The Hospital Readmission Reduction Policy
and Population Health in Heart Failure

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Burden of Hospitalizations for Heart Failure

- Heart Failure (HF) is the leading medical cause of hospitalization among adults aged 65 years and older in the US and globally.

- In US, 900,000 hospitalizations with HF as primary discharge diagnosis and 2-3 million hospitalizations with HF as secondary diagnosis.

- HF hospitalization represents a period of very high risk for patients, during which their likelihood of death and rehospitalization is significantly greater than for a comparable period of chronic but stable HF.

- Nearly 1 in 3 patients do not survive a full year after a hospitalization for HF.

- Treatment of HF patients is highly variable and outcomes need to improve.

The 30 Day Readmission Metric and Hospital Readmission Reduction Program (HRRP) in Hospitalized HF Patients

In a 2007 report, MedPAC recommended CMS target readmissions

Healthcare Policy Approaches to Reduce Readmission

- Transparency: Public reporting of 30-Day RSRR metric
- Financial incentives: Hospital Readmission Reduction Program (HRRP)

Public reporting on 30-Day Risk Standardized Readmission Rates (RSRR)


HRRP: Statutorily mandated by the ACA of 2010

- Initial Target HF, Pneumonia, AMI (top 3 conditions with readmissions)
- 2 Phases: Penalty-free implementation phase (April 2010 to Sep 2012)
- Penalty phase (Oct 2012 onwards)

- Up to 3% of a hospital’s total Medicare revenue is at stake if readmission rates for target conditions are higher than national average

In FY 2020, 83% of US acute care hospitals penalized by CMS under the HRRP with $563 million in penalty based revenue for CMS

- Overall budgeted for $7.7 billion in revenue for CMS
What CMS, Measure Developers, and Policymakers Have Told Clinicians

- The majority of 30-day readmissions could be easily prevented.
- Effective strategies to prevent 30-day readmissions were readily available but were underutilized due to lack of financial incentives.
- The 30-Day Risk Standardized Readmission Metric is an accurate, fair, reliable, and actionable measure suitable for accountability/penalties.
- Any concerns about the 30 Day RSRR metric and HRRP penalties were unfounded and raised by those vested in maintaining the status quo.
- The 30-Day RSRR metric and HRRP have been a tremendous success with readmissions falling substantially for targeted conditions the first time in decades. Billions of dollars saved for Medicare! (via penalties).
- There has been no credible evidence for harm.
CMS 30 Day Risk Standardized Readmission Rate Measure

**Administrative Codes Only**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years over 65</td>
<td>Age, years over 65</td>
</tr>
<tr>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>History of Percutaneous Transluminal Coronary Angioplasty (ICD9 V45.82)</td>
</tr>
<tr>
<td></td>
<td>History of Coronary Artery Bypass Graft Surgery (ICD9 V45.81)</td>
</tr>
<tr>
<td></td>
<td>History of heart failure (HCC 80)</td>
</tr>
<tr>
<td></td>
<td>History of Myocardial Infarction (HCC 81)</td>
</tr>
<tr>
<td></td>
<td>Unstable angina (HCC 82)</td>
</tr>
<tr>
<td></td>
<td>Chronic atherosclerosis (HCC 83-84)</td>
</tr>
<tr>
<td></td>
<td>Cardiopulmonary-respiratory failure and shock (HCC 79)</td>
</tr>
<tr>
<td></td>
<td>Nephrotic heart disease (HCC 86)</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>Hypertension (HCC 89-91)</td>
</tr>
<tr>
<td></td>
<td>Stroke (HCC 95-96)</td>
</tr>
<tr>
<td></td>
<td>Renal failure (HCC 131)</td>
</tr>
<tr>
<td></td>
<td>Chronic Obstructive Pulmonary Disease (HCC 108)</td>
</tr>
<tr>
<td></td>
<td>Pneumonia (HCC 111-113)</td>
</tr>
<tr>
<td></td>
<td>Diabetes (HCC 15-20, 120)</td>
</tr>
<tr>
<td></td>
<td>Protein-calorie malnutrition (HCC 21)</td>
</tr>
<tr>
<td></td>
<td>Dementia (HCC 49-50)</td>
</tr>
<tr>
<td></td>
<td>Hemiplegia, paraplegia, functional disability (HCC 100-102, 68-69)</td>
</tr>
<tr>
<td></td>
<td>Peripheral vascular disease (HCC 104-105)</td>
</tr>
<tr>
<td></td>
<td>Metastatic cancer (HCC 7-8)</td>
</tr>
<tr>
<td></td>
<td>Trauma in last year (HCC 154-156, 158-162)</td>
</tr>
<tr>
<td></td>
<td>Major psychiatric disorders (HCC 54-56)</td>
</tr>
<tr>
<td></td>
<td>Chronic liver disease (HCC 25-27)</td>
</tr>
</tbody>
</table>

**Not Adjusted for in Model**

- Race/ethnicity
- Socioeconomic status
- SBP on admission
- HR on admission
- Body mass index
- BUN on admission
- Creatinine on admission
- Sodium on admission
- Hemoglobin on admission
- BNP or NT-BNP on admission
- LVEF
- LVEDD
- Functional status (NHYA Class)
- Mechanical ventilation (initial)
- Inotropic agent treatment

**Hospital Profiling Not Reflective of Care Quality**

Patient characteristics not included in Medicare’s risk-adjustment methods explained much of the difference in readmission risk between patients admitted to hospitals with higher vs. lower readmission rates.

Hospitals with high readmission rates are being penalized to a large extent based on the patients they serve rather than the quality of care provided.


C-Statistic 0.60

Indicating Poor Discrimination
CMS 30 Day Risk Standardized Readmission Rate Measure

Metric Fails to Account for Competing Risk of Mortality

Prediction models for hospitalization that do not account for the competing risk of death are predisposed to biased estimates. The readmission penalty is being unfairly and inappropriately applied to hospitals which provide higher quality care as a consequence of the lower mortality rates achieved by these hospitals.


Hospitals with Lower 30 Day RSRR

Worse Process of Care Measures

- Worse 30-Day Mortality
- Worse 90-Day Mortality
- Worse 1-Year Mortality
- Worse 3-Year Mortality
- Worse 5-Year Mortality

Hospitals providing superior care quality and better survival are far more likely to perform poorly in the 30 Day RSRR Measure and be Penalized by Medicare under HRRP.

CMS: Reporting and Financial Penalties

Maximum Penalty Amount

- **HRRP: 30-Day Risk Standardized Readmission**
  - 3.0%

- **HVBP: 30-Day Risk Standardized Mortality**
  - 0.2%

Is it patient-centered to prioritize reducing readmissions up to 10-15 fold greater than avoiding preventable deaths?
Measure Public Reporting, HRRP, and Readmissions in HF

Public Reporting/Pre-HRRP    HRRP Announcement    HRRP Penalty Phase

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day Readmissions</td>
<td>21.5%</td>
<td>17.8%</td>
<td></td>
</tr>
<tr>
<td>1-Year Readmissions</td>
<td></td>
<td></td>
<td>57.2%</td>
</tr>
</tbody>
</table>

**Trends in HF Readmissions in FFS Medicare**
- 30-Day Readmissions: 23.5% → 21.4%

**Trends in HF Readmissions in GWTG-HF**
- 30-Day Readmissions: 20.0% → 18.4%
- 1-Year Readmissions: 57.2% → 56.3%

How did the 30-Day Metric and HRRP Impact Readmissions?

• Did hospitals respond in a way that they invested in and improved transitional care of HF patients, reducing readmission and potentially mortality?

• Or was there financially incentivized:
  ▪ Upcoding of severity
  ▪ Delaying admissions beyond 30 days, even if clinically needed
  ▪ Blocking patients from admission from ER, even if admission needed
  ▪ Diverting patients to outpatient observation stays, even if unsafe
  ▪ Pressure on physicians to try strategies that place patient at higher risk
  ▪ Shifting funding away from patient safety, disease management
  ▪ Delaying initiation of GDMT out of misconceptions
  ▪ Coercion into hospice
  ▪ Decrease funding to the most vulnerable hospitals and patients
Were Reductions in Hospital Readmissions Illusory?

Increase in patients classified as “outpatient” observation stay


Marked increase in severity coding suggesting “upcoding” which accounted for 2/3rds of the decrease in 30 Day RSRR


Any degree of severity “upcoding” would make reductions in risk adjusted readmission appear larger and obscure increases in mortality

The mean number of comorbidities during index admissions as defined by Elixhauser per admission at control hospitals increased 19.6% (from 2.50 to 2.99) vs 38.8% (from 2.50 to 3.47) at hospitals exposed to the HRRP.
How Has Public Reporting of Hospital Readmission Rates and HRRP Affected Patient Outcomes?

Patient-Centered Strategies to Reduce Readmissions

- Increase use of evidence-based, guideline directed therapies
- Improved transitions of care
- Provision of early, high quality post discharge follow-up

<table>
<thead>
<tr>
<th>Readmits within 30d</th>
<th>ER Visits within 30d</th>
<th>OBS Visits within 30d</th>
<th>Net Returns within 30d</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ 3.9%</td>
<td>↑ 2.0%</td>
<td>↑ 1.2%</td>
<td>↓ 0.7%</td>
</tr>
</tbody>
</table>

Discourage patients with worsening symptom from being seen in ER
Blocking patients in ER within 30-days of d/c from being readmitted
Shunting patients to Observation Units (outpatient)
Delaying use of evidence-based, guideline directed therapies

Data from Medicare Payment Advisory Committee (MEDPAC) Report to Congress June 2018
HRRP Impact: Decreasing 30-Day HF Readmissions Accompanied by Increasing 30 Day Risk-Adjusted Mortality

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day Risk Adjusted Readmission with HRRP</td>
<td>23.5%</td>
<td>23.5%</td>
<td>23.4%</td>
<td>23.0%</td>
<td>22.5%</td>
<td>21.6%</td>
<td>21.4%</td>
<td>-2.1%</td>
</tr>
<tr>
<td>30-Day Mortality after discharge with HRRP</td>
<td>7.9%</td>
<td>8.1%</td>
<td>8.4%</td>
<td>8.7%</td>
<td>8.8%</td>
<td>9.1%</td>
<td>9.2%</td>
<td>+1.3%</td>
</tr>
<tr>
<td>30-Day Mortality after discharge without HRRP</td>
<td>(projected)</td>
<td>7.9%</td>
<td>7.8%</td>
<td>7.5%</td>
<td>7.2%</td>
<td>7.0%</td>
<td>6.7%</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

5,200 additional deaths in 2014 may be related to the HRRP.

10,400 additional deaths a year if previous declines in mortality had continued.

Has HRRP Reporting of Hospital Readmission Rates and Penalties Resulted in Harm?

The 30-day risk-adjusted readmission rate declined from 20.0% before the HRRP implementation to 18.4% in the HRRP penalties phase (hazard ratio (HR) after vs before the HRRP implementation, 0.91; 95%CI, 0.87-0.95; \( P < .001 \)).

In contrast, the 30-day risk-adjusted mortality rate increased from 7.2% before the HRRP implementation to 8.6% in the HRRP penalties phase (HR after vs before the HRRP implementation, 1.18; 95%CI, 1.10-1.27; \( P < .001 \)).

The 1-year risk-adjusted mortality rate increased from 31.3% to 36.3% (HR, 1.10; 95%CI, 1.06-1.14; \( P < .001 \)) after vs before the HRRP implementation.

Using clinical data to risk adjust HRRP was independently associated with increased HF Mortality.
# Increase in Risk-Adjusted Mortality after the HRRP Implementation among Medicare Beneficiaries Hospitalized for HF

<table>
<thead>
<tr>
<th>Study</th>
<th>GWTG-HF Registry linked to FFS Medicare Data¹</th>
<th>100% Sample of FFS Medicare Data²</th>
<th>5% Random Sample of FFS Medicare Data³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Adjustment</td>
<td>Clinical</td>
<td>Administrative</td>
<td>Administrative</td>
</tr>
<tr>
<td>30-Day Mortality</td>
<td>1.4% ↑</td>
<td>1.3% ↑</td>
<td>-</td>
</tr>
<tr>
<td>90-Day Mortality</td>
<td>-</td>
<td>2.2% ↑</td>
<td>-</td>
</tr>
<tr>
<td>1-Year Mortality</td>
<td>5.0% ↑</td>
<td>-</td>
<td>3.3% ↑</td>
</tr>
</tbody>
</table>

2. Dharmarajan et al. JAMA 2017;318:270-278.

JAMA Cardiol. doi:10.1001/jamacardio.2018.0218

Among Medicare beneficiaries, the HRRP was significantly associated with an increase in 30-day post-discharge mortality after hospitalization for HF and pneumonia, but not for AMI.

Wadhera RK et al. JAMA. 2018;320(24):2542-2552
Risk-Adjusted Mortality Trends for Medicare Beneficiaries: Was it Just “Sicker” Patients Now Being Hospitalized

Increase in the age-adjusted rate from 2012 through 2014 was significantly \((P<0.05)\). Ni H, Xu JQ. Recent trends in heart failure-related mortality: United States, 2000–2014. NCHS data brief, no 231. Hyattsville, MD: National Center for Health Statistics. 2015.

Did Hospital 30 Day RSMR Decline in Hospitals with Declining 30 Day RSRR?

In All Categories of Hospitals Exposed to HRRP, HF Mortality Increased

Aggregate trends across hospitals in 30-day risk-adjusted mortality rates after discharge for HF increased 0.008% (95%CI, 0.007% to 0.010%) per each month for 84 months

MedPAC found increased post HRRP mortality for HF patients but attributed this to dramatic increase in severity.

Is it plausible that intrinsic mortality risk increased dramatically post HRRP, yet in-hospital unadjusted mortality did not increase, when no change in LOS/transfers out?
“The evidence that HRRP caused the decrease in readmissions is of comparable quality to the evidence that HRRP caused an increase in mortality. It is hard to accept one without accepting the other.”

Timing of the Mortality Increase in HF

Trends in Hospitalizations and Outcomes for Acute Cardiovascular Disease and Stroke, 1999–2011

Harlan M. Krumholz, MD, SM; Sharon-Lise T. Normand, PhD; Yun Wang, PhD

Background—During the past decade, efforts focused intensely on improving the quality of care for people with, or at risk for, cardiovascular disease and stroke. We sought to quantify the changes in hospitalization rates and outcomes during this period.

Methods and Results—We used national Medicare data to identify all Fee-for-Service patients ≥65 years of age who were hospitalized with unstable angina, myocardial infarction, heart failure, ischemic stroke, and all other conditions from 1999 through 2011 (2010 for 1-year mortality). For each condition, we examined trends in adjusted rates of hospitalization per patient-year and, for each hospitalization, rates of 30-day mortality, 30-day readmission, and 1-year mortality overall and by demographic subgroups and regions. Rates of adjusted hospitalization declined for cardiovascular conditions (38.0% for 2011 compared with 1999 [95% confidence interval (CI), 37.2–38.8] for myocardial infarction, 83.8% [95% CI, 83.3–84.4] for unstable angina, 30.5% [95% CI, 29.3–31.6] for heart failure, and 33.6% [95% CI, 32.9–34.4] for ischemic stroke compared with 10.2% [95% CI, 10.1–10.2] for all other conditions). Adjusted 30-day mortality rates declined 29.4% (95% CI, 28.1–30.6) for myocardial infarction, 13.1% (95% CI, 11.1–23.7) for unstable angina, 16.4% (95% CI, 15.1–17.7) for heart failure, and 4.7% (95% CI, 3.0–6.4) for ischemic stroke. There were also reductions in rates of 1-year mortality and 30-day readmission and consistency in declines among the demographic subgroups.

Conclusions—Hospitalizations for acute cardiovascular disease and stroke from 1999 through 2011 declined more rapidly than for other conditions. For these conditions, mortality and readmission outcomes improved.

(Circulation. 2014;130:966-975.)

30 Day Mortality for Medicare HF Patients 1999-2010

Unadjusted: -8.1%
Adjusted: -16.4%
30 Day Readmission Metric, HRRP, and HF Outcomes

• No evidence of improved care quality
• No evidence for improved health status/quality of life
• No evidence for improvement in functional status
• No evidence of improved patient satisfaction
• No evidence for reduced financial toxicity for patients
• No evidence of reduced mortality

• HRRP had no causal association with the increase in mortality: mortality still increased
• HRRP only indirectly influenced increased mortality by diverting attention/resources from efforts that could have reduced mortality: mortality still increased
• HRRP incentivized policies that directly resulted in the increased mortality: mortality increased
Patient-Centered Alternatives for HRRP

1. Composite measure of risk adjusted 30-day mortality/readmission as basis for penalties

2. Have penalties for 30-day risk adjusted mortality as large or larger as those for 30-day risk adjusted readmissions

3. Measure, report, and penalize based on HF patient health status (KCCQ) and other patient reported outcome measures (PROMs)

4. Measure, report, and penalize based on index HF admission rates and incident HF rates (prevention)
# Long-term Outcomes

### Overall Population

<table>
<thead>
<tr>
<th>Long-term Outcomes</th>
<th>Q1 High Performing</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4 Low Performing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Survival, days (95% CI)</td>
<td>717 (700 – 734)</td>
<td>685 (668 – 705)</td>
<td>654 (636 – 674)</td>
<td>579 (565 – 594)</td>
</tr>
<tr>
<td>5-year Mortality (%)</td>
<td>75.6</td>
<td>76.2</td>
<td>76.9</td>
<td>79.6</td>
</tr>
</tbody>
</table>

### 30-day Survivors

<table>
<thead>
<tr>
<th>Long-term Outcomes</th>
<th>Q1 High Performing</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4 Low Performing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Survival, days (95% CI)</td>
<td>832 (815 – 852)</td>
<td>825 (805 – 843)</td>
<td>814 (794 – 831)</td>
<td>759 (742 – 779)</td>
</tr>
<tr>
<td>5-year Mortality (%)</td>
<td>73.7</td>
<td>73.7</td>
<td>74.3</td>
<td>76.8</td>
</tr>
</tbody>
</table>

22% (95% CI, 18-26) higher relative adjusted hazards of 5-year mortality for patients admitted to Q4 vs Q1 hospitals with extensive risk adjustment for clinical variables.

High Performing Hospitals (lower 30-day RSMR) had greater availability of advanced HF therapies, cardiac surgery, and PCI and provided higher care quality by process measures.

*JAMA Cardiol.* doi:10.1001/jamacardio.2018.0579
Cumulative Impact of Evidence-Based Heart Failure with Reduced EF Medical Therapies on All Cause Mortality

<table>
<thead>
<tr>
<th>Relative Risk</th>
<th>2 Year Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>- -</td>
</tr>
<tr>
<td>ARNI (vs imputed placebo)</td>
<td>28%</td>
</tr>
<tr>
<td>Beta Blocker</td>
<td>35%</td>
</tr>
<tr>
<td>Aldosterone Ant</td>
<td>30%</td>
</tr>
<tr>
<td>SGLT2 inhibitor</td>
<td>17%</td>
</tr>
</tbody>
</table>

Cumulative risk reduction in mortality if all evidence-based medical therapies are used: Relative risk reduction 72.9%, Absolute risk reduction: 25.5%, NNT = 3.9

## Potential Impact of Optimal Implementation of Evidence-Based HF Therapies on Mortality


<table>
<thead>
<tr>
<th>Guideline Recommended Therapy</th>
<th>HF Patient Population Eligible for Treatment, n*</th>
<th>Current HF Population Eligible and Untreated, n (%)</th>
<th>Potential Lives Saved per Year</th>
<th>Potential Lives Saved per Year (Sensitivity Range*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEI/ARB</td>
<td>2,459,644</td>
<td>501,767 (20.4)</td>
<td>6516</td>
<td>(3336-11,260)</td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>2,512,560</td>
<td>361,809 (14.4)</td>
<td>12,922</td>
<td>(6616-22,329)</td>
</tr>
<tr>
<td>Aldosterone Antagonist</td>
<td>603,014</td>
<td>385,326 (63.9)</td>
<td>21,407</td>
<td>(10,960-36,991)</td>
</tr>
<tr>
<td>Hydralazine/Nitrate</td>
<td>150,754</td>
<td>139,749 (92.7)</td>
<td>6655</td>
<td>(3407-11,500)</td>
</tr>
<tr>
<td>CRT</td>
<td>326,151</td>
<td>199,604 (61.2)</td>
<td>8317</td>
<td>(4258-14,372)</td>
</tr>
<tr>
<td>ICD</td>
<td>1,725,732</td>
<td>852,512 (49.4)</td>
<td>12,179</td>
<td>(6236-21,045)</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>67,996</td>
<td>(34,813-117,497)</td>
</tr>
<tr>
<td>ARNI (replacing ACEI/ARB)</td>
<td>2,459,644</td>
<td>2,459,644 (100)</td>
<td>30,366</td>
<td>(15,183-45,549)</td>
</tr>
</tbody>
</table>

Sensitivity Range: The range of potential lives saved per year for each therapy, assuming different percentages of eligible patients receiving treatment.
Conclusions

• The 30 day readmission metric and HRRP have important flaws in measuring quality and driving patient benefit

• The financial penalties surrounding this metric have created incentives for suboptimal care, by side-stepping the best interests of the patient, incentivizing denial of necessary care, eliminating or downplaying offsetting quality measures, and denying resources to the most vulnerable patients and hospitals

• HRRP has not only not improved outcomes in HF, it has been associated with the ultimate harm, increased mortality

• The HRRP as it involves HF patients should be revised or replaced

• It is critical to move away from artificial metrics and penalties and toward greater direct responsibility of health care systems for quality and efficiency, with rewards linked to longer-term patient benefit, through innovative approaches to care