

Clinical and Healthcare Resource Burden of Disease in Patients With Lennox-Gastaut Syndrome: Results From a US Claims Matched-Control Analysis

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INTRODUCTION

- Lennox-Gastaut syndrome (LGS) is a rare, childhood-onset epilepsy syndrome characterized by multiple severe concurrent seizure types^{1,2}
- In addition to seizures, patients with LGS experience comorbidities and nonseizure symptoms (NSS), such as cognitive decline, behavioral disorders, and developmental delays, which can profoundly impact patients' and caregivers' lives^{2,3}
- The current standard of care for seizure control typically includes antiseizure medications (ASMs) and expands to heterogeneous adjunct therapy^{4,5}
- There are limited available data quantifying disease burden of patients with LGS, especially in terms of occurrence of comorbidities and NSS and economic impact

OBJECTIVES

- Primary: To estimate incremental comorbidities and NSS and healthcare resource burden in patients with LGS compared to control participants
- Secondary: To describe seizures and seizure-related injuries and treatments in patients with LGS

METHODS

- This retrospective analysis used de-identified, patient-level closed claims data from Komodo's Healthcare Map™ during the observation period of January 2016 through December 2022
- Patients with LGS and control participants without LGS were matched on a 1:1 ratio on patient demographics including age, sex, region, insurance channel, and index date
 - For patients with LGS, the index date was a randomly selected calendar date on or after the first LGS diagnosis and associated with ≥ 12 months of continuous enrollment; the index date of the patient cohort was assigned to the control participant cohort and associated with ≥ 12 months of continuous enrollment
- Patients with LGS were eligible for inclusion if they had ≥ 2 LGS diagnoses ≥ 30 days apart during the observation period; control participants were eligible for inclusion if they had no LGS diagnoses during the observation period
 - Patients who had a diagnosis of Dravet syndrome in the claims history were excluded
- Comorbidities, NSS, and healthcare resource utilization (HCRU) were measured during the 12-month follow-up period
- Standardized mean differences were used to compare both patient and clinical characteristics
- Prevalence of comorbidities and NSS and utilization of HCRU were compared between cohorts using logistic regression models; numbers of HCRU visits were compared using negative binomial models.
 - Generalized estimation equations (GEE) were incorporated in these models to account for potential correlations between matched participant pairs

RESULTS

Patient Demographics

- This analysis included 9685 matched pairs of study participants; in both groups, median age was 15 years and over half of participants were male (56.8%); the majority of participants were insured by Medicaid (75.1%) (Table 1)
- Among patients with LGS, the most common types of seizures were status epilepticus (40.8%), generalized (40.7%), and focal (34.2%)
 - Among control participants, 1.8% experienced some type of seizure
- Among patients with LGS, the most common seizure-related injuries were craniocerebral injuries (11.5%), superficial injuries (10.1%), fractures and dislocations (7.2%), and closed internal injuries (3.9%)
 - Among control participants, 0.3% experienced some type of seizure-related injury

Table 1. Patient Demographics and Characteristics

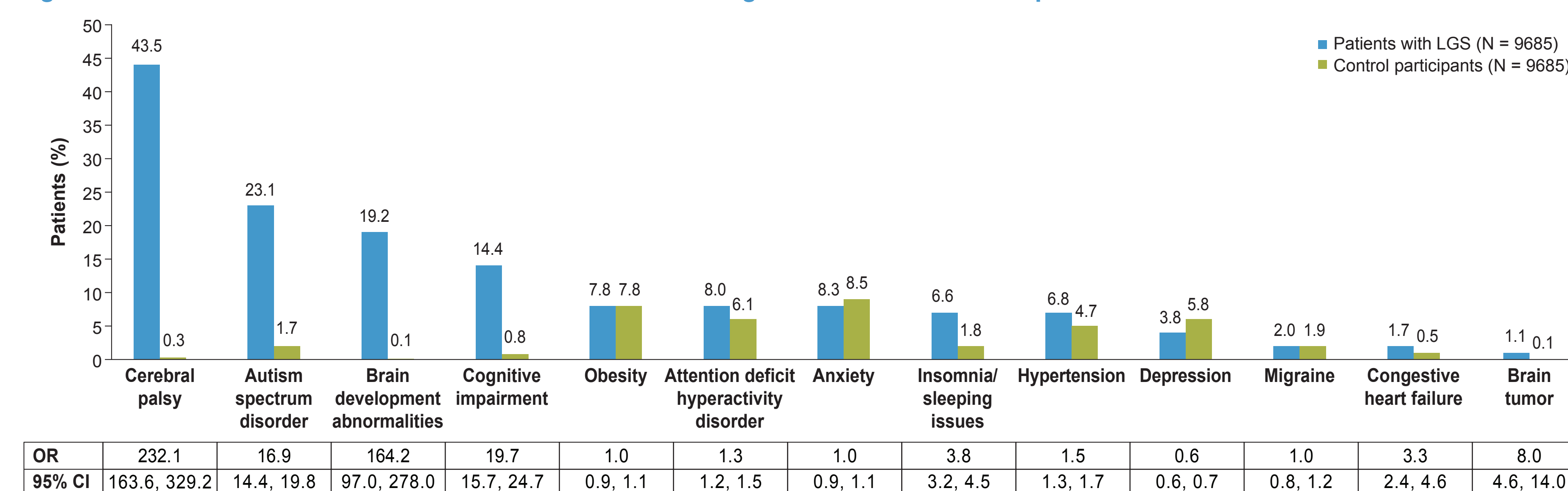
Characteristics	Patients With LGS (N = 9685)	Control Participants (N = 9685)
Age, years		
Median (min, max)	15 (0, 82)	15 (0, 82)
Sex, n (%)		
Male	5499 (56.8)	5499 (56.8)
Female	4181 (43.2)	4181 (43.2)
Unknown	5 (0.1)	5 (0.1)
Region, n (%)		
South	4414 (45.6)	4414 (45.6)
West	2074 (21.4)	2074 (21.4)
Northeast	1675 (17.3)	1675 (17.3)
Midwest	1522 (15.7)	1522 (15.7)
Index year, n (%)		
2016	857 (8.8)	857 (8.8)
2017	1087 (11.2)	1087 (11.2)
2018	1266 (13.1)	1266 (13.1)
2019	1515 (15.6)	1515 (15.6)
2020	2019 (20.8)	2019 (20.8)
2021	2941 (30.4)	2941 (30.4)
Payer channel^a, n (%)		
Commercial	1989 (20.5)	1989 (20.5)
Medicaid	7273 (75.1)	7273 (75.1)
Medicare Advantage	79 (0.8)	141 (1.5)
Dual eligible	344 (3.6)	282 (2.9)
CCI^b, mean ± SD	1 ± 1.2	0 ± 0.6
CCI categories, n (%)		
0	5830 (60.0)	8535 (88.0)
1–2	2799 (29.0)	1021 (11.0)
3–4	928 (10.0)	88 (1.0)
5+	128 (1.0)	41 (0)

^aPayer channel categories were mutually exclusive. The payer channel was summarized at the index date. Payer channel was matched on the primary payer type: commercial, Medicaid, Medicare (Medicare Advantage, dual eligible). Dual eligible has Medicare as the primary payer and Medicaid as the secondary payer. ^bQuan H, et al. *Med Care*. 2005;43(11):1130-1139. CCI, Charlson Comorbidity Index; LGS, Lennox-Gastaut syndrome; max, maximum; min, minimum; SD, standard deviation.

Comorbidities and Nonseizure Symptoms

- Cerebral palsy, autism spectrum disorder, and brain development abnormalities were more common in patients with LGS relative to control participants (Figure 1)
- NSS were more commonly reported in patients with LGS relative to control participants (Figure 2)

Figure 1. Prevalence of Select Comorbidities of Interest During the 12-Month Follow-Up Period



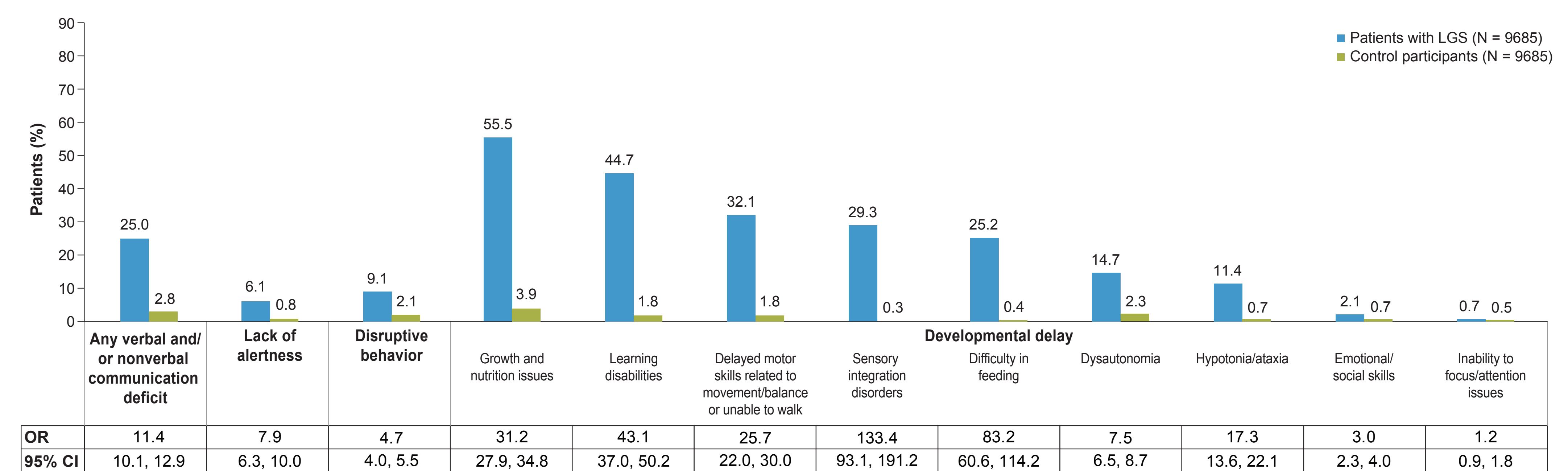
CI, confidence interval; LGS, Lennox-Gastaut syndrome; OR, odds ratio.

Conclusions

- This real-world analysis demonstrated that patients with LGS experienced increased clinical and economic burden compared with control participants, even with the use of ASMs and other treatments
 - NSS such as developmental delay, communication deficits, disruptive behavior, and lack of alertness were more commonly reported in patients with LGS relative to control participants
 - HCRU (such as home health and durable medical equipment use, outpatient hospital visits, and intensive care unit visits) was more common among patients with LGS relative to control participants
- This high burden in patients with LGS compared with control participants suggests the need for continued development of effective and safe treatments for LGS

- Most NSS reported in patients with LGS were categorized as communication deficits (25.0%), disruptive behavior (9.1%), lack of alertness (6.1%), or types of developmental delays, such as growth and nutrition issues (55.5%) and learning disabilities (44.7%)

Figure 2. Prevalence of Nonseizure Symptoms During the 12-Month Follow-Up Period



CI, confidence interval; LGS, Lennox-Gastaut syndrome; OR, odds ratio.

Healthcare Resource Utilization During the 12-Month Follow-Up Period

All-Cause Healthcare Resource Utilization

- More patients with LGS utilized healthcare resources compared with control participants during the 12-month follow-up period (Table 2)
 - The most frequent HCRU by setting of care among patients with LGS included home health and durable medical equipment use and professional office visits; mean (standard deviation, SD) numbers of visits were 56.2 (97.2) and 50.4 (68.6), respectively
 - The most frequent HCRU by setting of care among control participants included professional office visits and outpatient hospital visits; mean (SD) numbers of visits were 11.8 (22.1) and 3.3 (11.6), respectively
 - The most commonly used types of medical services for patients with LGS were developmental delay therapy and safety monitoring; mean (SD) numbers of visits were 7.0 (19.4) and 3.4 (5.0), respectively
 - The most commonly used types of medical services for control participants were safety monitoring and developmental delay therapy; mean (SD) numbers of visits were 1.0 (2.4) and 0.6 (5.8), respectively

Seizure-Related Healthcare Resource Utilization

- Control participants are not described here due to the small number of those who had seizure-related data
- Among patients with LGS, 16.6% reported a seizure-related surgery (mean [SD] number of visits: 0.4 [1.0])
- The mean (SD) number of maintenance ASMs received for patients with LGS was 29.5 (19.3) per patient per year
- The mean (SD) number of rescue ASMs received for patients with LGS was 1.9 (3.9) per patient per year

Table 2. All-Cause HCRU During the 12-Month Follow-Up Period

All-Cause HCRU During Follow-Up Period ^a	Patients With LGS (N = 9685)	Control Participants (N = 9685)	OR/Rate ratio ^b	95% CI
Medical service by care setting, n (%)				
Inpatient stays ^c	2585 (26.7)	360 (3.7)	9.4	8.4, 10.6
ICU visits	1291 (13.3)	48 (0.5)	30.9	23.1, 41.2
ER visits	4872 (50.3)	2448 (25.3)	3.0	2.8, 3.2
Outpatient hospital visits	7665 (79.1)	3517 (36.3)	6.7	6.2, 7.1
Professional office visits	9536 (98.5)	7808 (80.6)	15.4	13.0, 18.2
Home health and durable medical equipment ^d	7333 (75.7)	1270 (13.1)	20.7	19.2, 22.3
Ambulance services	2140 (22.1)	359 (3.7)	7.4	6.6, 8.3
Medical service by care setting, number of visits, mean (SD)^e				
Inpatient stays ^c	0.7 (3.2)	0.08 (0.9)	8.9	6.9, 11.4
ICU visits	0.2 (0.7)	0.01 (0.1)	35.4	25.3, 49.5
ER visits	1.4 (2.5)	0.5 (1.3)	2.8	2.6, 3.0
Outpatient hospital visits	18.3 (31.7)	3.3 (11.6)	5.5	5.1, 5.9
Professional office visits	50.4 (68.6)	11.8 (22.1)	4.3	4.1, 4.5
Home health and durable medical equipment ^d	56.2 (97.2)	1.0 (12.4)	55.1	43.1, 70.4
Ambulance services	0.8 (4.7)	0.07 (0.9)	11.5	8.8, 14.9
Medical services by type, n (%)				
Diagnostic tests ^f	4446 (45.9)	901 (9.3)	8.3	7.6, 9.0
Safety monitoring ^g	7732 (79.8)	4076 (42.1)	5.4	5.1, 5.8
Wheelchair use	2315 (23.9)	41 (0.4)	73.9	54.2, 100.8
Equipment supply	2288 (23.6)	7 (0.1)	427.6	203.5, 898.5
Developmental delay therapy	3430 (35.4)	466 (4.8)	10.8	9.8, 12.0
Medical services by type, number of visits, mean (SD)				
Diagnostic tests ^f	1.2 (2.5)	0.2 (0.7)	7.6	6.9, 8.4
Safety monitoring ^g	3.4 (5.0)	1.0 (2.4)	3.5	3.3, 3.7
Wheelchair use	1.3 (11.1)	0.01 (0.3)	94.8	58.0, 154.8
Equipment supply	1.1 (3.5)	0.001 (0.05)	823.5	364.7, 1859.4
Developmental delay therapy ^h	7.0 (19.4)	0.6 (5.8)	11.3	9.3, 13.7

All parameters were significant at $P < 0.0001$.

^aHCRU was assessed during the follow-up period (12 months post index date). ^bLogistic regression with GEE was built for binary variables; these values are reported with ORs; negative binomial models with GEE were built for count variables, which are reported with rate ratios. ^cInpatient stays included: inpatient hospitalization or admission to specialty facilities (includes skilled nursing facility, behavioral care facility, residential substance abuse treatment, and hospital). ^dHome health was defined as home-based medical services; durable medical equipment included medical/surgical supplies, equipment, and devices. ^eNumber of visits were assessed as: inpatient; number of inpatient admissions were counted by admission date; ER; number of ER visits were counted by service date; outpatient; number of visits were counted by service category, rendering NPI, and service date; home health and durable medical equipment; multiple events that occurred on the same day were counted separately. ^fDiagnostic tests included genetic testing, radiologic testing, electroencephalogram (all types), and cerebrospinal fluid testing. ^gSafety monitoring included echocardiography, lab testing, eye exams, electrocardiogram, hepatic or renal ultrasounds, urine analysis, and check of ASM levels. ^hDevelopmental delay therapy included occupational therapy, speech therapy, and physical therapy. ASM, antiseizure medication; CI, confidence interval; ER, emergency room; GEE, generalized estimation equation; HCRU, healthcare resource utilization; ICU, intensive care unit; NPI, national provider identifier; OR, odds ratio; SD, standard deviation.

Content for a healthcare professional audience only