



Trends, Predictors, and Inpatient Burden of Neuropsychiatric Complications Following CAR-T Therapy: A National Inpatient Sample Analysis, 2017–2023

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Background

- CAR-T therapy has transformed the treatment of relapsed and refractory hematologic malignancies.
- The treatment is frequently complicated by immune effector cell–associated neurotoxicity syndrome (ICANS).
- Contemporary national trends and the real-world inpatient burden of these neuropsychiatric complications remain incompletely characterized.

Methods

- **Data Source:** National Inpatient Sample (NIS), 2017–2023.
- **Study Population:** Adult CAR-T hospitalizations, identified via ICD-10-PCS procedure codes.
- **Variables of Interest:** Neuropsychiatric complications identified using ICD-10-CM codes for:
 1. Toxic encephalopathy (G92)
 2. Delirium (F05)
 3. Acute psychotic disorders (F23, F29)
- **Statistical Analysis:**
 1. Survey-weighted analysis to estimate national incidence and temporal trends.
 2. Multivariable logistic and linear regression modeling.
- **Measured Endpoints:** Predictors of neurotoxicity, in-hospital mortality, length of stay (LOS), and total hospital charges.

Results

- **National Cohort:** The analysis evaluated 3,491 CAR-T hospitalizations, representing a weighted national estimate of approximately 17,455 admissions.
- **Overall Incidence:** Neuropsychiatric complications are common, occurring in **21.8%** of all evaluated cases.
- **Increasing Prevalence:** The rate of these complications quadrupled over a seven-year span, climbing steeply from 7.1% in 2017 to 30.0% in 2023 ($p<0.001$).
- **Age as a Key Risk Factor:** Patients who developed neurotoxicity were significantly older on average (mean age 61.7 vs. 56.8 years, $p<0.001$), with each additional year of age independently predicting the onset of these complications (adjusted OR 1.02 per year, $p<0.001$).

	In-Hospital Mortality	Length of Stay (LOS)
With Neurotoxicity	5.5%	21.6 days
Without Neurotoxicity	2.1%	16.1 days
Multivariable Adjusted Impact	aOR 3.71% (95% CI 2.25-6.13)	+ 7.37 days

Total Hospital Charges

	Total Hospital Charges
With Neurotoxicity	\$1.64 million
Without Neurotoxicity	\$1.23 million
Multivariable Adjusted Impact	+ \$292,456

Conclusions

- **Clinical Impact:** Neuropsychiatric complications are independently associated with higher in-hospital mortality and substantial healthcare resource utilization. They have increased substantially over time.
- **Key Risk Factor:** Older age serves as a consistent, independent predictor for developing neurotoxicity.
- **Future Directions:** There is a critical need for improved risk stratification, enhanced monitoring, and proactive management strategies as CAR-T utilization continues to expand.