Incidence of Withdrawal of Life Sustaining Measures in Patients Readmitted to the Intensive Care Unit

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Introduction

- Traumatic brain injury (TBI) constitutes a major cause of death and disability in the Unites States.
- The Glasgow Coma Scale (GCS) is the most widely used method to classify the severity of TBIs indicating mild (13-15), moderate (9-12), or severe (<9) injuries.
- Failure to rescue these patients can cause unwanted complications, such as unplanned intensive care unit (ICU) readmission or death.
- Patients with TBI may require life sustaining measures in which management warrants a balance of ethical, familial, and legal considerations.

Objective: **This study aimed to analyze the characteristics of TBI patients with unplanned readmission to the ICU and to determine the incidence of withdrawal of life sustaining measures (WLSM).**

Methods

A retrospective chart review was performed from 2016-2023 at a Level 1 Trauma Center in New Orleans. Adult TBI patients with unplanned readmission to the ICU were included. Patients were stratified based on mild, moderate, or severe TBI classifications at hospital admission. The primary outcomes were incidence of WLSM and mortality. Secondary outcomes included ICU length of stay (LOS), hospital LOS, and number of ICU admissions.

Results

Table 1. Baseline Demographics

	Mild TBI	Moderate TBI	Severe TBI	P value
	n=44	n=7	n=23	
Demographics				
Male Sex, n (%)	34 (77.3)	7 (100.0)	21 (91.3)	**0.0006**
Age, avg (SD)	59.07 (17.43)	54.00 (15.73)	41.83 (14.67)	0.4569
African American, n (%)	12 (27.3)	3 (42.9)	10 (43.5)	0.639
BMI, avg (SD)	25.22 (5.00)	24.48 (5.31)	25.43 (4.66)	0.906

Table 2. Injury Characteristics of TBI

Injury Characteristics	Mild TBI	Moderate TBI	Severe TBI	P value
LOC, n (%)	19 (43.2)	4 (57.1)	16 (69.6)	0.1177
ISS, avg (%)	18.66 (8.91)	19.00 (15.26)	25.08 (10.79)	0.0507
New ISS, avg (%)	26.14 (11.34)	27.86 (15.28)	35.43 (15.22)	**0.0249**
GCS, avg (%)	14.12 (0.88)	11.00 (1.63)	5.74 (2.05)	**<0.0001**
Blunt MOI, n (%)	43 (97.7)	7 (100.0)	18 (78.3)	**0.0153**
Subarachnoid Hemorrhage, n (%)	36 (81.8)	6 (85.7)	23 (100.0)	0.0951
Epidural Hematoma, n (%)	9 (20.5)	3 (42.9)	0 (0.0)	**0.013**
Subdural Hematoma, n (%)	26 (59.1)	6 (85.7)	18 (78.3)	0.1576
Brain Herniation, n (%)	9 (20.5)	2 (28.6)	9 (39.1)	0.2618
Midline Shift, n (%)	20 (45.5)	3 (42.9)	16 (69.6)	0.1478

Table 3. Hospital Risk Factors

Risk Factors	Mild TBI	Moderate TBI	Severe TBI	P value
Tube Feeds, n (%)	25 (56.8)	6 (85.7)	21 (91.3)	**0.0087**
Acute Kidney Injury, n (%)	15 (34.1)	2 (28.6)	13 (56.5)	0.1643
≥20mmHg ICP, n (%)	3 (6.82)	2 (28.6)	8 (34.8)	**0.0123**
Sepsis, n (%)	12 (27.273)	1 (14.3)	6 (26.087)	0.7646
Ventilator Assisted Pneumonia, n (%)	5 (11.364)	0 (0.0)	8 (34.783)	**0.0251**
Stroke/CVA, n (%)	11 (0.25)	1 (14.3)	3 (13.043)	0.4706
Seizure ICU, n (%)	12 (27.273)	4 (57.1)	8 (34.783)	0.2804
Rebleed Head, n (%)	14 (31.818)	0 (0.0)	7 (30.435)	**0.011**
ARDS, n (%)	3 (6.818)	3 (42.9)	1 (4.348)	**0.0062**
Pulmonary Embolism, n (%)	3 (6.818)	1 (14.3)	1 (4.348)	0.6564
Hyponatremia, n (%)	19 (43.182)	2 (28.6)	9 (39.130)	0.7549
Rhabdomyolysis, n (%)	1 (2.273)	0 (0.0)	2 (8.696)	0.3812
Fall Risk, n (%)	36 (81.818)	4 (57.1)	18 (78.261)	0.3379
Dysphagia, n (%)	25 (56.818)	7 (100.0)	14 (60.87)	0.0902
Neurosurgical Intervention, n (%)	14 (31.818)	4 (57.1)	12 (52.174)	0.1755
Extracranial Surgery, n (%)	22 (0.50)	5 (71.4)	18 (78.261)	0.0663
Mechanical Ventilation, n (%)	25 (56.818)	3 (42.9)	16 (69.565)	0.3863

Table 4. Patient Outcomes

Outcomes	Mild TBI	Moderate TBI	Severe TBI	P value
WLSM, n (%)	8 (18.182)	1 (14.3)	3 (13.043)	0.8544
Mortality, n (%)	11 (25)	0 (0.0)	4 (17.391)	0.2856
ICU Admissions, avg (SD)	2.27 (0.66)	2 (0.0)	2.3 (0.70)	0.5358
ICU LoS, avg (SD)	13.77 (12.8)	15 (10.3)	21.2 (10.2)	0.0573
Hospital LoS, (SD)	26.75 (17.68)	37.9 (31.1)	58.17 (64.66)	**0.0115**
Hours between Hospital Admission and WLSM, avg (SD)	778.82 (741.19)	2366.5 (0)	775.67 (414.92)	0.1416

Summary

Seventy-four patients were included in this study. All groups were similar in terms of age, race, and body mass index (p>0.05). The groups differed in injury characteristics such as New Injury Severity Score (p=0.025), GCS (p<0.0001), blunt mechanism of injury (p=0.015), and incidence of epidural hematoma (p=0.013). The incidence of tube feeds (p=0.009), ≥20mmHg increase of intracranial pressure (p=0.012), head rebleeds (p=0.011), ventilator assisted pneumonia (p=0.025), and acute respiratory distress syndrome (p=0.006) differed between the groups. The groups were similar regarding the incidence of WLSM, mortality, ICU length of stay, and quantity of ICU admissions (p>0.05), while differing in hospital length of stay (p=0.012).

Conclusions

Unplanned readmissions are associated with a significant proportion of mortality and increased hospital LOS. Patients with unplanned readmissions to the ICU had a similar incidence of WLSM and mortality, regardless of TBI severity. This suggests that WLSM may be associated with increased ICU admissions, which may be preventable. Further comparison of single ICU admissions is warranted.