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The increase in number of traumatic brain injury (TBI) has been astounding in recent times mostly attributed to road traffic accidents.[1,2] According to the global burden of disease study 2013, deaths from injury worldwide increased by 10·7% from 4.3 million deaths in 1990 to 4.8 million in 2013.[3] Ultimately, it increases the socioeconomic burden in a nation.[1,2] To improve the outcome from TBI in 2007 brain trauma foundation[4] had formulated guidelines, but in true sense, the implementation and adherence to the guidelines is always a key to improved outcome following TBI. No study till date has assessed the rates of adherence and the impact of adherence on outcome following TBI. The authors conducted this bi-institutional Indo-US collaborative project to investigate Intensive Care Unit (ICU) TBI guideline adherence rates and to analyse the relationship between ICU guideline adherence and in-patient mortality outcomes, and long-term outcomes as well in severe adult TBI at tertiary level institutions in India (Jai Prakash Narayan Apex Trauma Center [JPNATC], New Delhi, India), and the United States (Harborview Medical Center [HMC], Seattle, WA, USA). The authors hypothesise stern ICU guideline adherence would be associated with lower in-patient mortality after severe TBI. The study design used was a retrospective analysis from 2009 to 2011 at HMC, whereas it was a prospective analysis from 2012 to 2014 at JPNATC. They included participants older than 18 years with a diagnosis of severe TBI characterised by an abbreviated injury severity of >3, post-resuscitation Glasgow Coma Scale <8, alive with tracheal tube >48 h since admission, history of trauma and abnormal computed tomography of head. Authors excluded patients who died within 48 h of admission as per their belief that a minimum of 48 h of window is the necessary period for the patients to be acquainted with adherence to guidelines so as to investigate its associated outcome. Seventeen ICU clinical indicators were created to represent measures of adherence, and the adherence rate were calculated for each patient by simply adding up the number of indicators to which care was adherent divided by the sum of number of applicable indicators for that patient. The mean adherence rates for patients were calculated for first 72 h. Patient outcome was in-hospital mortality and also the post-discharge Glasgow Outcome Scale (GOS) at 3, 6 and 12 months. The authors declared that this study was not a comparison of the data between the two sites rather a representation of the practices followed in the two sites.

The study showed the overall ICU adherence rate was 74.9% (standard deviation [SD] 11.0) at JPNATC. According to the study results, the following indicators had adherence rates >90%: Achieving target temperature, not using prophylactic barbiturates, timely start of nutritional support and avoidance of intravenous steroids. Intracranial pressure (ICP) monitors were placed in 63% of patients, 52% of patients with intracranial hypertension received some sort of ICP reduction strategy and among patients with ICP monitoring, 94% of patients had all cerebral perfusion pressures 50–70 mmHg. Ninety-nine percent of patients received prophylactic antiepileptic medications. At HMC, the overall ICU adherence rate was 71.6% (SD 10.4) and the following indicators had adherence rates >90%: Achieving target temperature, not using prophylactic barbiturates, timely start of nutritional support and avoidance of intravenous steroids. ICP monitors were placed in 84% of patients and 98% of patients with intracranial hypertension received some form of ICP reduction treatment. Among patients with ICP monitoring, 63% of patients had all cerebral perfusion pressures 50–70 mmHg. Forty-two percent of patients received prophylactic antiepileptic medications. At JPNATC, a rise in adherence rate by 1% was associated with 3% lower in-patient mortality whereas an adherence rate <65% was associated with nearly twice higher in-patient mortality. However, at HMC, there was no significant association between adherence rate and in-patient mortality. In the post-discharge period the mortality and functional status were assessed at both the centres. At JPNATC, the number of deaths increased from 24% at discharge to 29% at 3 months, to 34% at 6 months and to 36% at 12 months. In HMC, there was only one new known death among post-discharge patients. While investigating the functional status in both centres, it was found out that, at discharge 8% of JPNATC and 21% of HMC patients returned to baseline functional status. Hence to summarise, the main findings in this Indo-US joint study early ICU guideline adherence was associated with lower in-patient mortality, >65% adherence resulted in reduction in the in-patient mortality by 2 times and even though 60% of patients shown improved functional status from discharge to 12 months post-discharge deaths and deterioration of GOS occurred at home. In this study, authors found out that adherence to the guidelines

improve discharge outcomes at JPNATC but did not find any correlation at HMC. The authors described this discrepancy in the two sites citing the more precise and real time data collection at JPNATC, a Hawthorne effect at JPNATC, the very inclusion of patients itself is different at these two sites (only TBI at JPNATC, whereas polytrauma patients at HMC). The Guideline adherence may be important, but the importance of it is much more in low and middle income countries like India. A recent study in ICP monitoring in severe TBI raised questions regarding the generalisability of findings of US to Latin American countries.[5] The concept of early rehabilitation post-discharge is important. In this particular study at JPNATC, there was not strong emphasis on rehabilitation whether in-patient or any skilled nursing facility. Gupta and Taly[6] reported improvements in disability rating sale among 44 Indian patients with severe TBI who initiated rehabilitation services 3 months post-TBI for 1 month. Furthermore, Agrawal and Joshi[7] recently reported continued improvement to 6 months post-TBI among 58 TBI patients who were followed to 12 months, and Sinha *et al*.[8] reported 58–61% good cognitive, functional and psychosocial outcomes in 77 severe TBI patients. In this study, TBI patients followed to 12 months in India, and it was shown a greater increase in good outcomes observed between 6 and 12 months in the absence of rehabilitation care. Differences are noted from other studies which may be explained by early ICU guideline adherence and post-discharge TBI care. In India, which has almost no rehabilitation facilities, whereas there is an overall improvement in post-discharge TBI outcomes, many patients deteriorate at home during the follow-up. These findings suggest while most patients improve despite the lack of organised rehabilitation services, outcomes may be further improved with systematic rehabilitation. Therefore, the authors suggested resource allocation for early rehabilitation for post-TBI patients is important.

The authors were not able to draw substantial conclusion regarding the prehospital TBI care because at JPNATC adherence to prehospital guidelines are practically non-existent but adherence to ICU guidelines was realistic and impacted the overall outcome. There are some limitations to this study as the authors operationalised some clinical indicators based on feasibility of data collection. The difference of the two centres in prehospital management. The difference in study design between the centres as the prospective study design adopted at JPNATC could have affected the adherence rates as the staffs were aware of the situation. The authors had the robust data from ICU only, because data collection from prehospital setup, the emergency department, or the operation theatres were not as complete as needed for analysis. Finally, they cannot conclude which protective indicator is more effective than another nor can we generalise these findings to other levels of trauma care.

In summary, in this largest prospective study of severe TBI with 12 month outcome follow-up in India, the authors showed that achieving early ICU guideline adherence above 65% adherence rate is attainable and improves discharge survival. They also outlined that despite attaining survival with ICU guideline adherence, and while long-term outcomes generally improved, patients discharged with favourable GOS often worsened at home. This warrants the need for post-discharge rehabilitation services.

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Conflicts of interest

There are no conflicts of interest.

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