Chronic Liver Disease Is Associated with a Greater Risk of Hospital Readmission in Patients with Heart Failure: A Nationwide Database Study in the US

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Introduction

- Previous studies support that chronic liver disease (CLD) is associated with an increased risk of cardiovascular disease (e.g., Heart Failure (HF)).
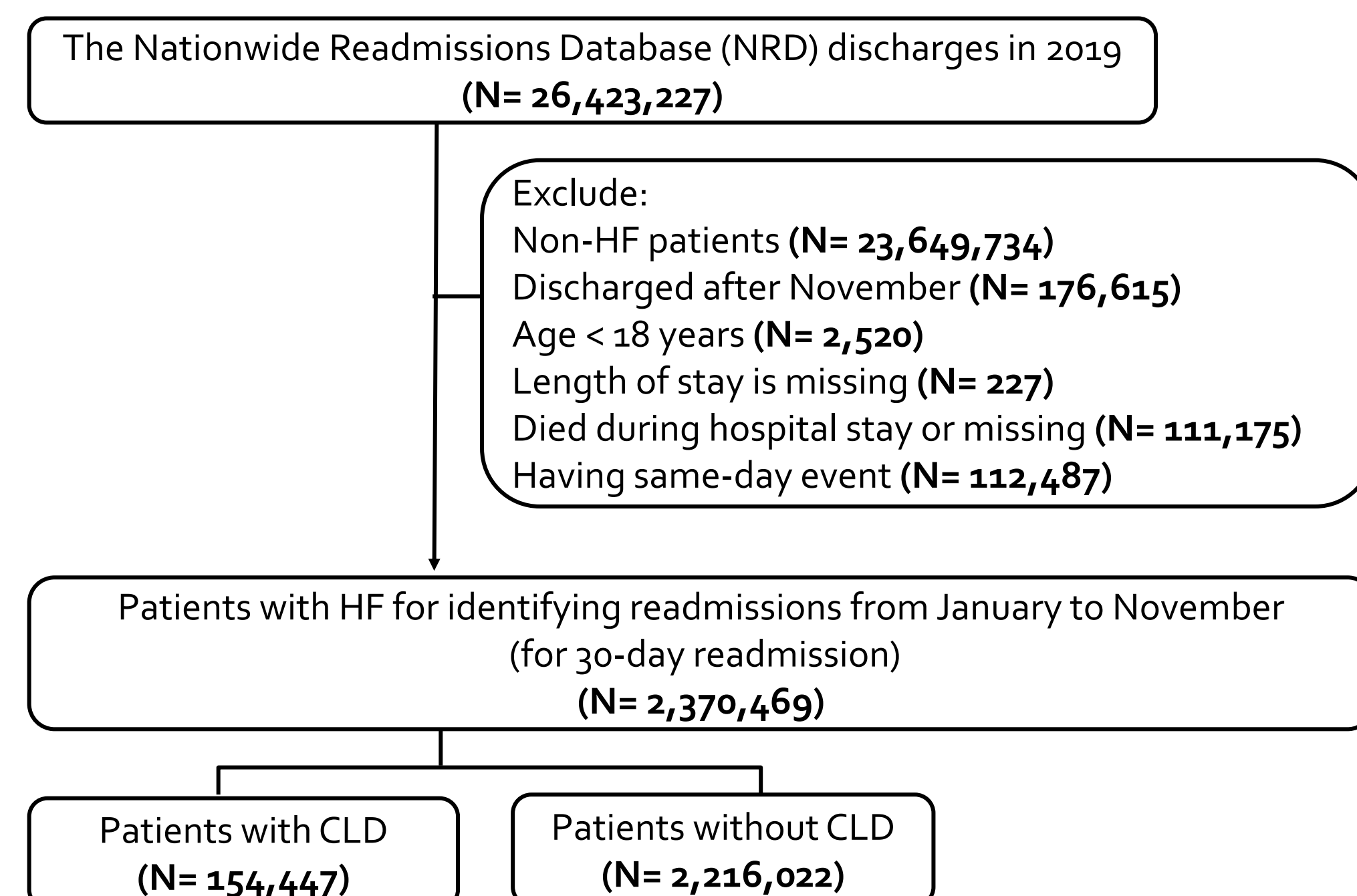- However, there is limited research investigating the association between CLD and patients with HF.

OBJECTIVE

- To examine the relationship between CLD and HF readmission outcomes
- To identify the predictors of readmission in patients with HF.

Methods

Data Source: National Readmission Database (NRD) in 2019

Study Population:

- The Nationwide Readmissions Database (NRD) discharges in 2019 (N= 26,423,227)
- Exclude:
  - Non-HF patients (N= 23,649,734)
  - Discharged after November (N= 176,615)
  - Age < 18 years (N= 2,520)
  - Length of stay is missing (N= 227)
  - Died during hospital stay or missing (N= 111,175)
  - Having same-day event (N= 112,487)
- Patients with HF for identifying readmissions from January to November (for 30-day readmission) (N= 2,370,469)
  - Patients with CLD (N= 154,447)
  - Patients without CLD (N= 2,216,022)

Study Outcomes:

- 30-day and 90-day all-cause and HF-specific readmission

Statistical Analysis:

- Multiple logistic regression was used to explore the association between CLD and readmissions in HF patients.
- Subgroup analyses were stratified by age and CLD subtypes, including hepatitis B (HBV), hepatitis C (HCV), nonalcoholic fatty liver disease (NAFLD), and alcoholic cirrhosis (ALC).
- Sensitivity analysis compared the readmission in different subgroups, including age, gender, risk of mortality, and Charlson Comorbidity Index (CCI), among HF patients with CLD.

Results

Table 1. Baseline characteristics of HF patients (for 30 days readmission analysis)

	All HF	HF with CLD	HF without CLD
Number of patients, n	n=2,370,469	n=154,447	n=2,216,022
Demographics			
Age, years (mean ± SD)	72.44 (0.10)	66.95 (0.10)	72.82 (0.10)
Female, n (%)	1,152,835 (48.63)	62,336 (40.36)	1,090,500 (49.21)
Comorbidities, n (%)			
Alcohol abuse	85,574 (3.61)	21,821 (14.13)	63,753 (2.88)
Drug abuse	70,314 (2.97)	12,586 (8.15)	57,728 (2.61)
Uncomplicated diabetes	278,363 (11.74)	16,965 (10.98)	261,398 (11.80)
Complicated diabetes	830,675 (35.04)	57,668 (37.34)	773,007 (34.88)
Uncomplicated hypertension	40,908 (1.73)	1,937 (1.25)	38,972 (1.76)
Complicated hypertension	1,779,263 (75.06)	116,058 (75.14)	1,663,205 (75.05)
Obesity	634,655 (26.77)	43,757 (28.33)	590,898 (26.66)
Atrial fibrillation and flutter	1,020,976 (43.07)	61,155 (39.60)	959,820 (43.31)
Prior myocardial infarction	336,201 (14.18)	19,131 (12.39)	317,070 (14.31)
Prior PCI	284,660 (12.01)	13,647 (8.84)	271,013 (12.23)
Prior CABG	277,660 (11.71)	13,224 (8.56)	264,436 (11.93)
Chronic pulmonary disease	838,782 (35.38)	55,931 (36.21)	782,851 (35.33)
Chronic kidney disease	1,025,101 (43.24)	68,081 (44.08)	957,020 (43.19)
Neoplasm	209,973 (8.86)	18,097 (11.72)	191,876 (8.66)
Arthropathies	99,009 (4.18)	6,201 (4.02)	92,807 (4.19)
AIDS	8,418 (0.36)	1,731 (1.12)	6,687 (0.30)
Dementia	238,848 (10.08)	9,304 (6.02)	229,545 (10.36)
Depression	309,271 (13.05)	22,449 (14.54)	286,822 (12.94)
Hypothyroidism	442,391 (18.66)	25,567 (16.55)	416,824 (18.81)
Other thyroid disorders	36,238 (1.53)	2,461 (1.59)	33,778 (1.52)
Charlson Comorbidity Index			
0-2	792,475 (33.43)	25,274 (16.36)	767,201 (34.62)
3-4	1,195,437 (50.43)	78,108 (50.57)	1,117,329 (50.42)
≥5	382,557 (16.14)	51,065 (33.06)	331,493 (14.96)
Insurance type, n (%)			
Medicare	1,817,788 (76.68)	102,188 (66.16)	1,715,600 (77.42)
Medicaid	188,739 (7.96)	23,273 (15.07)	165,466 (7.47)
Private	261,472 (11.03)	20,257 (13.12)	241,215 (10.89)
Uninsured	47,097 (1.99)	4,161 (2.69)	42,937 (1.94)
Others	55,374 (2.34)	4,569 (2.96)	50,805 (2.29)

Abbreviation: PCI: percutaneous coronary intervention; CABG: coronary artery bypass grafting; AIDS: acquired immunodeficiency syndrome

Table 2. Risk of readmission for HF patients with and without CLD within 30- and 90 days

	Patients, n (Weighted)	Events, n (Weighted)	Odds Ratio (95% CI) (Unweighted)	Odds Ratio (95% CI) (Weighted)
Index hospitalizations for 30 days all-cause readmission (N= 2,370,469)				
With CLD	154,447	32,233	1.19 (1.17-1.21)	1.20 (1.18-1.23)
Without CLD	2,216,022	372,093	Reference	Reference
Index hospitalizations for 30 days HF-specific readmission (N= 2,370,469)				
With CLD	154,447	25,077	1.15 (1.13-1.18)	1.16 (1.14-1.19)
Without CLD	2,216,022	299,880	Reference	Reference
Index hospitalizations for 90 days all-cause readmission (N= 2,060,370)				
With CLD	134,721	49,888	1.18 (1.16-1.20)	1.19 (1.17-1.21)
Without CLD	1,925,649	600,887	Reference	Reference
Index hospitalizations for 90 days HF-specific readmission (N= 2,060,370)				
With CLD	134,721	39,716	1.13 (1.11-1.15)	1.13 (1.11-1.16)
Without CLD	1,925,649	493,750	Reference	Reference

- HF patients with CLD showed higher 30-day all-cause readmission risk (adjusted Odds Ratio 1.20; 95% CI [1.18-1.23]), and similar trends were observed in the 90-day analysis (1.19 [1.17-1.21]). For HF-specific readmission, HF patients with CLD showed higher risk within 30 days (1.16 [1.14-1.19]), and similar trends were observed within 90 days (1.13 [1.11-1.16]). *(Table 2)*

Sensitivity analyses

- Among CLD subtypes within HF patients, patients with HBV, HCV, and ALC had significantly higher all-cause readmission (1.23 [1.21-1.24], 1.27 [1.24-1.29], 1.38 [1.29-1.47], respectively) and HF-specific readmission (1.34 [1.32-1.36], 1.16 [1.13-1.18], 1.23 [1.13-1.32], respectively) rates within 30 days compared to patients without these conditions. However, there was no significant difference in all-cause readmission (1.00 [0.96-1.05]) and HF-specific readmission (0.97 [0.92-1.01]) when comparing NAFLD patients to those without. *(Figure 1)*
- Sensitivity analyses ensure the robustness of the results. *(Figure 2)*

Figure 1. Risk of readmission for HF patients with different CLD subtypes within 30- and 90 days
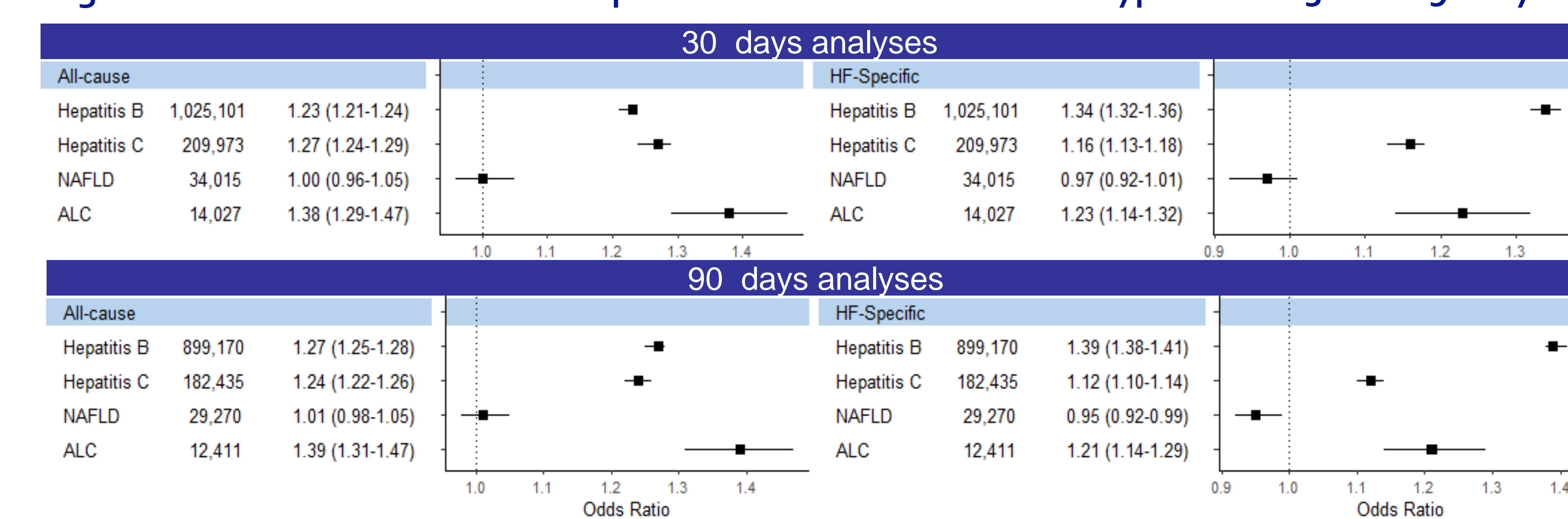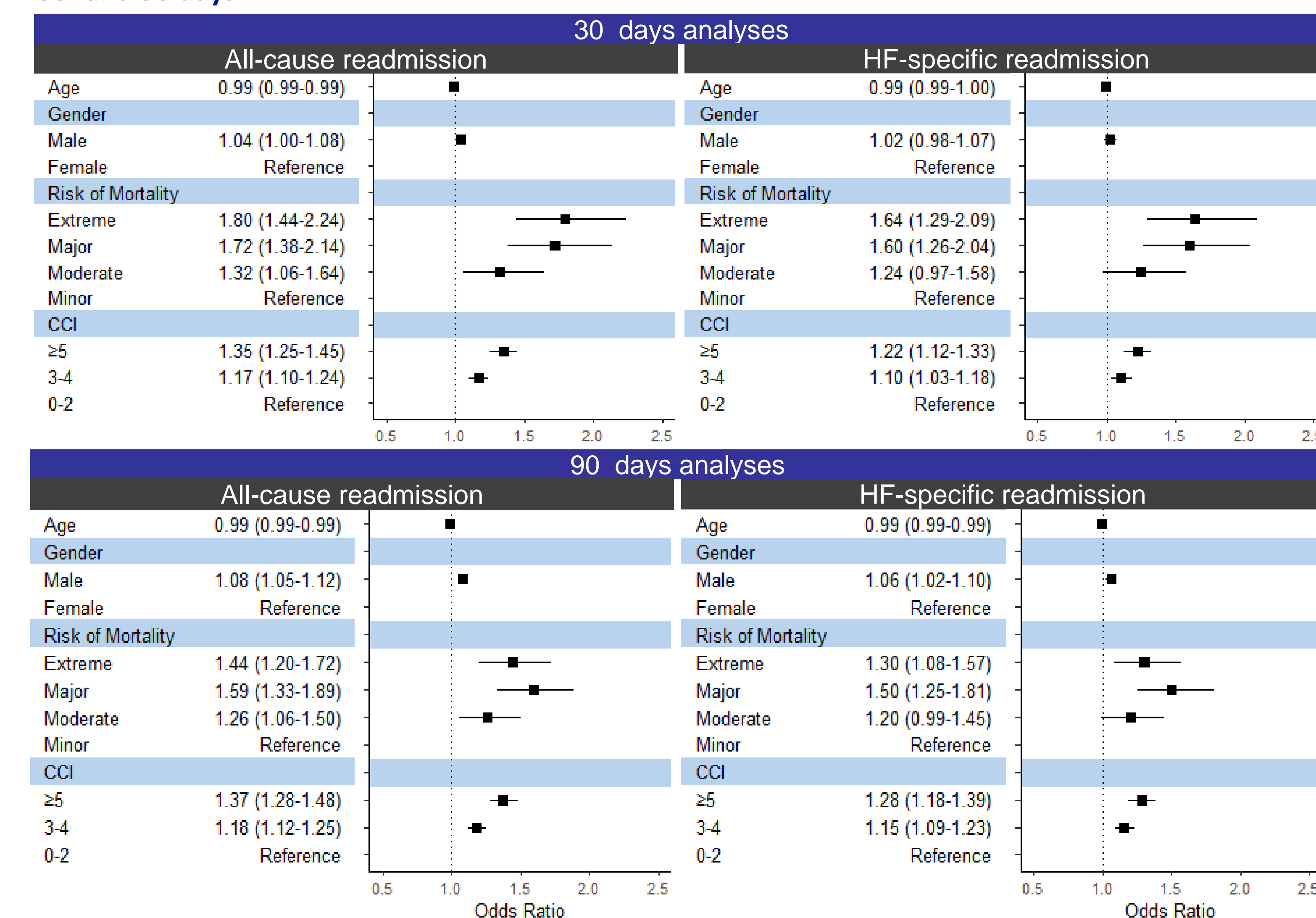

Figure 2. Sensitivity analysis of all-cause or HF-specific Readmission in HF patients with CLD within 30- and 90 days

Conclusion

- Compared to HF patients without CLD, those with CLD were associated with a higher risk of 30- and 90-day readmission.
- Patients with HBV, HCV, and ALC exhibited significantly higher risk of 30- and 90-day all-cause/HF-specific readmissions compared to patients without the conditions. However, there was no significant difference in 30- and 90-day readmissions for patients with NAFLD compared to those without.

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