Introduction

- Neurocritical care encompasses high illness severity and a wide range of comorbidities.
- Pediatric Intensive Care Unit (PICU) patients with primary neurologic diagnoses often experience gaps in follow-up care.
- Rates of unplanned hospital readmission and development of new-onset epilepsy in these patients are poorly described.

Objective

To characterize the frequency of hospital readmission and development of epilepsy during the year after hospitalization for a primary neurologic critical illness.

Hypotheses

Aim 1. Seizures during the index hospitalization are associated with readmission.
Aim 2. Patients admitted for traumatic brain injury are more likely to develop post-ICU epilepsy compared to other neurocritical care diagnoses.

Materials and Methods

Tertiary care children’s hospital (1/2013-12/2016)

Aim 1 (Readmission cohort): Inclusion: PICU patients mechanically ventilated for ≥ 3 days, primary neurologic diagnosis, post-discharge insurance data. Exclusion: tracheostomy prior to hospitalization, hospitalization non-survivors.

Aim 2 (Post-ICU epilepsy cohort): Aim 1 cohort with additional exclusions: prior diagnosis of epilepsy, < 9 months insurance data. Univariate and multivariable time-to-event analyses using patient, admission, and hospitalization characteristics to evaluate for risks of readmission (Aim 1) and post-ICU epilepsy defined as maintenance anti-epileptic prescription filled months 6-12 after discharge (Aim 2).

Results

Aim 1. Unplanned Readmission

Figure 1. 26 (26%) Patients Had Unplanned Readmissions within 1 Year of PICU Discharge

Time to Readmission: Median 2.5 months [IQR 0.5-4.4] Post-discharge mortality: 4 (4%)

Aim 2. Post-ICU Epilepsy

Almost 1/3 of Patients Develop Post-ICU Epilepsy: Post-ICU Epilepsy Highly Associated with Seizures During Index Hospitalization

Seizures While Admitted No Seizures While Admitted Total Cohort

-9 patients who did not have seizures during the index hospitalization developed epilepsy after discharge.

These nine patients are characterized by:
- Structural or hypoxic brain injuries without pre-existing chronic conditions;
- Older population (median age 143mos [12y] [IQR 63-162]);
- High illness severity (median PRISM III 11 [IQR 5-21]);
- Long durations of mechanical ventilation (median 9 days [IQR 7-12]);
- Long hospital lengths of stay (median 71 days [IQR 44-131]).

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Summary

- Unplanned readmissions were common and half occurred by 2.5 months after discharge.
- Patients admitted for seizures are at high risk of hospital readmission.
- 29% of patients without pre-existing seizures developed post-ICU epilepsy.
- A small but important proportion of patients develop post-ICU epilepsy despite a lack of seizures during their index hospitalization.

Limitations

- Cohort does not include less severely ill neurocritical care patients who required ≤ 3 days of mechanical ventilation.
- Patients without eligible insurance were excluded.
- Insurance claims for filled medication prescriptions were used to identify epilepsy.

Conclusions

- Unplanned, post-discharge health resource use was common.
- Unplanned readmissions were most common in patients with complex medical histories and patients with a primary seizure diagnosis.
- Only one severity indicator was predictive.
- Anticipatory guidance on post-ICU epilepsy should be considered in severely ill patients, even without seizures while inpatient.

Future Directions

- Within a larger cohort, characterize phenotypes of patients at risk for developing epilepsy.
- Confirm these findings in an ongoing prospective cohort study.
- Examine outcomes of patients who receive post-neurocritical care follow-up.