

Temporal Delays along the Neurosurgical Care Continuum for Traumatic Brain Injury Patients in Mulago Hospital in Kampala Uganda

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Abstract : Background: While delays to care exist in resource rich settings, greater delays are seen along the care continuum in low- and middle-income countries (LMICs) largely due to limited healthcare capacity to address the disproportional rates of traumatic brain injury (TBI) in Sub Saharan Africa (SSA). While many LMICs have government subsidized systems to offset surgical costs, the burden of securing funds by the patients for medications, supplies, and CT diagnostics poses a significant challenge to timely surgical interventions. In Kampala Uganda, the challenge of obtaining timely CT scans is twofold. First, due to a lack of a functional CT scanner at the tertiary hospital, patients need to arrange their own transportation to the nearby private facility for CT scans. Second, self-financing for the private CT scans ranges from \$80 - \$130, which is near the average monthly income in Kampala. These bottlenecks contribute significantly to the care continuum delays and are associated with poor TBI outcomes. Objective: The objectives of this study are to 1) describe the temporal delays through a modified three delays model that fits the context of neurosurgical interventions for TBI patients in Kampala and 2) investigate the association between delays and mortality. Methods: Prospective data were collected for 563 TBI patients presenting to a tertiary hospital in Kampala from 1 June - 30 November 2016. Four time intervals were constructed along five time points: injury, hospital arrival, neurosurgical evaluation, CT results, and definitive surgery. Time interval differences among mild, moderate and severe TBI and their association with mortality were analyzed. Results: The mortality rate of all TBI patients presenting to MNRH was 9.6%, which ranged from 4.7% for mild and moderate TBI patients receiving surgery to 81.8% for severe TBI patients who failed to receive surgery. The duration from injury to surgery varied considerably across TBI severity with the largest gap seen between mild TBI (174 hours) and severe TBI (69 hours) patients. Further analysis revealed care continuum differences for interval 3 (neurosurgical evaluation to CT result) and 4 (CT result to surgery) between severe TBI patients (7 hours for interval 3 and 24 hours for interval 4) and mild TBI patients (19 hours for interval 3, and 96 hours for interval 4). These post-arrival delays were associated with mortality for mild ($p=0.05$) and moderate TBI ($p=0.03$) patients. Conclusions: To our knowledge, this is the first analysis using a modified 'three delays' framework to analyze the care continuum of TBI patients in Uganda from injury to surgery. We found significant associations between delays and mortality for mild and moderate TBI patients. As it currently stands, poorer outcomes were observed for these mild and moderate TBI patients who were managed non-operatively or failed to receive surgery while surgical services were shunted to more severely ill patients. While well intentioned, high mortality rates were still observed for the severe TBI patients managed surgically. These results suggest the need for future research to optimize triage practices, understand delay contributors, and improve pre-hospital logistical referral systems.

Keywords : care continuum, global neurosurgery, Kampala Uganda, LMIC, Mulago, prospective registry, traumatic brain injury

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