

SCRIPT

ACUTE STROKE WITH FIBRINOLYTIC
INDICATION AND HYPERTENSION



SCENARIO

#32

NAME

IRENE CORNELL

SPECIALTY

Neurology

DIFFICULTY LEVEL

ADVANCED

SIMULATION ENVIRONMENT

INTRA HOSPITAL - EMERGENCY ROOM

BODY INTERACT™
VIRTUAL PATIENTS

This patient is not a real patient, and the clinical scenario, while clinically plausible, is fictional.

Scenario

General description of the scenario info. Corresponds to the initial information presented to the trainee when selecting this scenario.

Title

Acute stroke with fibrinolytic indication and hypertension

Context

When taking care of her grandchildren, Irene suddenly felt difficulty in moving her right arm. Her family also noticed she had facial asymmetry and was not talking properly.

Briefing

Female, 72 years old. Sudden onset of speech impairment and right-sided weakness three hours ago. No previously known health conditions or medication.

General learning objective

Recognize acute stroke.

Specific learning objectives

Start vital signs vigilance in acute care
Performance of neurological assessments (NIHSS)
Blood pressure management in acute stroke

Pre-simulation notes

-

Environment

Intra Hospital - Emergency Room

Specialty

Neurology

Difficulty Level

Advanced

Reviewers

Angels Initiative

Patient characteristics

Characterization of the patient's demographic, habits, behavior and specific status effects.

Avatar



Patient Name

Irene Cornell

Age

72 years

Race/Ethnicity

Southeast Asian

Eye color

Brown

Conscious

Yes

Confused

No

Last meal over 2h

Yes

Speech impairment

Yes

Gender

Female

Main hair color

Light gray

Smoker

No

Sedated

No

Agitated

No

Facial palsy

100

Renal metabolic compensation

Auto

Patient parameters

These parameter values are used by the simulator to initialize this scenario and correspond to a pre-treatment baseline.

Systolic arterial blood pressure (mmHg)

215

Heart rate (bpm)

130

Respiratory rate (/min)

32

Temperature (°C)

36.3

Urinary output (mL/kg/h)

0.61

Height (cm)

167

Diastolic arterial blood pressure (mmHg)

110

O2 saturation (%)

88

Blood glucose (mg/dL)

112

Hemoglobin (g/dL)

14.9

Weight (kg)

80

BMI

28.7

Potassium (mEq/L)

4.1

Sodium (mEq/L)

139

Physical examination

The items below characterize the patient's physical examination and monitoring findings on admission.

Airway

Airway inspection

1st Priority

Airway is open, not obstructed and safe. No upper airway abnormal noises.

Breathing

Chest palpation

Not a priority

Normal: 2L - normal; 2R - normal

Chest percussion

Not a priority

Right: 1R- resonance; 2R- resonance; 3R- resonance; 4R- resonance; 5R- dullness.
Left: 1L- resonance; 2L- resonance; 3L- superficial cardiac dullness; 4L- superficial cardiac dullness; 5L- resonance.

O2 Sat (%)

1st Priority

88

Pulmonary auscultation

2nd Priority

Clear to auscultation, with normal vesicular murmurs in all sites.

Respiratory rate (/min)

1st Priority

32

Circulation

Blood pressure (mmHg)

1st Priority

215/110

Capillary refill time (s)

Not a priority

1.3

Cardiac auscultation

2nd Priority

Regular rate and rhythm, normal S1 and S2 sounds, no murmurs, gallops or rubs.

Heart rate (bpm)

1st Priority

130

Pulse palpation

Not a priority

Central - Amplitude: strong; Rhythmic.
Peripheral - Amplitude: strong; Rhythmic.

Urinary output (mL/kg/h)

2nd Priority

0.61

Disability

Blood glucose (mg/dL)	1st Priority	112
Glasgow Coma Scale	2nd Priority	12 - Moderate impairment of consciousness (E4-V3-M5).
Pupil light reflex	Not a priority	Right: Size - 4 mm; Right eye light: 2 mm; Left eye light: 2 mm. Left: Size - 4 mm; Right eye light: 2 mm; Left eye light: 2 mm.

Exposure

Abdominal auscultation	Not a priority	Normal hydro-aerial sounds without abdominal murmurs.
Abdominal palpation	Not a priority	No rigidity. No pain. No guarding or signs of peritoneal irritation. No masses or palpable organomegalies.
Abdominal percussion	Not a priority	6R- tympanic; 7R- tympanic; 6L- tympanic; 7L- tympanic.
Temperature (°C)	2nd Priority	36.3

Dialogues

This is a complete list of all possible dialogue questions (on the left) and the corresponding responses (on the right).

History Taking

Chief Complaint

01. How are you feeling?	1st Priority	Boo... streen... (if Patient has Ischemic Stroke) I feel weak down the right side of my body. (if Patient doesn't have Ischemic Stroke)
02. What happened to you? (After question 1 is asked)	1st Priority	Remeen... leeff... (if Patient has Ischemic Stroke) Suddenly I couldn't move my right arm. (if Patient doesn't have Ischemic Stroke)

History of Present Illness

03. When was the last time you had something to eat?	Diabee...know.. (if Patient has Ischemic Stroke)
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	Not a priority	It was at lunchtime. (if Patient doesn't have Ischemic Stroke)
04. What were you doing when you felt ill?		Stree... boo... (if Patient has Ischemic Stroke)
	2nd Priority	I was taking care of my grandchildren at my house. (if Patient doesn't have Ischemic Stroke)
05. What was the last thing you ate?		Stree... boo... (if Patient has Ischemic Stroke)
	Not a priority	I had some meat off the barbecue, with rice and salad. (if Patient doesn't have Ischemic Stroke)
06. Were you doing any physical activity when you became ill?		Haavv... laa... (if Patient has Ischemic Stroke)
	Not a priority	Yes, I was playing with my grandchildren. (if Patient doesn't have Ischemic Stroke)
07. Are you in pain at all?		Stree... boo... (if Patient has Ischemic Stroke)
	1st Priority	No, just a feeling of weakness on one side of my body. (if Patient doesn't have Ischemic Stroke)
08. How long has it been since the symptoms started? (After question 2 is asked)		Diabee...know.. (if Patient has Ischemic Stroke)
	1st Priority	Three hours ago. (if Patient doesn't have Ischemic Stroke)

Past Medical/Surgical History

09. Can you tell us about any health problems you might have?		Diabee...know.. (if Patient has Ischemic Stroke)
	2nd Priority	Up until now, I've never had anything special.

(if Patient doesn't have Ischemic Stroke)

10. Do you have high blood pressure?

Stree... boo...

(if Patient has Ischemic Stroke)

2nd Priority

Yes, my doctor told me that I have.

(if Patient doesn't have Ischemic Stroke)

11. Do you have high cholesterol?

Haavv... laa...

(if Patient has Ischemic Stroke)

2nd Priority

Not that I know of.

(if Patient doesn't have Ischemic Stroke)

12. Do you have diabetes?

Haavv... laa...

(if Patient has Ischemic Stroke)

1st Priority

Not that I know of.

(if Patient doesn't have Ischemic Stroke)

13. Have you had any severe illnesses or injuries before?

Remeen... leeff...

(if Patient has Ischemic Stroke)

2nd Priority

Up until now, I've never had anything special.

(if Patient doesn't have Ischemic Stroke)

Medications and Allergies

14. Are you currently taking any medication?

Haavv... laa...

(if Patient has Ischemic Stroke)

1st Priority

But I'm not taking any medication.

(if Patient doesn't have Ischemic Stroke)

15. Have you had any side effects from your medication?

Boo... streen...

(if Patient has Ischemic Stroke)

2nd Priority

But I'm not taking any medication.

(if Patient doesn't have Ischemic Stroke)

16. Are you taking any supplements?

Boo... streen...

(if Patient has Ischemic Stroke)

	Not a priority	No, I don't take supplements. (if Patient doesn't have Ischemic Stroke)
17. Do you have any allergies?	1st Priority	Stree... boo... (if Patient has Ischemic Stroke) No. (if Patient doesn't have Ischemic Stroke)
Social History		
18. Can you please tell me what you usually eat?	Not a priority	Remeen... leeff... (if Patient has Ischemic Stroke) I eat more or less everything. I'm not picky. (if Patient doesn't have Ischemic Stroke)
19. How far do you walk each day?	Not a priority	Diabee...know.. (if Patient has Ischemic Stroke) I don't normally do much exercise. I only walk to the shops and back, that sort of thing. (if Patient doesn't have Ischemic Stroke)
20. Have you been under any stress lately?	2nd Priority	Boo... streen... (if Patient has Ischemic Stroke) No, I'm retired now. (if Patient doesn't have Ischemic Stroke)
21. How often do you consume alcohol?	Not a priority	Remeen... leeff... (if Patient has Ischemic Stroke) I don't drink alcohol at all. (if Patient doesn't have Ischemic Stroke)
22. Do you eat snacks between meals?	Not a priority	Haavv... laa... (if Patient has Ischemic Stroke) Yes, sometimes I eat between lunch and dinner, when I'm hungry. (if Patient doesn't have Ischemic Stroke)

23. Are you a smoker?

2nd Priority

Boo... streen...

(if Patient has Ischemic Stroke)

No, I've never smoked in my life.

(if Patient doesn't have Ischemic Stroke)

24. Any recent weight changes?

Not a priority

Boo... streen...

(if Patient has Ischemic Stroke)

I don't think my weight has changed.

(if Patient doesn't have Ischemic Stroke)

25. Have you felt any changes to your appetite?

Not a priority

Remeen... leeff...

(if Patient has Ischemic Stroke)

I think my appetite has been the same.

(if Patient doesn't have Ischemic Stroke)

Medical Tests

The items below describe the possible test results in this scenario, including rules that may affect those results.

Decision aids

Stroke scale (NIHSS)

1st Priority

- On admission, untreated stroke: 13 - Moderate stroke
- Untreated stroke deteriorated to severe status: 25 - Severe stroke
- Therapeutic fibrinolytic dose administered: 8 - Moderate stroke
- After Thrombectomy: 3 - Minor stroke
- Late therapeutic fibrinolytic dose administered: 20 - Moderate to severe stroke
- Fibrinolytic overdose: 28 - Severe stroke

Electrophysiology

12-Lead ECG

2nd Priority

Sinus tachycardia.

Imaging

Cerebral CT angiography

1st Priority

Occlusion of the M1 segment of the left middle cerebral artery. No other pathological findings are visible.

Cerebral perfusion CT	1st Priority	Impaired Cerebral Blood Flow (CBF) and prolonged Mean Transit Time (MTT) in the left frontoparietal lobes; preserved Cerebral Blood Volume (CBV) in the whole territory.
Chest CT	Not a priority	Absence of significant changes of pulmonary parenchyma density and pleural effusion.
Chest X-Ray	Not a priority	The lungs are clear. The heart is normal in size. The mediastinum is within normal limits.
Head CT	1st Priority	Spontaneous hyperdensity in the M1 segment of the left middle cerebral artery. This information needs to be integrated clinically but it is likely related to an acute thrombus. There are no visible acute parenchymal lesions. The cerebral cisterns and ventricles are of normal volume. Small hypodensities present in left internal capsule and subcortical white matter bilaterally in presumed relation to chronic lesions of small vessel disease. There are no signs of bone fractures. ASPECTS: 10.
Neck Doppler ultrasound	2nd Priority	Normal carotoid artery flow.
Transcranial Doppler	2nd Priority	Occlusion of the proximal M1 segment of the left MCA. All other intracranial arteries have normal flow.
Transesophageal echocardiogram	Not a priority	No alterations.
Transthoracic echocardiogram	Not a priority	No morphological alterations; tachycardic heart rate.

Lab tests

Arterial blood gas	Not a priority	Decrease in PaO ₂ and O ₂ sat. Increase in PaCO ₂ .
		Blood pH - 7.36 Hemoglobin (g/dL) - 14.9 PaO ₂ (mmHg) - 55 PaCO ₂ (mmHg) - 49 HCO ₃ ⁻ (mEq/L) - 26.7

		BE (mEq/L) - 1.59 O2 sat (%) - 88 Na+ (mEq/L) - 139 K+ (mEq/L) - 4.1 Cl- (mEq/L) - 102 Anion gap (mEq/L) - 10.3 Lactate (mg/dL) - 10.8
		Due to simulation of test imprecision, there may be slight differences in the actual results.
Biochemistry	2nd Priority	Increase in Blood glucose. Decrease in GFR. Blood glucose (conventional) (mg/dL) - 112 Blood glucose (SI) (mmol/L) - 6.2 BUN (mg/dL) - 19 Serum creatinine (mg/dL) - 0.9 Creatinine clearance (mL/min) - 68 GFR (mL/min/1.73m ²) - 62.75 Na+ (mEq/L) - 139 K+ (mEq/L) - 4.1 Cl- (mEq/L) - 101 AST (IU/L) - 20.9 ALT (IU/L) - 32 AST/ALT - 0.66 AP (IU/L) - 77 CK (IU/L) - 113 Osmolarity (mOsm/L) - 291 CRP (mg/L) - 2.3
		Due to simulation of test imprecision, there may be slight differences in the actual results.
Cardiac biomarkers	Not a priority	CK-MB Mass (ng/mL) - 2 Troponin I (ng/mL) - 0.01 Myoglobin (ng/mL) - 17
Coagulation tests	2nd Priority	aPTT (s) - 38 Prothrombin time (s) - 12.0 INR - 1.0
Complete blood count	2nd Priority	No significant alterations. Leukocytes (/μL) - 8500 Neutrophils (/μL) - 4500

Lymphocytes (/μL) - 3200
Monocytes (/μL) - 410
Eosinophils (/μL) - 280
Basophils (/μL) - 110
Immature granulocytes (/μL) - 2
Erythrocytes (×10⁶/μL) - 4.8
Hemoglobin (g/dL) - 14.9
Hematocrit (%) - 44
MCV (μm³) - 92
MCH (pg/cell) - 30
MCHC (g/dL) - 35
RDW (%) - 12
Platelets (×10³/μL) - 222

Due to simulation of test imprecision, there may be slight differences in the actual results.

Lipid profile

Not a priority

No significant alterations.

Total cholesterol (mg/dL) - 171
Triglycerides (mg/dL) - 145
HDL cholesterol (mg/dL) - 69
LDL cholesterol (mg/dL) - 73
Cholesterol ratio - 2.5

Due to simulation of test imprecision, there may be slight differences in the actual results.

Urinalysis

Not a priority

No significant alterations.

Specific Gravity - 1.024
pH - 6.0
Urine color - Yellow
Appearance - Clear
WBC Esterase - Negative
Protein - Negative
Albumin - Negative
Glucose - Negative
Ketones - Negative
Erythrocytes - Negative
Bilirubin - Negative
Urobilinogen, Semi-Qn - 0.0
Nitrite, Urine - Negative
Intoxicants - Negative

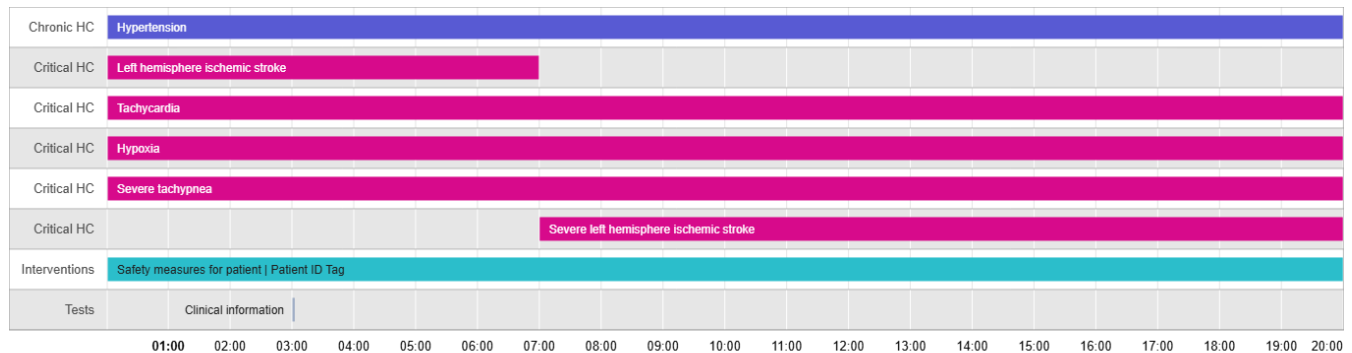
Initial notifications

Initial notifications presented to the trainee after a specified amount of time after starting the simulation

Medical test	Time	
Clinical information	03:00	Source: Emergency medical team report Previous medication: Family member informed that patient does not take any medication. Other information: Onset of speech impairment, drowsiness and right sided weakness 3 hours ago.

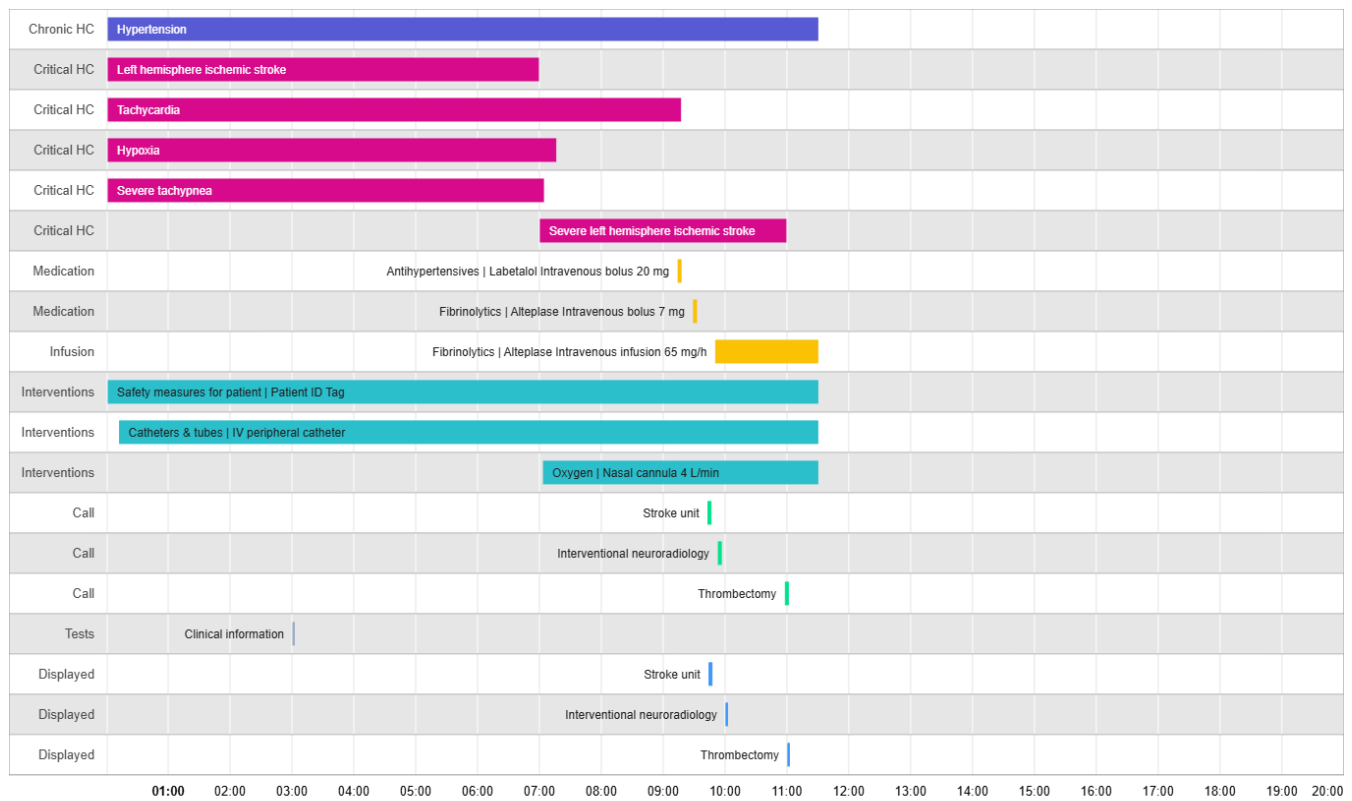
Baseline

This section is automatically generated and predicts scenario behavior assuming no actions by the trainee, which usually represents the worst-case scenario.



Optimal clinical approach

This section previews how the optimal approach resolves the scenario successfully. Comparison with Baseline may be useful to understand the scenario behavior.



Management

The items below represent management actions relevant to solving this clinical scenario. Notes: 1st Priority – Mandatory items required for a successful outcome. 2nd Priority – Optional items considered adequate but not essential. Not a Priority – Unnecessary items that are inadequate or a waste of time.

i.1 - Oxygen supplementation

1st Priority

Interventions | Oxygen | Nasal cannula

Interventions | Oxygen | High flow mask

i.2 - Administer an antihypertensive

1st Priority

Medications | Antihypertensives | Labetalol

i.3 - Administer an antihypertensive

2nd Priority

Medications | Antihypertensives | Clevidipine

i.4 - Administer a fibrinolytic

1st Priority

Medications | Fibrinolytics | Alteplase

Medications | Fibrinolytics | Tenecteplase

i.5 - Call Stroke unit

1st Priority

Call | Stroke unit

Message: "The stroke unit has been notified."

i.6 - Call Thrombectomy

1st Priority

Message: "The patient is ready to undergo a thrombectomy. Do you want to proceed?"

If the user presses the button:

- Thrombectomy by interv.

neuroradiology: Thrombectomy is

performed and a video with a report is

shown (see report in the "Notes"

section below)

- Cancel: the case continues

Report after Thrombectomy:
"Initially, occlusion of the proximal M2
segment of the left Middle Cerebral
Artery is visible (TICI 0).
Procedure: one pass of stentriever.
Final angiographic result: full
recanalization was observed (TICI 3)."

Question(s) during the simulation

Questions presented to the trainee in order to have a more detailed evaluation of the use of the clinical scenario.

Head CT question:

Question

Based on the patient's clinical
assessment and the head CT
findings, select the most likely
diagnosis:

Correct answer

Acute ischemic stroke

2 Incorrect answer(s)

Hemorrhagic stroke

Brain tumor

Head CT question:

Question

Does this CT have signs of any
intracranial hemorrhage?

Correct answer

No

1 Incorrect answer(s)

Yes

Head CT question:

Question

Based on the neurological
assessment, please rate the
stroke severity:

Correct answer

Moderate stroke

2 Incorrect answer(s)

Minor stroke

Severe stroke

Head CT question:

Question

Are there any contraindications for thrombolysis?

Correct answer

Yes

1 Incorrect answer(s)

No

Head CT question:

Question

Based on the patient's clinical assessment and the head CT findings, select the most likely diagnosis:

Correct answer

Acute ischemic stroke

2 Incorrect answer(s)

Hemorrhagic stroke

Brain tumor

Head CT question:

Question

Does this CT have signs of any intracranial hemorrhage?

Correct answer

No

1 Incorrect answer(s)

Yes

Head CT question:

Question

Based on the neurological assessment, please rate the stroke severity:

Correct answer

Moderate stroke

2 Incorrect answer(s)

Minor stroke

Severe stroke

Head CT question:

Question

Are there any contraindications for thrombolysis?

Correct answer

No

1 Incorrect answer(s)

Yes

Cerebral CT angiography question:

Question

Which vascular lesion is visible?

Correct answer

Occlusion of the left M1 MCA segment

2 Incorrect answer(s)

Occlusion of the left M3 MCA segment

No occlusions

Cerebral CT angiography question:

Question

What is the extent of the established ischemic infarct in the CT scan?

Correct answer

No changes. ASPECTS: 10

2 Incorrect answer(s)

Minor lesion. ASPECTS: 8

Large infarct. ASPECTS: 3

Cerebral CT angiography question:

Question

Does this patient have an indication for thrombectomy?

Correct answer

Yes

1 Incorrect answer(s)

No

Question(s) after simulation

Questions presented to the trainee in order to have a more detailed evaluation of the use of the clinical scenario.

Summative Multiple Choice

Question:

Question

What is the most likely diagnosis?

Correct answer

Ischemic stroke

3 Incorrect answer(s)

Migraine headache

Hemorrhagic stroke

Meningitis

Formative Multiple Choice

Question:

Question

No lesions were documented in the head CT performed 24 hours after thrombolysis. What is the adequate treatment choice at this point?

Correct answer

Start single antiplatelet immediately

2 Incorrect answer(s)

Start oral anticoagulation

Postpone antithrombotic medication until 48 hours

Formative Multiple Choice

Question:

Question

What is the maximum acceptable blood pressure value for thrombolysis

Correct answer

2 Incorrect answer(s)

administration?

185/110 mmHg

165/100 mmHg

205/120 mmHg

Formative Multiple Choice Question:

Question

What medical tests will this patient need after thrombolysis?

Correct answer

Transcranial Doppler; Neck ultrasound; ECG Holter

2 Incorrect answer(s)

Transcranial Doppler; CT perfusion; Neck ultrasound

EEG; Neck ultrasound; Transcranial Doppler

Handoff question

Question presented to the trainee to assess their ability to effectively communicate patient information during a transition of care. This question is optional.

Question

Summarize this Body Interact scenario using a structured handoff pattern.

Review handoff pattern

SBAR (Situation, Background, Assessment, Recommendation): Includes current condition and reason for handoff, relevant history and context, assessment details, and recommended actions.

SOAP (Subjective, Objective, Assessment, Plan): Covers

patient-reported symptoms and history, measurable data and findings, clinical impressions and diagnoses, and the treatment plan.

I-PASS (Illness Severity, Patient Summary, Action List, Situation Awareness and Contingency Planning, Synthesis by Receiver): Encompasses illness status, patient background, tasks and actions, potential changes and plans, and confirmation of understanding.

AT-MIST (Age, Time of incident or onset of symptoms, Mechanism of injury/Medical Complaint, Injuries or Inspections head-to-toe, vital Signs, and Treatments): Describes the cause of injury or medical complaint, findings from head-to-toe inspection, vital signs, and treatments provided.

Simulation Ending Messages

Feedback messages shown to the user based on specific successful or unsuccessful approaches, triggered by defined conditional rules.

Title	Type	Message	Conditional
Success	Success	Excellent work! You gathered the full clinical history and ensured comprehensive patient care. This thorough approach guarantees safe and accurate management, allowing you to better meet your patient's needs. Keep it up!	All health conditions have to be removed, except Hypertension, Severe Hypertension and Anuria which are allowed (case ends after 30 sec).
Failure	Failure	The patient suffered a severe	Health condition Severe Intracranial Hemorrhage was

intracranial hemorrhage, and induced in the patient (case underwent emergency neurosurgery. Recovered with severe permanent disability. ends after 2 min).

References

1. European Stroke Organisation (ESO) Executive Committee, ESO Writing Committee. Guidelines for management of ischaemic stroke and transient ischaemic attack 2008. *Cerebrovascular Diseases*. 2008;25(5):457-507.
2. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke*. March 2018.
3. Wahlgren N, Moreira T, Michel P, et al. Mechanical thrombectomy in acute ischemic stroke: Consensus statement by ESO-Karolinska Stroke Update 2014/2015, supported by ESO, ESMINT, ESNR and EAN. *International Journal of Stroke*. 2016;11(1):134-147.
4. Ahmed N, Wahlgren N, Grond M, et al. Implementation and outcome of thrombolysis with alteplase 3-4.5 h after an acute stroke: an updated analysis from SITS-ISTR. *Lancet Neurology*. 2010;9(9):866-874.
5. Barreto AD. Intravenous thrombolytics for ischemic stroke. *Neurotherapeutics: The Journal of the American Society for Experimental NeuroTherapeutics*. 2011;8(3):388-399.
6. Bivard A, Zhao H, Churilov L, et al. Comparison of tenecteplase with alteplase for the early treatment of ischaemic stroke in the Melbourne Mobile Stroke Unit (TASTE-A): a phase 2, randomised, open-label trial. *The Lancet Neurology*. 2022;21(6):520-527.
7. Brott T, Adams HP, Olinger CP, et al. Measurements of acute cerebral infarction: a clinical examination scale. *Stroke*. 1989;20(7):864-870.
8. Campbell BCV, Mitchell PJ, Churilov L, et al. Tenecteplase versus Alteplase before Thrombectomy for Ischemic Stroke. *New England Journal of Medicine*. 2018;378(17):1573-1582.
9. Dancsecs KA, Nestor M, Bailey A, Hess E, Metts E, Cook AM. Identifying errors and safety considerations in patients undergoing thrombolysis for acute ischemic stroke. *The American Journal of Emergency Medicine*. 2021;47:90-94.
10. Hacke W, Donnan G, Fieschi C, et al. Association of outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. *The Lancet*. 2004;363(9411):768-774.
11. Hall J, Thon JM, Heslin M, et al. Tenecteplase Improves Door-to-Needle Time in Real-World Acute Stroke Treatment. *Stroke: Vascular and Interventional Neurology*. 2021;1(1):e000102.

12. Huang X, Moreton FC, Kalladka D, et al. Coagulation and Fibrinolytic Activity of Tenecteplase and Alteplase in Acute Ischemic Stroke. *Stroke*. 2015;46(12):3543-3546.
13. LeCouffe NE, Kappelhof M, Treurniet KM, et al. 2B, 2C, or 3: What Should Be the Angiographic Target for Endovascular Treatment in Ischemic Stroke? *Stroke*. 2020;51(6):1790-1796.
14. Lees KR, Bluhmki E, von Kummer R, et al. Time to treatment with intravenous alteplase and outcome in stroke: an updated pooled analysis of ECASS, ATLANTIS, NINDS, and EPITHET trials. *The Lancet*. 2010;375(9727):1695-1703.
15. Mahawish K, Gommans J, Kleinig T, Lallu B, Tyson A, Ranta A. Switching to Tenecteplase for Stroke Thrombolysis: Real-World Experience and Outcomes in a Regional Stroke Network. *Stroke*. 2021;52(10):e590-e593.
16. Menon BK, Al-Ajlan FS, Najm M, et al. Association of Clinical, Imaging, and Thrombus Characteristics With Recanalization of Visible Intracranial Occlusion in Patients With Acute Ischemic Stroke. *JAMA*. 2018;320(10):1017-1026.
17. Menon BK, Buck BH, Singh N, et al. Intravenous tenecteplase compared with alteplase for acute ischaemic stroke in Canada (AcT): a pragmatic, multicentre, open-label, registry-linked, randomised, controlled, non-inferiority trial. *Lancet*. 2022;400(10347):161-169.
18. Miller SE, Warach SJ. Evolving Thrombolytics: from Alteplase to Tenecteplase. *Neurotherapeutics: The Journal of the American Society for Experimental NeuroTherapeutics*. 2023;20(3):664-678.
19. Palaiodimou L, Katsanos AH, Turc G, et al. Tenecteplase vs Alteplase in Acute Ischemic Stroke Within 4.5 Hours: A Systematic Review and Meta-Analysis of Randomized Trials. *Neurology*. 2024;103(9):e209903.
20. Tanswell P, Modi N, Combs D, Danays T. Pharmacokinetics and pharmacodynamics of tenecteplase in fibrinolytic therapy of acute myocardial infarction. *Clinical Pharmacokinetics*. 2002;41(15):1229-1245.
21. Warach SJ, Dula AN, Milling TJ, et al. Prospective Observational Cohort Study of Tenecteplase Versus Alteplase in Routine Clinical Practice. *Stroke*. 2022;53(12):3583-3593.
22. Warach SJ, Saver JL. Stroke Thrombolysis With Tenecteplase to Reduce Emergency Department Spread of Coronavirus Disease 2019 and Shortages of Alteplase. *JAMA neurology*. 2020;77(10):1203-1204.
23. Wardlaw JM, Murray V, Berge E, del Zoppo GJ. Thrombolysis for acute ischaemic stroke. In: *Cochrane Database of Systematic Reviews*. John Wiley & Sons, Ltd; 1996.
24. Zhu A, Rajendram P, Tseng E, Coutts SB, Yu AXY. Alteplase or tenecteplase for thrombolysis in ischemic stroke: An illustrated review. *Research and Practice in Thrombosis and Haemostasis*. 2022;6(6):e12795.

25. Metalyse® 5000 units (25 mg) EU Summary of Product Characteristics. Boehringer
Ingelheim International GmbH