

High Rate of Interhospital Transfers in Status Epilepticus: Challenges in the Management of Care

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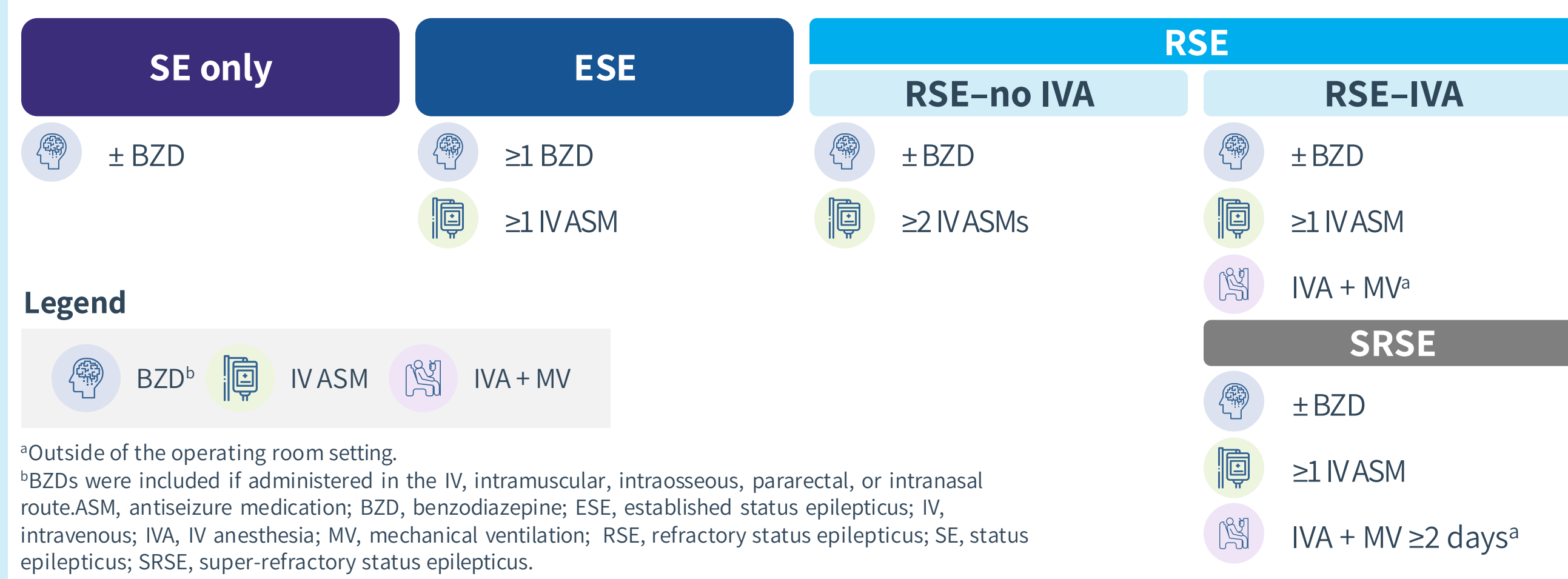
Introduction

- **Status epilepticus (SE)** is a common **neurologic emergency** that is associated with **high morbidity and mortality**.^{1,2}
- Management of **SE requires rapid and sustained seizure control** to minimize neurologic injury. Effective management additionally involves the **identification and treatment of underlying etiologies** and the **prevention or management of systemic complications**.¹
- Patients who do not respond to 1st- and 2nd-line treatments (**benzodiazepines [BZDs]** and **intravenous [IV] antiseizure medications [ASMs]**) are considered to have **refractory SE (RSE)**.³
- **Progression to RSE requires additional therapies**, such as **3rd-line IV anesthesia (IVA)**, and is **associated with worse outcomes**, including increased morbidity, mortality, and health care resource utilization.⁴
- There is **limited real-world evidence** available to guide optimal treatment selection for maximizing patient outcomes.
- We conducted a 5-year, cross-sectional analysis of health care claims data to **examine care settings and interhospital transfer characteristics in the management of SE in the United States**.

Methods

- US hospital-based, service-level, all-payer data from the PINC AI™ Healthcare Database (2018-2022) and Komodo Health Healthcare Map (2017-2022) were analyzed for **hospitalized patients with SE admitted to an emergency department or inpatient unit**.
- Patients were included if the billing for the encounter listed an **International Classification of Diseases, Tenth Revision (ICD-10) code for SE** at the admit, primary, or secondary diagnostic position over the 5-year study period.
- SE episodes were segmented according to BZD, IV ASM, and IVA exposures with mechanical ventilation (**Figure 1**).

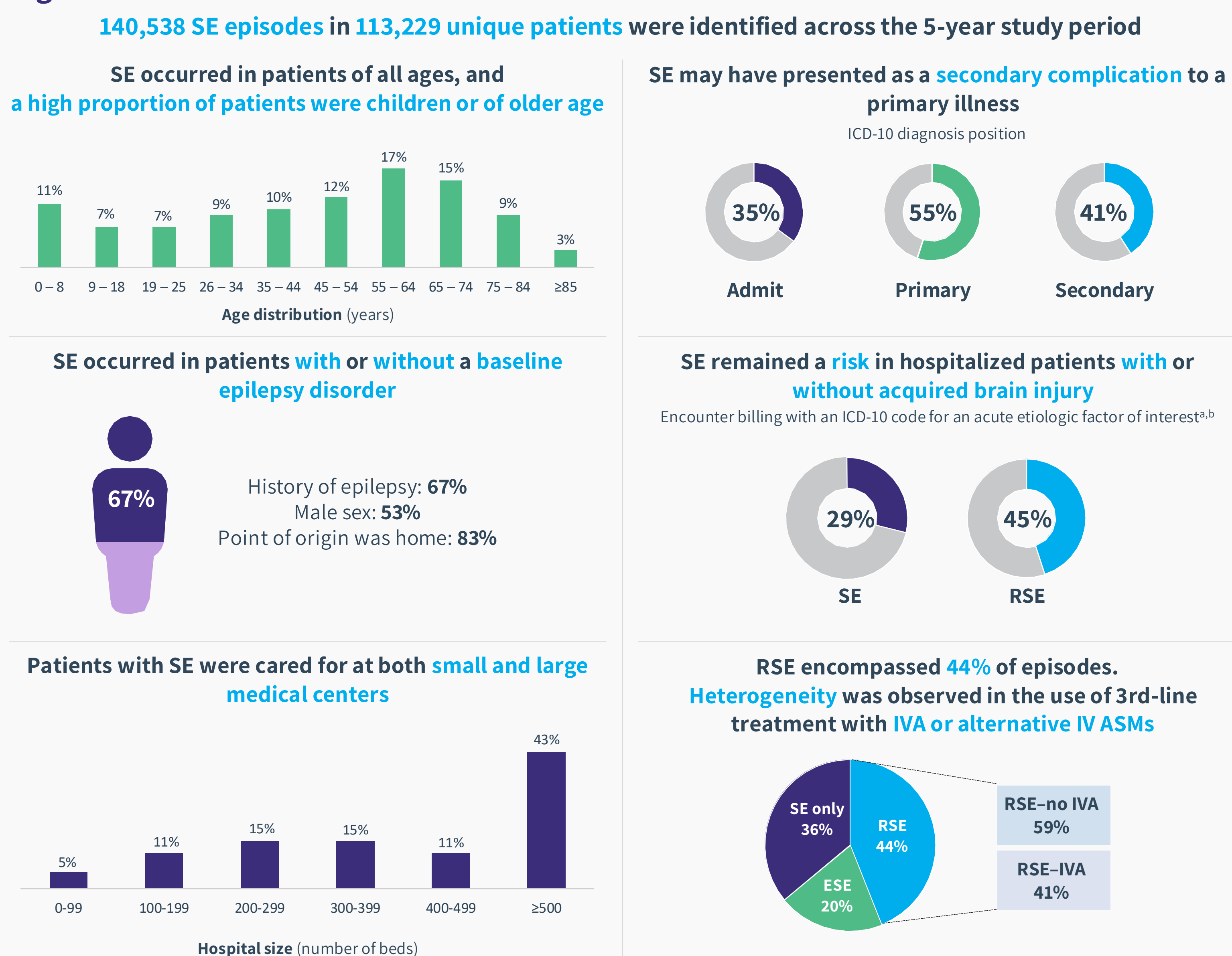
Figure 1. Categorization of SE episodes



- Metrics that required complete visibility into the patient encounter (e.g., patient demographic characteristics and clinical outcomes) were estimated using a subset of patients with SE (N=92,322) who were not transferred to another center during their care, as patients could not
- Interhospital transfer characteristics, including hospital archetypes, were extracted from the Komodo Health Healthcare Map for all SE episodes.
- Analysis of a subset of 3,566 linked claims between the Komodo Health Healthcare Map and Komodo Hospital Insights was utilized for transfer data that required visibility into treatment characteristics during SE episodes.

Results

Figure 2. Baseline characteristics and clinical outcomes



^aComorbid conditions were more common in RSE episodes. Across all SE episodes, 29% of encounter billing had an ICD-10 code for an acute etiologic factor of interest, which included hyponatremia (9%), central nervous system infection (5%), anoxic brain injury (5%), stroke (4%), alcohol withdrawal (4%), hemorrhage (1%), and traumatic brain injury (1%). ^bAcross RSE episodes, 45% of encounter billing had an ICD-10 code for an acute etiologic factor of interest, which included hyponatremia (15%), central nervous system infection (9%), anoxic brain injury (11%), stroke (7%), alcohol withdrawal (6%), hemorrhage (2%), and traumatic brain injury (2%). ASM, antiseizure medication; ESE, established status epilepticus; ICD-10, International Classification of Diseases, Tenth Revision; IV, intravenous; IVA, IV anesthesia; RSE, refractory status epilepticus; SE, status epilepticus.

Table 1. RSE was associated with worse outcomes and increased health care resource utilization across the SE continuum

	ESE	RSE
Hospital LOS, days, median (interquartile range)	3 (2, 6)	7 (4, 14)
ICU LOS, days, median (interquartile range)	2 (1, 3)	4 (2, 8)
ICU admission, %	44	78
EEG utilization, %	57	83
Discharge disposition, %		
• Home	72	47
• SNF/ICF	10	18
• LTC/rehab	3	8
• Hospice	3	7
• In-hospital mortality	6	17
• Other ^a	7	4

^aOther discharge locations and causes include court/law enforcement, swing bed, nursing facility, left against medical advice, expired in medical facility (for hospice), still a patient—expected to return, or information not available. EEG, electroencephalogram; ESE, established status epilepticus; ICF, intermediate care facility; ICU, intensive care unit; LOS, length of stay; LTC, long-term care; RSE, refractory status epilepticus; SNF, skilled nursing facility.

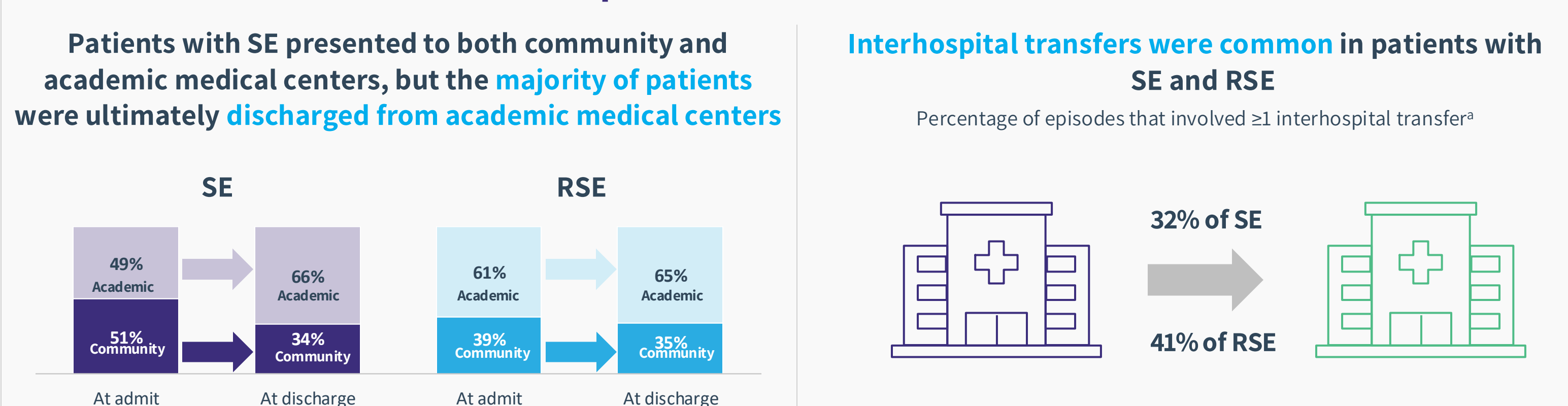
Limitations

- SE-related diagnoses and comorbid conditions were reliant on ICD-10 coding by providers, and we were unable to differentiate between SE subtypes or offer definitive assessment of etiologic factors.
- SE refractoriness was determined by exposure to IV ASMs and IVA using previously established methods; however, we were unable to confirm the clinical context for which medications were started during SE episodes.
- The indication for interhospital transfer was not able to be captured within this claims analysis and warrants further examination.
- Only a small subset of SE episodes with interhospital transfers had available linked data between the Komodo Health Healthcare Map and Komodo Hospital Insights tools.

Conclusions

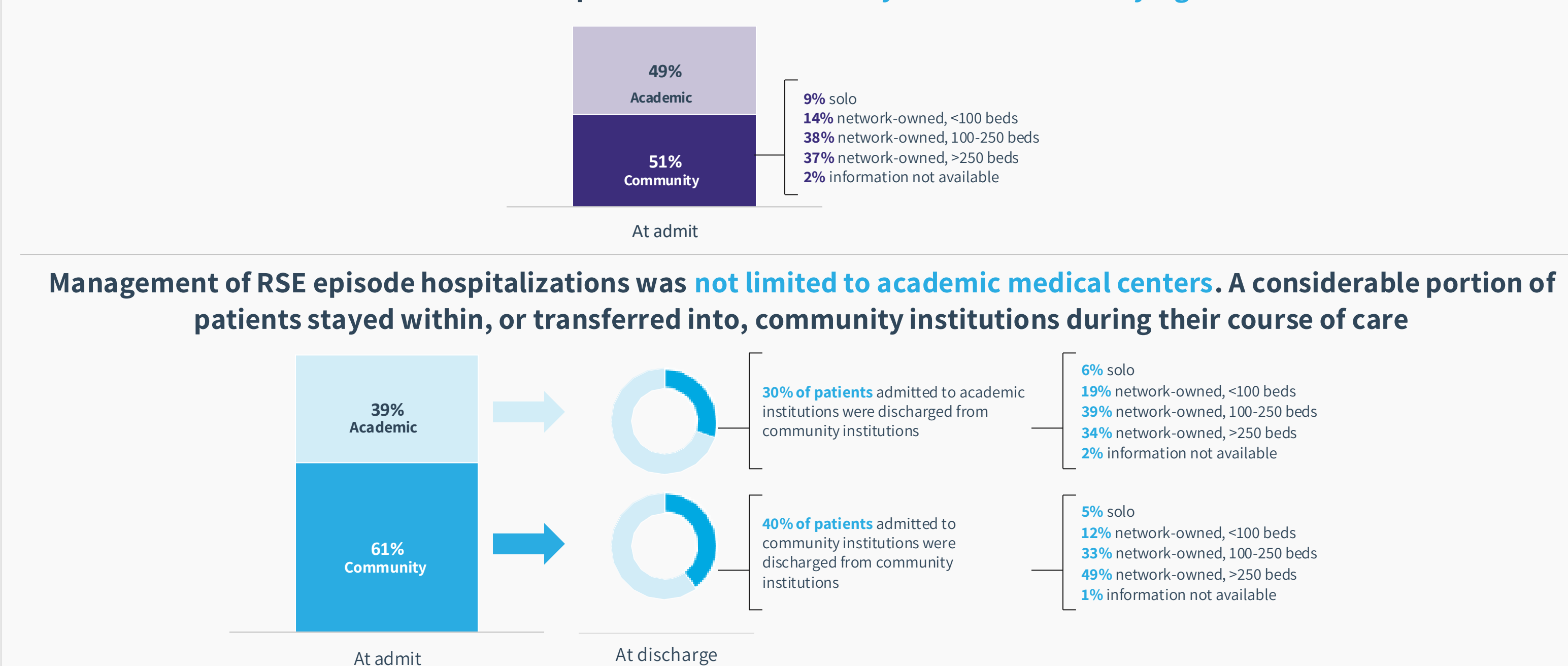
- A high proportion of SE episodes involved **≥1 interhospital transfer**.
- SE episodes were managed in both community and academic medical centers of varying sizes.
- Increased treatment intensity and a diagnosis of RSE were associated with an increased need for interhospital transfers, higher health care resource utilization, and worse outcomes.
- These data highlight the ongoing need for coordinated efforts to provide optimal care for patients with SE and RSE.

Figure 3. Patients with SE had complex care pathways that commonly required coordinated efforts and interhospital transfers



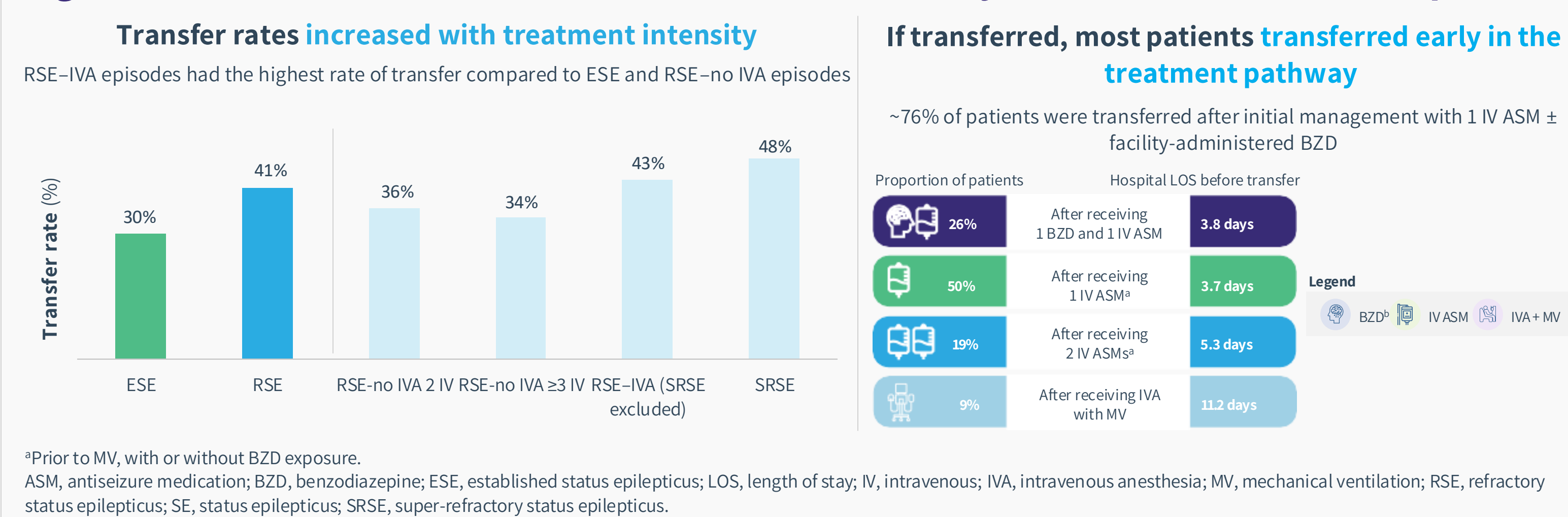
^a203,176 episodes of SE in 146,408 unique patients were analyzed in the Komodo Health Healthcare Map claims; 65,545 (32%) episodes required ≥1 transfer. 140,538 episodes of SE in 113,229 unique patients were analyzed within the PINC AI™ Healthcare Database; 48,483 (34%) episodes involved ≥1 interhospital transfer. RSE, refractory status epilepticus; SE, status epilepticus.

Figure 4. Management of SE and RSE occurred at both academic and community institutions^a



^aData shown for patients with ≥1 transfer. RSE, refractory status epilepticus; SE, status epilepticus.

Figure 5. Transfer rates varied with treatment intensity and over the treatment period



^aPrior to MV, with or without BZD exposure. ASM, antiseizure medication; BZD, benzodiazepine; ESE, established status epilepticus; LOS, length of stay; IV, intravenous; IVA, intravenous anesthesia; MV, mechanical ventilation; RSE, refractory status epilepticus; SE, status epilepticus; SRSE, super-refractory status epilepticus.

- Most transfers for SE episodes occurred early in the treatment pathway (**Figure 5**).
- Less than one-third of transferred patients had an electroencephalogram (EEG) prior to transfer, indicating that EEG capabilities might be correlated with a transfer decision.

References

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Disclosures

MB, HV, and ER are employees of Marinus Pharmaceuticals, Inc. and hold shares in the company. SS is an employee of Trinity Life Sciences.

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