3M Science. Applied to Life.™

Overview of APR DRGs and Potentially Preventable Readmissions

Minnesota Hospital Association

June 2018

Our Agenda Today

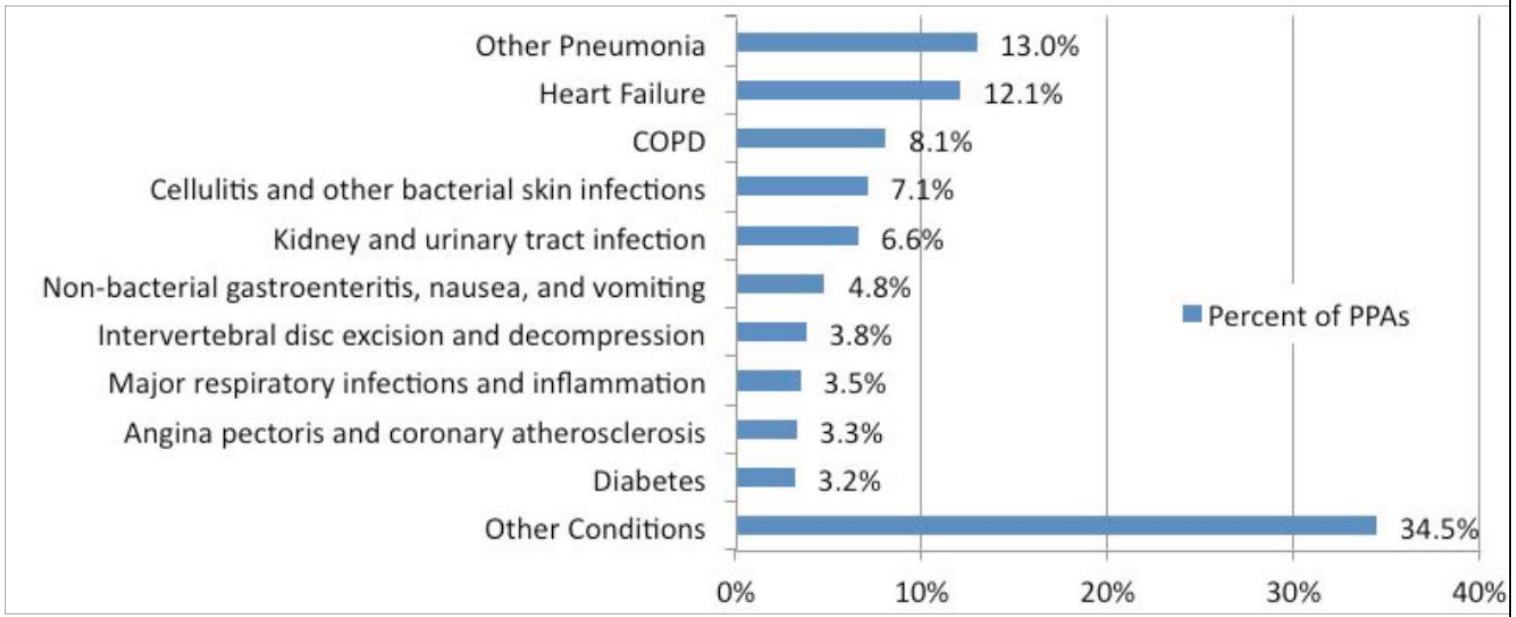
1. APR DRGs: Definition and Methodology Overview
2. Risk Adjustment and Reporting with APR DRGs
3. PPRs: Definition and Methodology Overview
4. Risk Adjustment and Reporting with PPRs

APR DRGs: Definition and Methodology Overview

Quick Summary: All Patient Refined DRGs

- *Applicable sites of service:* Hospital inpatient stay
- *Data required*: Hospital inpatient claims
- *Definition:* A system of classifying patients by their reason of admission, severity of illness, and risk of mortality. DRGs comprise classes of patients who are similar clinically and in consumption of hospital resources.
- *Uses*: Payment, hospital management, reporting, risk adjustment for quality measures

FIGURE 4: Distribution of Potentially Preventable Hospital Admissions by Condition, 2012



* "Other pneumonia" is pneumonia that excludes bronchiolitis and Respiratory Syncytial Virus (RSV)

SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

Source: Minnesota Department of Health, *An Introductory Analysis of Potentially Preventable Health Care Events in Minnesota,* www.health.state.mn.us/healthreform/allpayer/potentially_preventable_events_072115.pdf

Input and Output: APR DRGs

INPUT

Data source: hospital inpatient claims

- Diagnoses and POA indicators
- Procedures and Px dates
- Discharge status
- Age and gender

3M APR DRG Grouper

Available in:

- Mainframe version
- Core Grouping Software
- Grouper Plus Content Serv
- Coding & Reimbursement System
- 360 Encompass

OUTPUT

- Major Diagnostic Category
- Base APR DRG (admission and discharge)
- Severity of Illness (admission and discharge)
- Risk of Mortality (admission)
- Relative weights

Input Pearls

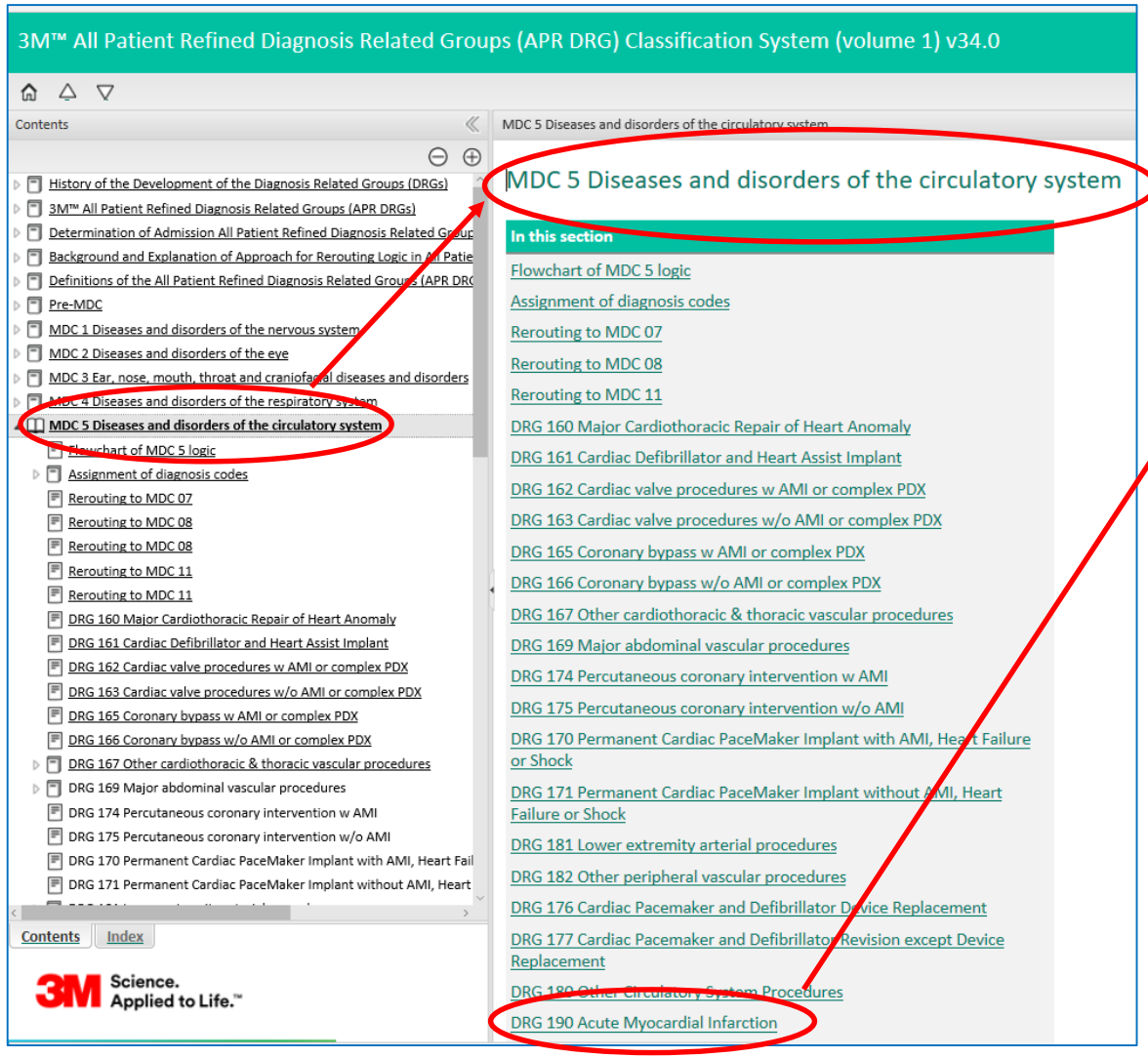
- Check completeness, accuracy, and formatting on diagnosis, present on admission, procedure and procedure date fields
- Search for and verify extreme values of charges, payment, length of stay, and Px/Dx code counts

Output Pearls

- Check records with error codes
- Admission and discharge DRGs are used for different purposes
- Dx and Px “affect” fields show impact on grouping
- Choice of relative weights: charge-based vs HSRV

Not all input and output fields are shown. Input and output pearls are only the most important of many steps needed for valid analysis

Assigning the Base APR DRG



- Definitions Manual available to licensees on 3M customer care site
- Suggestions welcome!

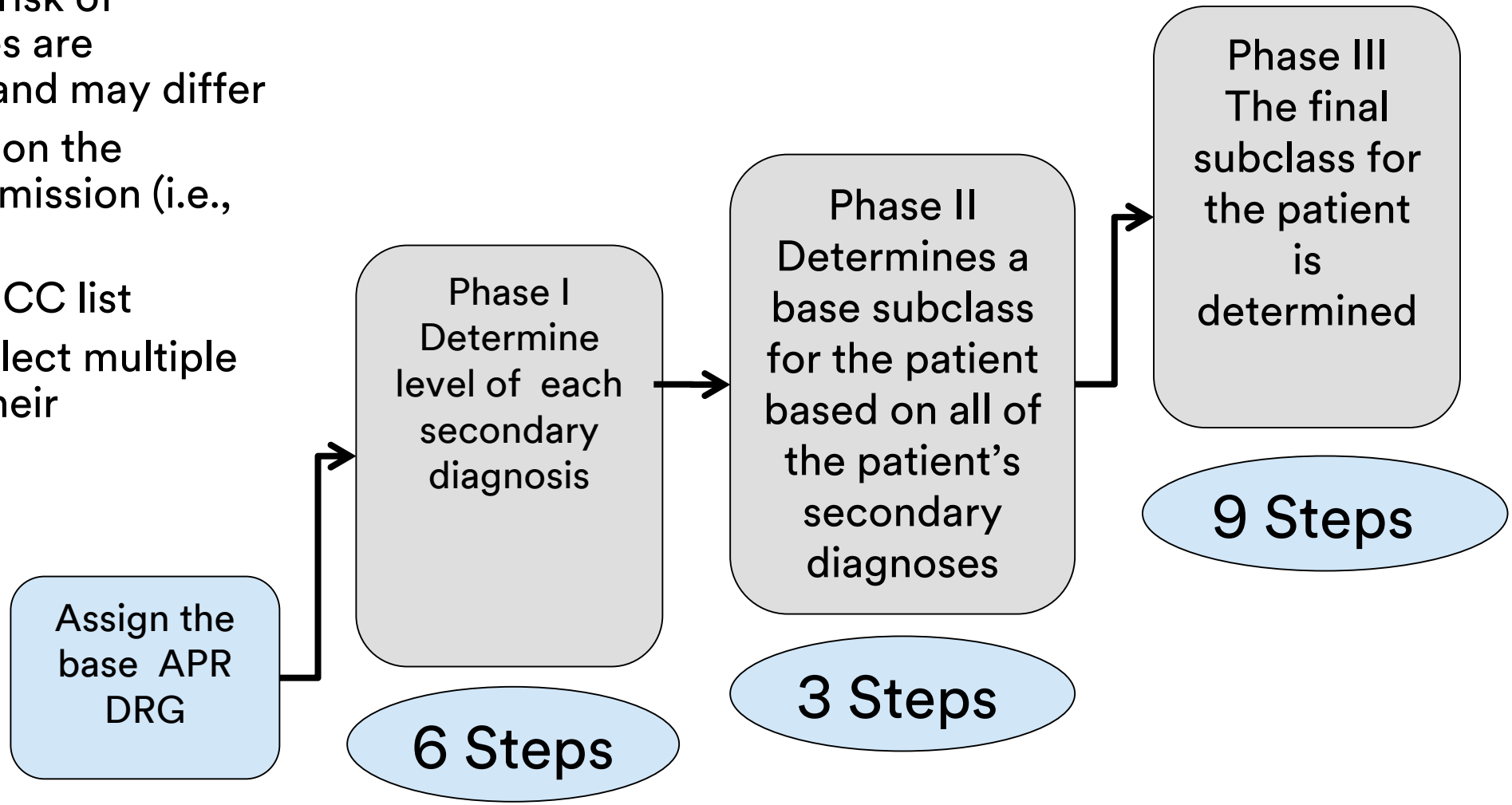
DRG 190 Acute Myocardial Infarction

PRINCIPAL DIAGNOSIS

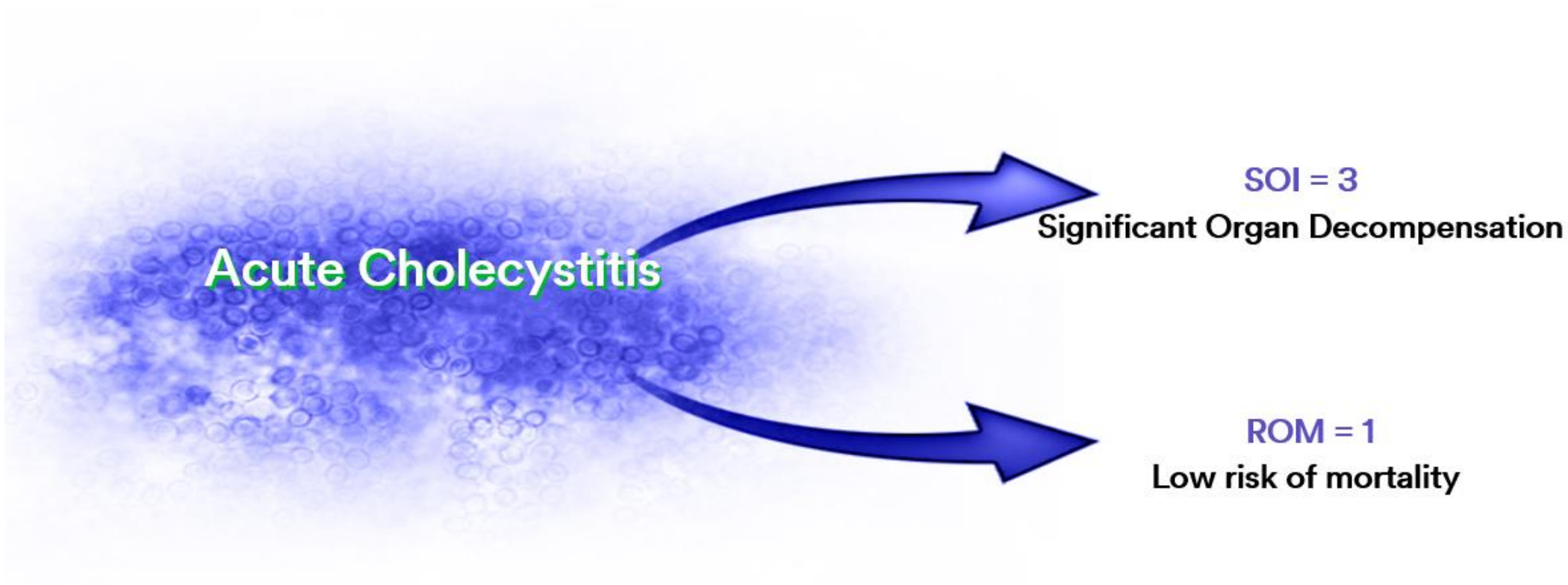
I2101	ST elevation (STEMI) myocardial infarction involving left main coronary artery
I2102	ST elevation (STEMI) myocardial infarction involving left anterior descending coronary artery
I2109	ST elevation (STEMI) myocardial infarction involving other coronary artery of anterior wall
I2111	ST elevation (STEMI) myocardial infarction involving right coronary artery
I2119	ST elevation (STEMI) myocardial infarction involving other coronary artery of inferior wall
I2121	ST elevation (STEMI) myocardial infarction involving left circumflex coronary artery
I2129	ST elevation (STEMI) myocardial infarction involving other sites
I213	ST elevation (STEMI) myocardial infarction of unspecified site
I214	Non-ST elevation (NSTEMI) myocardial infarction
I220	Subsequent ST elevation (STEMI) myocardial infarction of anterior wall
I221	Subsequent ST elevation (STEMI) myocardial infarction of inferior wall
I222	Subsequent non-ST elevation (NSTEMI) myocardial infarction
I228	Subsequent ST elevation (STEMI) myocardial infarction of other sites
I229	Subsequent ST elevation (STEMI) myocardial infarction of unspecified site

18 Steps to Assign Severity of Illness and Risk of Mortality

- Severity of illness and risk of mortality subcategories are calculated separately and may differ
- SOI and ROM depend on the patient's reason for admission (i.e., the base APR DRG)
  - No single CC or MCC list
- High SOI and ROM reflect multiple serious diseases and their interaction



SOI and ROM are Independent



- The severity of illness and risk of mortality subclass are calculated separately and may be different from each other.

Comparing Medicare DRGs and 3M APR DRGs

	Medicare DRGs	APR DRGs	Key Diff
Methodology developer	3M for CMS	3M	
Population for methodology	Medicare fee-for-service population	All patient population	*
OB, pediatrics, newborns	Very low prevalence (0.4% of stays)	High prevalence (27% of stays)	*
Data requirements	Diagnoses, procedures, age, sex, discharge status	Diagnoses, procedures, age, sex, discharge status*	
Major Diagnostic Categories	Pre-MDC and 25 MDCs	Pre-MDC and 25 MDCs	
OB, pediatrics, newborns	Minimal attention to grouping logic	Extensive analysis	*
Number of DRGs	759 (757+ 2 error DRGs)	1,272 (318 base DRGs x 4 subclasses + 2 error)	
Severity of illness	• Standard list of CCs and MCCs across base DRGs • Some base DRGs stand alone; some have base DRG + CC; some have base + CC + MCC	• SOI calculation varies, depending on base DRG and on interaction of comorbidities • Each base DRG has four severities of illness: minor, moderate, major, extreme	*
Analysis of mortality	Not possible because discharge status 20 (expired) may affect DRG assignment	DRG assignment is independent of mortality. Benchmark risk of mortality parameters calculated for each APR DRG.	*
Present on admission (POA) indicator	Used only for evaluation of HACs	Used for admission APR DRG assignment	

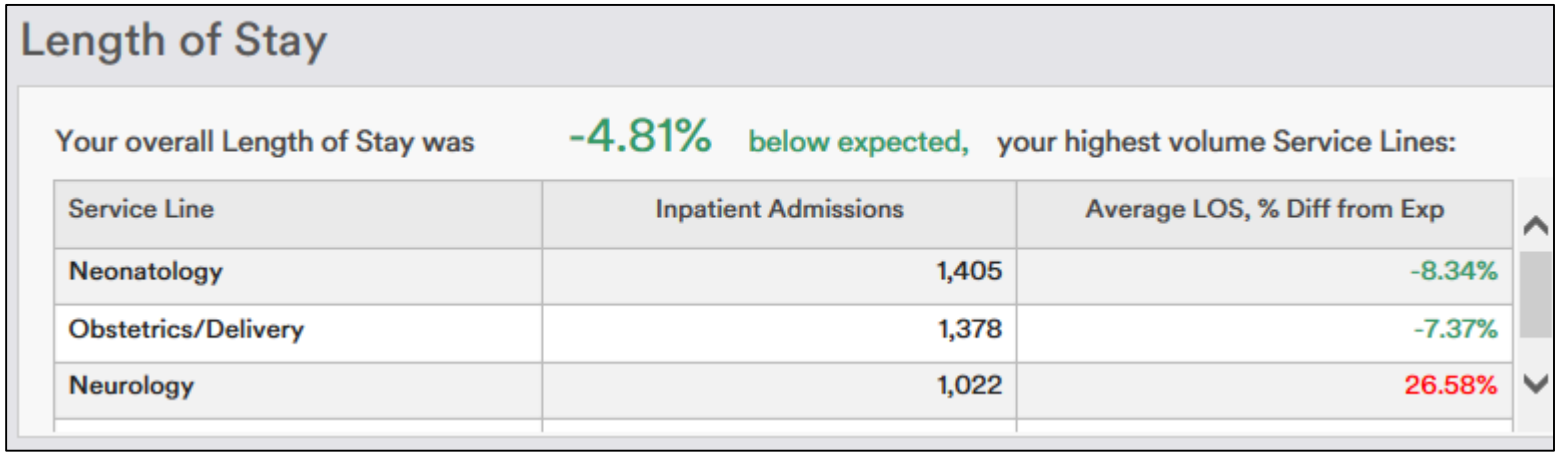
* Birthweight is an important input to APR DRGs. It can be submitted either as a diagnosis code or a value code (preferred)

Risk Adjustment and Reporting with APR DRGs

Overview of Expected Values Using APR DRGs

The expected value is the average value of the resource or outcome variable (e.g. LOS, readmission rate) that would result if the health plan or provider's mix of patients within each unit of comparison (e.g. DRG) had been treated at the average value of the resource or outcome variable in a reference norm population

- Indirect rate standardization
- Method of case mix/risk adjusting



Length of Stay

Your overall Length of Stay was -4.81% below expected, your highest volume Service Lines:

Service Line	Inpatient Admissions	Average LOS, % Diff from Exp
Neonatology	1,405	-8.34%
Obstetrics/Delivery	1,378	-7.37%
Neurology	1,022	26.58%

Source: 3M Performance Matrix Hospital Compare

Indirect Standardization Used to Compute Expected Values

Table 1: Sample inpatient expected value calculations for a single 3M APR DRG based on statewide data

APR DRG	APR DRG Severity	Cases	Actual Cost	Actual Cost Total	Expected Cost	Expected Cost Total
139 Other Pneumonia	1-Minor	680	$4,000	$2,720,000	$4,000	$2,720,000
139 Other Pneumonia	2-Moderate	1,200	$5,500	$6,600,000	$5,500	$6,600,000
139 Other Pneumonia	3-Major	750	$9,000	$6,750,000	$9,000	$6,750,000
139 Other Pneumonia	4-Extreme	120	$15,000	$1,800,000	$15,000	$1,800,000
Aggregate		2,750	$6,498	$17,870,000	$6,498	$17,870,000

Table 2: Application of inpatient expected values to sample hospital data

APR DRG	APR DRG Severity	Cases	Actual Cost	Actual Cost Total	Expected Cost	Expected Cost Total	%Diff Cost
139 -Other Pneumonia	1-Minor	50	$3,500	$175,000	$4,000	$200,000	-14.3%
139 -Other Pneumonia	2-Moderate	175	$5,000	$875,000	$5,500	$962,500	-10.0%
139 -Other Pneumonia	3-Major	100	$10,000	$1,000,000	$9,000	$900,000	10.0%
139 -Other Pneumonia	4-Extreme	25	$18,000	$450,000	$15,000	$375,000	16.7%
Aggregate		350	$7,143	$2,500,000	$6,964	$2,437,500	2.5%

- Expected values are calculated separately for each 3M APR DRG and severity level.
- Expected values are based on all hospitals selected for 'in expected list' (e.g. a statewide data set)
- The expected value for the 3M APR DRG is the weighted average of the values across all 4 severity levels.
- Expected values for all metrics (costs, charges, ALOS, etc.) are calculated the same way.

Facility Comparisons Using Expected Values

Facility	Inpatient Admissions	Average Length of Stay	Expected Average Length of Stay	Length of Stay, % Diff from Exp	Average Cost	Expected Average Cost	Cost, % Diff from Exp
Total	**136,330**	**4.03**	**4.03**	**-0.00%**	**$8,315**	**$10,088**	**-17.57%**
Samaritan Medical Center	22,473	3.94	3.90	1.08%	$15,523	$11,837	31.14%
Atlantic Practice	21,169	4.40	4.47	-1.47%	$0	$10,524	-100.00%
MidState General	18,693	3.54	3.73	-4.99%	$9,149	$10,821	-15.45%
Southwest Regional Medical Center	13,094	3.87	3.79	2.05%	$6,228	$9,033	-31.06%
Covenant General Hospital	11,814	3.96	3.79	4.57%	$6,748	$10,015	-32.63%
St Judes Medical Center	11,094	3.48	3.68	-5.56%	$9,482	$9,034	4.95%
Albany County Memorial	9,453	3.50	3.56	-1.60%	$8,751	$9,202	-4.90%
Mountain View Internal Medicine	3,600	5.58	5.33	4.63%	$16,440	$15,591	5.44%
Delaware Memorial Med Center	3,403	2.39	2.68	-10.62%	$6,295	$4,840	30.06%
Strong Medical Center	3,139	2.55	2.84	-10.13%	$5,075	$4,844	4.77%
Sunnyvale General	2,493	2.76	2.66	3.86%	$5,716	$5,764	-0.83%
Rock Creek Med Center	1,607	7.47	7.05	5.97%	$17,827	$12,966	37.49%
St. James Community Hospital	1,186	2.85	2.75	3.81%	$5,432	$4,226	28.55%
City General	1,002	3.16	3.01	4.94%	$5,873	$5,085	15.50%
Westside Medical Group - South	897	3.95	6.68	-40.91%	$5,223	$11,856	-55.95%
Bayside Community Hospital	647	3.92	5.87	-33.26%	$2,407	$9,474	-74.60%
St. Joseph County Clinic	615	8.07	7.60	6.24%	$33,782	$17,601	91.94%
Spencer City Pediatrics	584	6.13	6.59	-6.94%	$3,217	$11,027	-70.82%

Source: 3M Performance Matrix (Demo)

- % differences: observed values variance from expected values

Pearls for Success in Using APR DRGs

1. APR DRGs are applicable to the full range of acute hospital inpatients
   - Not intended for outpatient care, nursing facilities, etc.
   - Can be used for psychiatric, rehabilitation, LTAC stays – with caveats
2. APR DRGs are much more than a means of payment
3. Version control: grouper, mapper, relative weights, and benchmarks
   - Grouper version, relative weights and benchmarks should all match
   - Code mapping enables crosswalks between APR DRG and ICD-10 versions
   - V30-33 have similar logic and same list of APR DRGs; changes from V34 on
   - V33 and onward are ICD-10 only groupers
4. Don’t compare severity levels across DRGs; compare relative weights instead
5. Present on admission, hospital acquired conditions, and complications of care
   - Distinct concepts with distinct applications

PPRs: Definition and Methodology Overview

Potentially Preventable Readmissions Defined

3M PPRs are:

- Return hospitalizations that may result from deficiencies in the process of care and treatment or lack of post discharge follow-up.
- Assumptions:
  - ✓Not all readmissions are preventable
  - ✓Patients who have had a problem with the quality of inpatient care or outpatient care following discharge will be more likely to be readmitted
  - ✓Discharged too sick, too quick
  - ✓Poor discharge planning
  - ✓Poor follow-up care

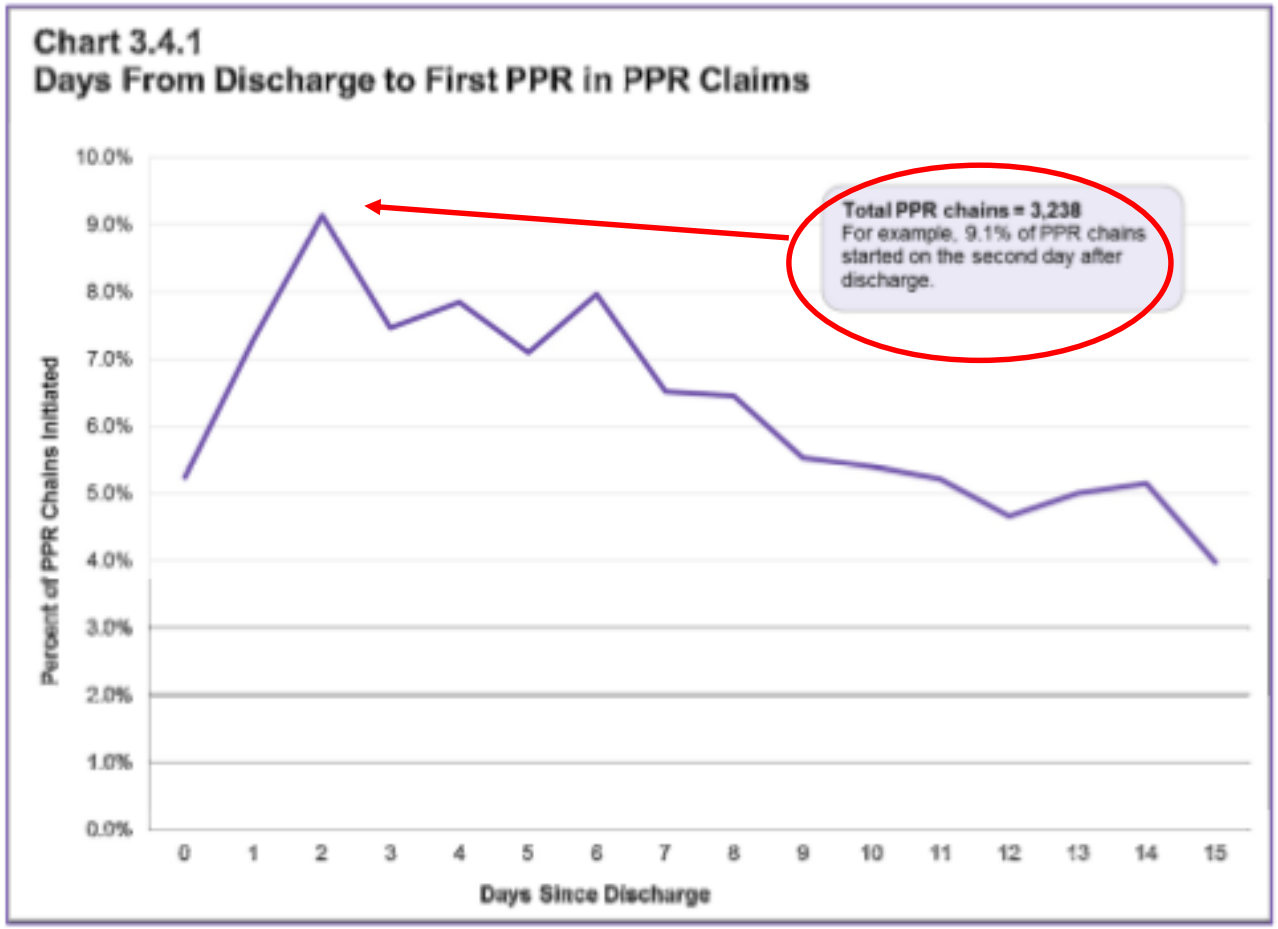
3M PPRs are based on and use:

- 3M™ All Patient Refined DRG (APR DRG) Classification System as the foundation
- 3M™ Potentially Preventable Readmission (PPR) Grouper

Quick Summary: Potentially Preventable Readmissions

- *Unit of analysis*: Hospital inpatient stay and readmissions
- *Applicable sites of service:* Hospital inpatient care
- *Risk adjustment:* APR DRG, age, presence of major mental health/substance abuse comorbidity
- *Data required*: Hospital inpatient claims linked by patient ID
- *Uses*: Pay for outcomes, reporting, hospital management, population health, managing MCOs

- Example: in Rhode Island, an all-payer analysis generated actionable data to be used in reducing readmissions

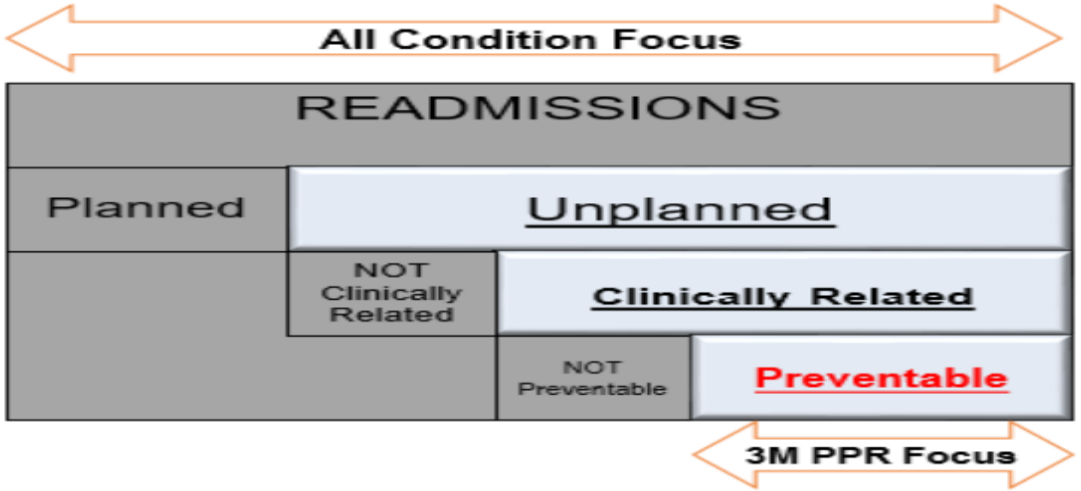


Source: Xerox State Healthcare, *Potentially Preventable Readmissions in Rhode Island*, 4/28/14, www.ohic.ri.gov/ohic-reformandpolicy-research.php

PPRs: Based on Research, Used to Enable Insight and Change

How 3M Develops PPR Logic

1. Focus on Preventable Readmissions Difference

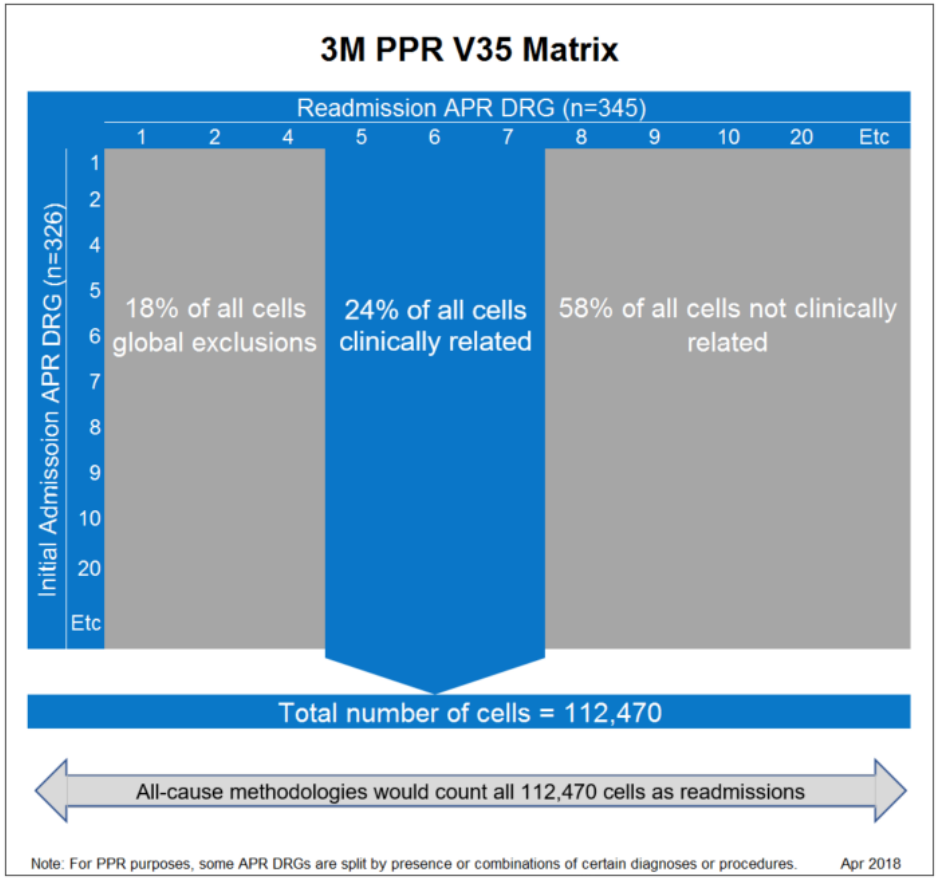


2. Develop Clinical Decision Rules

	Medical Readmit	Surgical Readmit
Medical Admit	PPR except for clearly unrelated acute events	Not PPR unless initial medical event clearly should have resulted in surgery
Surgical Admit	PPR except for clearly unrelated conditions	PPR if related to complications of prior surgery

3. Determine Potentially Preventable Readmissions

- 112,470 possible pairs of index admission APR DRG and readmission APR DRG were evaluated as indicating a PPR or not, and why
- Additional logic for situations such as transfers



Input and Output: PPRs

INPUT

Data source: hospital inpatient claims tied by unique patient identifiers

- Diagnoses and POA
- Procedures
- Discharge status
- Age and gender

3M PPR Grouper

Available in:

- Core Grouping Software
- Grouper Plus Content Serv
- Coding & Reimbursement System
- 360 Encompass

OUTPUT

- Unique patient identifier
- APR DRG
- PPR record type (only admission, initial admission, PPR etc.)
- PPR chain number
- Clinical reason for PPR
- Mental health status

Input Pearls

- Accurate patient identifiers and discharge disposition data ("patient status") are essential
- Check completeness, accuracy, and formatting on diagnosis, POA, and procedure fields
- Check list of hospital providers for anomalies such as rehab units, hospice, nursing facilities etc.

Output Pearls

- Check records with error codes
- Check findings for reasonableness against similar studies done on other populations
- Be mindful of difference between PPR candidates, PPR chains, and individual readmission cases.

Not all input and output fields are shown. Input and output pearls are only the most important of many steps needed for valid analysis

The PPR Grouper Classifies All Admissions

Type Code	PPR Type Code Desc	Use of Column in Reporting
EE	Error DRG	Error - Exclusion
HV	Human immunodeficiency virus DRGs	Exclusion
LA	Left against medical advice admission	Exclusion
IA	Initial admission	Initial Admission at risk, with one or more PPRs
MH	Mental health exclusion	Optional Exclusion
MA	Malignancy admission	Exclusion
MM	Major/metastatic malignancy admission	Exclusion
NE	Non-event admission	Exclusion
NM	Non-Event Malignancy/Other Diseases	Exclusion
NT	Neonatal admission	Exclusion
OA	Only admission-alive	Initial Admission at risk, without PPRs
OD	Only admission-died	Exclusion
OG	Other globally excluded APR-DRGs	Exclusion
PL	Palliative Care	Optional Exclusion
RA	Readmission	PPR linked to IA
RT	Readmission-transfer	Transfer PPR linked to IA (ends chain)
SA	Substance abuse exclusion	Optional Exclusion
TA	Transfer admission	Exclusion
UK	No Code	User created code - to avoid blanks in data

- All cases are assigned type codes
- Initial admissions (IA, OA) are those at risk for one or more clinically related readmissions (RA, RT)
- PPR rates for hospitals are based on chains / at risk initial admissions: IA / (IA + OA)

Examples of PPR Clinical Logic

Patient	Clinical Scenario (By APR DRG)	Potentially Preventable Readmission?	Comment
1	Admission 1: 139 Pneumonia (OA) Admission 2: 340 Fracture of Femur (OA)	No	Readmission not clinically related
2	Admission 1: 136 Resp. Malignancy (NM) Admission 2: 139 Pneumonia (OA)	No	Global exclusion 136
3	Admission 1: 139 Pneumonia Discharge status 07: Left against medical advice (LA) Admission 2: 139 Pneumonia (OA)	No	Patient left against medical advice
4	Admission 1: 139 Pneumonia Discharge status 02: Transfer to another acute care hospital (TA) Admission 2: 194 Heart Failure (OA)	No	Transfers are not readmissions
5	Admission 1: 139 Pneumonia (IA) Admission 2: 194 Heart Failure (RA)	Yes	Readmission possibly clinically related
6	Admission 1: 139 Pneumonia Discharge status 02: Transfer to another acute care hospital (TA) Admission 2: 139 Pneumonia (IA) Admission 3: 203 Chest pain (RA)	Admission 2: No Admission 3: Yes	Admission 3 counts as a PPR from the second hospital
7	Admission 1: 225 Appendectomy (OA) Admission 2: 240 Digestive malignancy (NM)	No	Global exclusion 240
8	Admission 1: 225 Appendectomy (IA) Admission 2: 251 Abdominal Pain (RA)	Yes	Readmission possibly clinically related

Note: All admissions are assumed to be within the designated window, e.g., 15 days or 30 days

Risk Adjustment and Reporting with PPRs

Example of Risk Adjustment for PPRs

Table 1: Sample PPR Expected Calculations Based on Statewide Data

3M APR DRG/SOI	Description	Observed PPR Chains	Candidate Cases	All Hospital PPR Rate
175-1	Percutaneous Cardiovascular procedures without AMI	70	1,000	7.0%
221-2	Major Small and Large Bowel procedures	80	1,600	5.0%
282-1	Disorders of Pancreas except malignancy	20	200	10.0%

Table 2: Application of PPR Expected Values to Sample Hospital Data

3M APR DRG/SOI	Description	Observed PPR Chains	Candidate Cases	Hospital PPR Rate	PPR Expected Rate	Variance From Expected PPR Rate
175-1	Percutaneous Cardiovascular procedures without AMI	9	130	6.9%	7.0%	-1.1%
221-2	Major Small and Large Bowel procedures	10	160	6.3%	5.0%	25.0%
282-1	Disorders of Pancreas except malignancy	7	80	8.8%	10.0%	-12.5%

- 3M also makes an adjustment to expected values for mental health conditions

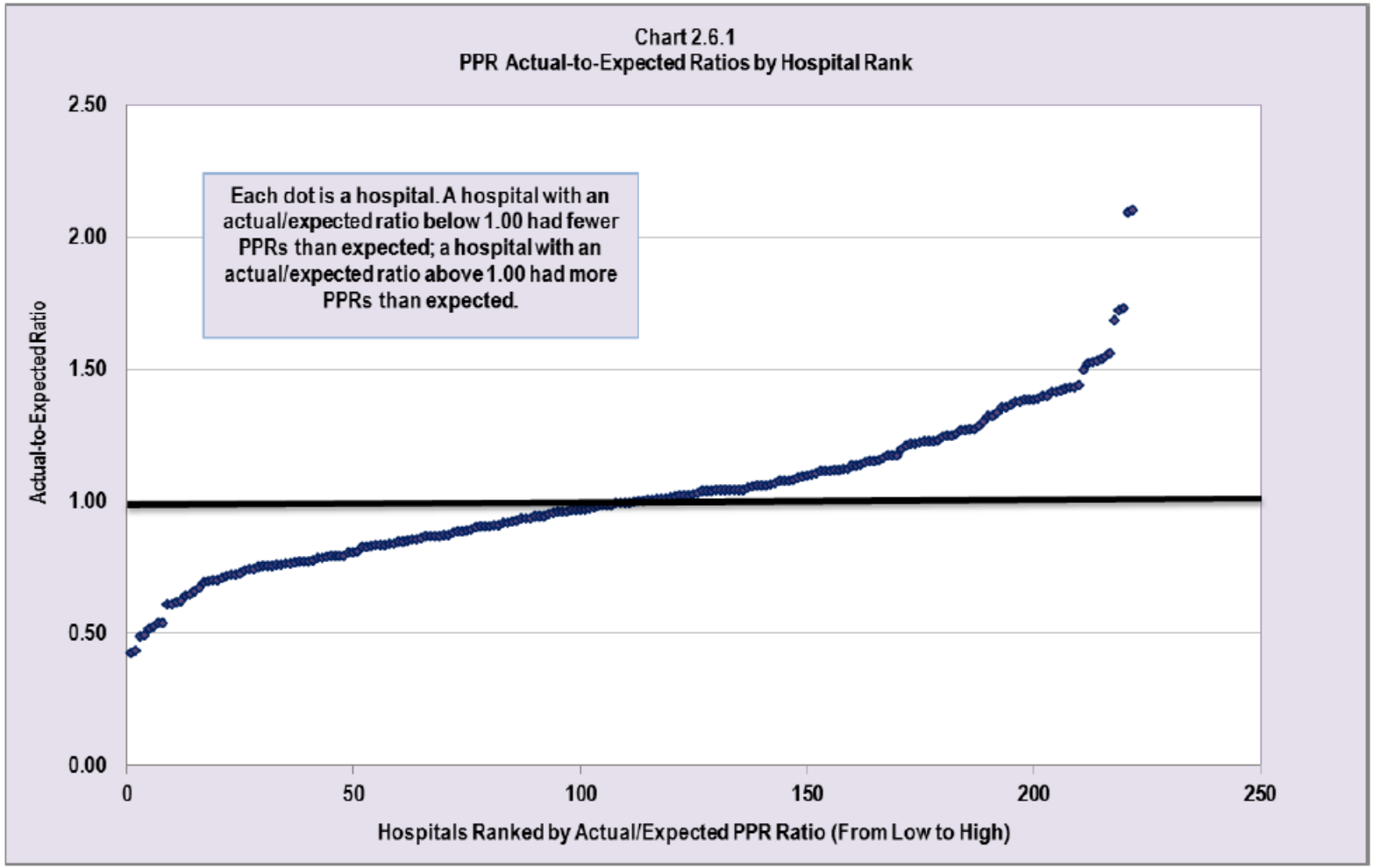
Application of Risk Adjusted Rates to Hospital Data

Facility		Inpatient Admissions	3M PPR Candidates	3M PPR Chains	3M PPRs	PPR Different Facility	PPR Rate	Expected PPR Rate	PPR Rate, % Diff from Exp
Total		2,058,689	1,682,781	81,173	97,484	0	4.82%	4.82%	0.01%
MN-Mayo Clinic Rochester St Marys	400	174,845	124,387	6,763	8,052	0	5.44%	5.82%	-6.58%
MN-University Of Minnesota Medical Center, Fairview	90	103,342	75,821	5,277	6,752	0	6.96%	5.84%	19.15%
MN-Abbott Northwestern Hospital	210	123,755	101,231	4,812	5,833	0	4.75%	4.85%	-1.98%
MN-St. Cloud Hospital	870	86,505	71,766	4,037	5,021	0	5.63%	5.28%	6.54%
MN-Hennepin County Medical Center	110	69,326	55,861	3,800	4,826	0	6.80%	5.45%	24.89%
MN-Regions Hospital	60	82,614	68,954	3,934	4,751	0	5.71%	5.40%	5.62%
MN-Park Nicollet Methodist Hospital	120	76,316	64,105	3,351	4,078	0	5.23%	4.84%	7.95%
MN-Mercy Hospital	10	77,058	64,916	3,318	3,935	0	5.11%	4.83%	5.90%
MN-United Hospital	220	78,773	65,745	3,179	3,810	0	4.84%	4.70%	2.96%
MN-North Memorial Medical Center	140	58,789	47,659	3,026	3,720	0	6.35%	6.18%	2.79%
ND-Sanford Medical Center Fargo	1297	78,113	64,108	3,110	3,709	0	4.85%	5.07%	-4.38%
MN-Essentia Health St Mary's Medical Center	420	54,633	45,030	2,456	2,934	0	5.45%	5.71%	-4.48%
MN-Fairview Southdale Hospital	180	61,392	52,352	1,945	2,277	0	3.72%	4.41%	-15.76%
ND-Altru Hospital	1109	42,366	32,710	1,741	2,067	0	5.32%	4.35%	22.35%
ND-Sanford Medical Center Bismarck	1312	33,924	27,782	1,637	2,028	0	5.89%	5.06%	16.45%
MN-St. Joseph's Hospital	80	34,096	28,618	1,672	1,995	0	5.84%	6.10%	-4.24%
MN-Children's Hospitals And Clinics Of Mn - Mpls	170	44,766	33,730	1,508	1,825	0	4.47%	4.74%	-5.72%
MN-St. John's Hospital	100	43,008	36,893	1,542	1,788	0	4.18%	4.49%	-6.92%

Source: 3M Performance Matrix Hospital Compare

Where There Is Variation, There Is Opportunity

- The chart shows A/E ratios for 222 Texas hospitals (excluding low-volume hospitals)
- 29 hospitals had A/E ratios < 0.75 (much better than expected)
- 30 hospitals had A/E ratios > 1.25 (much worse than expected)
- Variation in case mix-adjusted performance indicates room for hospitals to learn from each other



Source: Texas Health and Human Services Commission. *Potentially Preventable Readmissions in the Texas Medicaid Population, SFY 2012.* Austin, TX: HHSC, 2013. https://hhs.texas.gov/sites/default/files/ppr-report.pdf

Pearls for Success in Using PPRs

1. PPRs are measures both of hospital quality and of follow-up care in the community (e.g., MCO, ACO, primary care practice)
2. "Potentially Preventable Readmissions" means that not every readmission was preventable. It is a mistake to, for example, deny payment for every PPR
3. Keep in mind the difference between PPR chains, PPR stays, and PPR cost
4. Risk adjustment is essential for accuracy and fairness in any comparison
   - The comparison is always between actual and expected, where "expected" reflects the case mix of the population being analyzed
   - (Actual – Expected)/Expected, (Actual / Expected), and (Risk Adjusted Rates per 1,000 Members) are just alternative ways to present the same underlying results
5. Do not over-interpret results based on small cell sizes
   - A PPR rate for a hospital with 100 stays at risk of a PPR would be accurate but not meaningful
6. Financial analysis should take into account impacts other than the defined PPR
   - For example, what resources were needed to achieve improved PPR rates?

Readmissions: Comparing Medicare and 3M PPRs

	Medicare Readmissions	3M Potentially Preventable Readmissions	Key Diff
Population Used to Develop Methodology	Medicare fee-for-service population age 65 and over	All patient population (excluding newborns)	*
Conditions Included	Focus on seven common Medicare conditions + hospital-wide measure (4)	All	*
Readmissions Included	All unplanned readmissions	Only those with a plausible clinical connection to the index admission	*
Readmission Window	30 days	User defined; 15 and 30 days are typical	
Methodology	Regression	Categorical	
Drill-Down Analysis	Not possible (3)	Possible (3)	*
Methodology Developer	Yale University for CMS	3M Health Information Systems	
Risk Adjustment	Diagnoses within past year, age	APR DRG (reason for admission and severity), age, MH/SA co-morbidity (5)	
Also Used By	N/A	FL, IL, MD, MN, NY, TX, others (6)	*

Notes

1. Source: 3M Health Information Systems, including information from www.hospitalcompare.gov.
2. APR DRG = All Patient Refined Diagnosis Related Group; MH/SA = mental health/substance abuse
3. "Drill-Down Analysis" refers to the opportunity to start from summary results and then drill down to understand readmission patterns for specific diagnoses, time periods, or sub-populations. In general, categorical methodologies enable drill-down analysis while regression-based methodologies do not.
4. The seven conditions are acute myocardial infarction, heart failure, pneumonia, chronic obstructive pulmonary disease, total hip and knee arthroplasty, coronary artery bypass graft and stroke
5. APR DRG reason for admission is as determined, after study, at time of discharge
6. The nature of usage varies, with some payers adjusting payment based on PPR performance while other organizations use PPRs for reporting and enabling learning collaboratives.

Questions?