

## The effects of age following traumatic brain injury: characteristics at presentation, and risk factors for unfavorable outcome

John K. Yue BA; Sourabh Sharma; Ethan A. Winkler MD PhD; Young Min Lee MD, BSPH; John Frederick Burke MD, PhD; Pavan S Upadhyayula BA; Adam Ferguson PhD; Mary J Vassar RN, MS; Jason Talbott MD, PhD; Laura Benjamin Ngwenya MD, PhD; Phiroz E. Tarapore MD; Esther Yuh; Pratik Mukherjee MD, PhD; Wayne A Gordon PhD; Alex B. Valadka MD;

### Introduction

Age-related differences may complicate the road to recovery following traumatic brain injury (TBI), leading to disparate recovery profiles across subpopulations.

### Methods

We utilize the Transforming Research and Clinical Knowledge in TBI (TRACK-TBI) Pilot study to characterize young-adults (18-40), middle-aged (41-64) and elderly (65-years) following acute TBI. Multivariable multinomial regression was performed for patients completing 3-month Glasgow Outcome Scale Extended (GOSE), a measure of global functional outcome, to determine predictors of severe disability/death (GOSE 1-4), moderate disability (5-6) and good recovery (7-8). Odds ratios (OR) and 95% confidence intervals are reported.

### Results

In 422 patients, (young-adult=46.0%, middle-aged=38.6%, elderly=15.4%), falls predominated middle-aged and elderly injuries (50.3%/69.2%-vs.-36.6%;  $p<0.001$ ). The elderly showed decreased propensity for loss of consciousness (LOC; 36.9%-vs.-54.0%/56.7%;  $p=0.003$ ) and post-traumatic amnesia (PTA; 30.7%-vs.-55.7%/41.1%;  $p=0.008$ ), and lower incidence of prior TBI (23.1%-vs.-46.4%/54.6%;  $p<0.001$ ). Age associated with intracranial CT pathology (38.1%, 45.4%, 61.5%,  $p<0.001$ ). Elderly patients were more likely to admit to ICU (47.7%-vs.-38.1%/32.5%;  $p<0.001$ ) and less likely to be discharged home (16.9%-vs.-35.1%/25.2%;  $p=0.001$ ).

On multivariable regression, middle-age (OR=4.86 [2.52-9.37]), intracranial pathology (OR=2.51 [1.19-5.29]), and psychiatric history (OR=2.27 [1.27-4.12]) predicted moderate disability over good recovery. Middle-age (OR=5.04 [1.61-15.73]) and elderly (OR=5.38 [1.10,26.27]), moderate/severe TBI (OR=13.38 [3.77-47.48]), polytrauma (OR=4.07 [1.49-11.16]) and history of endocrine (OR=5.84 [2.09-16.31]) or ear/nose/throat (OR=3.89 [1.25-12.09]) illnesses predicted severe disability/death over good recovery.

### Conclusions

Elderly patients demonstrate lower rates of prior TBI, LOC and PTA, and higher rates of CT pathology and ICU admissions following TBI. At 3-months postinjury, middle-aged and elderly patients experience elevated risk for severe disability and/or death compared to young-adults.

### Learning Objectives

1) Describe the impact of age on clinical and injury history following traumatic brain injury. 2) Discuss the differential recovery profiles of young adults, the middle-aged, and elderly patients following traumatic brain injury. 3) Identify age-specific considerations for risk stratification and prognosis following traumatic brain injury.