

Healthcare Costs Associated with Obesity-Related Conditions and Comorbidities Among U.S. Adults with Overweight or Obesity

Rodolfo J. Galindo, MD¹; Katja Grasic, PhD²; Meg Wang, ScD³; Najma Saleem, PharmD³; Shuang Wang, PhD⁴; Keith A. Betts, PhD⁵; Guillermo Villa, PhD⁶

¹University of Miami, Miller School of Medicine, Miami, FL, USA; ²Amgen UK, Cambridge, United Kingdom; ³Amgen Inc, Thousand Oaks, CA, USA; ⁴Analysis Group Inc, Boston, MA, USA; ⁵Analysis Group Inc, Los Angeles, CA, USA; ⁶Amgen (Europe) GmbH, Rotkreuz, Switzerland

OBJECTIVE

To estimate the incremental all-cause direct healthcare costs and healthcare resource utilization (HCRU) associated with selected obesity-related conditions and comorbidities (ORCs) among U.S. adults with overweight or obesity.

KEY TAKEAWAYS

- Among U.S. adults living with overweight or obesity, cardiovascular-kidney-metabolic conditions were associated with substantial increases in healthcare expenditures and resource utilization.
- All evaluated ORCs were associated with increased total healthcare costs and HCRU among adults with overweight or obesity. The largest economic burden was observed for cardiovascular conditions, including atrial fibrillation (AF), heart failure (HF), stroke, peripheral artery disease (PAD), and myocardial infarction (MI).
- These findings highlight the economic burden associated with ORCs and underscore the potential value of effective obesity management strategies that address multimorbidities.

BACKGROUND

- Overweight and obesity are associated with an increased risk of numerous obesity-related complications (ORCs), particularly cardio-reno-metabolic conditions, including type 2 diabetes (T2D), heart failure (HF), hypertension, chronic kidney disease (CKD), obstructive sleep apnea (OSA), and osteoarthritis.¹⁻⁴
- There is limited contemporary evidence on the direct healthcare costs and healthcare resource utilization (HCRU) associated with individual ORCs.
- Therefore, we conducted a retrospective study to estimate the incremental all-cause HCRU and healthcare costs associated with individual ORCs among U.S. adults with overweight or obesity.

METHODS

Data Source and Study Design

- A retrospective observational cohort study using a sample of Optum® Market Clarity database, from January 1, 2016, to March 31, 2025
- A predefined sampling scheme was applied to the source population before cohort selection, including 1.5 million individuals with BMI ≥40 kg/m², 1.5 million with BMI between 30 and <40 kg/m², and 2.5 million with BMI between 18 and <30 kg/m².
- Adults with BMI ≥27 kg/m² (**overweight or obesity**) were identified as the study cohort. The **index date** was defined as the earliest date meeting all three following criteria: (1) having BMI measurement ≥27 kg/m², (2) having 12 months of continuous enrollment prior to index (i.e., **baseline period**), and (3) age ≥ 18 years.
- Eligible individuals were required to have continuous enrollment for ≥6 months during the **follow-up**, defined from the index date to the earliest of death, end of continuous enrollment, or end of data availability.

Exposure and Outcomes

- Each ORC was assessed as a time-varying exposure on a monthly basis and evaluated at the start of each monthly interval, allowing for the development of ORCs during follow-up; once identified, an ORC was assumed to persist for the remainder of follow-up. The ORCs assessed are shown in Table 1.
- Outcomes included all-cause direct healthcare costs (in 2025 USD) and their components, including medical service costs and pharmacy costs, as well as HCRU rates by care setting assessed during the subsequent monthly intervals.

Statistical Analysis

- Healthcare costs and HCRU associated with ORCs were estimated using two-part regression models:
 - A logistic model to estimate the probability of incurring any costs or HCRU, and a generalized linear model to estimate outcomes among observations with non-zero values (gamma distribution for costs and Poisson distribution for HCRU rates).
 - Incremental costs and HCRU rates for each ORC were derived using least-squares means and reported with mean (95% CI). Model estimates were annualized from per-patient-per-month (PPPM) to per-patient-per-year (PPPY).
- For each ORC, the model adjusted for demographics, baseline costs and HCRU, Charlson Comorbidity Index (CCI), time-varying BMI (on a monthly basis), and other time-varying individual ORCs.

RESULTS

Baseline Characteristics

- The study included 954,544 adults with overweight or obesity, with a median (interquartile range [IQR]) follow-up duration of 33.0 (18.0, 61.0) months. The mean (standard deviation [SD]) age at index was 50.4 (16.6) years, and 59.0% were female (Table 1).
- At index, the mean (SD) BMI was 36.9 (8.2) kg/m².
- At baseline, hypertension was the most prevalent ORC (41.9%), followed by T2D (20.5%) and OSA (13.3%).

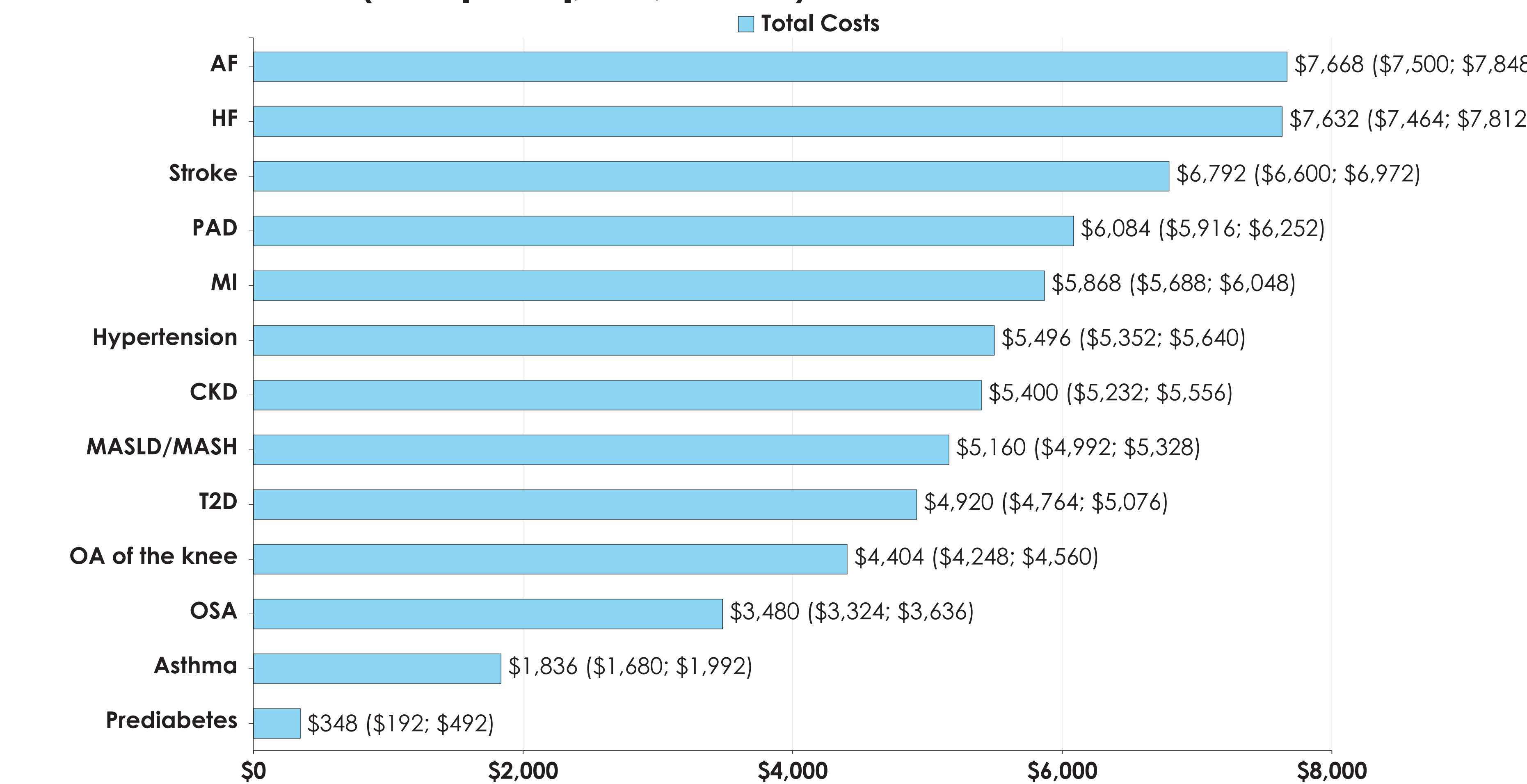
Table 1. Baseline characteristics of the study cohort

Characteristics	Study Cohort ¹
N = 954,544	
Age at index (years), mean ± SD	50.4 ± 16.6
Age at index (years), median (IQR)	51.0 (37.0, 63.0)
Age category at index, n (%)	
<65 years	741,893 (77.72%)
≥65 years	212,651 (22.28%)
Sex, n (%)	
Female	563,223 (59.00%)
Male	390,882 (40.95%)
Unknown	439 (0.05%)
Race/ethnicity, n (%)	
Caucasian	694,952 (72.80%)
African American	132,982 (13.93%)
Hispanic	72,296 (7.57%)
Asian	15,124 (1.58%)
Other/Unknown	39,190 (4.11%)
Insurance type, n (%)	
Commercial	485,501 (50.86%)
Medicare	217,636 (22.80%)
Medicaid	143,339 (15.02%)
More than one type	108,068 (11.32%)
Index BMI (kg/m²), mean ± SD	36.9 ± 8.2
Index BMI by overweight/obesity classification, n (%)	
Overweight (27.0–29.9 kg/m ²)	217,523 (22.79%)
Class I obesity (30.0–34.9 kg/m ²)	256,289 (26.85%)
Class II obesity (35.0–39.9 kg/m ²)	153,466 (16.08%)
Class III obesity (≥40.0 kg/m ²)	327,266 (34.29%)
ORCs during the baseline period, n (%)	
AF	44,907 (4.70%)
HF	44,188 (4.63%)
Stroke	16,133 (1.69%)
PAD	36,554 (3.83%)
MI	22,517 (2.36%)
Hypertension	400,062 (41.91%)
CKD	63,049 (6.61%)
MASLD/MASH	34,778 (3.64%)
T2D	195,310 (20.46%)
OA of the knee	75,720 (7.93%)
OSA	127,248 (13.33%)
Asthma	98,580 (10.33%)
Prediabetes	26,343 (2.76%)
CCI during the baseline period, mean ± SD	0.7 ± 1.4
All-cause baseline healthcare utilization (PPPY), mean ± SD	
Number of inpatient admissions	0.1 ± 0.6
Number of emergency department visits	0.8 ± 2.5
Number of outpatient visits	14.9 ± 24.6
All-cause baseline healthcare cost (PPPY) in 2025 USD, mean ± SD	
Total costs	\$18,702 ± \$46,335
Total medical costs	\$15,245 ± \$41,256
Total pharmacy costs	\$3,456 ± \$16,847

Incremental Annual Healthcare Costs Associated with ORCs

- Compared with follow-up periods without the respective ORC, the presence of each ORC was associated with higher annual healthcare costs among adults with overweight or obesity.

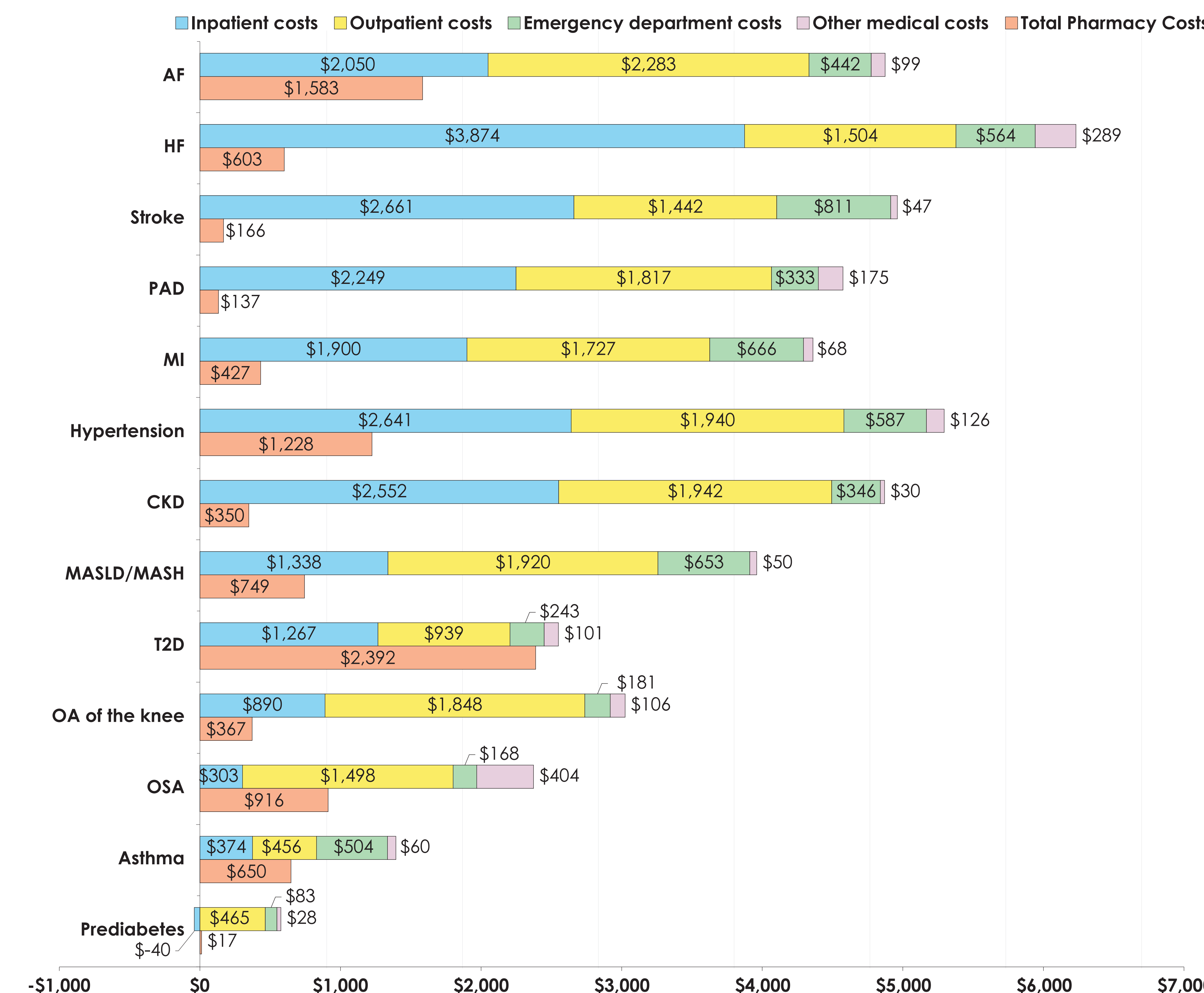
Figure 1. Adjusted difference in annual healthcare total costs for adults with overweight or obesity, with vs. without individual ORCs (Mean [95% CI], PPPY, 2025 USD)



Notes: The mean duration of follow-up after diagnosis ranged from 24.6 months (prediabetes) to 39.9 months (hypertension), including AF (34.8), asthma (36.7), CKD (34.7), HF (32.0), MASLD/MASH (31.4), MI (32.8), OA of the knee (36.4), OSA (36.3), PAD (32.6), stroke (30.0), and T2D (37.8).

- Across all ORCs, incremental healthcare costs were primarily driven by medical costs, with smaller contributions from pharmacy costs. The exception was T2D, which was associated with comparable incremental medical and pharmacy costs.
- Inpatient and outpatient services accounted for the largest components of incremental medical costs across most ORCs.

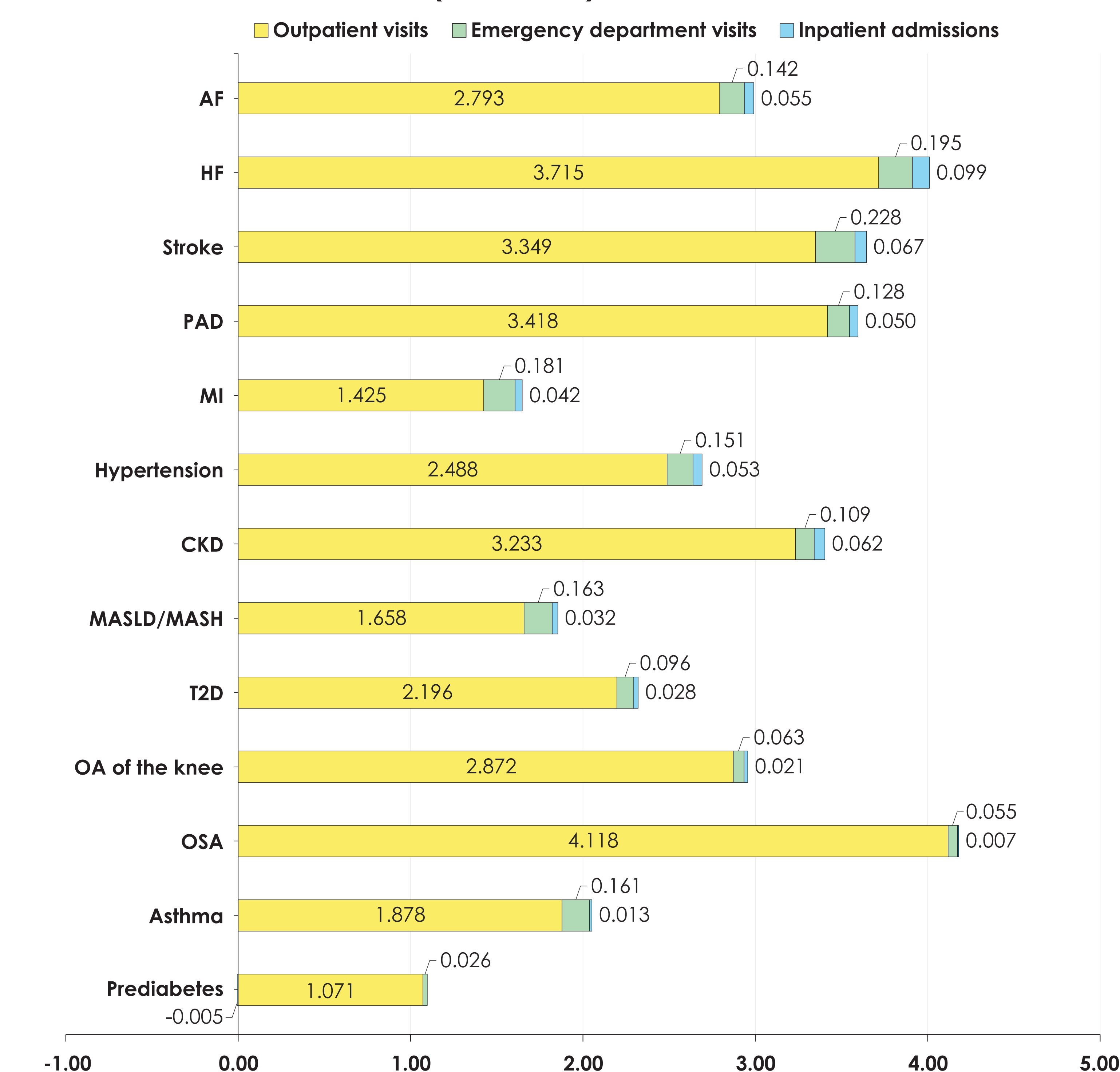
Figure 2. Adjusted difference in annual pharmacy and medical costs components for adults with overweight or obesity, with vs. without individual ORCs (Mean, PPPY, 2025 USD)



Incremental Annual HCRU Associated with ORCs

- Across all ORCs, individuals with the ORC had higher HCRU rates than those without, including inpatient admissions, emergency department visits, and outpatient visits, except for inpatient admissions for prediabetes.
- For ORCs associated with higher HCRU rates, the incremental annual rates ranged from 0.007 to 0.099 PPPY for inpatient admissions, 0.026 to 0.228 PPPY for emergency department visits, and 1.071 to 4.118 PPPY for outpatient visits.
- The largest increases in inpatient admissions were observed among patients with HF, stroke, and CKD, while the largest increases in outpatient visits were observed among those with OSA, HF, PAD, and stroke (Figure 3).

Figure 3. Adjusted difference in annual HCRU rates for adults with overweight or obesity, with vs. without individual ORCs (Mean, PPPY)



LIMITATIONS

- BMI and weight measurements are recorded at irregular intervals in routine clinical practice; therefore, previously observed BMI values were carried forward when measurements were unavailable during follow-up intervals.
- Results are subject to limitations inherent to claims and EHR data, including potential missing data and misclassification or measurement errors. Despite adjustment for multiple baseline and time-varying covariates, residual confounding from unmeasured factors (e.g., lifestyle behaviors or disease severity) may remain, and findings should be interpreted as associative rather than causal.

Abbreviations

AF, Atrial Fibrillation; BMI, Body Mass Index; CCI, Charlson Comorbidity Index; CI, Confidence Interval; CKD, Chronic Kidney Disease; HF, Heart Failure; IQR, Interquartile Range; MASLD, Metabolic Dysfunction-Associated Steatotic Liver Disease; MASH, Metabolic Dysfunction-Associated Steatohepatitis; MI, Myocardial Infarction; OA, Osteoarthritis; ORC, Obesity-Related Condition; OSA, Obstructive Sleep Apnea; PAD, Peripheral Artery Disease; PPPM, Per Patient Per Month; PPPY, Per Patient Per Year; SD, Standard Deviation; T2D, Type 2 Diabetes Mellitus; USD, United States Dollar.

References

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