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Outcomes of a Modification of the Brain Injury Guidelines (BIG) on Resource Utilization and its Impact on Outcomes

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Background:
Brain injury guidelines (BIG) were developed to classify traumatic brain injury (TBI) patients and identify those that did not require ICU admission. Our aim was to implement our modified BIG (mBIG) in hopes of decreasing use of ICU beds for small TBI hemorrhages without compromising outcomes.

Methods:
Our mBIG protocol was implemented in January 2021 at Detroit Receiving Hospital with patients classified per the Table. Concurrent and retrospective data collected included demographics, ICU admission, outcomes, head CT scans and need for neurosurgical intervention. One-way ANOVA and chi-squared analysis were used with a p-value of ≤ 0.05 being significant.

Results:
125 patients met inclusion criteria including 16 mBIG1, 18 mBIG2, and 91 mBIG3. mBIG3 category had lower GCS (11.0 ± 4.5; $p<0.001$), higher ISS (19.4 ± 9.2; $p<0.001$), longer ICU LOS (7.7 ± 13.5 days; $p=0.011$) and more head CT scans(3.4 ± 1.9; $p=0.004$). Overall, 67% were admitted to ICU, 7.2% to stepdown, and 25.6% to the acute care floor. Adherence to the guidelines for ICU admission was 71% with 15 mBIG1 and mBIG2 patients inappropriately admitted to the ICU and 14 mBIG3 patients admitted to acute care. Adverse outcomes were only in mBIG3 group admitted to the ICU (19 patients with neurological changes, 6 patients underwent operative intervention based on a second CT scan and 12 patients died).

Conclusions:
Our mBIG criteria accurately identified patients WITHOUT severe TBI as well as those at high risk for progression requiring neurosurgical intervention. Adherence to guidelines will decrease resource utilization without causing harm.

DRH Modified BIG Guidelines			
Variables	**mBIG1**	**mBIG2**	**mBIG3**
GCS	14-15	13	12 or less
Focal Neurologic Exam	Normal	Normal	Abnormal
Pupillary Exam	Normal	Normal	Abnormal
Antiplatelets/Anticoagulants	No	No	Yes
Thrombocytopenia/ESLD	No	No	Yes
Intoxication	No	No/Yes	No/Yes
SDH	< 4mm	4-7mm	≥ 8mm
EDH	No	No	Any
IPH	<4mm, 1 location	4-7mm, 2 locations	≥ 8mm, multiple locations
SAH	≤ 3 sulci and <1mm	1 hemisphere, >3 sulci, 1-3mm	Bi-hemispheric or >3mm
IVH	No	No	Yes
Skull Fracture	No	Non-displaced	Displaced
Midline Shift	No	No	Yes
Therapeutic Plan			
Hospitalization	Observation/Acute Care	Acute Care	ICU
Repeat Head CT at 6 hours	No	No	Yes
Anti-epileptic Drug Prophy	No	No	Yes

Therapeutic Plan			
	Hospitalization	**Repeat head CT 6 hrs**	**Anti-epileptic drug prophylaxis**
mBIG1	Observation/Acute Care	No	No
mBIG2	Acute care	No	No
mBIG3	ICU	Yes	Yes

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