. Because the Total line for each column is a simple summation of the rows, the Total line does not reflect a distinct case count for the column.

Metrics Affected

The rows show a distinct case count in the rows for the following metrics:

- Total Cases
- Outcome Cases (LOS, Mortality, Cost, and Charge)
- Days
- Deaths
- Cost
- Charges

Note: Because Observed and Expected outcomes (and those outcomes derived from Observed and Expected outcomes) are derived from base metrics that include a distinct case count at the row level, Observed and Expected outcomes include a distinct case count at the row level automatically.

Multi-Value Attributes

A multi-value attribute is an attribute where the patient can have more than one value. For example, Secondary Diagnosis – 3 Digit is a multi-value attribute because each patient can have more than one ICD9 code for any given encounter/case.

Multi-value attributes are placed on the grid when:

- You select a multi-value attribute as a row option at the prompts on the Set Up Analysis tab.
- You drill to a multi-value attribute after the analysis is run.

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The following is a complete list of multi-value attributes:

Diagnoses

- Diagnosis (All) - 3 Digit
- Diagnosis (All) - 3 Digit POA Grouping
- Diagnosis (All) - 4 Digit
- Diagnosis (All) - 4 Digit POA Grouping
- Diagnosis (All) - 5 Digit
- Diagnosis (All) - 5 Digit POA Grouping
- Diagnosis (All) POA Grouping
- Diagnosis (All) POA Indicator
- Secondary Diagnosis - 3 Digit
- Secondary Diagnosis - 3 Digit POA Grouping
- Secondary Diagnosis - 4 Digit
- Secondary Diagnosis - 4 Digit POA Grouping
- Secondary Diagnosis - 5 Digit
- Secondary Diagnosis - 5 Digit POA Grouping
- Secondary Diagnosis POA Grouping
- Secondary Diagnosis POA Indicator

Procedures

- CPT®4 Code
- Procedure (All) - 2 Digit
- Procedure (All) - 3 Digit
- Procedure (All) - 4 Digit
- Secondary Procedure - 2 Digit
- Secondary Procedure - 3 Digit
- Secondary Procedure - 4 Digit

Practitioners

- Consulting Practitioner
- Procedure (All) Surgeon

Standard Practice Specialties

- Consulting Practitioner’s Standard Specialty
- Procedure (All) Surgeon’s Standard Specialty

Resources

- Facility Charge Master Resources
- Perspective Standard Department Roll-up Category
- Perspective Standard Department
- Perspective Clinical Summary

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- Perspective Clinical Detail
- Perspective Standard Charge Master

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Chapter 13 - Outlier Prompt Methodlogy

Outlier Prompt Methodology

QualityAdvisor identifies and flags inpatients as outliers in the QualityAdvisor Database if the inpatient meets any one of the following criteria:

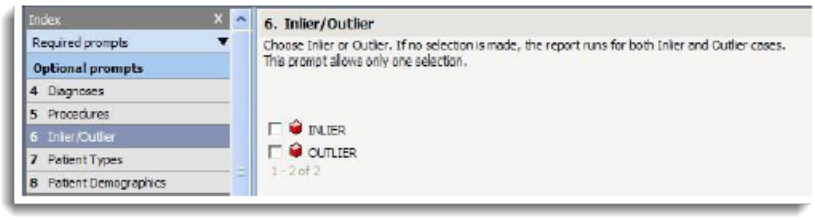
- The inpatient was transferred to another acute care facility (UB-04® discharge disposition code of 02).
- The inpatient left against medical advice (AMA) or discontinued care (UB-04® discharge disposition code of 07).
- The inpatient has an LOS that exceeds two standard deviations (+/-) from the mean for APR DRGs.*
- The inpatient exceeds two standard deviations for charges (+/-) for APR DRG.*

Notes:

- Outlier methodology does not apply to the outpatient population.
- Calendar year 2023 discharges were used to calculate the two standard deviation values for LOS and charges. Patients with UB-04® discharge disposition codes of 02 or 07 were excluded from the calculation.
- *If the APR DRG severity had less than 30 cases for calendar year 2023, the available severities within the APR DRG were used to calculate the appropriate value.

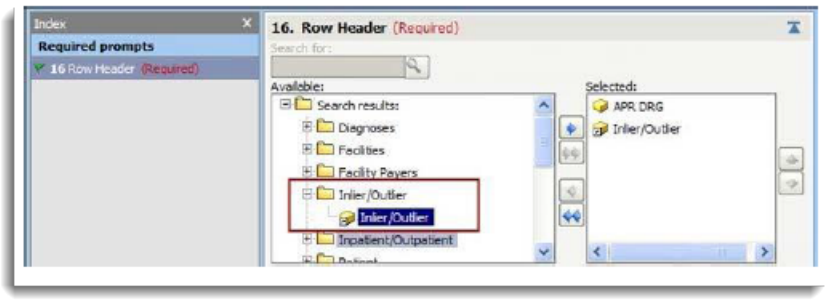
Prompts

This outlier methodology is applied at the **Inlier/Outlier** prompt on the Select Population tab:



Select **Inlier** to remove Outliers from the inpatient population.

The **Inlier/Outlier** attribute in the Row Header prompt on the **Set Up Analysis tab.**



When you select **Inlier/Outlier**, the data is divided into two rows: one row for Inlier inpatients and one row for Outlier inpatients. Only rows with data appear. If an attribute has no Outlier inpatients and only Inlier inpatients, then only the Inlier row will appear.

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Chapter 14 - AHRQ Methodology

AHRQ Methodology

QualityAdvisor uses the source code from the Agency for Healthcare Research Quality (AHRQ) SAS software module for PSIs and IQIs to calculate PSI and IQI rates. This is the standard software module from AHRQ that runs the SAS statistical software package.

- For each patient, the AHRQ SAS module accepts up to 35 ICD diagnosis codes and up to 30 ICD procedure codes. The order of the diagnosis and procedure codes is evaluated in the software based on the order in which Premier receives them.

  The first diagnosis code is the principal code and the remaining 34 are the secondary codes. If a patient has any codes beyond the 35-code limit, the AHRQ SAS module won't recognize those codes.

  The first procedure code is the principal code and the remaining 29 are the secondary codes. If a patient has any codes beyond the 30-code limit, the AHRQ SAS module won't recognize those codes.
- For both Patient Safety Indicators (PSI) and Inpatient Quality Indicators (IQI), QualityAdvisor does not consider utilization of area-level procedures, which are procedures whose use varies widely across relatively similar geographic areas (for example, CABG Area Rate).

Risk Adjustment

Risk-adjustment is a statistical process that takes into account the underlying health status related to patient outcomes or health care costs. In order to create a robust regression model, AHRQ first required two complete years of ICD-10 data beginning with 10/1/2015 discharges. Risk-adjustment is now currently available with the ICD-10 based AHRQ versions.

Data Used in Calculating PSI Rates

Reference Population for the PSIs

The reported Expected, Risk-adjusted, and Smoothed rates for the hospital-level PSIs are calculated using data from a reference population.

AHRQ uses the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) as the reference population. The SID is a large database of hospital discharge data maintained by AHRQ. It contains data for all hospital discharges from 47 States, representing more than 95 percent of all U.S. hospital discharges (for more information, see http://www.hcup-us.ahrq.gov/sidoverview.jsp).

Using this dataset, AHRQ performs statistical analyses to calculate reference population PSI rates and identify risk factors. These measures are available as part of the AHRQ SAS software that Premier uses to calculate the PSI rates.

Weights for the Smoothed Rates

The Smoothed rates are calculated using weights that reflect the stability of your hospital's PSI rates, which are affected by the size of your hospital's patient population and the types of quality and safety events that occur in your hospital.

When Premier runs the AHRQ QI SAS software, weights are applied to the risk-adjusted rates for each PSI. These weights "shrink" the hospital's Risk-adjusted rate toward the overall mean from the SID. The shrinkage estimate is called a "reliability adjustment."

For a hospital with less reliable PSI rate estimates, its smoothed rates will shrink more toward the SID mean (Reference Population Rate), compared to Smoothed rates for a hospital with more reliable rates. The resulting rates will have smaller year-to-year fluctuations in performance, so they will appear "smoother" than the raw rates.

Data Used in Calculating PSI Rates

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The reported Expected, Risk-adjusted, and Smoothed rates for the hospital-level PSIs are calculated using data from a reference population.

AHRQ uses the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) as the reference population. The SID is a large database of hospital discharge data maintained by AHRQ. It contains data for all hospital

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AHRQ Rates View Column Definitions

Following are detailed definitions of the columns that display when you select the **AHRQ Rates View.**

Column Name	Definition
Observed Numerator	The actual number of cases that occurred in your hospital during the time period selected. A case is not counted if its associated discharge is not part of the denominator.
Observed Denominator	The number of cases that met the inclusion criteria of each PSI measure during the time period selected.
Observed Rate/1000	The actual rate at which events measured by the PSI occurred, multiplied by 1000.
Expected Rate/1000	The rate at which your hospital was expected to perform if your hospital had performed the same as the reference population given your actual case mix (based on age, gender, DRG, and morbidity categories), multiplied by 1000.
O/E Ratio	• If your observed divided by the expected rate for an indicator is higher than the expected rate (an O/E ratio greater than 1), then your hospital has an opportunity compared to the reference population with an equivalent patient case mix. • If your observed divided by the expected rate for an indicator is lower than the expected rate (an O/E ratio less than 1), then your hospital performed better than the reference population with an equivalent case mix.
Reference Population Rate/1000	The overall rate of the reference population, multiplied by 1000. AHRQ uses the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) to calculate the reference population PSI rates.
Risk-Adjusted Rate/1000	An estimate of how your hospital would perform for the same case mix as the reference population, multiplied by 1000.

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Column Name	Definition
Smoothed Rate/1000	A blend of your Risk-adjusted rate and the reference population rate into a single rate based on the reliability of your data. • If there are a large number of observed denominator patients eligible for a PSI, your data will be more reliable. Thus, the PSI's smoothed rate will be closer to your Risk-Adjusted rate than the reference population rate. • If there are a fewer number of observed denominator patients eligible for a PSI, your data will be less reliable. Thus, the PSI's smoothed rate will be closer to the reference population rate than your Risk-adjusted rate. The smoothed rate will have smaller year-to-year fluctuations in performance since the rate includes a portion of both your own Risk-adjusted rate and the reference population rate.

Smoothed Rates

Smoothing is part of the standard AHRQ method for computing the PSI-90 Composite.

Smoothing takes into account the reliability of each measure as an indicator of your hospital's performance. In the process, it effectively substitutes an average performer's score in place of part of your hospital's score.

For each measure, a reliability weight is computed based on your hospital's data. Reliability is lower for a measure when a small patient population is at risk for the measure (denominator) and when there is more variance in the expected rate.

For all inpatients, smoothing results in a hospital's PSI-90 score being pulled toward 1.0. Generally, the smaller the hospital, or the shorter the time period, the more dramatically the PSI-90 score will be pulled toward 1.0.

CMS also uses smoothed rates in the composite score for VBP (for Medicare FFS only). With the CMS method, smoothing results in a hospital's PSI-90 score being pulled toward **.62**, which is the national median PSI-90 score for the Medicare population and the Achievement Threshold for CMS VBP 2015.

Calculating the PSI-90 Composite

Each measure's smoothed Observed/Expected ratio is computed as follows, for each measure *i*:

$$\text{Smoothed Ratio}_i = \frac{\text{Hospital Observed Rate}_i}{\text{Hospital Expected Rate}_i} \times \text{Reliability Weight}_i$$

$$+ \frac{\text{Reference Population Obs Rate}_i}{\text{Reference Population Exp Rate}_i} \times (1 - \text{Reliability Weight}_i)$$

The smoothed ratio is then used in the following calculation:

$$\text{Composite Score} = \sum_{i=1}^{n} \left(\text{Smoothed Ratio}_i \text{ X NQF\_weight}_i\right)$$

Note: The Reference Population Observed/Expected Ratio for each measure is **1** for the all-inpatient analysis. For the CMS-defined analysis, it is the observed/expected ratio seen in the Medicare FFS population during the VBP 2015 baseline period (known as the "K-values").

The NQF weights sum to 1.0. So as the Reliability Weight approaches zero for each measure, each Smoothed Ratio approaches 1, and the final Composite Score approaches 1.0 (or 0.62 if using the CMS method for Medicare FFS only).

K-Values

The K-values (scaling factors) are used to recalibrate the AHRQ software for Medicare FFS patients so that hospitals may replicate CMS results using their own claims data.

We are using the VBP 2015 K-values for computing PSI-90 for VBP 2015 (using AHRQ v 4.4).

CMS is expected to publish the VBP 2016 K-values in late Spring of 2014. Until that time, we will use the 2015 values to compute PSI-90 for VBP 2016.

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Example showing the effect of smoothing

The following example illustrates the pronounced results of smoothing on a smaller hospital's PSI-90 score for its Medicare FFS population.

In this example, **Hospital A** is larger and has a better PSI-90 score; **Hospital B** is smaller, and has a worse PSI-90 score despite having a better (perfect) observed rate.

Hospital A

Hospital A has a larger population, a greater observed rate, and a higher reliability weight for each measure than Hospital B.

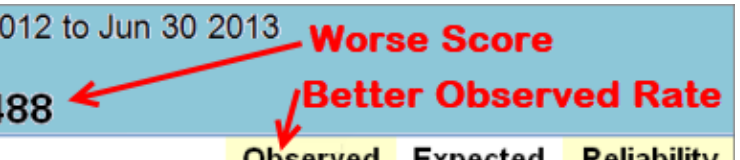
Performance period: Oct 15 2012 to Jun 30 2013
Patient count: 2316
PSI-90 (CMS): **0.456055**

Measure	Numerator	Denominator	Observed Rate	Expected Rate	Reliability Weight
PSI-3	0	480	0.000000	0.010067	0.6801
PSI-6	1	2188	0.000457	0.000669	0.2994
PSI-7	0	1283	0.000000	0.001360	0.4877
PSI-8	0	357	0.000000	0.000030	0.0044
PSI-12	2	576	0.003472	0.007750	0.5851
PSI-13	1	151	0.006623	0.018633	0.3882
PSI-14	0	39	0.000000	0.003951	0.1519
PSI-15	2	2268	0.000882	0.002546	0.5306

Hospital B

Hospital B has no patients in the numerator for any measures. Even though Hospital B's observed rate is **better** than Hospital A's, and the reliability weighting is **less**, Hospital B has a PSI-90 Composite Score of 0.576488—**worse** than that of Hospital A.

Performance period: Oct 15 2012 to Jun 30 2013
Patient count: 301
PSI-90 (CMS) **0.576488**



Measure	Numerator	Denominator	Observed Rate	Expected Rate	Reliability Weight
PSI-3	0	78	0.000000	0.004515	0.1329
PSI-6	0	289	0.000000	0.000187	0.0154
PSI-7	0	227	0.000000	0.000225	0.0267
PSI-8	0	8	0.000000	0.000027	0.0001
PSI-12	0	39	0.000000	0.004673	0.0513
PSI-13	0	4	0.000000	0.003555	0.0030
PSI-14	0	7	0.000000	0.001980	0.0158
PSI-15	0	301	0.000000	0.001200	0.0665

Why would the Composite Score on the analysis be different from the score on the graph?

The analysis first computes the composite score for the entire date range. The greater the date range, the higher the reliability and the less pronounced the effect of smoothing.

However, when the score is recalculated for each month in the range (so that it can be plotted on the graph), the population for each month is much smaller and the reliability weight is much lower, so the composite score for each month is pulled

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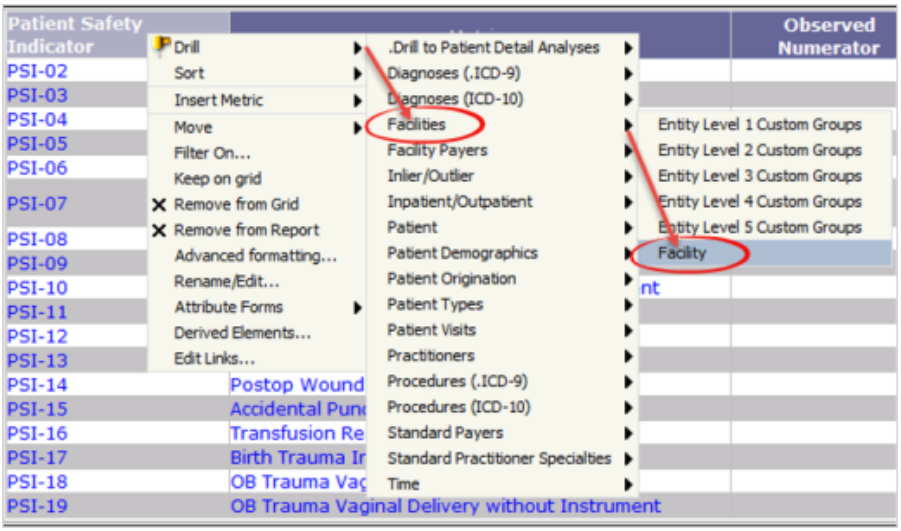
strongly toward 1.0. The smoothing process is useful here—the smaller the data set, the less you should trust it—so smoothing reduces unusual variances in your score, pulling your score toward that of an average performer.

For this reason, the score on the graph should not be compared directly to the overall composite score on the analysis, but is useful for showing whether the trend is up or down and to see whether there are individual months that would benefit from further analysis.

Working with Reports (AHRQ Rates View)

Refer to the table below for specific help in working with the reports in AHRQ Rates View.

If you wish to...	Then...
Create this report for more than one facility	1. Select more that one facility from the Facilities Prompt 2. Then select your other criteria and run the report 3. Then select the **AHRQ Rates View** link on the completed report
Add Facility to the analysis	1. Right click on the Patient Safety Indicator column header 2. Select Drill > Facilities > Facility 
Change the order of the columns	Click in a column heading and drag the column to a new position

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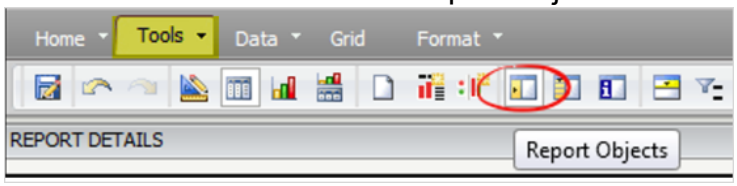
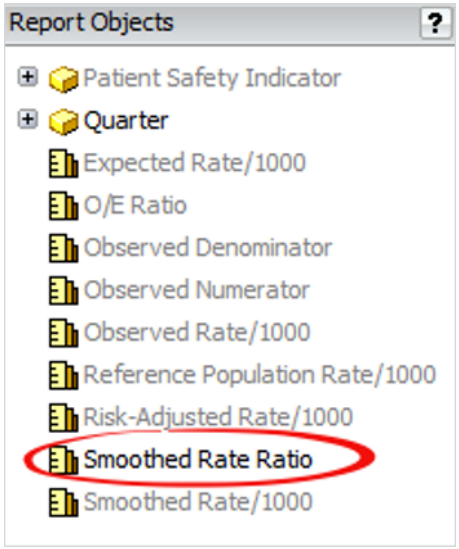
If you wish to...	Then...
Add a metric to the analysis	1. Select Tools and then select Report Objects  2. Click and drag a metric into the analysis. For example: Smoothed Rate Ratio  3. The metric is added to the analysis

Examples of PSI Rates Use

In this example, two hypothetical hospitals (A and B) are assessing their performance on **PSI 3: Pressure Ulcers**.

The rates calculated for each hospital are summarized here; these rates for the two hospitals are discussed below, including examples of how you should interpret the rate comparisons as you assess the performance of your hospital on these indicators.

Rates for PSI 3	Hospital A	Hospital B
Observed Rate/1000	0.02	0.06
Expected Rate/1000	0.04	0.10
Risk-adjusted Rate/1000	0.025	0.03
Smoothed Rate/1000	0.026	0.04

Reference Population Rate/1000 = 0.05

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Example 1 - Calculate Observed Rates

The two hospitals calculate their Observed rates for PSI 3.

Hospital A has an Observed rate of 0.02, and Hospital B has an Observed rate of 0.06. The national Reference population rate for PSI 3 is 0.05.

Result: It is not clear whether Hospital A or Hospital B has better or worse than average performance on PSI 3, compared to the reference population, because the two hospitals may have different case mixes than the reference population.

Example 2 - Compare Expected Rates

Hospital A has an Expected rate of 0.04 for PSI 3.

Result: Since the Expected rate is lower than the reference population rate (0.05), the mix of patients is at lower risk for PSI 3 than the average case mix. Since the Expected rate is higher than the Observed rate, the hospital is performing better than expected on its case mix of patients.

Hospital B has an Expected rate of 0.10 for PSI 3.

Result: Since the Expected rate is higher than the reference population rate (0.05), the mix of patients is at higher risk of PSI 3 than the average case mix. Since the Expected rate is higher than the Observed rate, the hospital is also performing better than expected on its case mix of patients.

Example 3 - Calculate Risk-adjusted Rates

Hospital A has a risk adjusted rate of 0.025, and Hospital B has a risk adjusted rate of 0.03. The rates are calculated by multiplying each hospital's ratio of observed to expected rate by the reference population rate of 0.05.

Result: These risk-adjusted rates suggest that Hospital A is performing slightly better on PSI 3 than Hospital B, and both hospitals are performing better than average, as represented by the reference population rate.
Note: A lower risk-adjusted rate for a PSI indicates better performance because fewer adverse events have occurred - in this case, fewer patients with pressure ulcers.

Example 4 - Smoothed Rates

The calculation for the Smoothed Rate Ratio is:

$$\textit{Smoothed Rate Ratio} = \frac{\textit{Smoothed Rate - Reference Population Rate}}{\textit{Risk-adjusted Rate - Reference Population Rate}}$$

Hospital A is a relatively large hospital and has a Smoothed rate of 0.026 on PSI 3, which is slightly more similar to the reference population rate than its Risk-adjusted rate.

Result: The Smoothed rate ratio is 0.96, suggesting that Hospital A's strong performance on PSI 3 is likely to persist.

Hospital B is a small hospital that sees fewer number of patients who are eligible for PSI 3. Hospital B has a smoothed rate of 0.04.

Result: The Smoothed rate ratio is 0.50, which suggests that Hospital B's apparent good performance may not persist over time; that is, it may not reflect real performance. That known, Hospital B may want to consider using the smoothed rate in comparing its performance on PSI 3 to benchmarks, or it could recalculate the Risk-adjusted rate for PSI 3 using two years of discharge data to gain more stability in its rates.

AHRQ Rates View Analysis Examples

Following are examples to demonstrate the information you can glean when analyzing data in the AHRQ Rates View.

Analysis Example 1 – Compare Observed Rate to Expected Rate (O/E Ratio)

In this example, you are comparing your observed rate to your expected rate.This type of analysis allows you to compare your performance to the reference population's national average using your own severity mix of patients.

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Consider **PSI-15: Accidental Puncture or Laceration**. Here, your hospital had 10,565 patients; of that number, 27 patients experienced an accidental puncture or laceration (or as the Observed Rate/1000 shows, 2.56 of your hospital's patients).

Based on the Expected reference population and the case mix of the 10,565 patients, your facility's Expected rate/1000 is 2.37.

Dividing the Observed rate by the Expected rate yields the OE Ratio. In this example, the OE Ratio is 1.08. It can be interpreted that your hospital's Observed rate is higher than expected by 8 percent.

Patient Safety Indicator	Metrics	Observed Numerator	Observed Denominator	Observed Rate/1000	Expected Rate/1000	O/E Ratio	Reference Population Rate/1000	Risk-Adjusted Rate/1000	Smoothed Rate/1000
PSI-02	Death in Low Mortality DRGs	0	3,808	0.00	0.26	0.00	0.28	0.00	0.04
PSI-03	Pressure Ulcer	0	2,148	0.00	0.34	0.00	0.41	0.00	0.17
PSI-04	Death in Surgical Pts w Treatable Complications	12	91	131.87	112.72	1.17	117.37	137.31	126.13
PSI-05	Retained Surgical Item or Unretrieved Device Fragment	1	--	--	--	--	--	--	--
PSI-06	Iatrogenic Pneumothorax	3	10,649	0.28	0.35	0.81	0.44	0.35	0.41
PSI-07	Central Venous Catheter-Related Blood Stream Infection	3	7,538	0.40	0.41	0.97	0.41	0.40	0.40
PSI-08	Postop Hip Fracture	0	1,665	0.00	0.03	0.00	0.03	0.00	0.03
PSI-09	Perioperative Hemorrhage or Hematoma	15	2,789	5.38	6.08	0.88	5.74	5.07	5.34
PSI-10	Postop Physiologic and Metabolic Derangement	1	1,906	0.52	0.59	0.89	0.47	0.42	0.45
PSI-11	Postop Respiratory Failure	18	1,598	11.26	7.95	1.42	8.32	11.79	10.85
PSI-12	Perioperative PE or DVT	6	2,935	2.04	3.84	0.53	4.37	2.33	2.83
PSI-13	Postop Sepsis	4	227	17.62	13.89	1.27	11.80	14.98	13.14
PSI-14	Postop Wound Dehiscence	1	356	2.81	1.99	1.41	1.87	2.64	2.00
PSI-15	Accidental Puncture or Laceration	27	10,565	2.56	2.37	1.08	2.43	2.62	2.59
PSI-16	Transfusion Reaction	0	--	--	--	--	--	--	--
PSI-17	Birth Trauma Injury to Neonate	3	1,238	2.42	--	--	2.11	--	--
PSI-18	OB Trauma Vaginal Delivery with Instrument	5	74	67.57	--	--	139.92	--	--
PSI-19	OB Trauma Vaginal Delivery without Instrument	16	793	20.18	--	--	22.54	--	--

Analysis Example 2 – Compare Risk-adjusted Rate to Reference Population Rate

PSI Risk-adjusted rates enable hospital to hospital comparisons since the rates estimate each hospital's performance for an average case mix of patients, rather than each hospital's own mix of patients. Risk-adjusted rates are also a good option to use when trending a single hospital's performance across time.

In this example, we are comparing the Reference Population Rate and Risk-adjusted Rate columns directly. The Risk-adjusted Rate is the estimate of how you would perform based on the average case mix of Reference Population patients.

So, consider **PSI-15: Accidental Puncture or Laceration**. The Risk-adjusted population rate/1000 is 2.62, and the Reference Population rate/1000 is 2.43, so your hospital's rate is higher.

Patient Safety Indicator	Metrics	Observed Numerator	Observed Denominator	Observed Rate/1000	Expected Rate/1000	O/E Ratio	Reference Population Rate/1000	Risk-Adjusted Rate/1000	Smoothed Rate/1000
PSI-02	Death in Low Mortality DRGs	0	3,808	0.00	0.26	0.00	0.28	0.00	0.04
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PSI-04	Death in Surgical Pts w Treatable Complications	12	91	131.87	112.72	1.17	117.37	137.31	126.13
PSI-05	Retained Surgical Item or Unretrieved Device Fragment	1	--	--	--	--	--	--	--
PSI-06	Iatrogenic Pneumothorax	3	10,649	0.28	0.35	0.81	0.44	0.35	0.41
PSI-07	Central Venous Catheter-Related Blood Stream Infection	3	7,538	0.40	0.41	0.97	0.41	0.40	0.40
PSI-08	Postop Hip Fracture	0	1,665	0.00	0.03	0.00	0.03	0.00	0.03
PSI-09	Perioperative Hemorrhage or Hematoma	15	2,789	5.38	6.08	0.88	5.74	5.07	5.34
PSI-10	Postop Physiologic and Metabolic Derangement	1	1,906	0.52	0.59	0.89	0.47	0.42	0.45
PSI-11	Postop Respiratory Failure	18	1,598	11.26	7.95	1.42	8.32	11.79	10.85
PSI-12	Perioperative PE or DVT	6	2,935	2.04	3.84	0.53	4.37	2.33	2.83
PSI-13	Postop Sepsis	4	227	17.62	13.89	1.27	11.80	14.98	13.14
PSI-14	Postop Wound Dehiscence	1	356	2.81	1.99	1.41	1.87	2.64	2.00
PSI-15	Accidental Puncture or Laceration	27	10,565	2.56	2.37	1.08	2.43	2.62	2.59
PSI-16	Transfusion Reaction	0	--	--	--	--	--	--	--
PSI-17	Birth Trauma Injury to Neonate	3	1,238	2.42	--	--	2.11	--	--
PSI-18	OB Trauma Vaginal Delivery with Instrument	5	74	67.57	--	--	139.92	--	--
PSI-19	OB Trauma Vaginal Delivery without Instrument	16	793	20.18	--	--	22.54	--	--

Analysis Example 3 – Smoothed Rate

The Smoothed Rate (blended) is a weighted average of your Risk-adjusted Rate and the Reference Population Rate.

Note: The Smoothed Rate Ratio is available within **Report Objects**. Learn more.

The Smoothed Rate can be used to assess whether any difference between your Risk-adjusted Rate and the Reference Population Rate is likely to remain in the next measurement period, assuming the same amount of time is used; for example, the reliability of one year's data is likely to be the same as another year's data.

You can compare the Smoothed Rate for a PSI with its Risk-adjusted Rate by calculating the following ratio:

$$\textit{Smoothed Rate Ratio} = \frac{\textit{Smoothed Rate - Reference Population Rate}}{\textit{Risk-adjusted Rate - Reference Population Rate}}$$

The larger the Smoothed Rate Ratio, the more similar the smoothed rate is to the Risk-adjusted Rate.

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AHRQ suggests that if the ratio is greater than 0.80, the difference between the Risk-adjusted rate and the reference population rate--whether positive or negative--is likely to persist into the next measurement period.

If the ratio is less than 0.80, a greater share of the difference between the Risk-adjusted rate and the reference population rate may be due to a small patient population and the random differences in patient characteristics. If your hospital has a relatively small number of eligible discharges for a particular PSI, it may not be possible to accurately estimate changes in rates for that PSI over time.

If the Smoothed Rate Ratio indicates that the Risk-adjusted Rate is unlikely to persist over time (ratio is less than 0.80), AHRQ suggests that you use the Smoothed Rate for comparison to benchmarks and that you interpret these comparisons with caution.

Alternatively, you can calculate the Risk-adjusted Rate using discharges from more than one year, which will make the rate more stable and reliable.

In this example, the Smoothed Rate Ratio is .84, so you can be confident that the difference between the Reference Population Rate and the Risk-adjusted Rate will continue into the next measurement period.

Patient Safety Indicator		Metrics	Observed Numerator	Observed Denominator	Observed Rate/1000	Expected Rate/1000	O/E Ratio	Reference Population Rate/1000	Risk-Adjusted Rate/1000	Smoothed Rate/1000
PSI-02	Death in Low Mortality DRGs		0	3,808	0.00	0.26	0.00	0.28	0.00	0.04
PSI-03	Pressure Ulcer		0	2,148	0.00	0.34	0.00	0.41	0.00	0.17
PSI-04	Death in Surgical Pts w Treatable Complications		12	91	131.87	112.72	1.17	117.37	137.31	126.13
PSI-05	Retained Surgical Item or Unretrieved Device Fragment		1	--	--	--	--	--	--	--
PSI-06	Iatrogenic Pneumothorax		3	10,649	0.28	0.35	0.81	0.44	0.35	0.41
PSI-07	Central Venous Catheter-Related Blood Stream Infection		3	7,538	0.40	0.41	0.97	0.41	0.40	0.40
PSI-08	Postop Hip Fracture		0	1,665	0.00	0.03	0.00	0.03	0.00	0.03
PSI-09	Perioperative Hemorrhage or Hematoma		15	2,789	5.38	6.08	0.88	5.74	5.07	5.34
PSI-10	Postop Physiologic and Metabolic Derangement		1	1,906	0.52	0.59	0.89	0.47	0.42	0.45
PSI-11	Postop Respiratory Failure		18	1,598	11.26	7.95	1.42	8.32	11.79	10.85
PSI-12	Perioperative PE or DVT		6	2,935	2.04	3.84	0.53	4.37	2.33	2.83
PSI-13	Postop Sepsis		4	227	17.62	13.89	1.27	11.80	14.98	13.14
PSI-14	Postop Wound Dehiscence		1	356	2.81	1.99	1.41	1.87	2.64	2.00
PSI-15	Accidental Puncture or Laceration		27	10,565	2.56	2.37	1.08	2.43	2.62	2.59
PSI-16	Transfusion Reaction		0	--	--	--	--	--	--	--
PSI-17	Birth Trauma Injury to Neonate		3	1,238	2.42	--	--	2.11	--	--
PSI-18	OB Trauma Vaginal Delivery with Instrument		5	74	67.57	--	--	139.92	--	--
PSI-19	OB Trauma Vaginal Delivery without Instrument		16	793	20.18	--	--	22.54	--	--

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Chapter 15 - Winsorized Scoring Methodology

Winsorized Scoring Methodology

This method uses a continuous measure score rather than grouping composite results into deciles. In alignment with CMS, the Premier decile benchmarks have been replaced with comparisons based on a similar Winsorized z-scoring method.

The benefits of this methodology are that it:

- Creates a more level playing field than the previously used linear regression model
- Mitigates situations where hospitals with no adverse events and no score were eligible for a penalty
- Makes it easier to distinguish performance across hospitals
- Substantially reduces ties between composite scores

The FY2018 analysis includes the Premier Median and Premier 75th Percentile.

This is the Z-score calculation:

$$\text{Z-Score} = \frac{(\text{Hospital's Measure Performance} - \text{Mean Performance for All Hospitals})}{\text{Standard Deviation for All Hospitals}}$$

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Chapter 16 - Case Mix Index (CMI)

Case Mix Index (CMI)

Case Mix Index (CMI) is the average relative value or weight assigned to a Medicare Severity-Diagnosis Related Group (MS-DRG) of patients in a medical care environment. For example, a hospital's inpatient discharges. The CMI reflects the diversity & clinical complexity, and determines the allocation of resources to care for and/or treat all patients in the clinical setting. A higher CMI indicates a more complex and resource-intensive case load and, typically, yields a higher reimbursement rate.

CMS defines CMI as: "the average MS-DRG relative weight calculated by summing the MS-DRG weights for all Medicare discharges and dividing by the number of discharges."

Patients are classified into an MS-DRG, which represents groups having the same condition (based on principal and secondary diagnoses, age, procedures performed, discharge status and gender), complexity (the presence of co-morbidity and/or complications) and needs. In order to calculate CMI, weights are assigned to each MS-DRG by CMS. These MS-DRG weights reflect the national "average hospital resource consumption" by patients for that particular MS-DRG, relative to the national "average hospital resource consumption" of all patients. Although the MS-DRG weights are based on resource consumption by Medicare patients, it can be applied to all patient discharge data during the course of a calendar year, or specified timeframe. The CMI is then calculated by averaging the MS-DRG weight of patients discharged with the calendar year or specified timeframe (i.e. the sum of MS-DRG weights divided by the number of patients).

In QualityAdvisor, CMI metrics are available on the following analyses for both CareScience Analytics and 3M™ APR DRG risk methodologies:

- **Custom Query (Facility only)**
- **Custom Comparison (Facility only)**
- **Facility Profiling**

The CMI metrics on the Custom Query & Custom Comparison analyses are calculated at the patient level while the CMI metric on the Facility Profiling analysis is calculated at the facility level.

> **Note:** Due to the inclusion and exclusion differences between the facility-level CMI and the patient-level CMI it is possible that the CMI FY value for a facility on the Facility Profiling analysis may not match the patient-level CMI on either the Custom Query or Custom Comparison analyses for the same facility.

- The facility-level CMI FY value is calculated based on all inpatients (total cases) for the fiscal year, and includes both weighted and non-weighted MS-DRGs.
- The patient-level CMI is calculated based on inpatients that have an MS-DRG that carries a weight assigned (i.e. MS-DRG 998 and 999 are not included.)

  As a result, total cases used to calculate facility-level CMI FY may not match the total cases used to calculate patient-level CMI for the same facility and therefore could yield different CMI results.

Custom Query & Custom Comparison

The patient-level CMI metrics on the Custom Query and the Custom Comparison analyses allow you to report on any attribute in QualityAdvisor, including by practitioner. However, the patient level CMI metrics only include ICD-10 MS-DRGs that have been given a weight by CMS. The following two MS-DRGs are not assigned a weight, and are therefore excluded from the patient-level CMI calculation:

- MS-DRG 998: Principal Diagnosis Invalid as Discharge Diagnosis
- MS-DRG 999: Ungroupable

Since these two MS-DRGs are excluded from the calculation, it is possible that the total cases used to calculate CMI may not match the total cases for the report population.

- The **Case Mix Index - Total Cases** metric on these two analyses show the number of cases used to calculate the CMI.

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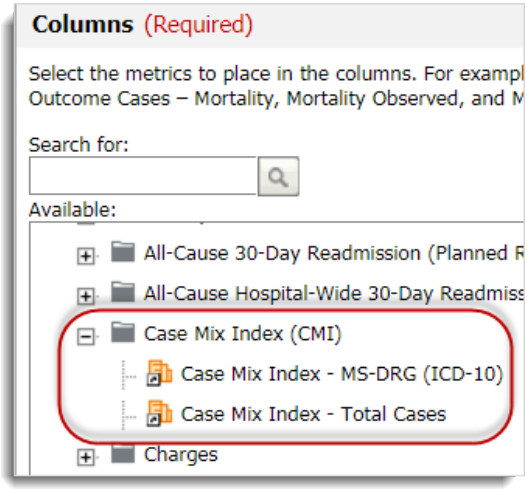

The patient-level CMI metric is calculated by summing the MS-DRG weight for each discharge (based on the attribute selected within the reporting prompts) and dividing the total by the number of discharges for the selected population. If the reporting timeframe spans multiple CMS fiscal years, the MS-DRG weights applicable to the fiscal year in which the patients' discharge date occurred is considered.

CMI Examples with One Fiscal Year:

MS-DRG	Fiscal Year	# of Patients	Weight
001	FY17	50	.5
002	FY17	100	1.5

CMI = (50)(.5) + (100)(1.5) / 150

CMI Examples with Multiple Fiscal Years:

MS-DRG	Fiscal Year	# of Patients	Weight
001	FY17	50	.5
001	FY16	50	1.0
002	FY17	100	1.5

CMI = (50)(.5) + (50)(1.0) + (100)(1.5) / 200

Facility Profiling

The CMI metric on the Facility Profiling analysis is calculated at the facility level per fiscal year (FY), and is based on data in the Comparative Database.

The CMI FY value is calculated based on all inpatients (total cases) for the fiscal year regardless of MS-DRG weight assignment. Since the CMI FY includes both weighted and non-weighted MS-DRGs, the total cases used to calculate facility-level CMI FY may not match the total cases used to calculate patient-level CMI for the same facility.

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Chapter 17 - ICU Risk Adjustment

Metrics for Intensive Care

Patients Under Intensive Care

- Patients under Intensive Care are identified as inpatients, whose billing file includes at least one Room & Board billing item from an Intensive Care unit. (PCS_CODE='110102' from QADV_PROD.Prov_CDM)
- Filter (Age >=18)

1. If a patient's R&B dates are continuous, they are regarded as one episode of intensive care.
2. If there is a gap between R&B dates, the latter date is regarded as the beginning of a new episode of intensive care

R&B Date	Episode 1	Episode 2
01/01/2020	Yes	
01/02/2020	Yes	
01/03/2020	Yes	
01/08/2020		Yes
01/09/2020		Yes

4.8% of patients had more than one episode of intensive care.

Initial Day of Intensive Care

The earliest date of Room & Board is regarded as the initial day of Intensive Care.

Initial Day	No. of Patients	Pct. of Patients
1	1,101,250	75.3%
2	122,040	8.4%
3	54,714	3.7%
4	38,908	2.7%
5 & above	146,107	10%

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Final Discharge from Intensive Care

- If a patient's last day of R&B billing is the same or one day before the final discharge date, the patient is regarded as being discharged from ICU.
- About 32% of patients were discharged from ICU.

	R&B Billing (initial day)	R&B Billing (last day)	Discharge Date	Final Discharge from ICU
Patient 1	01/01/2020	01/02/2020	01/08/2020	No
Patient 2	01/02/2020	01/05/2020	01/05/2020	Yes
Patient 3	01/08/2020	01/10/2020	01/11/2020	Yes
Patient 4	01/10/2020	01/15/2020	01/25/2020	No

A key factor to determine numerator of mortality rate in ICU

A key factor to determine denominator of return to ICU

Discharge Status	Percent of Patients
Home/Self Care	43%
Expired	22%
Transferred to a different hospital	7%
Home health organization	7%
Transferred to SNF	6%
Hospice	5%

- Patients with Medical MS_DRGs are more likely directly discharged from ICU.
- Step-Down is not consistently documented across member hospitals.

Outcomes

1 - Mortality in ICU

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- Mortality in ICU is defined as patients who died in an Intensive Care Unit.

- Denominator = Intensive Care Episodes, excluding patients who were transferred to a different hospital (final discharge from ICU)
- Numerator = Expirations (final discharge from ICU)
- *If a patient was transferred from an Intensive Care Unit to a regular ward and died there, the case is EXCLUDED from numerator.*

Mortality in ICU	Avg. Rate
QualityAdvisor	7.5%

Mortality rate may vary by timeframe.

2 - Hospitalization Mortality (ICU Patients)

- Hospitalization Mortality (ICU Patients) is defined as patients who died during hospitalization, in which Intensive Care was the sole or part of care provider.
- Denominator = total number of patients, excluding those who were transferred to a different hospital
- Numerator = Expirations
- *If a patient died in an Intensive Care Unit, the case is included in numerator*
- *If a patient was transferred from an Intensive Care Unit to a regular ward and died there, the case is included in numerator.*

ICU Patient Mortality	Avg. Rate
QualityAdvisor	9.90%

Mortality rate may vary by timeframe.

3 - Length of Stay in ICU

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- ❑ Length-of-Stay in ICU is defined as the number of days that a patient was under Intensive Care during a hospitalization.
- ❑ Length-of-Stay in ICU is derived from Room & Board billing date in a patient's billing file.
- ❖ *If a patient had more than one episode of Intensive Care during the same hospitalization, Length-of-Stay in ICU is calculated separately for each episode.*

LOS in ICU	Median	Mean
QualityAdvisor	2 Days	3.5 Days

4 - ICU Patient Length of Stay

- ➢ ICU Patient Length-of-Stay is defined as the number of days that a patient stayed in hospital, including in ICU.
- ➢ Inpatient Length-of-Stay is currently available in QADV_PROD. Mapping ICU patients to the existing LOS data shall be sufficient.

5 - ICU Patient Ventilator Days

- ➢ Ventilator Days are defined as the total number of days that mechanical ventilation-related charge items appear in a patient's billing file. (PCS_CODE ='410017' from QADV_PROD.Prov_CDM)
- ➢ Mechanical ventilation-related charge items are standardized across hospitals at some extent. Inconsistencies exist in patients' billing file.
- ➢ There are three ICD-10 procedure codes (5A1935Z, 5A1945Z, 5A1955Z) designated for mechanical ventilation.
- ❖ *If a patient's ICD data did not include one of those three procedure codes, the patient's ventilator days will be set to zero even though mechanical ventilator-related billing items appear in the billing file.*
- ❖ *If a patient had more than one episode of ICU admission, ventilator days are calculated separately for each episode.*

Ventilator Days	Median	Mean
QualityAdvisor	3 Days	5.2 Days

About 20% ICU patients had at least one ventilator day.

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6 - Return to ICU

- Return to ICU is defined as a patient who had been transferred from an Intensive Care Unit to a regular ward, and then transferred back to an Intensive Care Unit during the same hospitalization.
- *Episodes of Intensive Care are derived from date stamp of Room & Board billing items. There has to be at least one day gap between two episodes. For example, if a patient had Room & Board charge item on day 1, then day 3 and 4, they are counted as two episodes of Intensive Care. The second episode is counted as Return to ICU.*
- Denominator = Intensive Care Episodes, excluding patients who were discharged from ICU (final discharge)
- Numerator = Subsequent Intensive Care Episodes
- *If the second episode occurred in a different Intensive Care Unit, it is included in numerator.*
- *If a patient had more than one return to ICU during the same hospitalization, each episode is counted in numerator separately.*

Readm to ICU	Avg. Rate
QualityAdvisor	7.1%

7 - Returns to ICU within 48 Hrs

- A patient had subsequent ICU episodes within 48 hours of being transferred from the ICU during the same hospitalization.
- Numerator: Intensive Care Episodes where patient returned to ICU within 48 hours.
- Denominator: Intensive Care Episodes, excluding patients who were discharged from ICU as their final discharge.

Risk-Adjustment Model

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- ❑ A model is specified for each sub-populations of ICU patients: 1) Burns and Corrosion, 2) Organ and Bone Marrow Transplant, 3) Major Cardiac Surgery, 4) COVID-19, 5) Neurology, 6) General ICU patients
- ❑ Risk factors include patient demographics, selective factors (i.e. payor), disease grouping (primarily based on principal diagnosis, or principal procedure), secondary ICD diagnosis and procedure codes.
- ❑ Secondary diagnosis codes are included in risk-adjustment if they are present on admission or on POA-exempt list.
- ❑ A flag is added for patients who were admitted to Intensive Care between day 2 and day 4.
- ❑ A flag is added for patients who were admitted to Intensive Care on day 5 or later.
- ❑ In the model for Length-of-Stay and Ventilator Days, a flag is added to indicate final discharge from ICU.

ICD_Proc_Code	ICD_Proc_Desc
5A12012	Performance of Cardiac Output, Single, Manual
5A1213Z	Performance of Cardiac Pacing, Intermittent
5A1221Z	Performance of Cardiac Output, Continuous
5A1223Z	Performance of Cardiac Pacing, Continuous
5A15223	Extracorporeal Membrane Oxygenation, Continuous
5A1935Z	Respiratory Ventilation, Less than 24 Consecutive Hours
5A1945Z	Respiratory Ventilation, 24-96 Consecutive Hours
5A1955Z	Respiratory Ventilation, Greater than 96 Consecutive Hours
5A2204Z	Restoration of Cardiac Rhythm, Single

- ➢ This list of ICD procedure codes are highly influential risk factors.
- ➢ They are included in risk-adjustment if procedure occurred within the first two days under Intensive Care.
- ❖ *Performance of Cardiac Pacing/Output are excluded if a patient had heart transplant, or coronary bypass, or heart valve procedure.*

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- Logistic Regression Model

Outcome	C-statistic
Mortality in Hospital	0.89
Mortality in ICU	0.90
Readmission to ICU	0.77

- Semi-log Regression Model

Outcome	R^2
Hospital Length-of-Stay	0.62
ICU Length-of-Stay	0.33
ICU LOS – final discharge	0.48
ICU LOS – non-final discharge	0.31
Ventilator Days	0.26

- *ICU LOS appears significantly affected by hospital's practice and operation.*

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