

STAAR Issue Brief: Reducing Barriers to Care Across the Continuum - *Measuring Rehospitalizations at the State Level*

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A Comparative Analysis of Three Population Based Rehospitalization Measurement Systems

As part of a process for a Massachusetts state-level steering committee charged with making recommendations on the usefulness of reporting rehospitalization rates for consumer information and quality improvement, the STAAR Initiative performed a comparative analysis of three major rehospitalization measurement systems:

- “Potentially Preventable Rehospitalization” (PPR) measure, 3M Health Information Systems
- “All-Cause Readmission Index ” measure, United Health Group (UHG)
- Hospital Compare Rehospitalization measure, (CMS)

This brief describes the ***characteristics of a rehospitalization measure*** that are commonly considered, and ***compare three major measurement systems*** used to analyze rehospitalizations at a population (state or payer) level. We discuss the ***strengths and limitations*** of each measurement system and the ***implications for policymakers***.

Key Findings

- ***Measurement systems matter***; they are not different ways of measuring the same thing
- The ***rates vary two-fold*** from PPR (8.5%) to UHG (19.3%) and CMS (21.9%)
- The measures ***correlate weakly*** with each other (correlation 0.27-0.47)
- The measures produce ***sharply different performance rankings*** for hospitals
- The measures capture ***recurrent rehospitalizations*** (several within a month) differently
- All three measures have ***weaknesses*** and should be improved
- Improvement on any of the measures would likely reflect an ***improvement in care***
- The exclusion rules in each measure have ***strong clinical and policy implications***
- Use of any of these measures for ***consumers*** would require clear messaging

“Rehospitalizations?” What Are We Talking About Exactly?

The STAAR Initiative aims to reduce ***30-day all cause rehospitalizations***. The intent is to improve care at times of transitions and in the weeks following a hospitalization so that, to the extent that it is possible, individuals do not need to return to ***any hospital for any reason***.

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STAAR uses **“rehospitalization” as a person-centered measure**, inclusive of the subset of hospitalizations that occur when a patient is discharged from one hospital and subsequently rehospitalized at another. In contrast, **“readmissions” are a hospital-based measure** that capture patients discharged from, and readmitted to, the same facility.

Are All Rehospitalizations Avoidable?

No. There are planned, necessary indications to return to the hospital for care, and there are unplanned, unforeseeable legitimate reasons that individuals will emergently return to the hospital. Thus, **a provider’s 30-day rehospitalization rate will never be zero**. However, a range of population based analyses and individual case studies highlight the high numbers of rehospitalizations that occur within days to weeks of discharge that **could be avoided- and have been avoided-** with better transitional care processes.

What is the “Right” Rehospitalization Rate?

To our knowledge, **no one knows**. What we do know is that rehospitalizations are frequent in all populations, particularly high in certain populations, and that when system changes are made to improve care transitions processes and support in the outpatient setting, rehospitalization rates decrease. Importantly, they **decrease to the satisfaction of patients, families, and providers** alike.

Measuring Rehospitalizations

Although rehospitalization seems it should be a fairly straightforward definition – a discharge followed by a subsequent hospitalization – **a wide variety of potential specifications exist**. The range of specifications and the measurement systems developed around these specifications have led to a **lack of a uniform, nationally adopted measurement** system for rehospitalizations.

Three Major Rehospitalization Measurement Systems: PPR, UHG, CMS

A detailed description of the technical specifications and methodology behind each measure is beyond the scope of this document. A brief description of each is below:

- **PPR** - by 3M Health Information Systems; adjudicates rehospitalizations as “potentially preventable” based on a clinical matrix of nearly 100,000 discharge-readmission pairings.
- **UHG** - by Pacificare (now United Health Group, UHG) includes all-cause rehospitalizations; endorsed by NQF, not widely used.
- **CMS** - by Krumholtz for *CMS Hospital Compare*; rates for three conditions. It is NQF endorsed.

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Key Features of a Rehospitalization Measure

Rehospitalization rate is defined as rehospitalizations divided by index discharges. Many decisions can be made about what is included and excluded in the numerator and in the denominator, and what method of risk adjustment to use. The considerations are described, below:

1. Denominator = Index discharge

- CMS, PPR and UHG exclude patients who died or were transferred to another hospital.
- CMS and PPR exclude a rehospitalization from being counted as another index discharge.
- PPR **excludes patients with certain conditions**, such as metastatic cancer, trauma, or burns.
- PPR and CMS exclude discharges against medical advice.

2. Numerator= Rehospitalizations

- Time frame of interest is a choice, although most use 30 days (7,15, 90 days also used).
- PPR **excludes rehospitalization for certain conditions**, such as metastatic cancer, trauma, burns, or rehospitalization following discharge against medical advice.
- PPR **excludes rehospitalizations for “clinically unrelated events.”**
- CMS and UHG include essentially all rehospitalizations in the numerator.

3. Risk Adjustment

All 3 measurement systems use the same basic approach when adjusting for differences in patients treated, whether in hospitals or in communities (using observed to expected ratios).

- CMS uses a hierarchical logistic regression methodology for risk adjustment.
- PPR uses APR-DRGs; UHG uses DRGs.

4. Links and Chains

Some patients are repeatedly rehospitalized within a 30-day period. *See tables for illustrations.*

- PPR links rehospitalizations together into a “chain” if they occur within a certain time period and are clinically related; **a chain counts only once** in the denominator and the numerator.
- CMS **excludes a rehospitalization from being an index discharge** for a subsequent rehospitalization.
- UHG **allows a rehospitalization to also be an index discharge** for a subsequent rehospitalization.

These rules have a **significant impact on rates**. For example, if Patient A has 4 clinically-related rehospitalizations each 14 days apart and died during the 4th, **PPR would count 1** index discharge, **CMS would count 2** index discharges, and **UHG would count 3** index discharges (*see table, next page*).

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Counting Index Discharges

Hospitalization 1	Hospitalization 2	Hospitalization 3	Hospitalization 4	# index discharges
Day 0	Day 14	Day 28	Day 42; died	
Index	Rehospitalization (RH)	RH	RH	PPR - 1 index
Index	RH	Index	RH	CMS - 2 index
Index	Index	Index	RH	UHG - 3 index

The rehospitalization rate (rehospitalization/ index discharges) would be **100% under all 3 methods:**

Calculating the Hospital’s Rephospitalization Rate for Patient A

Hospitalization 1	Hospitalization 2	Hospitalization 3	Hospitalization 4	Rehospitalization Rate
Day 0	Day 14	Day 28	Day 42; died	
Index	Rehospitalization	Rehospitalization	Rehospitalization	PPR: 1 chain/1 index= 100%
Index	Rehospitalization	Index	Rehospitalization	CMS - 2 RH / 2 index= 100%
Index	RH and Index	RH and Index	Rehospitalization	UHG - 3 RH/3 index= 100%

If there were 3 other patients (patients B, C, D) without rehospitalization, the rehospitalization rate for the hospital would be: **PPR= 25%, CMS= 40%, and UHG= 50%:**

Calculating the Hospital’s Rephospitalization Rate

Hospitalization 1	Hospitalization 2	Hospitalization 3	Hospitalization 4	Hospital rate, 4 patients
Day 0	Day 14	Day 28	Day 42; died	
Patient A Index	Rehospitalization	Rehospitalization	Rehospitalization	PPR rules
Patient A Index	Rehospitalization	Index	Rehospitalization	CMS rules
Patient A Index	RH and Index	RH and Index	Rehospitalization	UHG rules
Patient B Index				PPR: 1 chain/4 index=25%
Patient C Index				CMS - 2 RH/5 index= 40%
Patient D Index				UHG - 3 RH/6 index= 50%

Thus, the 3 measurement systems will tend to give ***different impressions of performance*** for hospitals in part depending on how many of their rehospitalizations occurred in patients with ***high personal rehospitalization rates***. Providers attempting to improve performance based on these measurement systems, then, may well ***direct the focus of their improvement efforts toward different groups*** of patients – specifically the UHG measure would be more sensitive to changes in rehospitalization rates for so-called “frequent fliers.”

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Results of Analysis on Massachusetts Discharge Data

Overall Numbers

- There were **843,167** discharges in the Massachusetts Discharge Data Base in FY2006.
- **717,688** discharges had valid data (125,000 discharges missing social security numbers).
- PPR used **564,371** discharges in the denominator (after exclusion criteria applied).
- UHG used **677,366** discharges in the denominator (after exclusion criteria applied).

Rehospitalization Rates

The CMS rate is more than twice the average PPR rate with UHG rates lying in between. Since these are statewide averages, differences in risk adjustment are unlikely to explain the difference. CMS is likely higher than UHG primarily because it includes only Medicare Fee-For-Service patients and only for 3 conditions which have high rehospitalization rates. Because CMS is entirely medical (heart attack, heart failure, and pneumonia discharges), we compare it with PPR and UHG for medical discharges.

- For CMS, the average hospital had a 30-day rehospitalization rate of **21.9%** (std dev 1.5%).
- For UHG, the average hospital had a 30-day rehospitalization rate of **19.3%** (std dev 3.2%).
- For PPR, the average hospital had a 30-day rehospitalization rate of **8.5%** (std dev 1.1%);
 - o Medicine 9.4% (std dev 1.2%); Surgery 6.4% (std dev 2.4%);
 - o Of note, 3M included obstetrical discharges in the denominator in a recent updated version, which reduced the overall rehospitalization rate from 10.7% to 8.5%.

Results of Potentially Preventable Classification

- PPR found **82,828 admissions were rehospitalizations** within 30 days of an index discharge;
- **61,908 (75%)** of these as **potentially preventable**;
- **20,920 (25%)** not classified as potentially preventable.

Effects on Teaching and Safety-Net Hospitals

There is **little relationship** between a hospital's **disproportionate share status** and its likelihood of having an **above-average rehospitalization rate**, regardless of the measure used.

- Teaching hospitals are **more likely** to have above-average rehospitalization rates with CMS.
- Teaching hospitals are **not different** from non-teaching hospitals using PPR or UHG.

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Differences in Hospital Ranking under Different Models

The table below shows the ranking of risk-adjusted rehospitalization rates for 51 hospitals using each of the 3 systems. **The results are quite different**; observe how the rankings of the top 10 hospitals under UHG change under PPR or CMS.

RANKING OF 51 MASSACHUSETTS HOSPITALS USING 3 REHOSPITALIZATION MEASUREMENT SYSTEMS		
Risk Adjusted UHG Medical Rank	Risk Adjusted PPR Medical Rank	Risk Adjusted CMS Rank
1	2	4
2	1	6
3	14	24
4	47	30
5	21	2
6	24	18
7	10	47
8	37	25
9	5	16
10	13	17
11	6	11
12	3	3
13	33	51
14	36	41
15	30	44
16	32	32
17	26	28
18	22	13
19	12	39
20	16	22
21	17	21
22	15	7
23	25	31
24	4	14
25	38	45
26	7	10
27	43	20
28	35	40
29	18	36
30	28	27
31	50	38
32	20	12
33	39	34
34	8	19
35	46	8
36	27	37
37	41	48
38	42	42
39	23	23
40	48	50
41	40	5
42	44	33
43	9	1
44	51	26
45	31	9
46	19	15
47	29	43
48	45	46
49	11	49
50	49	29
51	34	35

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Strengths and Weaknesses of Each Measure

PPR. The major advantage of PPR is that it has a **comprehensive model** for how rehospitalizations should be measured and has largely turned that model into a **software product**. PPR's risk adjustment for **mental health comorbidity is innovative** and may be valuable protection for high-risk patients.

The disadvantages are a precise reflection of those strengths: major **assumptions** in parts of the model (such as excluding metastatic cancer) are **debatable**, and parts of the software (such as the relatedness matrix) are of uncertain reliability and validity. PPR has **not been endorsed by NQF** because of questions about reliability of underlying decision-making and because many details are proprietary.

UHG . The major advantages of the UHG measure are that it is relatively **simple and easy to explain** and understand, that it is **easy to program**, that it is an **open technology**, and that it is **NQF endorsed**.

The disadvantage is that although it has been piloted in two states, it is **not widely used**. United Health Group does not appear strongly committed to maintaining it, and it does not exclude categories of rehospitalization whose exclusion would be easy both to implement and to endorse.

CMS. The major advantages of the CMS measure are that it has probably the **most sophisticated risk adjustment** system and it is currently being used and **published for most hospitals** in the US.

The disadvantages are that it is **exceedingly difficult** for any organization except CMS to use or modify, that it applies only to **Medicare patients with 3 conditions**, and that it is nationally computed; even local report modification appears **infeasible**. In addition, it may be relatively **resistant to showing recent improvements** in care.

Key Findings

- **Measurement systems matter;** they are not different ways of measuring the same thing
- The **rates vary two-fold** from PPR (8.5%) to UHG (19.3%) and CMS (21.9%)
- The measures **correlate weakly** with each other (correlation 0.27-0.47)
- The measures produce **sharply different performance rankings** for hospitals
- The measures capture **recurrent rehospitalizations** (several within a month) differently
- All three measures have **weaknesses** and should be improved
- The exclusion rules in each measure have **strong clinical and policy implications**

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Recommendations for Policymakers

- Statewide, **all-payer rehospitalization data are essential** to setting aims and achieving progress toward reducing rehospitalization rates. State leaders should ensure data are available.
- State-level healthcare delivery system priorities, such as **reducing avoidable cost and improving quality** through medical home demonstration projects, community-based care transitions projects, and others, will require **state-level rehospitalization data** to guide and inform progress toward these aims.
- A **national, uniformly adopted rehospitalization measure is needed**; in the absence of one, state leaders must consider the relative merits of the major measurement systems available.
- Measuring rehospitalizations at the state level requires **common understanding** of the measurement systems being considered, their **clinical face validity**, and their **utility to guide improvement at the front line** (frequency of reports, sensitivity to detecting change).
- Each measurement system has substantial strengths and technical limitations; therefore, it is difficult to make a case that any one is “right” or should be adopted without a clear plan for improvement.
- State leaders should assess the **clinical impact** of selecting one measurement system over another. For example, because PPR excludes metastatic cancer, trauma and burn patients, it is possible that a facility would not feel a sense of urgency to improve care at times of transitions for these patients. Similarly, because CMS reports just on Medicare patients with three diagnoses, it is possible a facility would focus on improving care transitions exclusively for these patients. Finally, if UHG were used, it is possible facilities may first focus on reducing rehospitalizations for the subset of patients who are frequently in and out of the hospital.
- State leaders should determine whether current **NQF endorsement** is a necessary feature.
- Nevertheless, **improved performance** on any of these measures would be very likely to reflect **better care delivered** to patients.