

# SCRIPT

ACUTE ISCHEMIC STROKE IN CAROTID  
SEVERE STENOSIS



SCENARIO **#293**

**NAME**

FRANK BUTLER

**MEDICAL CATEGORY**

Neurology

**SCENARIO DIFFICULTY**

INTERMEDIATE

**SIMULATION ENVIRONMENT**

EMERGENCY ROOM

This patient is not a real patient and the clinical case, whilst 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 ischemic stroke in carotid severe stenosis

### Context

Mr. Frank Butler was at home with his wife when he suddenly felt difficulty moving his left limbs. In the previous days, there were two similar episodes but he recovered spontaneously and did not seek medical attention.

### Briefing

Male, 75 years old. Admitted to the emergency room due to a sudden onset of left hemiparesis. Mentions similar symptoms that resolved in the previous days.

### General learning objective

Select adequate reperfusion therapy treatments in acute stroke situations.

### Specific learning objectives

Recognize signs of an acute stroke

Identify the indications and contra-indications to intravenous thrombolysis and thrombectomy

Relate recurrence of symptoms within the same arterial territory as suggestive of arterial disease

Implement optimal therapeutical approach for acute stroke situations

### Environment

Emergency room

### Speciality

Neurology

### Difficulty

Intermediate

### Authors

Angels Initiative

## Patient characteristics

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

### Avatar



### First name

Frank

### Last name

Butler

**Age**

75

**Gender**

Male

**Race/Ethnicity**

Caucasian

**Model****Hair color**

Light gray

**Eye color**

Brown

**Smoker**

No

**Conscious**

Yes

**Sedated**

No

**Confused**

No

**Agitated**

No

**Last meal over 2h**

No

**Acetylsalicylic acid intolerance**

No

**Facial palsy**

100

**Speech impairment**

No

**Eyelid closure**

0

**Notes**

The patient has right facial palsy (left mouth deviation).

## Patient parameters

These parameter values are used by the simulator to initialize this scenario.

**Systolic arterial blood pressure (mmHg)**

156

**Diastolic arterial blood pressure (mmHg)**

101

**Heart rate (bpm)**

75

**O2 saturation (%)**

97

**Respiratory rate (/min)**

13

**Blood glucose (mg/dL)**

133

**Temperature (°C)**

36

**Hemoglobin (g/dL)**

15

Urinary output (mL/kg/h)

0.6

Weight (kg)

70

Potassium (mEq/L)

4.1

Speech rate (speed multiplier)

1

Height (cm)

160

BMI

27.34

Sodium (mEq/L)

139

## ABCDE assessment

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

### Airway

Airway observation

2nd Priority

Clear airway. Normal oropharynx. No readily audible abnormal breath sounds.

### 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 - resonance  
Left: 1L - resonance; 2L - resonance; 3L - superficial cardiac dullness; 4L - superficial cardiac dullness; 5L - resonance  
97

O2 Sat (%)

1st Priority

Pulmonary auscultation

2nd Priority

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

Respiratory rate  
(breath/min)

2nd Priority

13

### Circulation

Blood pressure (mmHg)

1st Priority

156/101

Capillary refill time  
(seconds)

Not a priority

1.3

Heart auscultation

2nd Priority

Irregular rhythm.

Heart rate (bpm)

1st Priority

75

Pulse palpation

Not a priority

Carotid - Amplitude: normal; Arrhythmic  
Radial - Amplitude: normal; Arrhythmic;  
Femoral - Amplitude: normal; Arrhythmic;  
Dorsalis pedis & Posterior tibial - Amplitude: normal; Arrhythmic;  
Popliteal - Amplitude: normal; Arrhythmic.  
0.6

Urinary output (mL/kg/h)

Not a priority

## Disability

Blood Glucose (mg/dL)	1st Priority	133
Glasgow Coma Scale	1st Priority	15 (E-4; V-5; M-6)
Pupil light reflex	2nd 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

## Dialogues

This is a complete list of all the possible dialogue lines both by the health practitioner (on the left) and respective responses by the patient (on the right).

### Medical condition

01. How are you feeling?	2nd Priority	I am not feeling too well. I have difficulty moving my left arm and leg.
02. Feeling pain?	2nd Priority	No, not really.
03. When did your symptoms start?	1st Priority	Approximately five hours ago.
04. What happened to you?	1st Priority	I was at home with my wife when I suddenly felt difficulty moving my left limbs.
05. Have you had any similar symptoms before?	1st Priority	Yes. Three days ago and yesterday I also had difficulty moving my left arm, but it lasted only about 15 minutes.
06. Do you have concomitant health conditions?	2nd Priority	I have high blood pressure and a small tumor in my urinary bladder.
07. Did you have any severe illness or injury before?	2nd Priority	Well... I have this tumor in my bladder, but they say it is controlled and only in my bladder.
08. Previous hospitalization?	2nd Priority	Yes, I did a minor intervention to my bladder two weeks ago.
09. Any recent weight changes?	Not a priority	No.

## Medication

- |   |                |   |
|---|----------------|---|
| 01. What medication have you been taking? | 1st Priority   | I am taking a pill for my blood pressure. I was also taking aspirin, but I stopped after the bladder intervention and have not restarted yet. |
| 02. Medication side-effects present?      | Not a priority | No.   |
| 03. Taking your medication properly?      | Not a priority | Well... I stopped the aspirin and I still haven't asked when I should restart it.   |

## Nutrition

- |  |                |                    |
|--|----------------|--------------------|
| 01. Describe your diet.                  | Not a priority | Relatively normal. |
| 02. How many meals per day?              | Not a priority | Five.              |
| 03. Have there been changes in appetite? | Not a priority | No.                |
| 04. Last time you ate?                   | Not a priority | Two hours ago.     |

## Activity

- |                            |                |                 |
|----------------------------|----------------|-----------------|
| 01. Do you exercise often? | Not a priority | No, not really. |
|----------------------------|----------------|-----------------|

## Risk factors

- |                                       |                |   |
|---------------------------------------|----------------|---|
| 01. Do you have hypertension?         | Not a priority | Yes, I do.  |
| 02. Do you have high cholesterol?     | Not a priority | I don't think so.                                     |
| 03. Recently under stress?            | Not a priority | Nothing out of the ordinary.                          |
| 04. Frequency of alcohol consumption? | Not a priority | Nothing.  |
| 05. Do you smoke?                     | Not a priority | Not now, but I have smoked before when I was younger. |

## Diagnostic strategies

The items below characterize the test results that are possible during this scenario, including rules that may condition test results.

### Bacteriological examinations

- |                |                |   |
|----------------|----------------|---|
| Blood cultures | Not a priority | Blood samples were collected and sent to microbiology lab. Complete results are due in four days. |
|----------------|----------------|---|

Urine culture	Not a priority	Samples were collected and sent to microbiology lab. Complete results are due in four days.
<b>Decision aids</b>		
Stroke scale (NIHSS)	1st Priority	000001(0403)00000=8 - Initial 100221(0403)02011=17 - After aggravation 000001(0201)00000=4 - After thrombectomy
<b>Electrophysiology</b>		
12-Lead ECG	Not a priority	Atrial fibrillation.
<b>Imaging</b>		
Abdominal CT scan	Not a priority	Liver: normal. Bile ducts: normal. Gallbladder: no calcified gallstones. Normal caliber wall. Pancreas: normal. Spleen: normal. Adrenals: normal. Kidneys: normal. Bowel: normal caliber. Mesenteric lymph nodes: no enlarged mesenteric lymph nodes. Peritoneum: no ascites or free air; no fluid collection. Vessels: normal. Retroperitoneum: normal. Abdominal wall: normal. Bones: normal. No visible alterations.
Abdominal radiography	Not a priority	Assessed abdominal structures present no alterations.
Abdominal ultrasound	Not a priority	No significant skeletal alterations.
AP pelvis radiography	Not a priority	A severe carotid atherosclerotic stenosis is observed in the post-bulbar segment of the right internal carotid artery. It shows irregular outline and causes a maximum stenosis of 80%.
Cerebral CT angiogram	1st Priority	The remaining supra-aortic vessels are all patent, showing minor atherosclerotic plaques without significant arterial stenosis (<50%). Absence of significant changes of pulmonary parenchyma density and pleural effusion.
Chest CT scan	Not a priority	No visible alterations.
Chest X-ray	Not a priority	Rectum: normal. Sigmoid Colon: normal. Descending Colon: normal. Splenic Flexure: normal. Transverse Colon: normal. Hepatic Flexure: normal. Ascending Colon: normal. Caecum: normal. Ileocecal valve: normal. Terminal Ileum: normal. No coronary occlusions found.
Colonoscopy	Not a priority	No presence of thrombus. No evidence of aortic dissection.
Coronary angiography	Not a priority	No parenchymal changes.
CT pulmonary angiography	Not a priority	No significant changes.
Head CT	1st Priority	
Lower ext. ultrasound	Not a priority	

Lower extremity CT	Not a priority	No significant alterations.
Neck Doppler ultrasound	Not a priority	Severe stenosis causing near occlusion of the right Internal Carotid Artery just after its beginning in the carotid bulb.
Pelvic CT scan	Not a priority	No enlarged retroperitoneal or pelvic lymph nodes. No ascites or free air. No other fluid collection. Blood vessels normal. Bone structures normal. Retroperitoneum normal.
Transcranial doppler	Not a priority	Occlusion of the right Middle Cerebral Artery in its M1 segment. All other intracranial arteries are visible and permeable.
Transesophageal echocardiogram	Not a priority	No alterations.
Transthoracic echocardiogram	Not a priority	No alterations found to cardiac morphology. Normal left ventricular systolic function.
Upper GI endoscopy	Not a priority	No visible alterations.
<b>Lab tests</b>		
Arterial blood gas	Not a priority	Blood pH - 7.39 PaCO <sub>2</sub> (mmHg) - 42 HCO <sub>3</sub> <sup>-</sup> (mEq/L) - 24.6 BE (mEq/L) - 0.02 Cl <sup>-</sup> (mEq/L) - 102 Lactate (mg/dL) - 9.0
Biochemistry	Not a priority	Due to simulation of test imprecision, there may be slight differences in the actual results. BUN (mg/dL) - 19 Na <sup>+</sup> (mEq/L) - 139 K <sup>+</sup> (mEq/L) - 4.1 AST (IU/L) - 21 ALT (IU/L) - 32 AP (IU/L) - 78 CK (IU/L) - 113 CRP (mg/L) - 2.3
Cardiac markers	Not a priority	Due to simulation of test imprecision, there may be slight differences in the actual results. CK-MB Mass (ng/mL) - 2 Troponin I (ng/mL) - 0.01 Myoglobin (ng/mL) - 17
Coagulation tests	2nd Priority	aPTT (s) - 36 Prothrombin time (s) - 12.0 INR - 1.0 D-Dimer (ug/mL) - 0.058



Complete blood count 2nd Priority

Leukocytes (/uL) - 8500  
Neutrophils (/uL) - 4500 (53%)  
Lymphocytes (/uL) - 3200 (38%)  
Monocytes (/uL) - 410 (5%)  
Eosinophils (/uL) - 280 (3%)  
Basophils (/uL) - 110 (1%)  
Immature granulocytes (/uL) - 0 (0%)  
Erythrocytes ( $\times 10^6/\mu\text{L}$ ) - 4.8  
Hemoglobin (g/dL) - 14.9  
Hematocrit (%) - 44  
MCV ( $\mu\text{m}^3$ ) - 92  
MCH (pg/cell) - 30  
MCHC (g/dL) - 35  
RDW (%) - 12.0  
Platelets ( $\times 10^3/\mu\text{L}$ ) - 222

Lipid profile Not a priority

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

Urinalysis Not a priority

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

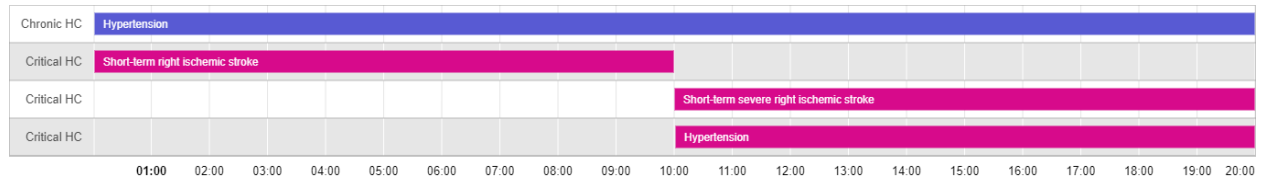
Specific Gravity - 1.024  
pH - 6.0  
Urine color - Yellow  
Appearance - Clear  
WBC Esterase - Negative  
Protein - Negative  
Albumin - Negative  
Glucose - Negative  
Ketones - Negative  
Erythrocytes - Negative  
Bilirubin - Negative  
Urobilinogen, Semi-Qn - 0.0  
Nitrite, Urine - Negative  
Intoxicants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

Urinary antigens Not a priority

Streptococcus pneumoniae - Negative  
Legionella pneumophila - Negative

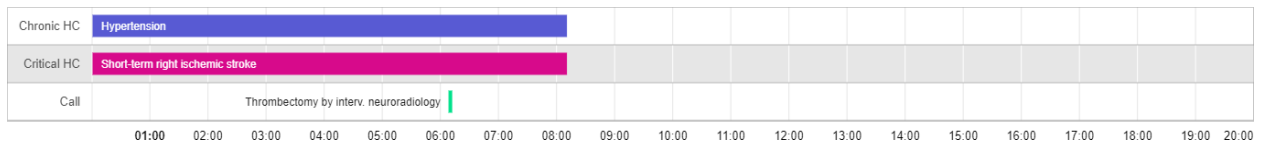
# Baseline

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.



## Health conditions

This section characterizes the illnesses, or Health conditions, the patient may be afflicted with in this scenario. These serve important foundational purposes in the Scenario, as they can be used to: affect what the patient says in Dialogues; influence how the patient deteriorates over time; condition Examination, Medical test and Call results; and determine the adequate Clinical approach required to solve the case successfully.

### Chronic health conditions

#### Hypertension

**Description:** High blood pressure.

### Critical health conditions

#### Hypertension

**Description:** Moderately high blood pressure. Does not directly lead to other conditions.

**Solution:** Antihypertensive or vasodilator.

#### Short-term right ischemic stroke

**Description:** Moderate blockage of a blood vessel in the right brain, with an onset less than 4.5 hours ago. After some time leads to severe short duration right ischemic stroke.

**Solution:** Alteplase, as long as within therapeutic window; and thrombectomy.

#### Short-term severe right ischemic stroke

**Description:** Severe blockage of a blood vessel in the right brain, with an onset less than 4.5 hours ago. Does not directly lead to other conditions.

**Solution:** Alteplase, as long as within therapeutic window; and thrombectomy.

## Treatment priorities

Treatment items that are considered necessary or adequate to solve this scenario are listed below. Notes: 1st Priority - mandatory items to solve the case successfully. 2nd Priority - optional items that are considered adequate, but are not essential. Not a Priority - unnecessary items that are considered inadequate or a waste of time.

### Medications

01

Acetylsalicylic acid (oral, between 75 and 300 mg)

Clopidogrel (oral, 75 or 300 mg)

Antiplatelets >  
Acetylsalicylic acid

2nd Priority

Antiplatelets > Clopidogrel

2nd Priority

### Call

#### Carotid stenting

The right common carotid artery was catheterized by retrograde approach through the right femoral artery. A severe stenosis was observed in the post-bulbar segment of the right internal carotid artery. A stent was implanted in the right internal and common carotid arteries. The final post-procedural angiogram showed permeable internal carotid artery. No relevant complications occurred.

Carotid stenting by interv.  
neuroradiology

2nd Priority

## Thrombectomy

Initially, occlusion of the proximal M1 segment of the right Middle Cerebral Artery is visible (TICI 0). After stentriever, full recanalization was observed (TICI 3).

Thrombectomy by interv. neuroradiology

1st Priority

## Differential diagnosis

Multiple choice question presented to the trainee in order to confirm whether they got the diagnosis right.

- Correct answer** Right hemisphere ischemic stroke
- 3 Incorrect answers** Basilar artery stroke
- Right hemisphere hemorrhagic stroke
- Brain tumor

## Ending messages

Feedback messages presented to trainees for particular successful or failed approaches and the respective conditional rules that trigger these messages.

Title	Type	Message	Conditional
Thrombectomy + stenting (with medication)	Success	You have solved the case with clinical success.	Case ends in 30 seconds if, after doing a thrombectomy and a carotid stenting, it's given to the patient acetylsalicylic acid (oral, between 75 and 300 mg) or clopidogrel (oral, 75 or 300 mg).
Thrombectomy + stenting (without medication)	Success	You have solved the case with clinical success. However, your medical approach to stenting was not ideal.	Case ends in 120 seconds if, after doing a thrombectomy and a carotid stenting, no medication is given.
Only thrombectomy (success)	Success	You have solved the case according to treatment guidelines, with clinical success.	Case ends in 120 seconds, after the thrombectomy.

Thrombectomy not performed

Failure

You didn't follow the guidelines nor had clinical success. Try again!

Case ends after 900 seconds if a thrombectomy is not conducted in that interval.

## References

1. Committee TESO (ESO) EC and the EW. 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*. 2018;49(3):e46-e99.
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.