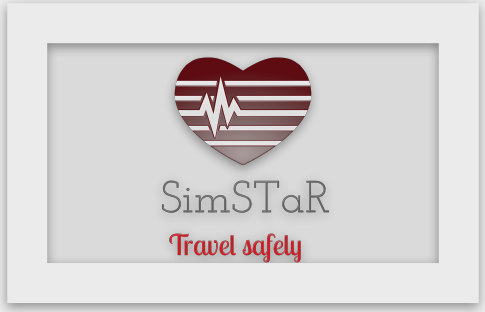
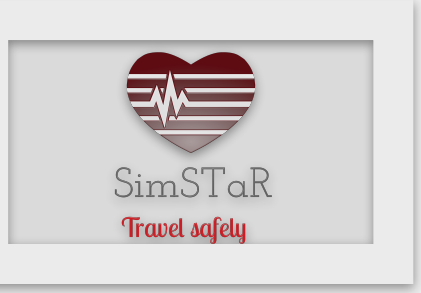
SimSTaR

Travel safely



Special Patient Groups



Neurosurgical patient

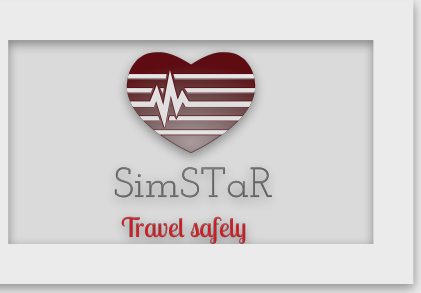
Vascular patient

Cardiac patient

Burns

Level 2 HDU patients

Overview



26 year old male

Trauma: cyclist vs car

CT extensive SDH, no other injuries sustained

Initial GCS 14/15 now dropped to 7/15 over 2 hours

Awaiting transfer to neurosurgical unit

Neurosurgical Patient

Epidemiology

- Common indication for transfer
  - 1 000 000 head injury attendances/year
  - 150 000 require hospitalisation
  - 7500 require urgent neurosurgical input
- Injuries
  - Traumatic brain injury
  - Extra/Sub dural haematoma
  - Subarachnoid haemorrhage
  - Acute hydrocephalus

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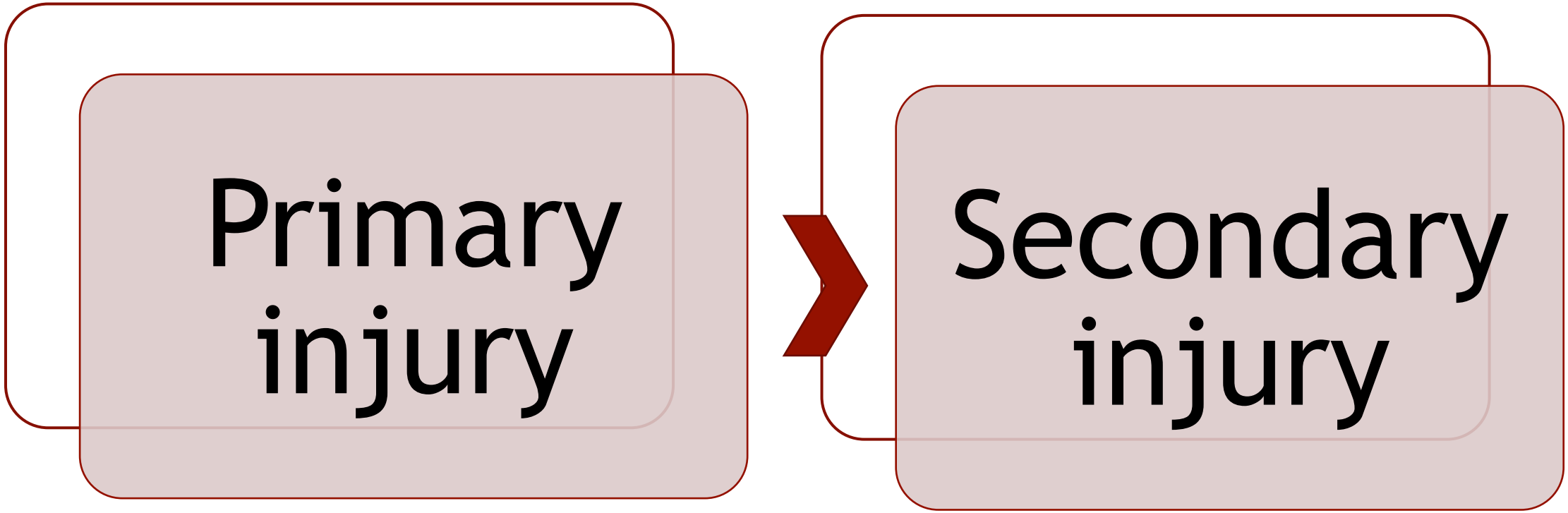

Prevention of secondary injury

1

Maintaining cerebral blood flow (CBF)

2

Minimising cerebral metabolic demand ($CMRO_2$)

3

Optimising intracranial pressure (ICP)

Cerebral Blood Flow

CPP = MAP – ICP

CPP = cerebral perfusion pressure

MAP = mean arterial pressure

ICP = intracranial pressure

CPP > 60mmHg

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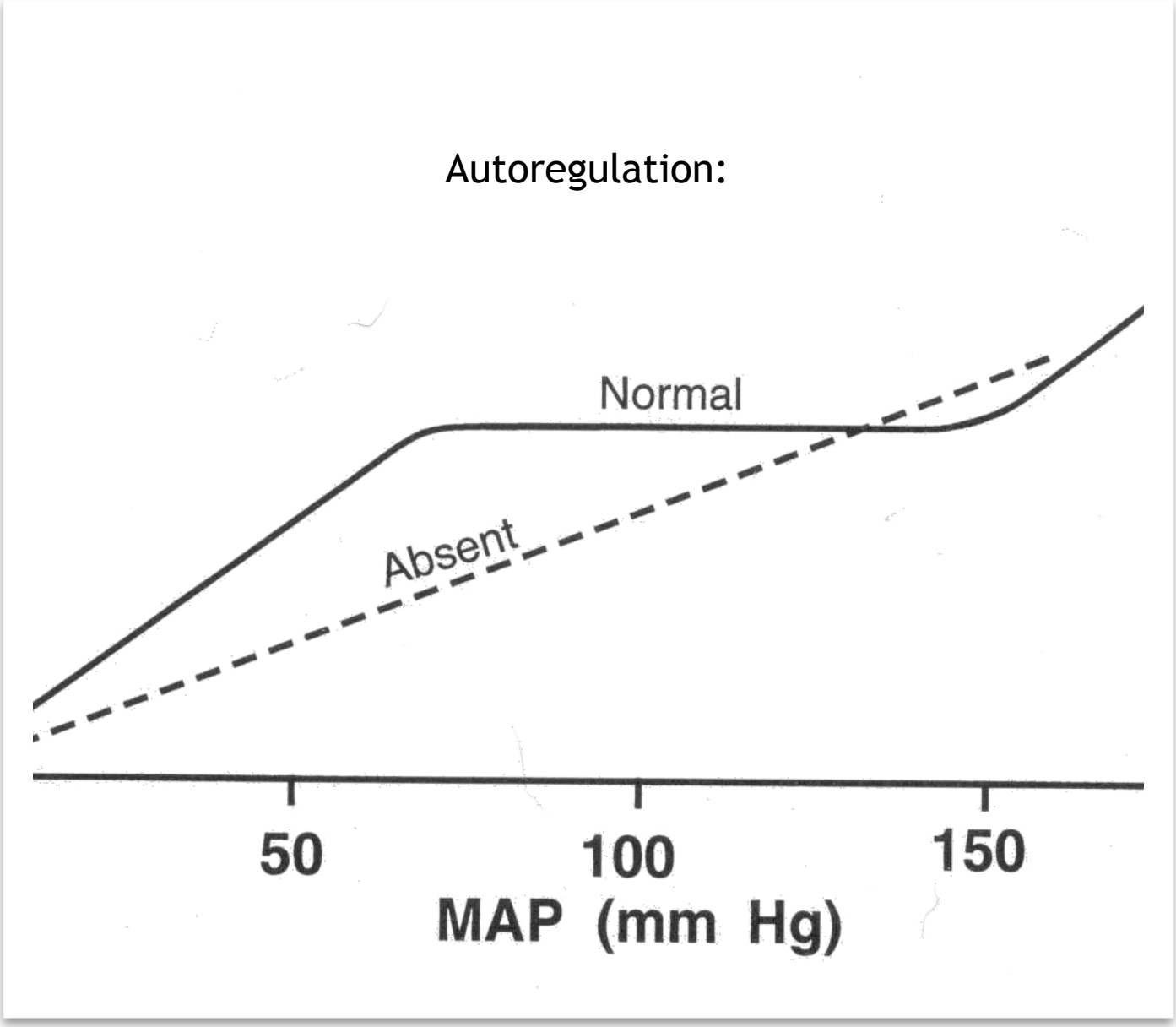

Minimising cerebral metabolic demand

- Treat seizures
- Adequate sedation
- Avoid
  - Hyperthermia
  - Hyperglycaemia
  - Sodium imbalance

Intracranial Pressure

Monroe – Kellie Doctrine

The sum of volumes of brain, cerebrospinal fluid (CSF) and intracerebral blood is constant.

An increase in one should cause a reciprocal decrease in either one or both of the remaining two.

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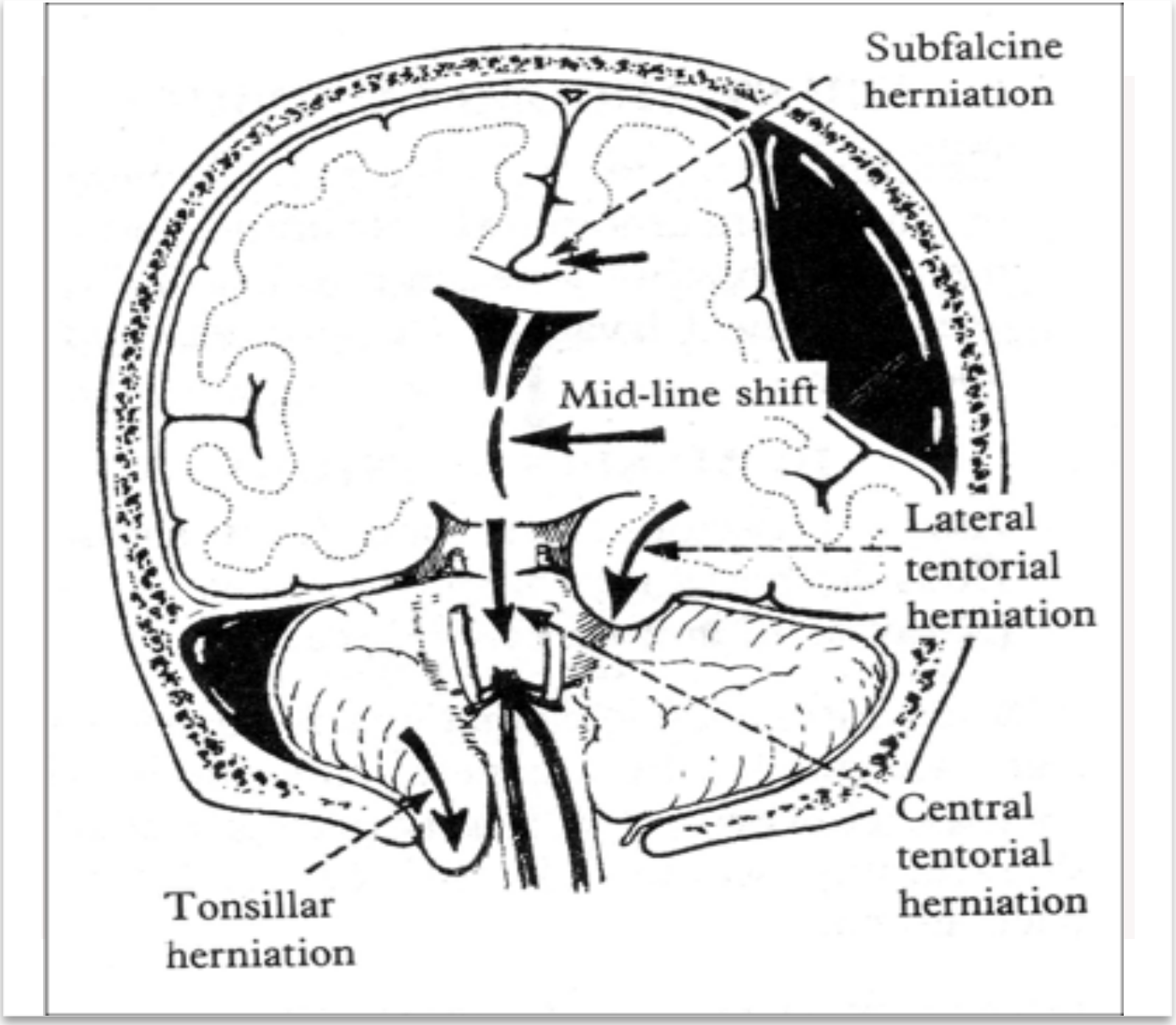
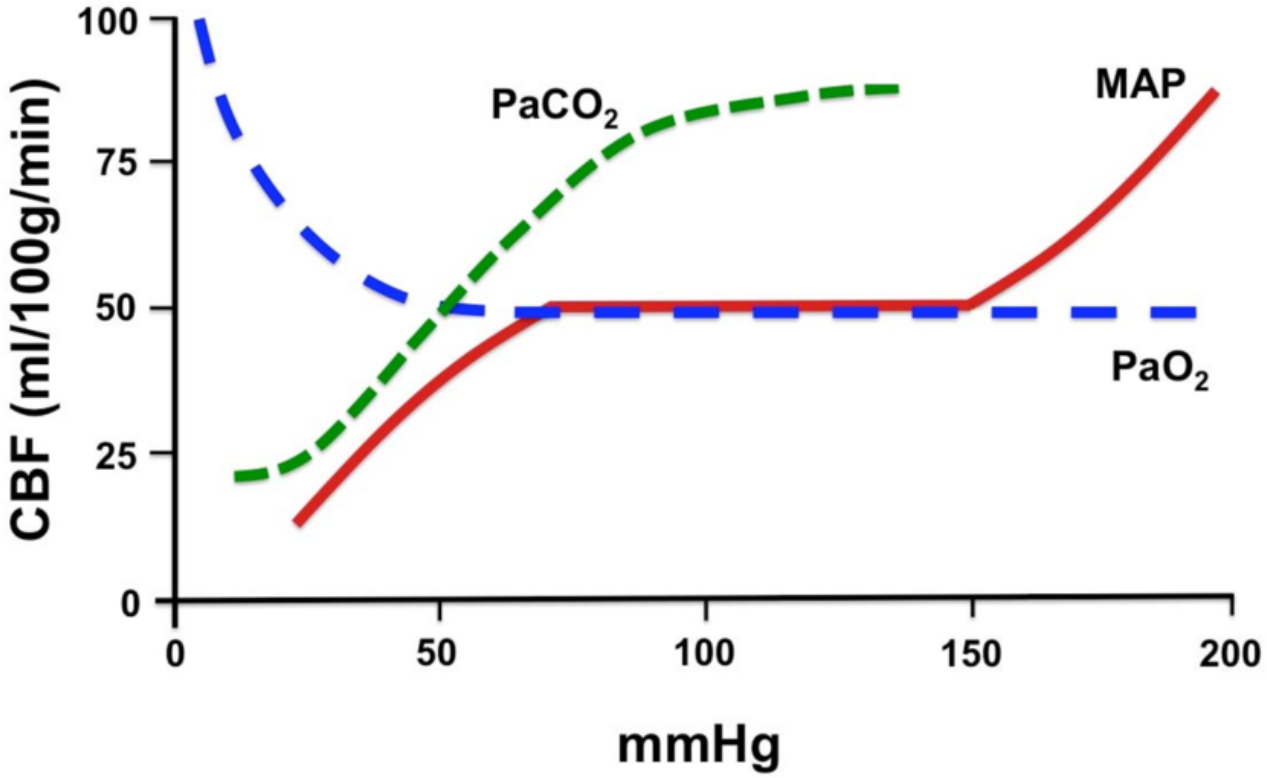


Minimising intracranial pressure

- Avoid cerebral vasodilation
- Maintain venous drainage
- Minimise intra-thoracic pressure



CBF = cerebral blood flow

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Ready to transfer?

24 year old male

Traumatic SDH requiring neurosurgical intervention

GCS on arrival 14/15 now dropped to 7/15

HR 120 BP 99/52 (68)

$Sa0_2$ 96% 15L NRB, no ABG available

Pre Transfer Stabilisation

AIRWAY

(& C-Spine)

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Pre Transfer Stabilisation

BREATHING

- Stabilise on transport ventilator
- Establish A-a gradient
- CXR

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Pre Transfer Stabilisation

CIRCULATION

- Invasive BP monitoring
- Anticipate hypotension
- Blood Pressure

CPP > 60 mmHg

MAP > 80-90 mmHg

Subarachnoid Haemorrhage?

-> SBP < 160 mmHg

Acute changes consider ICP or seizures

- Central lines

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Pre Transfer Stabilisation

DISABILITY

- Optimise intracranial pressure
  - Osmotherapy required?
  - Mannitol v Hypertonic Saline??
- Seizures
  - Phenytoin 15 mg/kg IV
  - Or Levetircetam 40mg/kg up to max 3000mg
- Documentation

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Pre Transfer Stabilisation

EXPOSURE

- Consider other injuries
  - Haemorrhage control
  - Secondary survey
- Anticipate fluid shifts

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What is the problem?

Patient intubated, sedated and paralysed for transfer

Decision made for time critical transfer by referring team to neurosurgical unit for urgent surgery

10 minutes into the journey

Patient becomes acutely hypertensive 200/105

Right pupil dilated and unreactive

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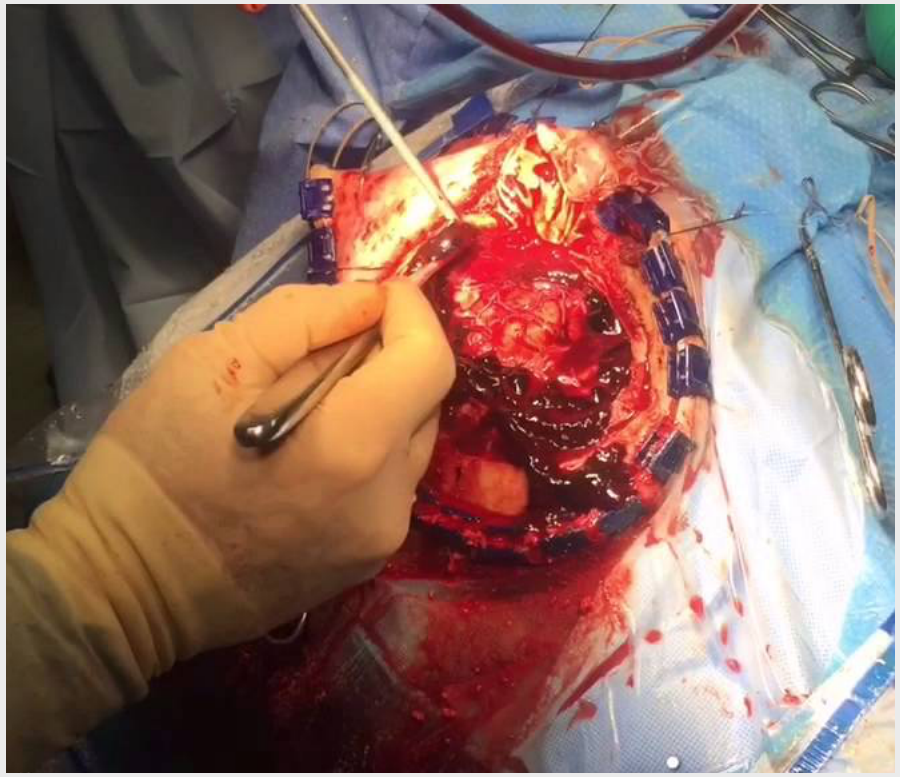
RAISED INTRA-CRANIAL PRESSURE!

Reduced GCS
Cushing's response
3rd Nerve palsy

- General measures
  - Head up
  - Loosen ETT ties
  - optimise blood pressure
  - ensure adequate oxygenation
  - consider hyperventilation
  - ensure adequately sedated
- Osmotic agent
  - 2.7% Saline 4 mls/kg (can be repeated)
  - Mannitol 0.25-1 g/kg (100-400 mls 20%)
- Discuss with neurosurgeons



Patient treated with Hypertonic Saline

Discussed with neurosurgery and decision to transfer directly to theatre for urgent surgery

Patient transferred to level 3 theatres RVH and care handed over to tertiary team

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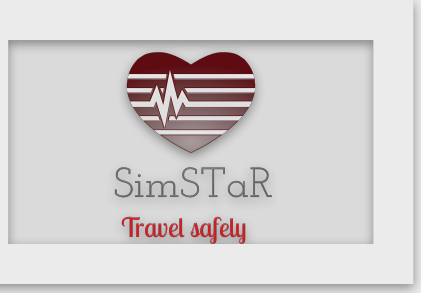
Travel safely

Key points

- TIME is BRAIN
  - Early communication with neurosurgical centre
- Neuroprotection
  - Optimise ICP
  - Maintain CPP > 60 mmHg
  - Reduce $CMRO_2$



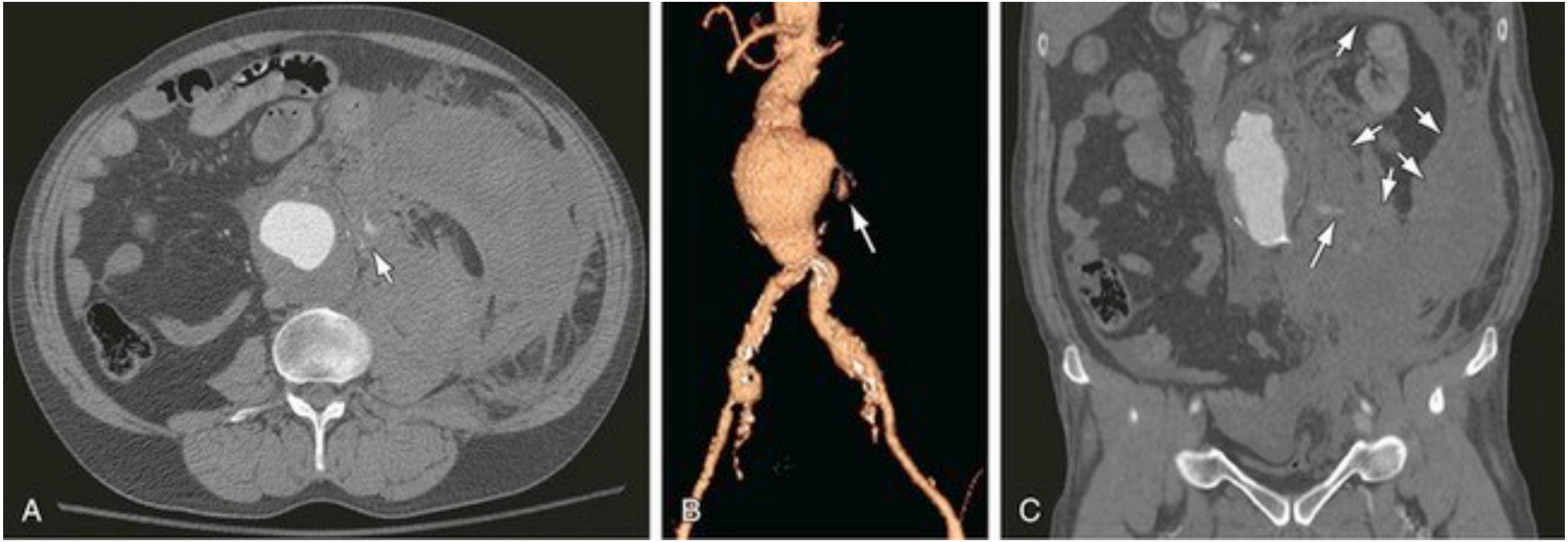
78 year old male

Presenting with acute abdominal pain radiating to the back

Confirmed contained endovascular aortic leak on CT angiogram

For transfer to vascular center

Vascular patient


A
B
C

Principles

- Fast focused history e.g. AMPLE history (Allergies; Medication; PMH; Last meal; Events)
- Co-morbidities may influence vascular management plan

- Monitoring and access
  - At least x 2 large bore IV lines
  - Arterial line
  - Blood products

Resuscitation goals

- Think Aortic tear
  - SBP < 100 mmHg
  - HR < 100
- Blood in the wrong place hurts!

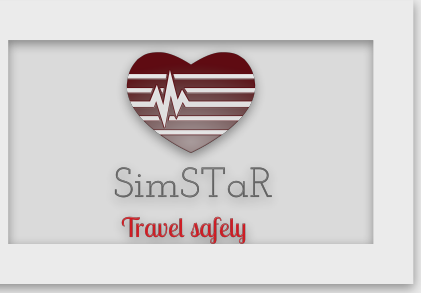
Deterioration

- Stay calm
- Analgesia
- Cautious fluids
- CPR likely to be futile

SimSTaR
Travel safely

Key points

- Needs swift transfer - definitive treatment not possible in DGH
- Cautious fluids
- Analgesia
- Stay calm



65 year old female

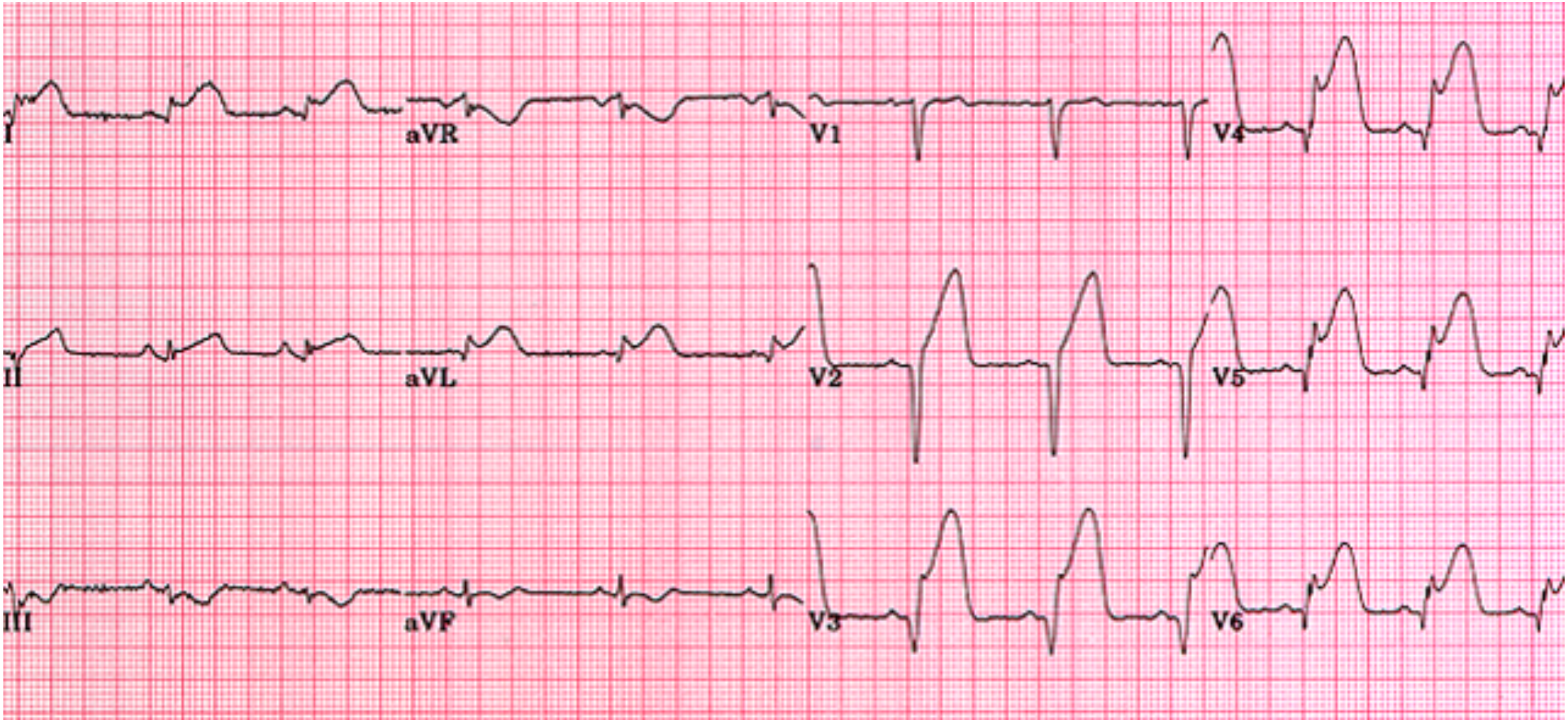
Sudden onset central chest pain and shortness of breath

Anterolateral STE on ECG

In extremis in ED

For transfer to PCI unit

Cardiac patient


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6

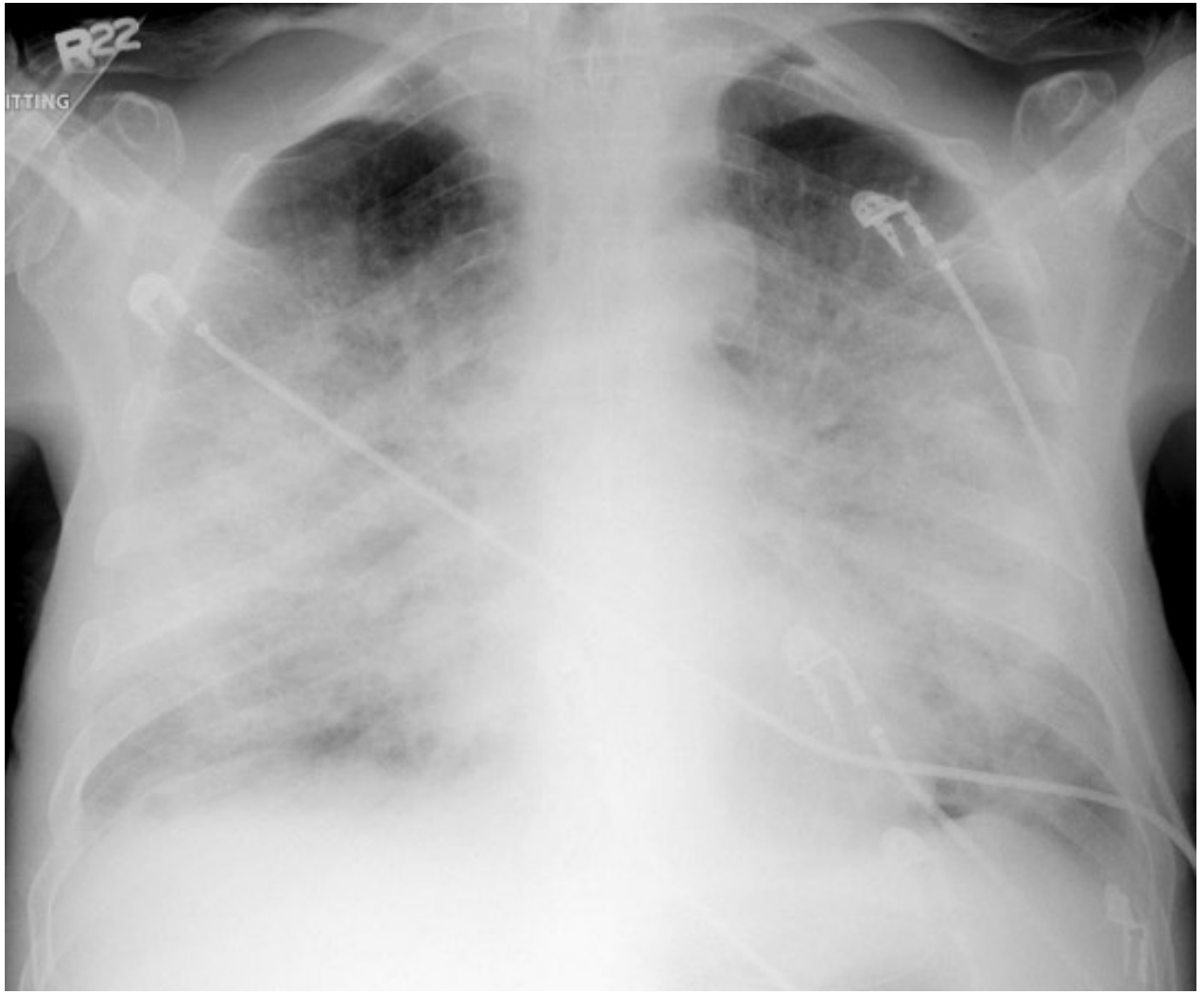
Other pathologies requiring transfer

- Acute myocardial infarction - for revascularisation
- Acute valvular dysfunction
- Failure of cardiac support device
- Acute pericardial pathology requiring surgery
- Refractory cardiogenic shock
- Trauma

Pre Transfer Stabilisation

AIRWAY + BREATHING

- pulmonary oedema?



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Pre Transfer Stabilisation

CIRCULATION

- Monitoring
  - Defibrillator
- Understand underlying pathology
- Inform receiving unit and discuss plan for deterioration

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Pre Transfer Stabilisation

CIRCULATION

- SBP > 100 mmHg
- MAP > 65 mmHg
- HR < 100

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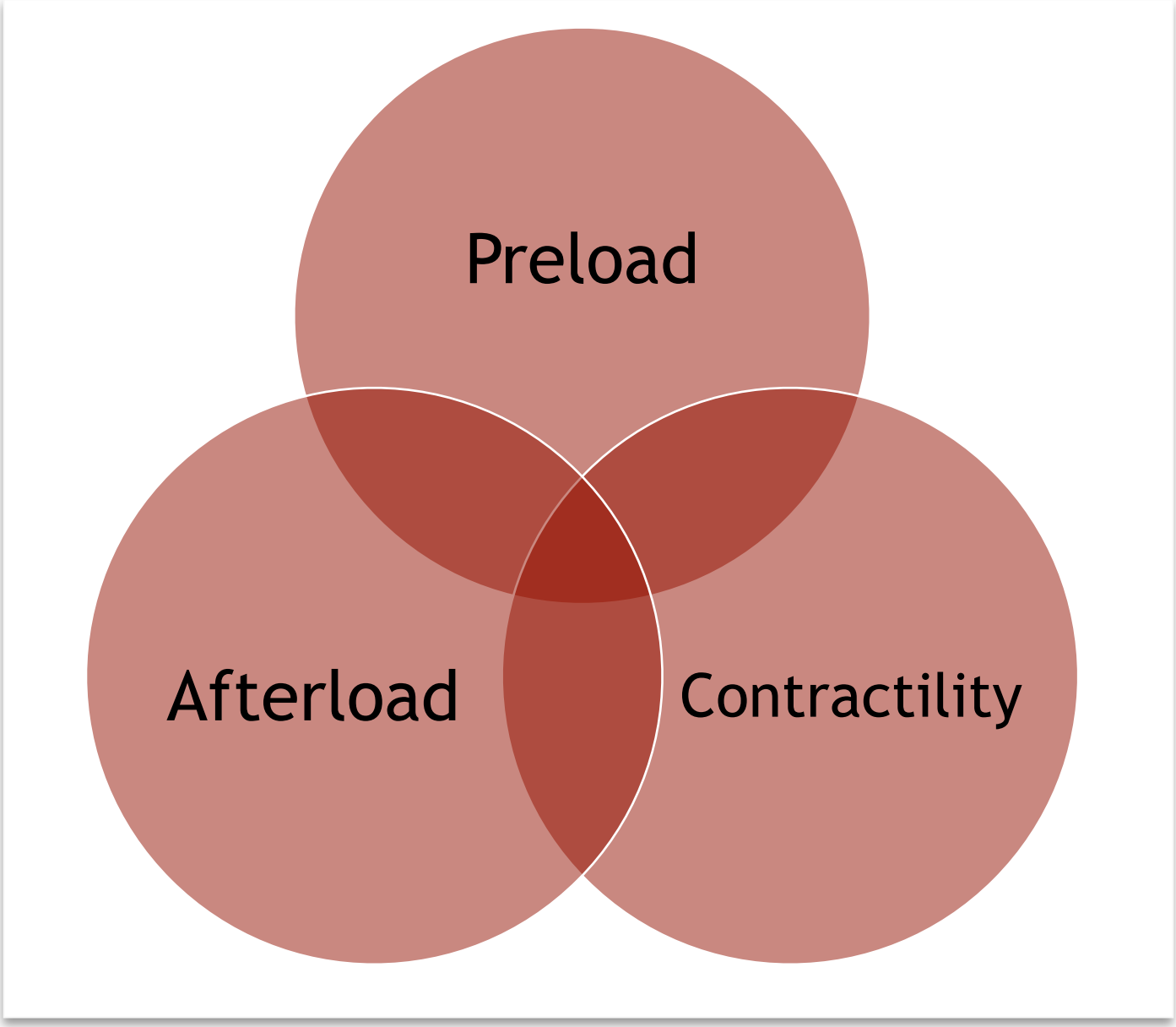

Patient intubated, arterial line inserted and peripheral adrenaline infusion commenced prior to transfer

10 minutes into transfer

VF with loss of arterial trace and $ETCO_2$ trace

What do you do?

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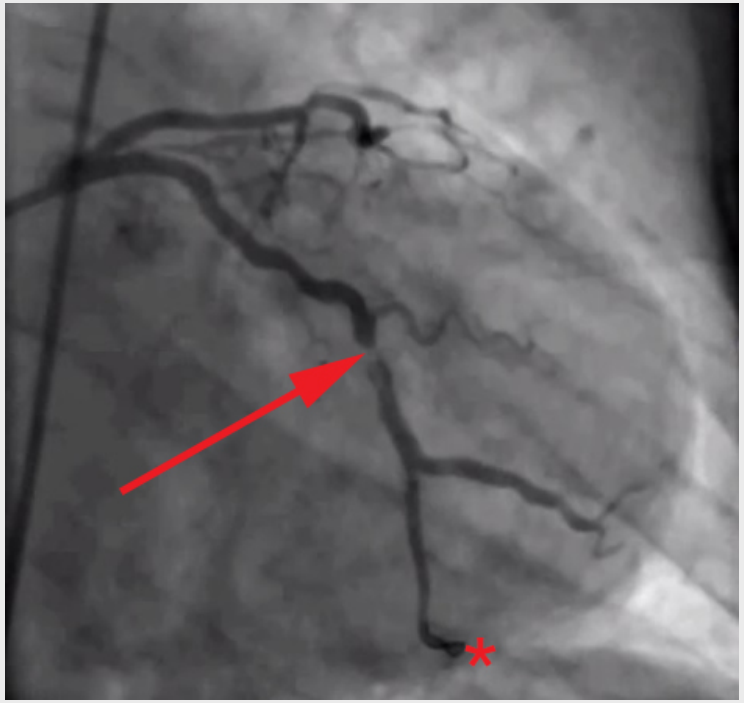
PULL OVER!

Deterioration

- Stay calm
- Think about underlying pathology
- Cautious IV fluids
- Titrate vasoactives
- Treat arrhythmias
- DCC for VF! - followed by ALS



- x2 cycles CPR, x1 adrenaline, x2 shocks ROSC
- Adrenaline infusion titrated
- Transferred directly to cardiac cath lab RVH without further incident
- Care handed over to tertiary team and undergoes primary PCI

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Key points

- Understand underlying pathology
- Pre-transfer stabilisation is key
- Optimise cardiac function
- Discuss destination and plan if deteriorates with receiving team

Burns patient

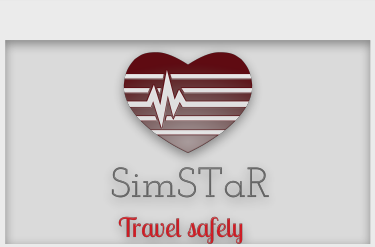
45 year old male

Extracted from a house fire

Partial thickness burns to face, neck, chest and arms

$Sa0_2$ 98% on room air, audible wheeze, complaining of shortness of breath

For transfer to burns unit



Airway and Breathing

- Intubate early if evidence of inhalational injury or airway burns
- High FiO_2 to reduce HbCO levels
- Use co-oximeter
- Beware cyanide toxicity

Circulation

- Parkland formula for fluid resuscitation
  - Fluid deficit (mls) = 4 x weight (kg) x % TBSA
  - 1/2 given in the first 8hrs
  - Remaining volume in the next 16hrs
  - UO 0.5-1 ml/kg/hour
- Analgesia
- Avoid hypothermia

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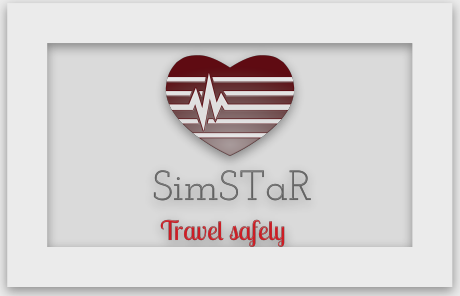
Key points

- Early intubation
- Fluid replacement
- Temperature management
- Analgesia



HDU level 2 patients

Non-Invasive Ventilation

- Cannot transfer patient on $HFNO_2$ (yet)
- High oxygen consumption
- Consider potential for deterioration

Summary

- Neurosurgical patient
  - Time is brain
  - Neuroprotection
  - Think ICP and seizures
- Vascular patient
  - Think aortic tear
- Cardiac patient
  - Understand pathology
  - Optimise cardiac function
- Burns
  - Early intubation
- HDU
  - Think oxygen

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