

JOINT TRAUMA SYSTEM



CATASTROPHIC NON-SURVIVABLE BRAIN INJURY

CLINICAL PRACTICE GUIDELINE (CPG) TRAINING

Joint Trauma System Trauma Care Educational Program



DISCLOSURE/DISCLAIMER



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AGENDA



- ◆ Purpose
- ◆ Summary
- ◆ Treatment
- ◆ Resuscitation
- ◆ Use of Blood Products
- ◆ Transport
- ◆ Performance Improvement (PI) Monitoring
- ◆ References
- ◆ Appendices
- ◆ Contributors

PURPOSE



- ◆ These slides are based on the Catastrophic Non-survivable Brain Injury CPG which provides useful guidelines to manage casualties with catastrophic, non-survivable brain injury at Role 2 and Role 3 facilities.
- ◆ Data of CPG publication: 27 Feb 2017
- ◆ JTS CPGs are evidence-based guidelines developed by subject matter experts in the military and civilian communities. CPGs are compiled from DoD Trauma Registry data, health data abstracted from patient records and after action reports.
- ◆ Information contained in this presentation is only a guideline and not a substitute for clinical judgment.

SUMMARY



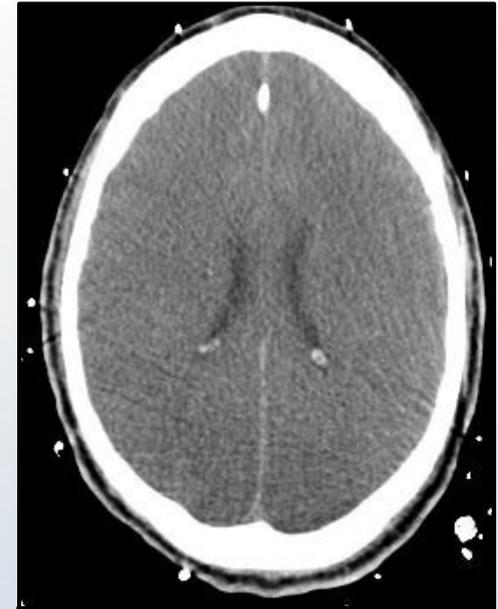
Catastrophic brain injury, for the purpose of this guideline, is defined as any brain injury that is expected after imaging evaluation and /or clinical exam to result in the permanent loss of all brain function above the brain stem level.

Patients identified as meeting criteria for catastrophic care receive all efforts dictated by protocol to keep them stable to deliver them to the next level of care.

BACKGROUND



Catastrophic brain injury is defined as any brain injury that is expected after imaging evaluation and/or clinical exam to result in the permanent loss of all brain function above the brain stem level.



Diffuse hypoxic brain injury

BACKGROUND



- ◆ Catastrophic brain injury is associated with profound physiologic changes:
 - ◆ Vascular regulatory disturbances
 - ◆ Widespread cellular injury
 - ◆ Alterations in metabolism, endocrine function, and immunology
 - ◆ Coagulopathy
- ◆ Approximately 60% of these patients have multiorgan system failure with cardiovascular collapse and asystole if not appropriately managed.

TREATMENT



Treatment focuses on hemodynamic stabilization which consists of 3 aspects:

1. Early identification of the severity of TBI as severity correlates with deficiencies in the pituitary adrenal axis.
2. Intensive care management.
3. Resuscitation with fluids and blood products with early use of vasopressors and endocrine/hormone therapy with refractory hemodynamic instability.

TREATMENT



- ◆ Early identification and management of related complications are also required. These complications include:
 - ◆ Disseminated intravascular coagulation.
 - ◆ Diabetes Insipidus.
 - ◆ Neurogenic pulmonary edema.
 - ◆ Hypothermia.
 - ◆ Cardiac arrhythmias.
- ◆ Fluid resuscitate to target systolic blood pressure >100 mm Hg and CVP > 7
 - ◆ Norepinephrine initial pressor
 - ◆ If Diabetes Insipidus (DI), vasopressin drip along with Desmopressin (DDAVP)

RESUSCITATION



Catastrophic brain injury resuscitation management for persistent hypotension

Evaluate Patient in ER ASAP (follow ATLS guidelines)

1. Labs obtained: ABG/serum lactate/CBC/PT/PTT/lytes head-injured patients
2. Transfuse to maintain Hct > 30
3. Bolus 1 liter NS or 500 ml 3% saline
4. Control active bleeding
5. Place large trauma central line
6. Transfer ASAP to ICU following CT scan

Caution: Patients may go from hypertension to hypotension rapidly

Continue to fluid resuscitate as needed and correct lab abnormalities. T-4 Replacement Protocol Table.

Normotensive patient?

Continue to fluid resuscitate with NS

See T-4 Replacement Protocol Table.

SBP > 100 or MAP > 65?

Continue to bolus with blood products to H/H of 10/30

Blood pressure & H/H goals met?

1. Norepinephrine drip (0.1-0.5 mcg/kg/min)
2. Look for DI and replace UOP over 200cc with 1/2 NS cc for cc every hour or, if patient is hypertensive, DDAVP 1-2 micrograms of DDAVP IVP (q 2-8 hours as needed)
3. Consider starting vasopressin at 0.01-0.04 units/min titrate to SBP > 100/MAP > 65 if DI is suspected after initial treatment with DDAVP

T-4 REPLACEMENT PROTOCOL



T-4 Replacement Protocol Table	
Pretreatment	
<ol style="list-style-type: none">1. Fluid resuscitate to predefined endpoints (CVP > 7, SBP > 100)2. Give blood to achieve an H&H above 10 and 303. Correct electrolyte imbalances	
Prerequisite	
Patient is requiring a combined vasopressor need greater than 15 mcg (all VP added) to maintain a systolic pressure of 100 after the pre-treatment is completed or becomes hemodynamically unstable.	
T-4 Protocol	
<ol style="list-style-type: none">1. Administer IV boluses of the following in rapid succession:<ul style="list-style-type: none">▪ 1 Amp of 50% Dextrose▪ 2 gm of Solumedrol▪ 20 units regular insulin▪ 20 mcg Thyroxin (T-4)▪ Start a drip of 200 mcg T-4 in 500cc Normal Saline (0.4mcg/cc). Administer at 25cc (10mcg) per hour initially. Reduce levels of other vasopressors as much as possible > 100 lbs give above dose▪ 50-75 lbs. give 13cc = 5.2 mcg/hr▪ 75-100 lbs. give 19cc = 7.6 mcg/hr2. After 30 to 60 minutes, patients may become tachycardic with an increase in temperature and blood pressure.3. Monitor K+ levels carefully. The only perceived complication of T-4 identified to this point is an unusually high K+ requirement in some cases.	

TREATMENT



- ◇ If after other treatments, more than one pressor required to maintain systolic blood pressure target or have evidence of DI, adjuncts addressing endocrine abnormalities should be considered.
 - ◆ Adjuncts include initial bolus of following:
 - ◇ 1 ampule 50% dextrose IV
 - ◇ 2 g Solumedrol IV
 - ◇ 20 units regular insulin IV
 - ◇ 20 µg of thyroid hormone (T4) IV, if available
 - ◆ Follow initial bolus by continuous infusion of 10 mcg/hr of T4 (if available).
- ◇ See appendices Management of Catastrophic Brain Injury and T-4 Replacement Protocol for details.

USE OF BLOOD PRODUCTS



- ◆ Use of blood products should be done in the context of whether it is a limited resource.
- ◆ If blood is available and the patient is responsive to interventions, use blood products to correct coagulopathy and significant anemia.
 - ◆ Goal hemoglobin: 10 g/dl
 - ◆ Goal INR: < 1.5
 - ◆ Goal Platelet Count: > 50,000

TRANSPORT



- ◆ Determine futility and the appropriateness of transport.
 - ◆ If the patient is responsive to initial resuscitation efforts and achieves stability, consider transporting to higher roles of care.
 - ◇ Re-unite service member with family at Role 4.
 - ◇ Consider organ donation.
- ◆ If the patient is not responsive to resuscitation efforts, then use a combination of clinical judgement and operational considerations (e.g., limited resources) to determine extent of care.
 - ◆ Leadership should be involved early to determine availability of transportation and resources.
 - ◆ If unable to transport or resources required elsewhere, withdrawal of support with dignity along with comfort care appropriate.

PI MONITORING



- ◆ Population of Interest
 - ◆ All patients with traumatic brain injury with head AIS > 3 and Role 3 or Role 4 discharge GCS=3 and death within 30 days.
- ◆ Intent (Expected Outcomes)
 - ◆ Safely evacuate patients to Role 4.
 - ◆ Patients with catastrophic brain injury receive medical management according to the CPG.
- ◆ Performance/Adherence Measures
 - ◆ Number and percentage of patients in the population of interest who have a documented neurosurgery consultation.
 - ◆ Number and percentage of patients diagnosed with brain death at Role 4 who are organ donors.
- ◆ Data Source
 - ◆ Patient Record
 - ◆ DoD Trauma Registry

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CPG APPENDICES



- ◆ **Appendix A:** Catastrophic Brain Injury Resuscitation Management for Persistent Hypotension
- ◆ **Appendix B:** Management of Catastrophic Brain Injury
- ◆ **Appendix C:** T-4 Replacement Protocol
- ◆ **Appendix D:** Additional Information Regarding Off-label Uses in CPGs

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