

# Healthcare Resource Utilization and Costs With the Introduction of Intranasal Midazolam in Acute Seizure Management: A Wisconsin-Based Claims Analysis

George L. Morris, 3rd<sup>1</sup>  
Derek Ems<sup>2</sup>  
Anna Kuba<sup>3</sup>  
Milena Tryfon<sup>3</sup>  
Pam Eads<sup>2</sup>

1. Ascension Wisconsin, St. Mary's Hospital,  
Milwaukee, WI, USA  
2. UCB, Smyrna, GA, USA  
3. UCB, Warsaw, Poland

## Background

- Midazolam (MDZ) nasal spray was approved in the United States in 2019 for acute (on-demand) treatment of intermittent, stereotypic episodes of frequent seizure activity (ie, seizure clusters, acute repetitive seizures).
- The MDZ nasal spray approval allows for non-hospital management of acute seizures and potential reduced healthcare resource utilization (HCRU).

## Objective

- To assess demographics at baseline and comorbidities, treatment patterns, HCRU, and healthcare costs of patients with epilepsy in Wisconsin prior to and following MDZ nasal spray prescription.

## Methods

- This study was a non-interventional, retrospective, claims-based cohort analysis using the Wisconsin Health Information Organization (WHIO) All-Payer Claims Database, which includes inpatient and outpatient care, radiology, pharmacy, and laboratory services.
- The index date was the first date on which all inclusion criteria were met: patients had to be ≥12 years of age at first MDZ nasal spray prescription and had to have ≥1 prescription claim for MDZ nasal spray in the identification period (Dec 01, 2019–Jun 30, 2020), continuous medical and pharmacy enrollment for 1 year prior to the index date (baseline period), and an epilepsy diagnosis (*International Classification of Diseases, 10th Revision: G40.X, R56.X, G25.3*) and ≥1 prescription claim for a chronic antiseizure medication during the baseline or identification period.
- Patient follow-up started on the index date and ended at the end of continuous enrollment, 365 days post-index date, or at data cut-off (Jun 30, 2021), whichever was earliest.
- All variables were summarized using descriptive statistics.

## Results

- During the identification period, 132 patients had filled ≥1 prescription for MDZ nasal spray; 109 of these fulfilled all inclusion criteria and were included in this analysis.

### Baseline demographics and insurance plan type

	Patients (N=109)
Female, n (%)	53 (48.6)
Age, mean (SD), years	23.8 (8.5)
Insurance plan type at index, n (%)	
Commercial	13 (11.9)
Commercial, Medicaid	9 (8.3)
Medicaid	87 (79.8)

### Comorbidities

	Baseline (N=109)	Follow-up (N=109)
Comorbidities, <sup>a</sup> n (%)		
Anxiety	31 (28.4)	20 (18.3)
Asthma	12 (11.0)	9 (8.3)
Depression	17 (15.6)	15 (13.8)
Diabetes	1 (0.9)	0
Hypertension	4 (3.7)	1 (0.9)

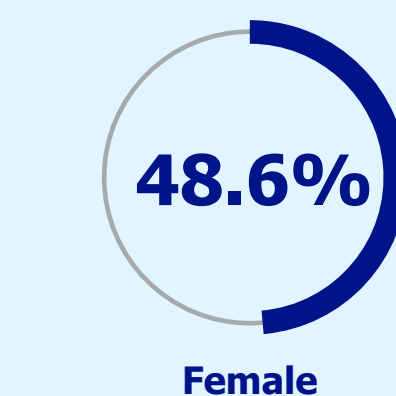
<sup>a</sup>Assessed using ICD-10 codes F41.X (anxiety), J45 (asthma), F32 (depression), E08-E13 (diabetes), and I10 (hypertension). ICD-10, International Classification of Diseases, 10th Revision.

## QUESTION

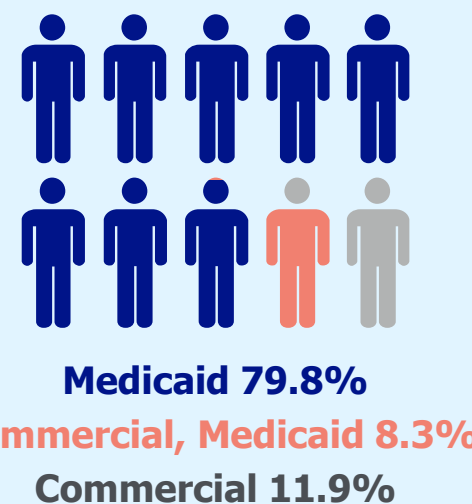
What are the demographics, treatment patterns, healthcare resource utilization (HCRU), and associated costs before and after midazolam (MDZ) nasal spray prescription in patients with epilepsy in Wisconsin?

## RESULTS

### Patient characteristics (N=109)



23.8  
(8.5)  
years  
Mean (SD) age

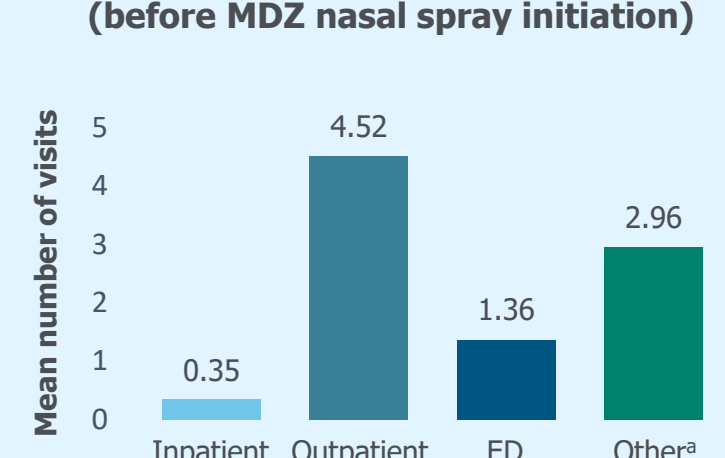


## INVESTIGATION

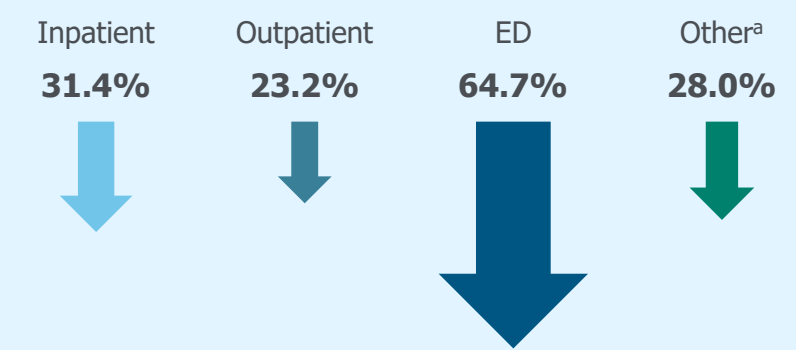
A retrospective claims-based cohort analysis using the Wisconsin Health Information Organization All-Payer Claims Database, which includes inpatient and outpatient care, radiology, pharmacy, and laboratory services. All-cause and epilepsy-related HCRU and costs (2021 US dollars) were captured 12 months before (baseline) and up to 12 months after (follow-up) MDZ nasal spray prescription.

### HCRU

#### Epilepsy-related HCRU during baseline (before MDZ nasal spray initiation)



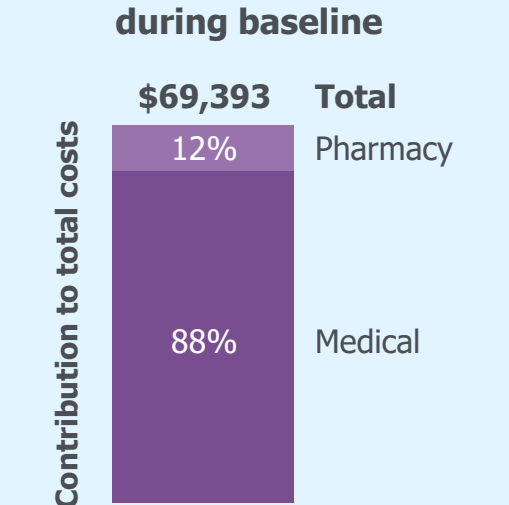
#### Change in epilepsy-related HCRU from baseline to follow-up



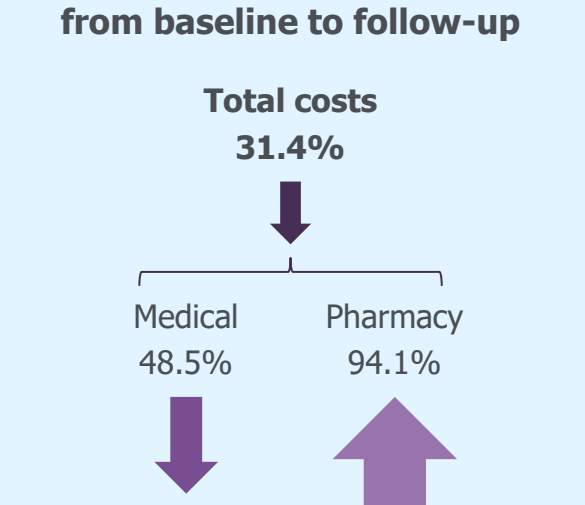
\*Other visits are those that do not meet criteria for inpatient, outpatient, and ED visits (eg, rehabilitation, laboratory test). ED, emergency department; HCRU, healthcare resource utilization.

### Costs

#### Mean epilepsy-related costs during baseline



#### Change in epilepsy-related costs from baseline to follow-up



## CONCLUSIONS

HCRU and costs were reduced following introduction of MDZ nasal spray. Increases in mean pharmacy costs were offset by reduced inpatient, emergency department, and outpatient visits and reduced total costs.

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### ASM prescriptions

	Baseline (N=1414) <sup>a</sup>	Follow-up (N=1906) <sup>a</sup>
ASM Rx count (%)		
Lamotrigine	442 (31.3)	472 (24.8)
Levetiracetam	348 (24.6)	474 (24.9)
Lacosamide	164 (11.6)	266 (14.0)
Topiramate	110 (7.8)	138 (7.2)
Zonisamide	85 (6.0)	157 (8.2)
Oxcarbazepine	86 (6.1)	112 (5.9)
Valproic acid	69 (4.9)	98 (5.1)
Carbamazepine	45 (3.2)	56 (2.9)
Perampanel	25 (1.8)	49 (2.6)
Brivaracetam	22 (1.6)	52 (2.7)
Phenytoin	16 (1.1)	31 (1.6)
Eslicarbazepine acetate	2 (0.1)	0
Cenobamate	0	1 (0.1)

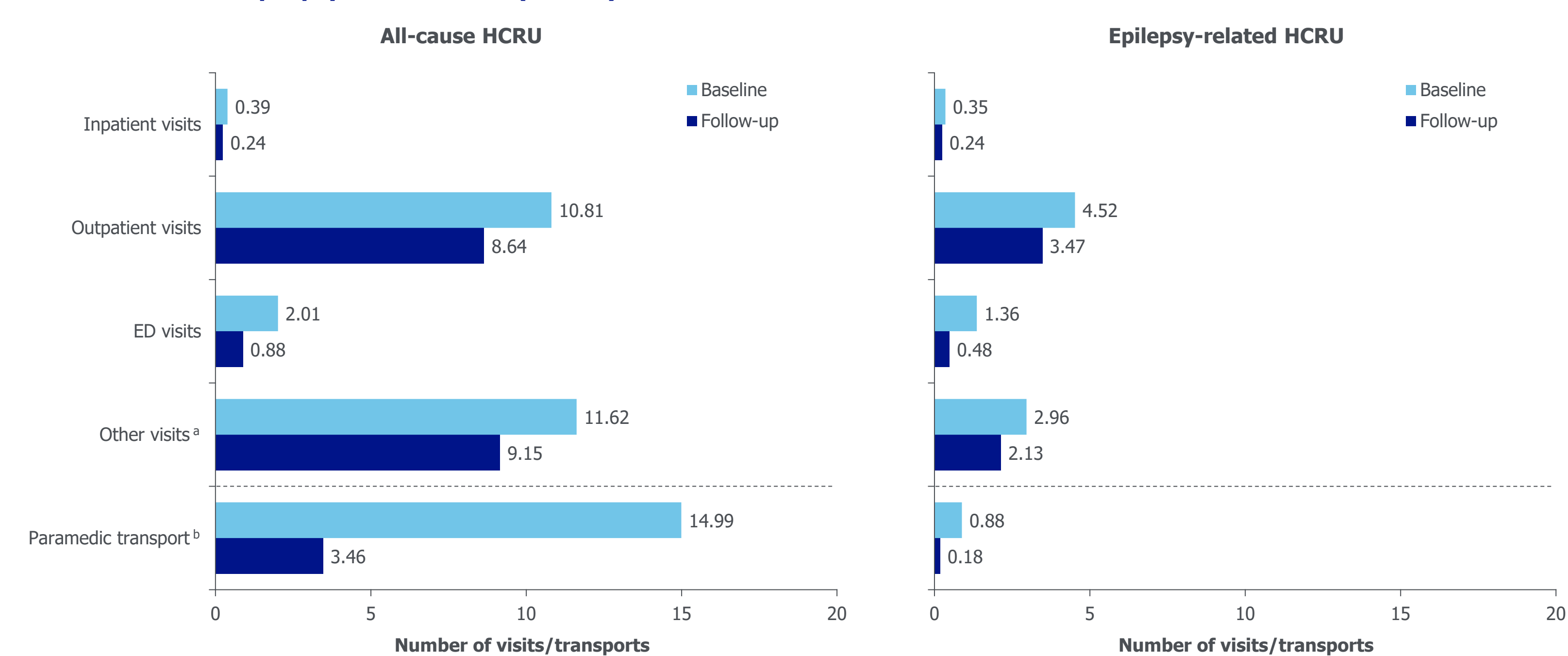
<sup>a</sup>All ASM prescriptions. ASM, antiseizure medication; Rx, prescription.

### ACT prescriptions

	Baseline (N=26) <sup>a</sup>	Follow-up (N=285) <sup>a</sup>
ACT Rx count (%)		
Midazolam nasal spray	0	271 (95.1)
Diazepam gel	26 (100)	14 (4.9)

<sup>a</sup>All ACT prescriptions. ACT, acute cluster treatment (rescue medication); Rx, prescription.

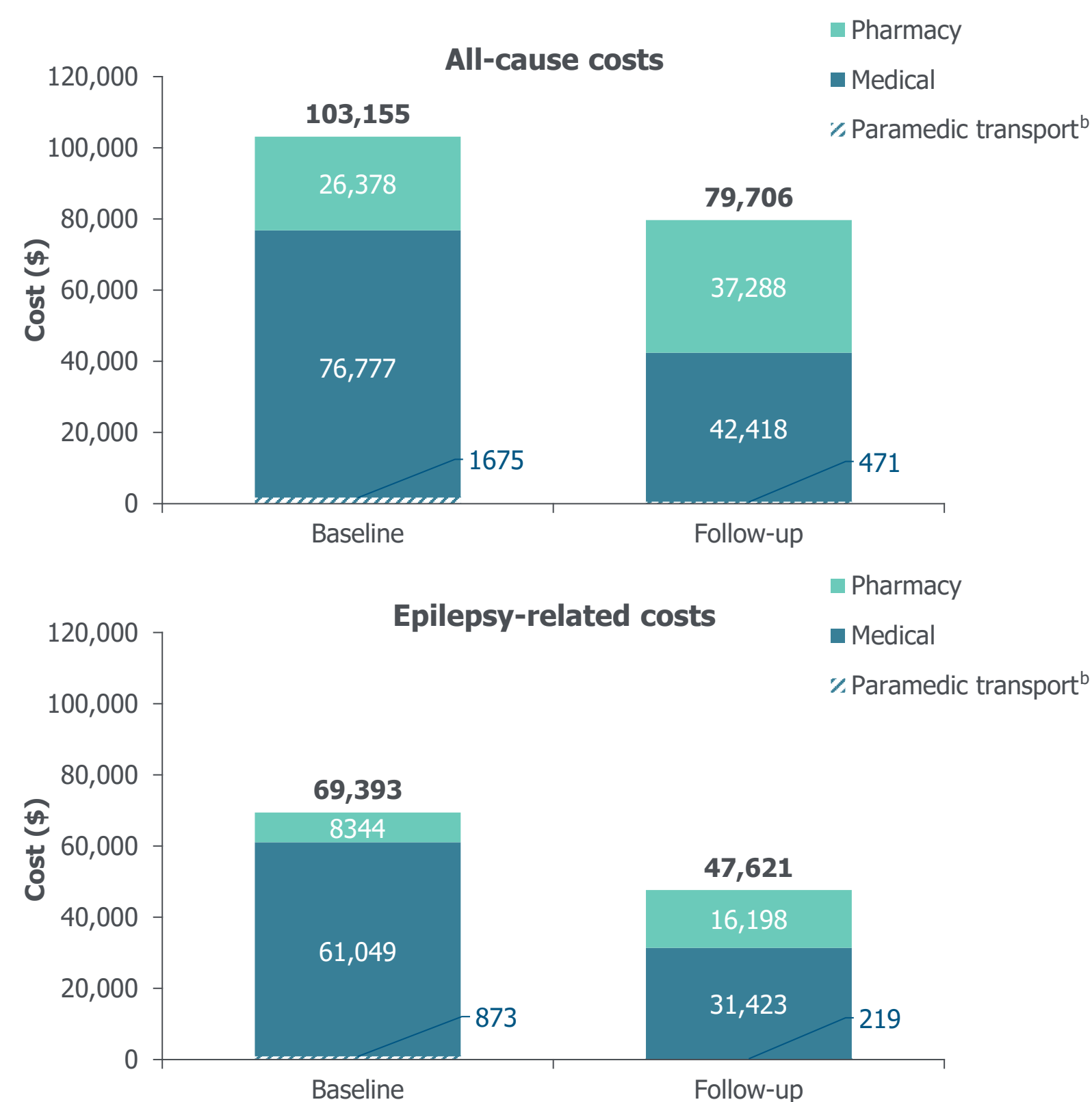
### Mean all-cause and epilepsy-related HCRU (N=109)



Data are presented as per person, per year. <sup>a</sup>Other visits are those that do not meet criteria for inpatient, outpatient, and ED visits (eg, rehabilitation, laboratory test); <sup>b</sup>Paramedic transport (as coded with appropriate CPT/HCPCS codes) is a subcategory of all different types of visits (inpatient, outpatient, ED, and other visits). CPT, Common Procedural Terminology; ED, emergency department; HCPCS, Healthcare Common Procedural Coding System; HCRU, healthcare resource utilization.

- Reductions in all-cause HCRU and epilepsy-related HCRU from baseline to follow-up were seen in mean inpatient stays, mean outpatient visits, mean emergency department (ED) visits, mean other visits, and mean paramedic transport use.

### Mean all-cause and epilepsy-related costs<sup>a</sup> (N=109)



Data are presented as per person, per year. <sup>a</sup>All costs were adjusted to 2021 US dollars; <sup>b</sup>Paramedic transport costs are included in medical costs.

- The reductions in HCRU were expressed in all-cause and epilepsy-related cost reductions from baseline to follow-up for mean medical services and mean total costs; mean pharmacy costs increased.

## Conclusions

- In patients who were prescribed MDZ nasal spray, HCRU and costs were reduced following the prescription.
- Increases in mean pharmacy costs were offset by reduced inpatient visits, ED visits, outpatient visits, and reduced total costs in these patients.
- Although not assessed in this analysis, quality of life improvements may be experienced with these reduced inpatient and ED visits.<sup>1,2</sup>

## References

- Bautista RE, et al. *Epilepsy Res* 2008;79(2-3):120-129.
  - Naseer M, et al. *Health Qual Life Outcomes* 2018;16(1):144.
- UCB-sponsored. UCB was involved in the design of the study, the collection, analysis, and interpretation of data, and review of the poster. The authors acknowledge Bobby Jacob, PharmD, MPH (UCB, Smyrna, GA, USA) for managing the development of the poster, and Michaela Fuchs, PhD, CMPP (Envision Spark, an Envision Medical Communications agency, a part of Envision Pharma Group, Horsham, UK) for writing assistance, which was funded by UCB. Author contributions: All authors contributed to study design, data analysis, and interpretation. All authors critically reviewed the poster and approved the final version for presentation. Author disclosures: GL Morris is a consultant for UCB. D Ems, M Tryfon, and P Eads are salaried employees of UCB and have received stocks from their employment. A Kuba is a salaried employee of UCB.



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American Epilepsy Society 79th Annual Meeting  
Atlanta, GA, USA | December 5-9, 2025