Making the Diagnosis

**Emergency Department**
- Call Stroke Level 1 for symptom onset < 8 hours from LKW
- Call Stroke Level 2 for symptom onset between 8-12 hours from LKW
- Refer to NIH Stroke Scale (document in all patients)

**Inpatient**
- Consult Stroke Team- Internal Stroke Code
- Call ERT for evaluation of patient with stroke symptom onset < 8 hours from LKW:
  - UH Main and East: 6-3133
- ERT will activate Stroke Code after initial evaluation

Initial Diagnostic Evaluation

With the exception of Level 1 alerts, consult Neurovascular / Neurosurgery Service when ICH diagnosis is confirmed on CT.

**Primary Tests (for all patients)**
- Non-contrast head computed tomography (CT) or magnetic resonance imaging (MRI)
- Complete blood count (CBC)
- Platelet count and platelet function assay
- Blood chemistry (electrolytes, BUN, creatinine)
- PT/aPTT/INR
- Troponin
- Type and cross
- HbA1C
- Serum alcohol level
- Liver function tests
- Toxicology screen
- Urine drug screen
- Electrocardiogram (ECG)
- Consult Hematology for known or suspected hematologic disorders

**Additional Tests (consider in special cases)**
- CT angiography and contrast-enhanced CT to help identify patients at risk for hematoma expansion
- When there is clinical or radiological suspicion for underlying structural lesions, including vascular malformation and tumors, consider the following:
  - CT angiography
  - CT venography
  - Contrast-enhanced CT
  - Contrast-enhanced MRI
  - MRI angiography
  - MRI resonance venography
- Conventional cerebral angiogram for possible small AVM or fistulae that can be missed on CT angiography or MRI angiography

Determine ICH Score:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
<th>ICH Score: Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS score</td>
<td>3–4</td>
<td>2</td>
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<tr>
<td></td>
<td>5–12</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>13–15</td>
<td>0</td>
</tr>
<tr>
<td>ICH volume ≥ 30 cm³</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>IVH</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
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<tr>
<td>Infratentorial origin of ICH</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Age, years</td>
<td>≥ 80</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&lt; 80</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total ICH Score</strong></td>
<td></td>
<td><strong>0–6</strong></td>
</tr>
</tbody>
</table>

Antithrombotic-Associated and Anticoagulant-Associated ICH Management

- See reversal of coagulopathy-associated intracerebral hemorrhage algorithm
- For patients previously on antiplatelet agents, there is no evidence that platelet transfusion improves outcomes in ICH
- For recommendations on anticoagulant reversal, please refer to the OSUWMC guidelines:
  - Dabigatran (Pradaxa®) Reversal Treatment for Bleeding Events
  - Rivaroxaban, Apixaban: Factor Xa Inhibitors - Reversal Treatment for Bleeding
  - Warfarin - Management of Elevated INR and Reversal
  - Unfractionated Heparin (UFH) and Low Molecular Weight Heparin (LMWH) Reversal

Initial Medical Care

- Admit to ICU or PCU for monitoring and management
- Perform dysphagia screen prior to any oral intake
- Manage clinical seizures with appropriate antiepileptic therapy
  - Prophylactic anticonvulsant medication should not be used
- Normotonic fluids are strongly recommended
  - Avoid hypotonic fluids to prevent exacerbating brain edema
- Treat sources of fever and administer acetaminophen to lower temperature in febrile patients
- Treat hypoglycemia / hyperglycemia
- Arterial line placement for continuous BP monitoring
**Hypertension Management**
- High systolic BP is associated with greater hematoma expansion, neurological deterioration, dependency, and death following ICH
- Early and rapid BP lowering improves patients’ chances of achieving better functional recovery
- Rapid lowering of SBP to < 140 mmHg
  - Rapid aggressive reduction of BP with IVP or continuous IV infusion with frequent BP monitoring every 5 min.
    - e.g., hydralazine, labetalol, nicardipine, esmolol

**Increased Intracranial Pressure (ICP) Management**
(See ICP algorithm)
- Consider inpatients with GCS score ≤ 8, clinical evidence of impending transtentorial herniation, significant IVH, or hydrocephalus
- ICP monitoring will be initiated after evaluation by Neurosurgery

**Pharmacological and Mechanical VTE Prophylaxis**
(See Deep Venous Thrombosis (DVT): Prevention guideline)
Place sequential compression devices (SCDs) barring any contraindications.
- After documentation of cessation of bleeding in non-surgical patients, consider low-dose subcutaneous low-molecular-weight heparin or unfractionated heparin with hemiplegia or immobility after 1 to 4 days.
- In post-surgical patients, pharmacologic VTE prophylaxis is at the discretion of surgical team
- Consider placement of a temporary vena cava filter for patients who develop an acute proximal venous thrombosis, particularly those with clinical or subclinical PE
- When deciding whether to add long-term antithrombotic therapy several weeks or more after placement of a temporary vena cava filter, consider:
  - The cause of the hemorrhage
  - Associated conditions with increased thrombotic risk (e.g., atrial fibrillation)
  - Patient’s health and mobility

**General Medical Care**
- Temperature should be kept < 99.1°F (37.3°C)
- Glucose should be monitored (normoglycemia is recommended)
- Manage elevated HgbA1C and/or fasting lipids
- Correct any major nutritional or hydration problems
- Provide stroke education
- Provide tobacco cessation information
- Consult the following as indicated:
  - Physical Medicine and Rehabilitation
  - PT
  - OT
  - Speech Language Pathology
- Withdraw care recommendations should be cautious and occur after aggressive care for patients without preexisting DNR orders
  - Consider Palliative Care consult

**Surgical Care**
- Ventricular drainage as treatment for hydrocephalus is reasonable in patients with decreased level of consciousness
- For patients with cerebellar hemorrhage > 3 cm, who are deteriorating neurologically or who have brain stem compression and/or hydrocephalus from ventricular obstruction, surgical removal of the hemorrhage should occur as soon as possible
- Consider injection of alteplase (TPA) into hematoma, minimally invasive clot evacuation, decompressive craniectomy, or evacuation of supratentorial ICH by standard craniotomy for select patients
- The patient should be assessed by the neurosurgeon both before and after surgery

**Prevention of Recurrent ICH**
- Address ongoing blood pressure needs to maintain BP <130/80 mmHg
- Recommend discontinuation of tobacco use, heavy alcohol use, and substance abuse
- For some patients, avoid long-term anticoagulation as treatment for nonvalvular atrial fibrillation after spontaneous lobar ICH due to the relatively high risk of recurrence
- Anticoagulation after nonlobar ICH and antiplatelet therapy after all ICH might be considered, particularly when there are definite indications for these agents

**Discharge Planning**
- Involve patient’s family/caregiver in assessment of post discharge needs, decision making and treatment planning.
  - Perform full NIH Scale and Modified Rankins Scale at discharge as well as at 90-days post-discharge
  - Follow-up outpatient appointment with the Neurovascular Stoke Team scheduled prior to discharge

**Multidisciplinary Focus**
- Provide education for patient’s family and/or caregivers on:
  - Stroke:
    - Activation of EMS system
    - Pathology
    - Prevention
    - Signs/ symptoms
    - Actions to take
  - Follow-up appointments/therapy
  - Treatment plan
Rehabilitation Services
- Encourage patient's family/caregiver to participate in the rehabilitation sessions and to be trained to assist the patient with functional activities.
- If the patient is aphasic, staff should assist the patient and family in establishing a communication pattern before discharge.

Case Manager
- Arrange family and team meeting to discuss:
  - Patient progress
  - Rehabilitation goals
  - Discharge needs or issues
  - Explanation of next level of care
  - Providing care and support associated with these deficits
  - Means of coping with stress associated with these impairments
- Consider availability of support services and desires of the patient's family/caregiver.
- Provide information about discharge plans and post-discharge management to primary care physicians and community services.

Associated Tools

Order sets
- Stroke Alert [2993]
- Hemorrhagic Stroke Confirmed [2972]
- Admission Spontaneous Intracerebral Hemorrhage (ICH / IPH) [2190]

Quality Measures
- Venous thromboembolism (VTE) prophylaxis
- Dysphagia screening
- Stroke education
- Tobacco cessation information
- Assessed for rehabilitation
- Severity measurement performed for SAH and ICH patients (overall rate)
- Procoagulant reversal agent initiation for intracerebral hemorrhage (ICH)

References

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Guideline Approved

Disclaimer: Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC’s guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.

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