CODE STROKE TEAM QUICK SHEET: A STEPPED PROGRESSION TO IDENTIFYING A POTENTIAL CAUSE FOR CRYPTOGENIC STROKE

This resource is intended to be a clinical support tool to balance diagnostic approach, potential causes and diagnostic tests. The figures represented in this tool do not necessarily represent the views and guidelines of the AHA/ASA.

CONSIDERATIONS FOR CLINICAL PRACTICE:
- For TTE, consider a bubble study using Valsalva maneuver. Rule out: PFO, etc.
- Monitoring choice will depend on status of patient (inpatient or outpatient). Standard evaluation will likely take place in hospital.
- When considering monitoring, consider stepwise using a shorter duration (14 days to 30 days), then move forward for longer durations as deemed clinically necessary. Consider selection of specific patients for prolonged monitoring.
- When considering testing for hypercoaguable states, consider this for younger patients.

ALGORITHM FOR THE IDENTIFICATION AND DIAGNOSTIC EVALUATION OF PATIENTS WITH CRYPTOGENIC ISCHEMIC STROKE OR TRANSIENT ISCHEMIC ATTACK (TIA):

ISCHEMIC STROKE OR TIA
↓
HISTORY PHYSICAL EXAMINATION
↓
STROKE TOPOGRAPHY
• MRI of the brain
• CT of the brain

VESSELS
• MRA of the head and neck
• CTA of the head and neck
• Carotid duplex ultrasonography and transcranial Doppler ultrasonography

CARDIAC – STRUCTURE
• TTE
• TEE

CARDIAC – RHYTHM
• 12-Lead ECG
• Inpatient cardiac telemetry
• 24-Hr Holter monitor

HEMATOLOGIC TESTING
• Complete blood count
• Platelet count
• INR
• Partial-thromboplastin time

STROKE CONSIDERED TO BE CRYPTOGENIC AFTER STANDARD EVALUATION

Advanced Evaluation

VESSELS
• Catheter angioplasty
• Transcranial Doppler monitoring for emboli
• Vasculitis tests

CARDIAC – RHYTHM
• Prolonged (2-4 wk) outpatient cardiac telemetry

HEMATOLOGIC TESTING
• Arterial hypercoagulability tests (all patients)
• Venous hypercoagulability tests (if right-to-left shunt)

STROKE CONSIDERED TO BE CRYPTOGENIC AFTER ADVANCED EVALUATION

Specialized Evaluation

GENETIC TESTING
• Mitochondrial disease
• CADASIL, Fabry’s disease, other genetic causes

VESSELS
• Detailed autoimmune evaluation
• CSF examination
• Brain biopsy

CARDIAC – STRUCTURE
• Cardiac CT
• Cardiac MRI

CARDIAC – RHYTHM
• Prolonged (1-3 yr) outpatient loop recording

HEMATOLOGIC TESTING
• Workup for occult cancer

### Diagnostic and Therapeutic Implications in Ischemic Stroke:

#### Cardiac Causes

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnostic Test</th>
<th>Therapeutic Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paroxysmal Occult AF</td>
<td>Noninvasive cardiac monitoring, and if no AF or flutter detected, then implantable cardiac monitoring</td>
<td>Anticoagulation therapy</td>
</tr>
<tr>
<td>Atrial Cardiopathy</td>
<td>Serum NT-proBNP, echocardiography, ECG</td>
<td>Treatment with antiplatelet vs anticoagulation is unknown, but empirical treatment with anticoagulation may be reasonable</td>
</tr>
<tr>
<td>Atrial Septal Defect</td>
<td>Echocardiography (TEE superior to TTE)</td>
<td>Venous imaging if atrial septal defect detected</td>
</tr>
</tbody>
</table>

#### Atherosclerotic Causes

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnostic Test</th>
<th>Therapeutic Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic Arch Disease</td>
<td>Echocardiography (TEE superior to TTE)</td>
<td>Antiplatelet and statin therapy</td>
</tr>
<tr>
<td>Substenotic Atherosclerosis</td>
<td>Vessel wall imaging, plaque MRI</td>
<td>Antiplatelet and statin therapy</td>
</tr>
</tbody>
</table>

#### Other Causes

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnostic Test</th>
<th>Therapeutic Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>CT chest, abdomen, and pelvis</td>
<td>Antiplatelet vs. anticoagulation treatment of underlying cancer</td>
</tr>
<tr>
<td>Hypercoagulable State</td>
<td>Hypercoagulable work-up, including antiphospholipid antibodies</td>
<td>Anticoagulation therapy based on findings</td>
</tr>
<tr>
<td>Arterial Dissection</td>
<td>MRA with fat-suppressed images</td>
<td>Antiplatelet therapy</td>
</tr>
</tbody>
</table>

*AF indicates atrial fibrillation; CT, computed tomography; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; NT-proBNP, N-terminal pro-B-type natriuretic peptide; TEE, transeosophageal echocardiography; and TTE, transthoracic echocardiography.


### Clinical Professionals Involved:

- **Neurologist**
  Primary physician throughout patient experience, coordinate all services, initiate diagnostic tests and personnel involved with patient care. Whenever possible, a vascular neurologist should direct the evaluation.

- **Stroke coordinators**
  Follow patient from first contact to optimize timing, maintain records, evaluate process and coordinate discharge.

- **Nurses**
  Continuous, direct, personal patient contact; accurate implementing of orders and recording of patient progress.

- **Radiologist**
  Accurate, timely imaging results coordination with neurologist, cardiologist and interventional radiologist.

- **Cardiologist**
  Necessary specialist to initiate diagnostic studies.

- **Electrophysiologist**
  Possible consultant to cardiologist if arrhythmia, specifically atrial fibrillation, is suspected cause of the event.

- **Sleep specialist**
  Recommended consultation since sleep apnea significantly elevates risk of subsequent problems.

- **Hematologist**
  Consultation if hypercoagulability is suspected.

- **Oncologist**
  Consultation if hypercoagulability is suspected due to occult (or known) malignancy.

- **Rheumatologist**
  Consultation if hypercoagulability due to occult (or known) malignancy is suspected.

- **Primary care provider (PCP)**
  A healthcare practitioner who will follow the patient after the cryptogenic stroke is diagnosed. The PCP should receive a hospital discharge summary to facilitate transition of care from the neurologist/cardiologist, and follow up on tests that provide definitive diagnosis of cryptogenic stroke if needed.