Outcomes in Heart Failure with Preserved vs. Reduced Ejection Fraction in Patients with Iron Deficiency Anemia (with propensity score matching)

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## Preamble:

* **Data Source**: Cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020.
* **Patient Selection**: Included all inpatient admissions with iron deficiency anemia.
* **HF Categories**:
  + Heart failure with reduced ejection fraction
  + Heart failure with preserved ejection fraction
* **ICD Codes**:
  + HFrEF = I50.2 and I50.4
  + HFpEF = I50.3
* **Propensity score matching**:
  + Using R package MatchIt
  + Nearest neighbor matching, caliper = 0.2, ratio = 1:1
* **Outcomes**:
  + In-hospital all-cause mortality
  + Total hospital length of stay (days)
  + Total charge, inflation adjusted to 2020 ($)
* **Software:** All analyses were performed using R Version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria)

## Baseline Table:

| **Characteristic** | **Heart failure with preserved ejection fraction** N = 4,756,715*1* | **Heart failure with reduced ejection fraction** N = 4,756,715*1* | **p-value***2* |
| --- | --- | --- | --- |
| Age, y | 72 (13) | 72 (13) | <0.001 |
| Sex |  |  | <0.001 |
| Female | 2,442,390 (51%) | 2,171,440 (46%) |  |
| Male | 2,314,325 (49%) | 2,585,275 (54%) |  |
| Race |  |  | <0.001 |
| White | 3,344,800 (70%) | 3,319,335 (70%) |  |
| Asian or Pacific Islander | 101,455 (2.1%) | 102,460 (2.2%) |  |
| Black | 819,515 (17%) | 840,980 (18%) |  |
| Hispanic | 360,440 (7.6%) | 361,855 (7.6%) |  |
| Native American | 25,280 (0.5%) | 26,435 (0.6%) |  |
| Other | 105,225 (2.2%) | 105,650 (2.2%) |  |
| Elixhauser comorbidity index | 6.68 (2.01) | 6.59 (2.07) | <0.001 |
| Residential income |  |  | 0.001 |
| $1 - $51,999 | 1,496,525 (31%) | 1,515,615 (32%) |  |
| $52,000 - $65,999 | 1,286,830 (27%) | 1,286,290 (27%) |  |
| $66,000 - $87,999 | 1,118,680 (24%) | 1,106,925 (23%) |  |
| $88,000 or more | 854,680 (18%) | 847,885 (18%) |  |
| Expected primary payer |  |  | <0.001 |
| Private | 613,260 (13%) | 658,035 (14%) |  |
| Medicaid | 402,115 (8.5%) | 429,145 (9.0%) |  |
| Medicare | 3,654,795 (77%) | 3,574,360 (75%) |  |
| Other | 86,545 (1.8%) | 95,175 (2.0%) |  |
| Hospital region |  |  | >0.9 |
| Midwest | 1,156,755 (24%) | 1,156,755 (24%) |  |
| Northeast | 890,230 (19%) | 890,230 (19%) |  |
| South | 1,897,245 (40%) | 1,897,245 (40%) |  |
| West | 812,485 (17%) | 812,485 (17%) |  |
| Hypertension | 402,335 (8.5%) | 377,765 (7.9%) | <0.001 |
| Hyperlipidemia | 2,649,390 (56%) | 2,638,400 (55%) | 0.011 |
| Peripheral vascular disease | 668,450 (14%) | 688,295 (14%) | <0.001 |
| Chronic obstructive pulmonary disease | 1,998,760 (42%) | 1,873,735 (39%) | <0.001 |
| Coronary artery disease | 2,201,465 (46%) | 2,392,615 (50%) | <0.001 |
| Dementia | 492,145 (10%) | 468,275 (9.8%) | <0.001 |
| Fluid and electrolyte imbalance | 2,141,595 (45%) | 2,129,180 (45%) | 0.002 |
| Valvular heart disease | 609,675 (13%) | 618,055 (13%) | 0.005 |
| Atrial fibrillation | 1,732,860 (36%) | 1,799,210 (38%) | <0.001 |
| Obesity | 1,260,700 (27%) | 1,115,595 (23%) | <0.001 |
| Presence of pacemaker | 517,560 (11%) | 534,450 (11%) | <0.001 |
| previous MI | 562,475 (12%) | 807,630 (17%) | <0.001 |
| Pior cardiac surgery | 675,155 (14%) | 730,805 (15%) | <0.001 |
| Malnutrition | 408,180 (8.6%) | 424,460 (8.9%) | <0.001 |
| Cancer | 236,205 (5.0%) | 236,690 (5.0%) | 0.8 |
| *1*Mean (SD); n (%) | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | |

## Outcomes Table:

| **Characteristic** | **Heart failure with preserved ejection fraction** N = 4,756,715*1* | **Heart failure with reduced ejection fraction** N = 4,756,715*1* | **p-value***2* |
| --- | --- | --- | --- |
| Died during hospitalization | 199,540 (4.2%) | 278,470 (5.9%) | <0.001 |
| Length of stay (days) | 6.4 (7.3) | 6.7 (7.8) | <0.001 |
| Inflation-adjusted total charge ($) | 78,960 (123,104) | 89,454 (157,003) | <0.001 |
| *1*n (%); Mean (SD) | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | |

## Multivariable Logistic Regression:

### All-Cause Mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Heart failure categories |  |  |  |
| Heart failure with preserved ejection fraction | — | — |  |
| Heart failure with reduced ejection fraction | 1.42 | 1.40, 1.44 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Heart failure categories |  |  |  |
| Heart failure with preserved ejection fraction | — | — |  |
| Heart failure with reduced ejection fraction | 0.26 | 0.23, 0.29 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation Adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Heart failure categories |  |  |  |
| Heart failure with preserved ejection fraction | — | — |  |
| Heart failure with reduced ejection fraction | 10,495 | 9,677, 11,312 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |