Clinical practice guidelines in severe traumatic brain injury in Taiwan

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Abbreviations: ABC, airway, breath, and circulation; AGREE, Appraisal of Guidelines Research and Evaluation; CBF, cerebral blood flow; CPP, cerebral perfusion pressure; CSF, cerebrospinal fluid; CT, computed tomography; ER, emergency room; GCS, Glasgow Coma Scale; ICP, intracranial pressure; MAP, mean arterial pressure; MRI, magnetic resonance imaging; NTD, new Taiwan dollars; RCT, randomized control trial; SIGN, Scottish Intercollegiate Guidelines Network; TBI, traumatic brain injury.

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Abstract

**Background:** Severe TBIs are major causes of disability and death in accidents. The Brain Trauma Foundation supported the first edition of the *Guidelines for the Management of Severe Traumatic Brain Injury* in 1995 and revised it in 2000. The recommendations in these guidelines are well accepted in the world.

There are still some different views on trauma mechanisms, pathogenesis, and managements in different areas. Individualized guidelines for different countries would be necessary, and Taiwan is no exception.

**Methods:** In November 2005, we organized the severe TBI guidelines committee and selected 9 topics, including ER treatment, ICP monitoring, CPP, fluid therapy, use of sedatives, nutrition, intracranial hypertension, seizure prophylaxis, and second-tier therapy. We have since searched key questions in these topics on Medline. References are classified into 8 levels of evidence: 1++, 1+, 1−, 2++, 2+, 2−, 3, and 4 based on the criteria of the SIGN.

**Results:** Recommendations are formed and graded as A, B, C, and D. Grade A means that at least one piece of evidence is rated as 1++, whereas grade B means inclusion of studies rated as 2++. Grade C means inclusion of references rated as 2+, and grade D means levels of evidence rated as 3 or 4.

Overall, 42 recommendations are formed. Three of these are rated as grade A, 13 as grade B, 21 as grade C, and 5 as grade D.

**Conclusions:** We have completed the first evidence-based, clinical practice guidelines for severe TBIs. It is hoped that the guidelines will provide concepts and recommendations to promote the quality of care for severe TBIs in Taiwan.

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1. Introduction

Traumatic brain injuries are major causes of disability and death in nonpenetrating trauma accidents. This is true of severe TBIs, which are associated with high unfavorable morbidity and mortality [16,18,48,55]. The pathogenesis of TBI can be grossly divided into primary and secondary insults. The primary insult is unpredictable and unpreventable, whereas the secondary insult is preventable and treatable to a certain degree. The prevention of the secondary insult can therefore significantly improve outcomes in traumatic brain-injured patients. Thus, the evidence-based, clinical practice guidelines for management of severe TBI were developed first in the United States in 1995 [12,18]. The Brain Trauma Foundation supported the first and second editions of the *Guidelines for the Management of Severe Traumatic Brain Injury* in 1995 and 2000 [6,7,12], respectively. Furthermore, the updated third edition was published in May 2007 [5]. The recommendations in these guidelines are so easy to practice that they have gained worldwide acceptance.

In an epidemiologic study of TBI in the east of Taiwan in 1989 (not published), the incidence of TBI was about 12% in a total of 11 900 trauma cases, which caused 350 deaths, and as high as 49% of these were due to TBI. The annual direct cost of TBI in Taiwan is currently about 5 billion NTD while the annual indirect cost is 50 billion NTD.

For the high mortality and high cost of TBI in Taiwan, the establishment of an evidence-based and easy-to-use guidelines of TBI, especially for severe TBI, is necessary to improve the outcome and to reduce the cost.

2. Methodology

In November 2005, the severe TBI guideline committee was organized by experts in neurotrauma and experienced specialists in evidence-based medicine to publish the guidelines. Nine topics were selected for discussion: ER treatment, ICP monitoring, CPP, fluid therapy, use of sedatives, nutrition, intracranial hypertension, seizure prophylaxis, and second-tier therapy.

Each topic had an assigned contributor and a working group. Contributors searched relevant information from 1996 to 2006 on the Medline database in English. The work included clinical studies but excluded clinical technical notes and operative (surgical) suggestions. Each contributor chose the keywords used in search of articles in the literature.

The contributors and working groups in every topic reviewed the searched literature articles. Referenced articles were divided into 8 groups according to the levels of evidence: 1++, 1+, 1−, 2++, 2+, 2−, 3, and 4 based on the criteria of the SIGN 50 [71] (Table 1). For example, if the article was designed for a high-quality meta-analysis, systemic review of RCTs, or RCTs with a very low risk of bias, the level of evidence of this article would be classified as 1++.

According to the levels of evidence, each reviewed article was given 1 of the 4 grades of recommendations: A, B, C, and D [71] (Table 2). For example, the recommendation would be grade A if the article reviewed had at least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population, or a systemic review of RCTs or a body of evidence consisting principally
of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results [71].

One will note that grades C and D were still considered to have evidence to support grades of recommendations, but the evidence level was lower than that in grades A and B. Recommendations of grades C and D should therefore not be interpreted to show poor clinical management.

For assessing the quality of the clinical practice guidelines, we adapted the AGREE instruments [78]. Two appraisers assessed the 6 domains consisting of 23 key items as follows:

Scope and purpose (items 1-3). Item 1: the overall objectives of the guidelines were specifically described. Item 2: the clinical questions covered by the guideline were specifically described. Item 3: the patients to whom the guidelines should apply were specifically described.

Stakeholder involvement (items 4-7). Item 4: the guideline development group included individuals from all the relevant professional groups. Item 5: the patients’ views and preferences were sought. Item 6: the target users of the guideline were clearly defined. Item 7: the guidelines were piloted among target users.

Rigor of development (items 8-14). Item 8: systematic methods were used to search for evidence. Item 9: the criteria for selecting the evidence were clearly described. Item 10: the methods used for formulating the recommendations were clearly described. Item 11: the health benefits, side effects, and risk were considered in formulating the recommendations. Item 12: there was an explicit link between the recommendations and the supporting evidence. Item 13: the guidelines had been externally reviewed by experts before its publication. Item 14: a procedure for updating the guidelines was provided.

Clarity and presentation (items 15-18). Item 15: the recommendations were specific and unambiguous. Item 16: the different options for management of the condition were clearly presented. Item 17: key recommendations were easily identifiable. Item 18: the guidelines were supported with tools for application.

Applicability (items 19-21). Item 19: the potential organizational barriers in applying the recommendations were discussed. Item 20: the potential cost implications of applying the recommendations were considered. Item 21: the guidelines presented key review criteria for monitoring and/or audit purposes.

Editorial independence (items 22-23). Item 22: the guideline was editorially independent from the funding body. Item 23: conflicts of interest of guideline development members have been recorded.

Overall assessment. The appraisers made judgment for the quality of guidelines and took each of the appraisal criteria into account.

Each item was rated on a 4-point scale: 4, “strongly agree”; 3, “agree”; 2, “disagree”; 1, “strongly disagree” [78].

3. Guidelines

In the severe TBI guidelines, the brief conclusions and grades of recommendations are given in the following sections. The grades of recommendations are quoted after brief conclusions.

3.1. Emergency room treatment

The most important aims in ER for patients with severe TBI are to maintain vital signs and to prevent secondary brain injury [3,6,16]. The following procedures are included:

3.1.1. Quick assessment (grade C)

Quick assessment for patients includes ABC; and trauma assessment for the cranium, face, cervical vertebra, spine, thoracic cavity, abdominal cavity, pelvic cavity, back, and limbs is the important first step [6,28,52,75,79].

3.1.2. Basic treatments (grade C)

Establishment of airway protection, by endotracheal intubation, or fluid resuscitation with normal saline for stabilizing blood pressure, for example, is recommended when necessary [3,6].

3.1.3. Neurologic examinations (grade C)

Evaluation using the GCS, pupil size and light reflex, respiratory pattern, and muscle power is necessary.

3.1.4. Further assessment dependent on various situations (grade C)

The sedatives are preserved for irritable intubated patients. Antiepileptic drugs are administrated for treatment of posttraumatic seizure or for the prevention of such conditions [17,48,55,82].

Hyperosmolarity diuretic agents, such as mannitol, could be used when intracranial hypertension is suspected [6,30,79].

3.1.5. Image examinations (grade C)

X-rays and CT scans of the brain are considered only when the vital signs of the patient are secured. Other imaging studies, such as angiography or MRI, are reserved for the situation where the former imaging examinations have failed [3,6].

3.1.6. Laboratory data (grade C)

Baseline blood counts, biochemistry, coagulation time, and electrocardiography are helpful. In some cases, the alcohol level and toxin screens may be needed.

3.1.7. Final diagnosis in ER (grade C)

All possibilities in the differential diagnosis should be considered, and the severity of trauma should also be assessed carefully.

3.1.8. Final management (grade C)

It is recommended to consult qualified neurosurgeons for further management. If qualified neurosurgeons are
unavailable, transportation of the patient to an appropriate hospital is necessary after the vital signs are secured.

3.2. Intracranial pressure monitoring

There are 3 main advantages of ICP monitoring with regard to diagnosis and treatment in severe TBI. (a) It helps in detecting the changes of ICP early and making therapeutic decisions easier [72]. (b) It helps in uses of multiple modalities for intracranial hypertension, such as hyperventilation, diversion of CSF, use of sedatives, and diuretics [44,45,63]. (c) It helps to predict the patients’ outcome [47,51,55]. The conclusions and grades of recommendations for ICP in our guidelines are listed below.

3.2.1. Indications for ICP (grade B)

The ICP monitors may be used on patients with the following conditions [7,43,55,59]:

1. Severe TBI (GCS score 3-8) with abnormal CT scan findings, such as hematomas, brain contusions, brain edema, and compressed basal cisterns.
2. Severe traumatic injury with normal CT scan findings but with at least 2 of the following conditions: (a) age of 40 years or older; (b) unilateral or bilateral decerebrate or decorticated posture; (c) systolic blood pressure of less than 90 mm Hg.
3. Intracranial pressure monitors may be considered individually for mild or moderate TBI.

3.2.2. Treatment threshold of ICP levels [1,33,68] (grade B)

The treatment threshold of ICP levels in adults is 20 to 25 mm Hg whereas that in children is 20 mm Hg.

3.2.3. Choice of ICP monitors (grade B)

The placement of an intraventricular or intraparenchymal monitor is considered a standard procedure [7,13,42]. The selection of the monitor depends on resource distribution, location, insurance, or other social factors.

3.3. Cerebral perfusion pressure

Cerebral perfusion pressure is defined as the value of MAP minus ICP. It reflects the CBF and brain metabolism [24,25,31,38]. In severe TBI, maintenance of adequate CPP is important to prevent brain ischemia and secondary brain injury. The following are brief statements and grades of recommendations for CPP in our guidelines:

Cerebral perfusion pressure levels should be maintained at 60 to 70 mm Hg (grade B), and levels less than 60 mm Hg may be harmful [14,24,38,49,64,66] (grade C). Overuse of a vasopressor or colloid fluid to raise the CPP level to more than 70 mm Hg may increase the rate of acute respiratory distress syndrome [4,9,10,23,24] (grade C).

3.4. Fluid therapy

The ultimate goal of fluid therapy is to restore vascular capacity, cardiac output, and tissue perfusion. In fluid resuscitation in severe TBI, there is no sufficient evidence to show whether the use or not of a colloid is necessary [32,65,84], but specialists in our country agree that some reasonable use of colloids can be helpful, although without complete agreement on which kind of colloid to use. The following are current consensus and grades of recommendations for fluid therapy in our guidelines.

For massive fluid transfusion, normal saline is better than lactated Ringer’s solution [26,29,40,54,73,83] (grade D). Fresh frozen plasma is only indicated for coagulopathy and not recommended to be used as a regular volume expander [58] (grade C). Hypertonic saline may be useful in patients who have complication of severe TBI and systemic shock [37,39,73] (grade D).

3.5. Use of sedatives

After airway protection and mechanical ventilation are secured in patients with severe TBI, sedatives and analgesics may be used for the following purposes [8,17,50,59]: alleviation of stress response and pain feeling, adaptation
for endotracheal intubation, reduction of intracranial hypertension resulting from therapeutic or nursing procedures. The sedative effects should rapidly decline after discontinuation of the drugs. The statements and grades of recommendations are listed as follows.

Sedatives have been used as an option of treatment for severe TBI patients with agitation or intracranial hypertension [2,17,36,82] (grade C). Secure airway protection, by endotracheal intubation, for instance, should be established before sedatives are administered [2,53,82] (grade C).

In Taiwan, propofol and benzodiazepines, such as midazolam, are most commonly used in neurologic intensive care. In a multicenter study proposed by Chiu et al [17] for head-injured patients in Taiwan, we compared 2 groups of patients in posttraumatic intensive care. One group consisted of those who were sedated with propofol (n = 44). In the other group (n = 60), propofol was not used. We found that the propofol group showed a higher survival rate (36% vs 28%, P < .001), lower ICP level (15.7 ± 10.3 vs 31.4 ± 26.6 mm Hg, P = .009), and higher mean CPP level (71.1 ± 15.3 vs 43.2 ± 29.9 mm Hg) than the non-propofol group [17].

### 3.6. Nutrition

Patients treated with sedative infusion should be provided with 100% of resting metabolic expenditure; and for those without sedation, 140% should be provided [11,19,21] (grade B). At least 15% of energy source from protein should be provided within 7 days after injury to maintain nitrogen balance, either by parenteral or by enteral nutrition supplement [20,56] (grade B). The feeding should be started within 24 to 72 hours after injury and the supplementary nutrition increased gradually to meet maximal caloric demand [61,80] (grade C).

### 3.7. Intracranial hypertension

Multiple modalities for management of intracranial hypertension in severe TBI are reviewed, such as drainage of cerebral spinal fluid, sedatives, hyperosmotic diuretics, hyperventilations, barbiturate coma, early decompressive craniectomy, and steroids. Prophylactic hyperventilation is not recommended for management of intracranial hypertension [4,15,30,44,45,63] (grade A). Steroids are not recommended for treating intracranial hypertension [27] (grade A).

The flowchart for management of intracranial hypertension and the recommendation grades are illustrated in Fig. 1.

It is worth mentioning some difference of opinion from other guidelines in the role of early decompressive craniectomy. Based on recent advances in TBI studies [34,35,57,62,67], we conclude that an early decompressive craniectomy is effective for severe TBI in certain cases. So, the timing for decompressive craniectomy is earlier in our guidelines than that classified as second-tier therapy in other guidelines.

### 3.8. Seizure prophylaxis

Prophylactic use of phenytoin, carbamazepine, phenobarbital, or valproate is not recommended for prevention of late posttraumatic seizures [69,76,77] (grade B). Phenytoin and carbamazepine could prevent early posttraumatic seizures effectively and may be used in high-risk patients. However, the present evidence does not support that prevention of early posttraumatic seizures improves the outcomes of TBI [69,76,81] (grade C). The high-risk patients include those with the GCS score of lower than 10, cortical contusion, depressed skull fractures, subdural hematoma, epidural hematoma, intracerebral hemorrhage, penetrating head injury, and epileptic seizures within 24 hours after injury [76] (grade C).

### 3.9. Second-tier therapy

The goal of severe TBI treatment is to control ICP, to increase cerebral perfusion, and to slow down brain
metabolism to prevent cerebral ischemia. Second-tier therapies, such as infusion of hypertonic saline, barbiturate coma, hyperventilation, hypothermia, and use of steroids, aim at rescuing the remaining function of the brain. These modality therapies may have considerable side effects and no established therapeutic effects [15,44,46].

3.9.1. Hypertonic saline (grade D)
With effects comparable with those of traditional agents used to decrease intracranial hypertension, hypertonic saline rapidly lowers ICP and effectively increases CPP. All pieces of present evidence are in favor of single use [60,70].

3.9.2. Barbiturate coma (grade D)
This management could slow down cerebral metabolic rates and reduce brain activities, and then lower ICP. However, the effects of these drugs depend on the timing of administration. So, these drugs should not be administered too late in case of severe brain stem dysfunction [41].

3.9.3. Hyperventilation (grade C)
Hyperventilation could reduce PaCO2, would reduce CBF, and then lower ICP by means of cerebral autoregulation. This mode of therapy is reserved for the following situations: (a) ICP more than 30 mm Hg and CPP less than 70 mm Hg; (b) CPP more than 70 mm Hg but higher ICP more than 40 mm Hg [22,44].

3.9.4. Systemic hypothermia (grade C)
There is no sufficient clinical evidence that proves its effectiveness.

3.9.5. Steroids (grade A)
The latest researches favor the opinion that steroids cannot reduce cerebral cytogenic edema caused by trauma and may increase the systemic and local infection rate. Therefore, routine use of steroids is not recommended [27].

3.10. Appraisal of Guidelines Research and Evaluation
After the procedures in the guidelines have been completed, 2 appraisers immediately assess meticulously the guidelines for the quality of reporting and that of recommendations by the AGREE instruments. The scores for every item are listed in Table 3.

The overall assessments are graded as 4 (“strongly recommended”).

3.11. Conclusions
This is the first evidence-based, clinical practice guidelines for severe TBI in Taiwan, with 9 important topics including ER treatment, ICP monitoring, CPP, fluid therapy, use of sedatives, nutrition, intracranial hypertension, seizure prophylaxis, and second-tier therapy. We have reviewed the literature for every topic based on the criteria of the SIGN 50 and classified the levels of evidence into 8: 1++, 1+, 1−, 2++, 2+, 2−, 3, and 4. According to the levels of evidence, we have graded the recommendations as A, B, C, and D. We have published and disseminated these guidelines for neurosurgeons, ER and intensive care physicians, nurses, and others who participate in TBI care.

There are naturally some differences in our guidelines from other TBI guidelines. For example, the common choices of sedatives in intensive care and the timing for early decompressive craniectomies in Taiwan’s guidelines are different from those in other published TBI guidelines.

It is hoped that our guidelines will provide useful, evidence-based, easy-to-understand concepts and recommendations to promote the quality of clinical care for severe TBI in Taiwan.

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References


McGrath CP. A cerebral perfusion pressure greater than 80 mm Hg is more beneficial. In: Hoff J, Betz A, editors. Intracranial pressure VII. Berlin: Springer-Verlag; 1989. p. 839-41.


Shapira Y, Artru AA, Cotey S. Brain edema and neurologic status following head trauma in the rat. No effect from large volumes of isotonic or hypertonic intravenous fluids, with or without glucose. Anesthesiology 1992;77:79-85.

Shapira Y, Artru AA, Qassam N. Brain edema and neurologic status with rapid infusion of 0.9% saline or 5% dextrose after head trauma. J Neurosurg Anesthesiol 1995;7:17-25.


Commentary

Liao et al discussed the development and final results of the Taiwan Clinical Practice Guidelines in severe TBI. The internationally well-received severe TBI guidelines developed by the US-based Brain Trauma Foundation (BTF) also provide a comprehensive review of the available literature. The vetting process for the BTF guidelines was very rigorous in the attempt to properly classify the evidence as to its strength and provide useful recommendations. Unfortunately, as with many areas of neurosurgery, there is a paucity of prospective, randomized data to offer recommendations of the highest strength.

The authors endeavored to create guidelines that were specifically applicable to Taiwan. They asserted that special national considerations require a separate analysis of the literature. Unfortunately, these considerations are not fully elucidated. Nevertheless, the authors developed guidelines by using a Medline search and grading the literature, and subsequently, the recommendation strengths in a different manner from the BTF. Some differences included more detailed recommendations on the initial TBI diagnosis and...