Comorbid Alcohol Use Disorder Is Associated With Increased Acute Care Utilization in Patients With Diabetes and Chronic Kidney Disease

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INTRODUCTION

- Alcohol use disorder (AUD) affects an estimated 28.8 million Americans,[1] many of whom have comorbid chronic medical conditions
- Excessive alcohol consumption, a defining feature of AUD, has been associated with an increased risk of diabetes mellitus (DM) and chronic kidney disease (CKD)[2-8]
- Limited data suggest that comorbid substance use disorder (SUD), including AUD, is associated with worse health outcomes, increased resource use and costs, and disparities in the receipt of care in patients with DM compared with those without SUD[9-11]
- However, there remains an unmet need for evidence about the magnitude of the health economic burden of comorbid AUD among patients with DM or CKD

OBJECTIVE

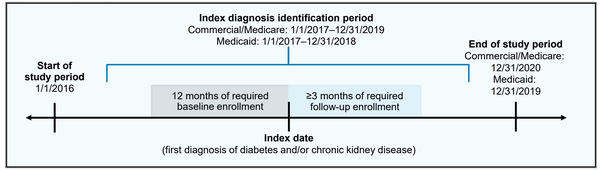
- To describe healthcare resource utilization (HCRU) and costs associated with comorbid AUD among patients with DM and patients with CKD using real-world data

METHODS

Study Design

- Retrospective cohort study using real-world claims data from the Merative™ MarketScan® Commercial and Medicare Supplemental (1/1/2016–12/31/2020) and Medicaid Multi-State (1/1/2016–12/31/2019) databases (**Figure 1**)

Figure 1. Study Design



- Receipt of condition-specific standard-of-care (SOC) therapies during the baseline period was assessed using pharmacy claims with National Drug Codes before propensity score matching in each chronic condition cohort in patients with and without AUD
  - DM-specific SOC therapies assessed included alpha-glucosidase inhibitors, dipeptidyl peptidase-4 (DPP-4) inhibitors, glucagon-like peptide-1, insulin, meglitinides, metformin, pramlintide, sodium-glucose cotransporter 1/2 (SGLT1/2) inhibitors, sulfonylureas, and thiazolidinediones
  - CKD-specific SOC therapies assessed included angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers, dialysis, diuretics, and SGLT2 inhibitors
- Outcomes included all-cause monthly inpatient visits, total length of inpatient stay, emergency department (ED) visits, outpatient visits, pharmacy claims, and the associated costs

Study Population

- Adults with ≥1 inpatient or ≥2 outpatient claims on separate days with a chronic disease diagnosis of DM and/or CKD, where the first observed DM and/or CKD diagnosis served as the index date
- Patients were required to have ≥1 year of continuous enrollment before diagnosis (baseline) and 3 months after (follow-up)
- Adults with comorbid moderate to severe AUD (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*) were identified within each disease cohort by the presence of an associated claim (*International Classification of Diseases, Tenth Edition:* F10.2x, excluding F10.21) during the baseline period. Patients without such a claim were included in the non-AUD cohort

Statistical Analysis

- Patient demographics, clinical characteristics, and outcomes were summarized using descriptive statistics
- Propensity score matching methods were used to balance baseline covariates across AUD and non-AUD groups in a 1:5 ratio for each cohort, where a standardized mean difference (SMD) <0.1 was considered balanced
- After propensity score matching, all-cause HCRU and costs (adjusted to 2020 USD) according to the presence of AUD within each cohort were compared using generalized linear models with negative binomial distribution. No additional adjustment was performed post-matching for residual imbalances

RESULTS

Baseline Demographics and Characteristics

- 1,580,531 patients with DM and 1,155,142 patients with CKD were studied
  - The prevalence of AUD during the baseline period was 0.78% (n = 12,340) for the DM cohort and 1.25% (n = 14,472) for the CKD cohort
- Before propensity score matching (data not shown):
  - In both cohorts, patients with AUD were more likely to be younger and male compared with those without AUD
  - Patients with AUD had a higher comorbidity burden compared with patients without AUD
  - Human immunodeficiency virus or hepatitis C virus, SUDs, and psychiatric/mental health comorbidities were higher in patients with AUD than in patients without AUD
  - Most patients were White in both DM (53% and 56% in AUD and non-AUD, respectively) and CKD cohorts (58% in both AUD and non-AUD patients). Most non-AUD patients were commercially insured in both DM (66%) and CKD cohorts (61%), whereas AUD patients were more likely to be on Medicaid (56% in both DM and CKD cohorts)
- Baseline characteristics for patients with DM and CKD with comorbid AUD after propensity score matching are shown in **Table 1**
  - After propensity score matching, there were no covariates that had an SMD >0.10 in the DM cohort. For the CKD cohort, most covariates were balanced; however, for some covariates, SMD remained >0.10 (covariate [SMD]: hepatitis C virus [0.117]; other SUD [0.167]; bipolar disorder [0.115])

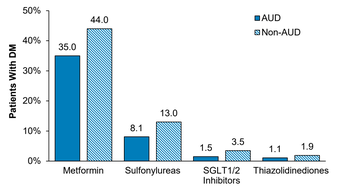
Table 1. Baseline Characteristics Among Patients With Comorbid AUD After Propensity Score Matching

	DM After Matching		CKD After Matching	
	AUD (n = 12,340)	Non-AUD (n = 61,700)	AUD (n = 14,339)	Non-AUD (n = 63,088)
Age at index, mean (SD), years	53.1 (11.1)	53.2 (11.8)	52.6 (12.0)	53.1 (12.9)
Male, n (%)	8,402 (68.1)	40,551 (65.7)	9,880 (68.9)	42,314 (67.1)
CCI score, mean (SD)	8.6 (5.5)	8.4 (5.4)	9 (5.4)	8.5 (5.4)
HIV, n (%)	158 (1.3)	707 (1.1)	266 (1.9)	1,048 (1.7)
HCV, n (%)	1,236 (10.0)	4,593 (7.4)	1,668 (11.6)	5,130 (8.1)
Hypertension, n (%)	9,606 (77.8)	48,470 (78.6)	10,905 (76.1)	48,233 (76.5)
Other substance use disorders, n (%)	4,986 (40.4)	22,349 (36.2)	6,143 (42.8)	21,916 (34.8)
Nicotine dependence, n (%)	7,088 (57.4)	35,039 (56.8)	8,739 (61.0)	36,165 (57.4)
Psychiatric/mental health comorbidities, n (%)				
Schizophrenia	1,111 (9.0)	4,416 (7.2)	1,096 (7.6)	3,499 (5.6)
Schizoaffective disorder	908 (7.4)	3,459 (5.6)	850 (5.9)	2,613 (4.1)
Bipolar disorder	2,485 (20.1)	10,533 (17.1)	2,599 (18.1)	8,777 (13.9)
Major depressive disorder	5,969 (48.4)	29,095 (47.2)	7,002 (48.8)	28,045 (44.5)
Anxiety disorders	2,467 (20.0)	11,805 (19.1)	3,033 (21.2)	11,675 (18.5)
ACSC-specific medication use, n (%)	4,754 (38.5)	24,747 (40.1)	7,334 (51.2)	32,711 (51.9)

ACSC = ambulatory care sensitive condition; AUD = alcohol use disorder; CCI = Charlson Comorbidity Index; CKD = chronic kidney disease; DM = diabetes mellitus; HCV = hepatitis C virus; HIV = human immunodeficiency virus.

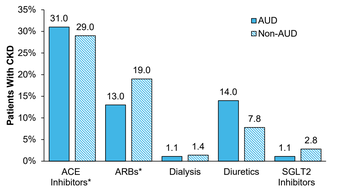
- Prior to matching, in the DM cohort, patients with AUD had fewer SOC pharmacy claims relative to patients without comorbid AUD, except for DPP-4 inhibitors, which had similar claims among both cohorts (**Figure 2**)
  - Metformin (AUD: 35%, non-AUD: 44%) was the most common medication in patients with DM, regardless of AUD status (**Figure 2**)
- Prior to matching, in the CKD cohort, ACE inhibitors (AUD: 31%, non-AUD: 29%) were the most common medication in patients with CKD, regardless of AUD status (**Figure 3**)

Figure 2. Receipt of Condition-Specific Treatment During Baseline* Among Unmatched Patients in the DM Cohort



*Only treatments with >1% usage for each condition represented in this figure.
AUD = alcohol use disorder; DM = diabetes mellitus; SGLT1/2 = sodium-glucose cotransporter 1/2.

Figure 3. Receipt of Condition-Specific Treatment With SOCs During Baseline Among Unmatched Patients in the CKD Cohort

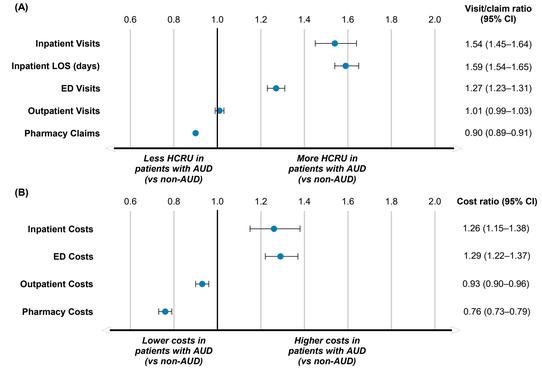


*ACE inhibitors and ARBs may also be used in hypertension, which was a comorbid condition in patients with and without AUD.
ACE = angiotensin-converting enzyme; ARB = angiotensin II receptor blocker; AUD = alcohol use disorder; CKD = chronic kidney disease; SGLT2 = sodium-glucose cotransporter 2; SOC = standard of care.

HCRU and Costs Among DM Patients With Comorbid AUD

- Matched patients with DM and AUD had more monthly inpatient visits (57% vs 45%; visit ratio [VR], 1.54 [95% CI, 1.45–1.64]), ED visits (79% vs 73%; VR, 1.27 [95% CI, 1.23–1.31]), and longer mean inpatient stays (0.81 vs 0.51 days; VR, 1.59 [95% CI, 1.54–1.65]) relative to patients without AUD (**Figure 4A**)
- Matched patients with DM and AUD had greater mean inpatient ($3,106 vs $2,472; cost ratio [CR], 1.26 [95% CI, 1.15–1.38]) and ED costs ($501 vs $387; CR, 1.29 [95% CI, 1.22–1.37]) than those without AUD (**Figure 4B**)
- Lower mean outpatient costs were also observed in patients with AUD relative to those without AUD ($1,948 vs $2,104; CR, 0.93 [95% CI, 0.90–0.96]) (**Figure 4B**)
- Comorbid AUD in patients with DM was associated with fewer monthly pharmacy claims (98% vs 98%; claims ratio, 0.90 [95% CI, 0.89–0.91]) (**Figure 4A**) and lower pharmacy costs ($765 vs $1,009; CR, 0.76 [95% CI, 0.73–0.79]) vs patients without AUD (**Figure 4B**)

Figure 4. (A) Monthly All-Cause HCRU Visit/Claims Ratios and (B) Monthly All-Cause Cost Ratios Between Matched DM Patients With and Without AUD*

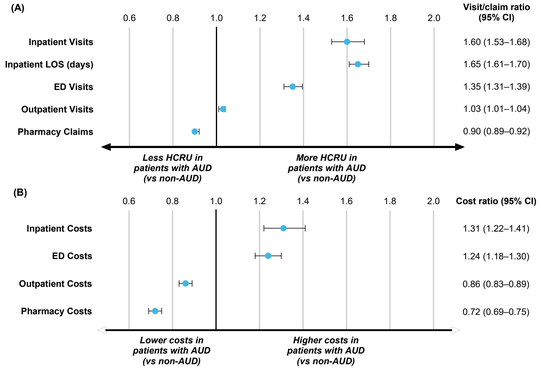


*Comparisons of HCRU and costs are reported as a visit/claim/cost ratio of means, with the non-AUD group set as the reference group. A ratio of 1 indicates no difference between the AUD and non-AUD groups.
AUD = alcohol use disorder; DM = diabetes mellitus; ED = emergency department; HCRU = healthcare resource utilization; LOS = length of stay.

HCRU and Costs Among CKD Patients With Comorbid AUD

- Matched patients with CKD and AUD had more monthly inpatient visits (72% vs 56%; VR, 1.60 [95% CI, 1.53–1.68]), ED visits (86% vs 79%; VR, 1.35 [95% CI, 1.31–1.39]), and longer mean inpatient stays (1.26 vs 0.76 days; VR, 1.65 [95% CI, 1.61–1.70]) relative to patients without AUD (**Figure 5A**)
- Comorbid AUD in patients with CKD was associated with fewer monthly pharmacy claims vs patients without AUD (97% vs 98%; claims ratio, 0.90 [95% CI, 0.89–0.92]) (**Figure 5A**)
- Matched patients with DM and AUD had greater monthly mean inpatient ($5,064 vs $3,862; CR, 1.31 [95% CI, 1.22–1.41]) and ED costs ($630 vs $508; CR, 1.24 [95% CI, 1.18–1.30) than those without AUD (**Figure 5B**)
- Significantly lower mean outpatient ($2,247 vs $2,606; CR, 0.86 [95% CI, 0.83–0.89]) and pharmacy costs ($725 vs $1,005; CR, 0.72 [95% CI, 0.69–0.75]) were observed in patients with AUD relative to those without AUD (**Figure 5B**)

Figure 5. (A) Monthly All-Cause HCRU Visit/Claims Ratios and (B) Monthly All-Cause Cost Ratios Between Matched CKD Patients With and Without AUD*



*Comparisons of HCRU and costs are reported as a visit/claim/cost ratio of means, with the non-AUD group set as the reference group. A ratio of 1 indicates no difference between the AUD and non-AUD groups.
AUD = alcohol use disorder; CKD = chronic kidney disease; ED = emergency department; HCRU = healthcare resource utilization; LOS = length of stay.

STUDY LIMITATIONS

- Propensity score matching is not able to completely account for all variables (eg, other SUD, infectious diseases) that may be imbalanced between groups. The results may thus reflect bias owing to unmeasured confounding factors
- Results may reflect bias owing to confounding factors including SOCs indicated for other comorbid conditions such as hypertension
- Administrative claims evaluated in this study were generated for billing, instead of research purposes, and may contain omissions and inaccuracies. This is expected to equally affect all cohorts and, therefore, should have minimal impact on overarching conclusions

CONCLUSIONS

- In this real-world study, the presence of AUD in patients with DM or CKD was characterized by a greater comorbidity burden, higher acute care utilization and costs, and lower outpatient pharmacy utilization relative to patients with DM or CKD without AUD
- Further research is needed to understand the burden of AUD among patients with chronic conditions such as DM and CKD
- These findings highlight the importance of AUD screening and treatment referral during care delivery for chronic conditions such as DM and CKD

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Disclosures

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