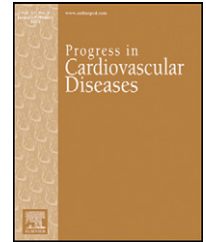


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The Prevention of Hospital Readmissions in Heart Failure

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ABSTRACT

Heart failure (HF) is a growing healthcare burden and one of the leading causes of hospitalizations and readmission. Preventing readmissions for HF patients is an increasing priority for clinicians, researchers, and various stakeholders. The following review will discuss the interventions found to reduce readmissions for patients and improve hospital performance on the 30-day readmission process measure. While evidence-based therapies for HF management have proliferated, the consistent implementation of these therapies and development of new strategies to more effectively prevent readmissions remain areas for continued improvement.

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Approximately 5.7 million American adults are living with heart failure (HF) and the projections are that the prevalence of HF will increase 46% from 2012 to 2030 with greater than 8 million adults living with the chronic condition. HF is one of the leading primary diagnoses for hospitalization with an estimated 1 million patients discharged in 2010. The total cost of HF for 2012 was \$30.7 billion. According to Medicare, from 2009 to 2012 the median risk-standardized 30 day readmission rate for HF was 23.0%.¹ Readmissions receive particular attention from researchers and policy makers as they are perceived as a correctable source of poor quality of care and excessive medical spending. The Affordable Care Act instituted a financial penalty for excessive readmissions for hospitals that is capped at 3% of a hospital's total Medicare payments for 2015 and beyond. Previously Medicare's diagnosis-related group payment system lacked a financial disincentive to reduce readmissions.² The

Centers for Medicare and Medicaid Services' (CMS) Hospital Readmission Reduction Program currently only assesses risk-adjusted 30-day readmission rates for HF, acute myocardial infarctions, pneumonia, chronic obstructive pulmonary disease, and elective total knee and hip arthroplasty.³

While 30-day HF readmission rates are an increasing focus of quality improvement, inpatient interventions for effectively preventing or reducing readmissions are not agreed upon. Furthermore, the 30-day period for readmissions is likely an arbitrary period of observation and a multitude of factors external to the quality of inpatient care influence readmission risk. Nevertheless, the goal for health systems should be to reduce all avoidable admissions whether index hospitalization or repeat admission. The following review article will highlight research on the strategies to prevent HF readmissions.

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Abbreviations and Acronyms

ACE = angiotensin-converting enzyme

ARB = angiotensin receptor blocker

CMS = Centers for Medicare and Medicaid Services

CRT = cardiac resynchronization therapy

HF = heart failure

ICD = implantable cardioverter defibrillator

NYHA = New York Heart Association

The burden of heart failure hospitalizations

HF management has evolved considerably over recent decades with improvements in medical therapies and interventions that enable living with the condition for longer. Recent trends observe a reduction in length of stay as well as in-hospital and 30-day mortality, whereas 30-day readmission rates and discharges to

skilled nursing facilities have increased (Fig 1).⁴ Among Medicare patients hospitalized for HF from 2008 to 2010, 67.4% experienced a readmission and 35.8% died within one year of the index hospitalization. The daily risk of readmission was highest on day 3 after discharge. Not until 38 days after hospitalization did the daily readmission risk decrease by 50% (Fig 2).⁵ Although the risk for readmission declines over time, patients with an index HF hospitalization have a significantly elevated risk of readmission for at least one year. An index HF admission is a significant marker of morbidity and mortality that extends beyond 30 days that should indicate to both inpatient and outpatient medical providers the severity of illness and importance of close evaluation and management (Fig 3).

The primary mechanism of acute HF decompensation is congestion and typically not a decrease in cardiac output. Subclinical congestion may precede clinical congestion by days to weeks.⁶ However, only 17%–35% of readmissions are attributed to a HF re-exacerbation and 53%–62% of readmissions are secondary to non-cardiovascular causes. Among readmitted Medicare patients with HF, the five most common primary diagnoses — HF, renal disorders, pneumonia, arrhythmias, and sepsis — account for 56% of the readmissions with no other diagnoses accounting for more than 5%.^{7,8} The diversity of readmission triggers highlights the importance of comprehensive care to prevent complications from secondary conditions and patient specific risk factors. Furthermore, the degree to which readmissions are avoidable is unclear. A meta-analysis of the literature estimates that only 23.1% of hospital 30-day readmissions may be avoidable. The estimates from the 16 primary studies included in the meta-analysis ranged from 5% to 79% for the proportion of readmissions deemed avoidable.⁹ The assessment of “avoidability” is not a standardized measure and researchers employ differing criteria mostly through chart review that may over or underestimate true rates. Nevertheless, the current evidence suggests only a quarter of 30-day readmissions may be preventable.

Risk models and variations in hospital performance

Predicting readmissions is important to both identify patients at-risk for readmissions, as well as risk adjust hospitals for comparison. A systematic review of 30 studies and 26 models

unfortunately found that prediction models generally had poor discrimination with c-statistics ranging from 0.55 to 0.65 for models using administrative data alone, while other models used smaller populations that require further validation.¹⁰ Residual congestion at discharge has been noted in approximately 10%–15% of patients enrolled in randomized control trials and is associated with an increased risk for rehospitalization and mortality.^{11,12} Poor performance on the Mini-Cog exam was recently found to be both prevalent in a quarter of HF patients and doubled the risk of death or readmission during a mean follow-up of 6 months.¹³ Evaluation of health literacy, functional and cognitive status along with traditional markers of HF severity would strengthen models, but further validation is required.

CMS risk-adjusted hospital HF readmission rates vary considerably ranging from 17.0% to 28.2% with a median of 21.9% in the most recent CMS report. From 2010 to 2013, CMS observed a 1.5% decrease in the median readmission rate.¹⁴ Studies have revealed hospital characteristics outside of the current CMS risk-adjustment model that are associated with higher and lower readmission rates. One study found that hospitals with lower HF admission rates have higher rates of HF emergency department visits and subsequent increased risk for hospitalization after emergency department visits.¹⁵ A few studies have noted differences in HF care based on the overall hospital volume of admissions. Hospitals with a higher volume of HF admissions had better mortality and lower readmission rates suggesting better quality of care.¹⁶ While another study found that the all-cause hospital admission rate was associated with a greater risk for HF readmission. The analysis estimated that the hospital referral region explained 16% of the variation in readmissions compared to 2.6% for case mix (adjustments included age, sex, self-reported ethnicity, and Elixhauser comorbidities).¹⁷ These findings suggest that hospital case mix adjustments inadequately account for the healthcare needs of regional populations and that perhaps access to quality ambulatory care before and after hospital admission may better alleviate readmission risks.

Hospitals in resource-poor communities secondary to financial and clinical restraints have higher 30-day readmission rates. Having more exhaustive cardiac services and higher nurse staffing ratios are associated with lower readmission rates after controlling for other hospital factors.¹⁸ Furthermore, adding socioeconomic status removes two to three times the expected hospital readmission variation and may make readmission models more useful.^{19,20} Hospitals in lower socioeconomic regions are disadvantaged by the current 30-day readmission performance measures and the CMS adjustments do not account for this bias.

Optimizing medical therapy to improve outcomes and reduce hospitalizations

Despite the challenges in identifying factors that predict readmission, a strong foundation exists for the use of evidence-based medical therapies to improve outcomes and reduce the hospitalization burden for HF patients.²¹ Therapies

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