

Certification Corner

Are you preparing for stroke certification as a Neurovascular Registered Nurse (NVRN), Advanced Neurovascular Practitioner (ANVP), Certified Neurointerventional Clinician (CNIC), or an Advanced Stroke Coordinator (ASC)? Use these questions to gauge your preparedness to test.

Part I: CNIC & ANVP Applicable Questions

1. A patient presents with a known history of chronic subdural hematoma (cSDH) that has been present for at least two months. The noncontrast CT should reveal a lesion appearing as which of the following?
 - a. Isodense intra-axial lesion not crossing suture lines with homogenous blood density
 - b. Hypodense intra-axial lesion not crossing suture lines with homogenous blood density
 - c. Hyperdense extra-axial lesion crossing suture lines; may have mixed blood densities
 - d. Hypodense extra-axial lesion crossing suture lines; may have mixed blood densities
2. You receive report on a patient awaiting transfer from a primary stroke center hospital for what has been reported as an “altered neurologic exam” following an admission for hypertensive emergency (BP 260/140 mm Hg). Only a noncontrast CT is available for review; findings implicate the need for vascular imaging of which of the following?



- a. Anterior cerebral artery
- b. Posterior cerebral artery
- c. Middle cerebral artery
- d. Internal carotid artery



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Part II: NVRN, ASC, CNIC & ANVP Applicable Questions

3. You receive notification that a stroke patient is on route to your hospital by ambulance from an acute stroke ready hospital (ASRH). The NIH Stroke Scale (NIHSS) score was reported as 12 and the noncontrast CT scan was read as normal by the telemedicine provider, but no other imaging has been performed. Symptoms started 30 minutes before hospital arrival, so the patient was treated by the ASRH with intravenous tenecteplase. The patient is due to arrive at your hospital at 2.5 hours from symptom onset. Based on this information, you anticipate which of the following actions when the patient arrives?
 - a. Perform CT angiography (CTA) and CT perfusion imaging to determine thrombectomy candidacy
 - b. Transfer the patient directly to the neurointerventional lab for thrombectomy since the NIHSS score is indicative of large vessel occlusion (LVO) stroke
 - c. Transfer the patient directly to the Stroke Unit for continued care
 - d. Perform CTA to determine whether the patient has an LVO

4. Aneurysmal subarachnoid hemorrhage is most commonly found in patients with which of the following characteristics?
 - a. Japanese race
 - b. Male sex
 - c. Age ranging from 60-75 years
 - d. Known history of amyloid angiopathy

5. You are asked by your stroke coordinator to calculate the ICH Score for your 72-year-old hypertensive deep subcortical hemorrhage (volume = 42 mL) patient; the Glasgow Coma Scale score is 5 and the patient has intraventricular extension. You tell the stroke coordinator that the patient's score is:
 - a. 1
 - b. 2
 - c. 3
 - d. 4

Part III: ASC Questions

6. As a stroke coordinator, your work is tied to improving practice to enhance outcomes; you recognize that understanding organizational behavior and motivation are key to successfully implementing change. Knowing this, which of the following reflects important knowledge about healthcare workers today that may impact your ability to change practice?
 - a. Most workers are highly engaged in their work and the work setting.
 - b. More than half of workers do not trust their employers or supervisors.
 - c. Employees would be happier on the job if they were paid more money.



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- d. Most managers have significant expertise in implementing change.
- 7. Which of the following is an example of an intrinsic motivator?
 - a. Working in a healthy workplace culture that promotes honest, supportive relationships
 - b. Being paid a salary that reflects workload and the special knowledge required to perform optimally
 - c. Work colleagues that are kind, friendly, and fun
 - d. Receiving personal recognition for one's contribution to the stroke team

Part IV: CNIC Questions

- 8. The Barrow Carotidocavernous Fistulae (CCF) classification is the most widely utilized system for classifying CCF; it categorizes cases:
 - a. Based on the degree of venous system involvement in the anomaly.
 - b. Into "direct" and "indirect" fistulas.
 - c. By the presence or absence of subarachnoid hemorrhage on imaging.
 - d. Similarly to systems used for dural arteriovenous fistulae (dAVF).
- 9. You have been asked to be a part of a work group in your neurointerventional lab that is developing policies and procedures that ensure radiation safety and protection. You know that the guiding principle for radiation protection is ALARA, which stands for:
 - a. **AL**ways **A**void **R**adiation **A**rtifact.
 - b. **A**void **L**ong **A**ssistance-in **R**adiographic **A**reas.
 - c. **A**ll **L**ead **A**pron **R**adiation **A**rea.
 - d. **A**s **L**ow **A**s **R**easonably **A**chievable.
- 10. The 3 sources of radiation that all workers should be shielded from in neurointerventional labs include which of the following:
 - a. Directed, secondary, and discharged radiation
 - b. Procedural, focused, and environmental radiation
 - c. Primary, leakage, and scattered radiation
 - d. Non-procedural, capitated, and errant radiation

Part V: NVRN & ANVP Questions

- 11. Which of the following was the first successful intervention to treat acute stroke disability?
 - a. Tissue plasminogen activator (tPA)
 - b. Aspirin 81 mg per os or per rectum
 - c. Specialized stroke units
 - d. Fellowship-trained vascular neurologists
- 12. Which of the following is true about thrombolytic agents?

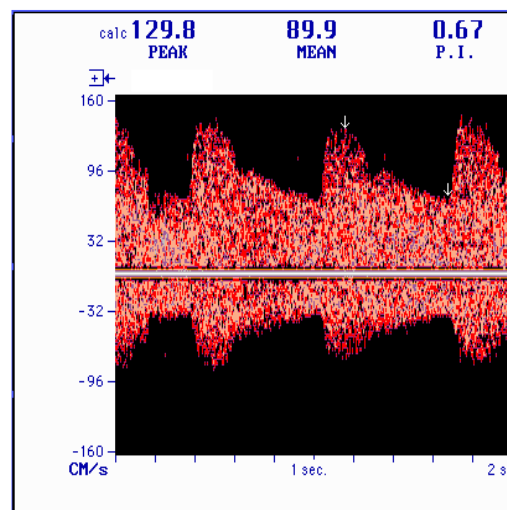


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- a. Alteplase dosing is not affected by renal impairment, whereas tenecteplase dosing must be modified in patients with impaired renal function.
 - b. Tenecteplase has a shorter half-life than alteplase.
 - c. Tenecteplase and alteplase are both tissue plasminogen activator (tPA) agents.
 - d. All patients were weighed on bed or stretcher scales to determine dose in the NINDS rt-PA Stroke Study that led to approval of alteplase for ischemic stroke treatment.
13. You are caring for a patient with a 38-pack year history of smoking who has recently been admitted with a first-ever ischemic stroke. He is awake and oriented to time, place and person, with no language deficits and minimal 4/5 left arm and left lower facial weakness after treatment with tenecteplase; his score on the *Readiness to Quit Ladder* is 2. In preparing to provide smoking cessation counseling you know that which of the following are important considerations?
- a. Previous quit attempts should be viewed as failures and not used to motivate behavioral change
 - b. Menthol cigarettes carry a higher stroke risk than non-menthol brands, making this important information to impart
 - c. The importance of a “cold turkey” quit approach should be emphasized, with complete abstinence once the patient leaves the hospital
 - d. Physiologic dependence on nicotine typically lasts up to 3 months; quit dates for complete abstinence should be set after this time

Part VI: ANVP Questions

14. Which of the following is true about the transcranial Doppler waveform below?



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- a. The waveform represents reverberating flow classically seen in patients progressing to brain death.
 - b. The image is suggestive of vasospasm warranting angiography.
 - c. There is high resistance to forward flow, suggesting markedly increased intracranial pressure.
 - d. The waveform reflects a low-pressure state with normal mean flow velocities.
15. You are caring for a 39-year-old father of two young children that was transferred to your comprehensive stroke center 16 hours after total left hemispheric cerebral infarction due to traumatic dissection of the internal carotid artery. Because the patient was positive for alcohol at the time of his initial presentation to a small community hospital, his neurologic changes went undiagnosed and were assumed to be due to alcohol intake. He presents now at your comprehensive stroke center (CSC) with lethargy, and an NIH Stroke Scale (NIHSS) score of 21: Item 1A = 1; Item 1B = 2; Item 1C = 2; Item 2 = 2; Item 3 = 2; Item 4 = 2; Item 5 = 3; Item 6 = 3; Item 7 = 0; Item 8 = 1; Item 9 = 2; Item 10 = 1; 11 = 0. Imaging repeated at your CSC shows no midline shift or evidence of herniation on imaging. Which of the following is the most evidence-based approach to optimizing outcome for this patient and his family?
- a. Providing therapeutic hypothermia (33-degrees C) to reduce metabolic demands and provide neuroprotection.
 - b. Discussing transfer to palliative care services since quality of life is extremely poor in patients with total left hemispheric stroke.
 - c. Immediate transfer to the operating suite for left decompressive hemi-craniectomy.
 - d. Beginning serial NIHSS assessments with STAT repeat imaging for further deterioration, and immediate notification of neurosurgery for worsening.

Part I: Answers

1. **D.** Chronic subdural hematoma (SDH) appears hypodense and may have mixed layers of blood density within it from recurring bleeding intervals. Subacute SDH appears isodense, whereas acute SDH appears hyperdense. SDH crosses suture lines, whereas epidural hematomas (EDH) do not because of fusion of the dura to the calvarium at the margins of the sutures. Both SDH and EDH are extra-axial lesions.
2. **D.** The noncontrast CT shows a watershed infarction; these are strokes that occur “between arterial territories” that result from severe large artery hemodynamic compromise, in this case due to near occlusion of the right internal carotid artery. Hypertensive emergency as a presenting symptom was likely due to the patient’s underlying hypertension diagnosis in combination with near occlusive stenosis; aggressive antihypertensive treatment resulted in a significant reduction of blood flow to the far distal aspects of the middle and anterior cerebral arterial territories resulting in the watershed infarction.



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Part II: Answers

3. **D.** The patient should undergo CT angiography (CTA) of the aortic arch, neck, and head to rule in/out large vessel occlusion (LVO) stroke. Although the NIH Stroke Scale (NIHSS) score is 12, this does not guarantee the presence of an LVO; additionally, CTA provides important information that can assist interventionalists with vascular system catheter navigation. The patient does not warrant the need for CT perfusion (CTP) given that he is only 2.5 hours from symptom onset, and since CTP can overcall infarction, many physicians favor determining tissue viability by review of the noncontrast CT alone.
4. **A.** The Japanese carry the highest incidence of aneurysmal subarachnoid hemorrhage (aSAH) in the world. Females have a higher incidence of aSAH than males, and age range is most commonly around 50 years. Amyloid angiopathy is closely associated with intracerebral hemorrhage, but not aSAH.
5. **C.** The patient is under 80 years of age (score = 0), with a hemorrhage greater than 30 mL (score = 1), a Glasgow Coma Score of 5 points (score = 1), a supratentorial hemorrhage (score = 0) and intraventricular extension (score = 1 point).

Part III: Answers

6. **B.** Unfortunately, trust is currently a key issue for healthcare workers, and when changing approaches to how care has been traditionally provided, stroke coordinators should know that trust comes further into question. Employee engagement today is poor, and employees that are unhappy on the job rarely report salary as the key issue. Complicating things further, most people in managerial positions lack expertise instituting change in a positive manner.
7. **D.** Intrinsic motivators come from within the individual and are a powerful stimulus for motivation. Extrinsic motivators can also be powerful for employees and contribute to work environment culture.

Part IV: Answers

8. **B.** The Barrow Classification divides carotidocavernous fistulas into direct (type A) or indirect (types B-D). Type A fistulas are the most common, with a direct connection between the intracavernous internal carotid artery (ICA) and the cavernous sinus. Type B fistulas have a dural shunt between the meningeal branches of the intracavernous ICA and the cavernous sinus. Type C fistulas have a dural shunt between meningeal branches of the external carotid artery (ECA) and the cavernous sinus. Type D fistulas have a dural shunt between both meningeal branches of the intracavernous ICA and the meningeal branches of the ECA with the cavernous sinus. Others have proposed an alternative classification based on venous drainage, but this is not widely utilized.
9. **D.** Radiation levels should always be set as low as possible while still producing good quality imaging that supports clinical and treatment decision making.
10. **C.** Primary radiation is that which comes from the x-ray source, whereas secondary radiation is created when the primary beam interacts with matter; scatter radiation is considered a form of secondary radiation that results when the x-ray beam is deflected from its path by interaction with matter.



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Part V: Answers

11. **C.** In 1991, stroke patients that received care on specialized stroke units were first shown to have significantly lower rates of disability and death, compared to those cared for on general care or mixed units, well before approval of alteplase tissue plasminogen activator (tPA). Numerous studies since that time continue to show significant reductions in both disability and death for patients cared for on specialized stroke units. Aspirin is not a disability reducing stroke treatment, and while vascular neurologists have played an important role improving acute and ongoing preventive care for stroke, they are a relatively new specialty and not themselves a treatment for stroke.
12. **C.** Tenecteplase, alteplase, and even reteplase are all types of tissue plasminogen activators (tPA); because of this, when tPA is written in a medical record, the provider should state “alteplase tPA” or “tenecteplase tPA.” Both tenecteplase and alteplase do not require special dosing for renal impairment, and alteplase has a shorter half-life making it require dosing with both a bolus and an hour-long infusion. In the NINDS rt-PA Stroke Study and all other clinical trials of alteplase tPA approval, patients were not weighed to determine dose; dose was estimated or calculated from available information (e.g. drivers licenses) because bed/stretchers scales did not exist at the time of these studies meaning we can be assured that these methods also produce safe dosing and effective treatment results.
13. **B.** Recent data have shown higher risk for stroke with menthol cigarettes. Previous quit attempts signal a patient that is motivated and wants to quit smoking; these should be discussed to determine what caused the attempt to fail. Cold turkey methods carry low success rates for smoking cessation. Physiologic dependence on nicotine generally concludes by 2 weeks, whereas behavioral dependence can last quite some time.

Part VI: Answers

14. **D.** The waveform is normal with low resistance flow as reflected by both the pulsatility index (PI) and the generous diastolic flow. The waveform is bidirectional showing both the middle cerebral artery (MCA) blood flow and the anterior cerebral artery blood flow at the bifurcation. The MCA flows toward the probe (positive waveform) with its normally higher mean flow velocity (MFV), while the ACA flows away from the probe (negative waveform) with a lower MFV.
15. **C.** While decompressive hemicraniectomy is lifesaving, it is not always disability reducing; however, many patients go on to experience meaningful happy lives. A nihilistic approach that advocates for palliation does take into consideration the needs of a young conscious (although lethargic) patient with young children. Attempts to discuss surgical treatment should be made by the team. Waiting and watching for deterioration is not recommended because when hemicraniectomy is undertaken, the results are best when patients have not yet worsened. While therapeutic hypothermia is sometimes used as a last-ditch effort, it has yet to be proven as a method to decrease disability.



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Are you an NVRN, ANVP, ASC, or CNIC board certified clinician and interested in writing test items for the Neurovascular Clinicians Certification Corporation (NVC-3)? Contact info@anvc.org at your earliest convenience to learn how to contribute!

