

# Prophylaxis of Venous Thrombosis in Neurocritical Care Patients: An Evidence-Based Guideline

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# Purpose

- Provide clinicians with an evidence-based framework for the appropriate administration of venous thromboembolism (VTE) prophylaxis in patients with neurologic illness, with a focus on those requiring neurocritical care.
- This includes patients with ischemic stroke, intracranial and intraventricular hemorrhage (ICH and IVH), aneurysmal subarachnoid hemorrhage (aSAH), traumatic brain injury (TBI), spinal cord injury (SCI), brain neoplasms, neuromuscular disorders, and patients undergoing neurosurgical and neurovascular interventions.

# Process

- The Neurocritical Care Society (NCS) selected a multidisciplinary panel of experts on the subject matter of VTE prophylaxis.
- A representative from the Society of Critical Care Medicine (SCCM) was recruited and acted as a liaison between the two organizations.
- The panel was subdivided into topic-related working groups according to expertise.
- Performed literature review and assessed quality of evidence using GRADE system.

# Methods

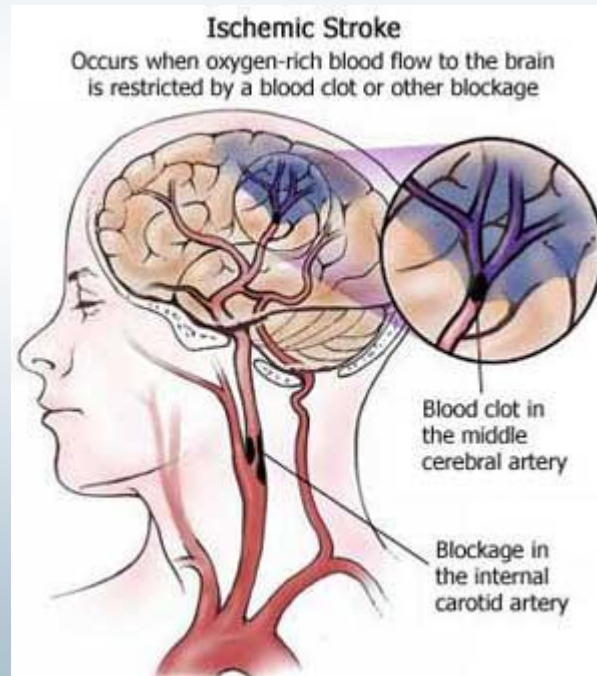
## GRADE System

- Classifies recommendations as strong or weak based on:
  - Balance of risk vs benefit
  - Patient Preferences
  - Cost
  - Quality of Evidence
- Quality of Evidence
  - High: further research very unlikely to change the estimate of effect
  - Moderate: further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate
  - Low: further research very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate
  - Very Low: any estimate of effect is uncertain

# Topics Covered

- VTE Prophylaxis in Critically Ill Patients with
  - Ischemic Stroke
  - Intracranial & intraventricular hemorrhage
  - Aneurysmal subarachnoid hemorrhage
  - Traumatic brain injury
  - Spinal cord injury
  - Brain neoplasms
  - Neuromuscular disorders
  - Patients undergoing neurosurgical & neurovascular interventions

# *VTE Prophylaxis in Critically Ill Patients with Ischemic Stroke*



# Ischemic Stroke Recommendations

- Strong recommendation, high quality evidence
  - Initiate VTE pharmacoprophylaxis as soon as is feasible in all patients with acute ischemic stroke.
- Acute ischemic stroke and restricted mobility, provide prophylactic-dose low-molecular-weight heparin (LMWH) over prophylactic-dose unfractionated heparin (UFH) in combination with intermittent pneumatic compression device (IPC).

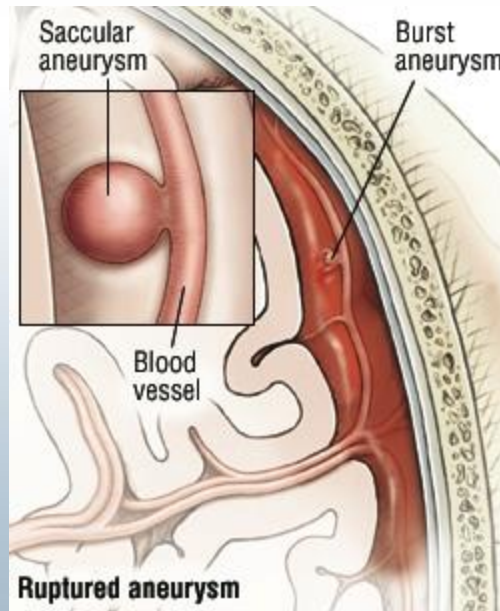


# Intracranial Hemorrhage Recommendations

- Strong recommendation, high quality evidence
  - Use of IPC and/or compression stockings (CS) over no prophylaxis beginning at the time of hospital admission.
- Weak recommendation, low quality evidence
  - Use prophylactic doses of subcutaneous UFH or LMWH in patients with stable hematomas and no ongoing coagulopathy beginning within 48 hours of hospital admission.
  - Continue mechanical VTE prophylaxis with IPCs in patients started on pharmacologic prophylaxis.



# *VTE Prophylaxis for Critically Ill Patients with Aneurysmal Subarachnoid Hemorrhage*



# Aneurysmal SAH Recommendations

- Strong recommendation, high quality evidence
  - Use UFH in all patients with aSAH
    - EXCEPT in those with unsecured ruptured aneurysms expected to undergo surgery. (Strong recommendation, low quality evidence)
  
- Strong recommendation, moderate quality evidence
  - Initiate IPCs as soon as patients with aSAH are admitted to the hospital.
  - Use of UFH at least 24 hours after an aneurysm has been secured by surgical approach or by coiling.

*VTE Prophylaxis  
for Critically Ill Patients with  
Traumatic Brain Injury (TBI)*

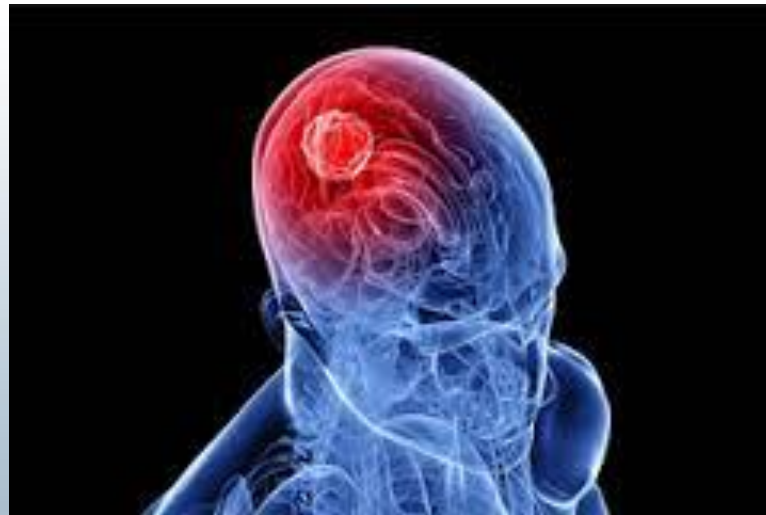


# TBI

## Recommendations

- Weak recommendation, low quality evidence
  - Initiate IPC within 24 hours of presentation with TBI or within 24 hours after completion of craniotomy as supported by evidence in ischemic stroke and postoperative craniotomy.
  - Initiate LMWH or UFH within 24-48 hours of presentation with TBI and ICH, or 24 hours after craniotomy.
  - Use mechanical devices such as IPC based on data from other neurological injuries such as ischemic stroke.

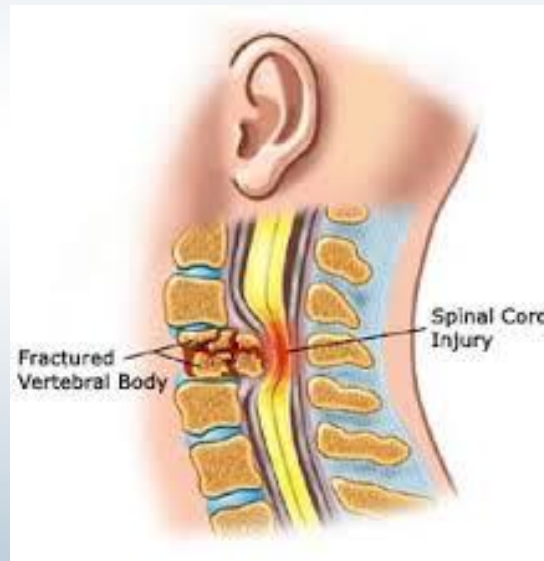
*VTE Prophylaxis  
for Critically Ill Patients with  
Brain Tumors*



# Brain Tumor Recommendation

- Strong recommendation, moderate quality evidence.
  - Initiate VTE prophylaxis with either LMWH or UFH upon hospitalization for patients with brain tumors who are at low risk for major bleeding and who lack signs of hemorrhagic conversion.

# *VTE Prophylaxis for Critically Ill Patients with Spinal Cord Injury*

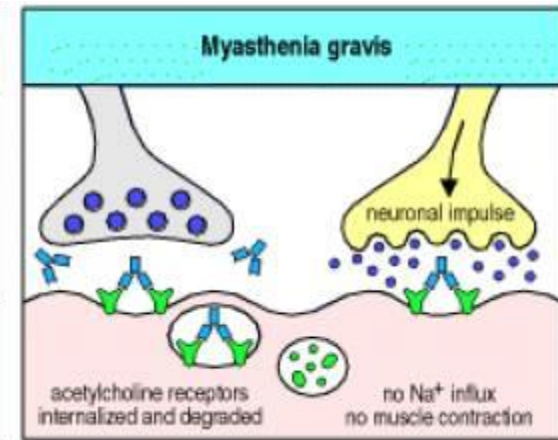
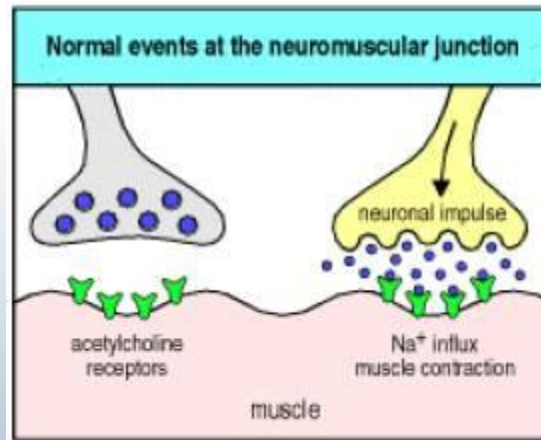
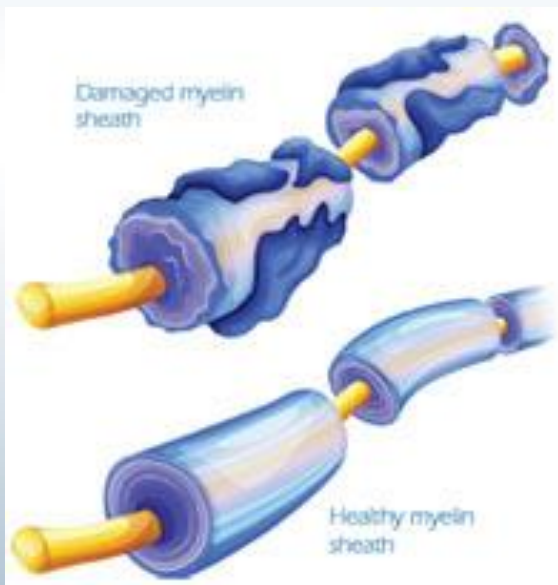


# Spinal Cord Injury Recommendations

- Strong recommendation, high quality evidence
  - Initiate VTE prophylaxis as early as possible, within 72 hours of injury.
- Strong recommendation, moderate quality evidence
  - Initiate LMWH or adjusted dose UFH for VTE prophylaxis as soon as bleeding is controlled.
- Weak recommendation, low quality evidence
  - Do not use mechanical measures alone for VTE prophylaxis.
  - If VTE prophylaxis with LMWH or UFH is not possible, provide mechanical prophylaxis with IPC.



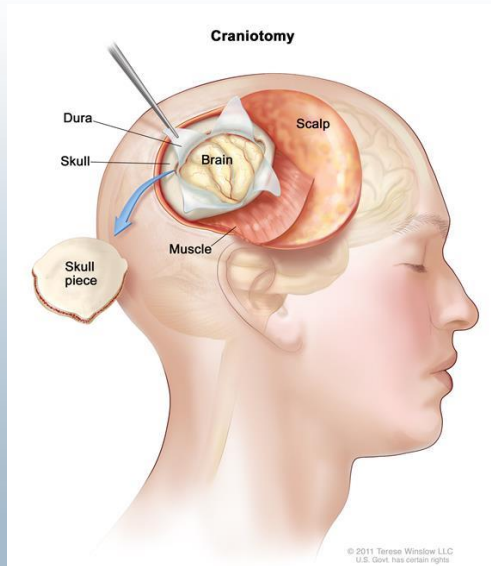
# *VTE Prophylaxis in Critically Ill Patients with Neuromuscular Disease*



# Neuromuscular Disease Recommendations

- Weak recommendation, low quality evidence
  - Combine pharmacologic and mechanical VTE prophylaxis (with IPC).
  - Use CS only for VTE prophylaxis in patients in whom neither pharmacologic prophylaxis nor IPC use is possible.

# *VTE Prophylaxis in Critically Ill Patients Undergoing Neurosurgical and Neurovascular Interventions*



Neurocritical Care: Published online 12/8/15

# Elective Spine Surgery Recommendations

- Strong recommendation, moderate quality evidence
  - In standard elective spine surgery, use ambulation with mechanical VTE prophylaxis (CS or IPC) alone, or combined with LMWH.
  - In patients with increased risk for VTE, use combined therapy with ambulation, CS or IPC, and LMWH.
  - Because of the increased risk of bleeding, use UFH only as an alternative to other methods of VTE prophylaxis.
- Weak recommendation, low quality evidence
  - Ambulatory back surgery with unique positioning strategies such as prone or kneeling has been associated with zero rates of VTE - use of IPC only for VTE prophylaxis.

# Complicated Spinal Surgery Recommendations

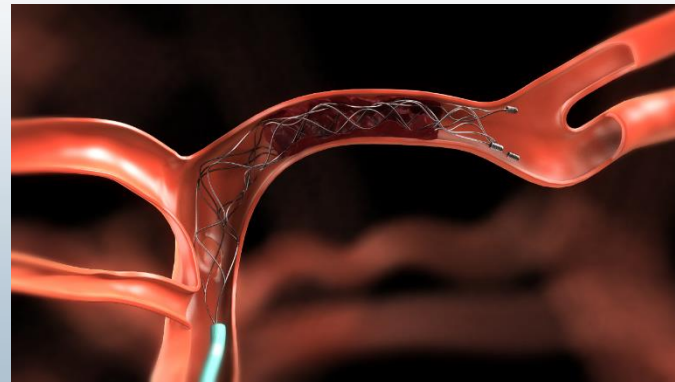
- Strong recommendation, moderate quality evidence
  - Use IPC with LMWH or UFH.
  
- Weak recommendation, low quality evidence
  - Do not routinely use Inferior Vena Cava (IVC) filters in the setting of severe spinal cord injury or complicated spine surgery.
  
  - Consider a removable prophylactic IVC filter as a temporary measure only in patients with PE and DVT or those with DVT at risk for PE who cannot be anticoagulated.

# Elective Craniotomy Recommendations

- Strong recommendation, moderate quality evidence
  - Use IPC with LMWH or UFH within 24 hours after craniotomy.
  - Use IPC with LMWH or UFH within 24 hours after standard craniotomy in the setting of glioma resection.

# Elective Intra-cranial/Intra-arterial Procedures Recommendations

- Weak recommendation, low quality evidence
  - Provide immediate VTE prophylaxis with LWMH or UFH.
  - Use CS and IPC until the patient is ambulatory.



# Intracranial Endovascular Procedures Recommendations

- Weak recommendation, low quality evidence
  - Initiate pharmacoprophylaxis with UFH and/or mechanical VTE prophylaxis with IPC or CS in patients with hemiparesis from stroke or other neurological injury within 24 hrs. if activated prothrombin time is measured.
  - If rtPA or other thrombolytics are used, then extra caution is advised, and delay of initiation of chemoprophylaxis only for at least 24 hours after the procedure should be considered.
  - Patients undergoing elective procedures may not require LMWH or UFH, but may benefit from early ambulation, and/or mechanical prophylaxis with IPC or CS.