Care of the Critically Ill Patient

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Northwick Park and St Marks Hospitals

My Hospital


Northwick Park
&
St. Marks Hospitals
ternity Drop Off Only
n Entrance
dent & Emergency

My Football Team

Lecture Aim

- PHYSIOLOGY

How do we treat the very ill patient?

Supplies

- Making sure that the blood has oxygen in it

Carrier

- Making sure that the blood has oxygen in it AND .....

Meeting the requirements

- Making sure that the blood has oxygen in it AND that the blood goes round and round the body

Delivery

- OXYGEN DELIVERY

Oxygen Delivery

- Oxygen delivery depends on:
  - Haemoglobin concentration

Oxygen Delivery

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  - Haemoglobin concentration
  - The amount of oxygen on haemoglobin (Oxygen Saturation)

Oxygen Delivery

- Oxygen delivery depends on:
  - Haemaoglobin concentration
  - Oxygen Saturation
  - Amount of blood pumped around the body (Cardiac Output)

Oxygen Delivery

- Oxygen delivery depends on:
  - Haemaoglobin concentration
  - Oxygen saturation
  - Cardiac output
- If patients don’t get any of these the organs begin to fail and die.

Oxygen delivery (VO_2)

- VO_2

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- VO_2 = [Hb] x 1.34

Oxygen delivery (VO_2)

- $VO_2 = [Hb] \times 1.34 \times SaO_2$

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  - pulse 140
  - drowsy
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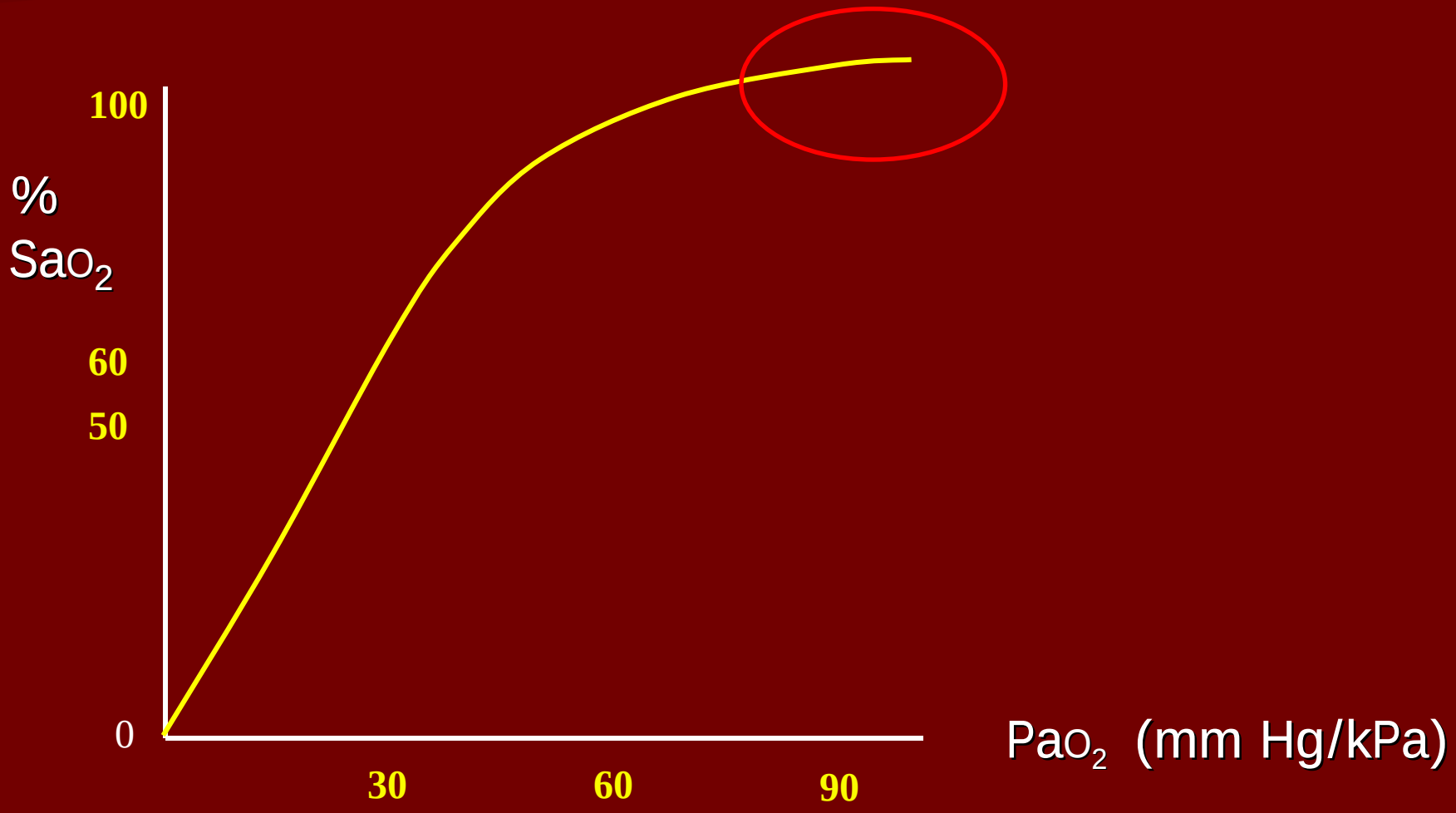
WHAT DO YOU DO FIRST?

100%

O_2

Oxygen Dissociation Curve



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Respiratory

- Hypoxia

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    - Pain and pethidine

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    - Asthma
    - ‘Alveolar Block’ – Pus / oedema / Blood

Respiratory

- Hypoxia
  - Hypoventilation
    - Pain and pethidine
  - Lung disease
    - Asthma, ‘Alveolar Block’ – Pus / oedema / Blood
  - Circulation
    - Poor pulmonary circulation – PE / Heart Failure

Example 1

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Blood Pressure and Shock

- Shock is a generalized state of hypoperfusion causing:
  - Anaerobic metabolism
  - Lactic acid production
  - Cellular dysfunction
  - Cell death
  - Organ Failure

Blood Pressure

- BP =

Blood Pressure

- BP = Cardiac Output (CO) x Systemic Vascular Resistance (SVR)

Blood Pressure

Cardiac Output

- CO =

Cardiac Output

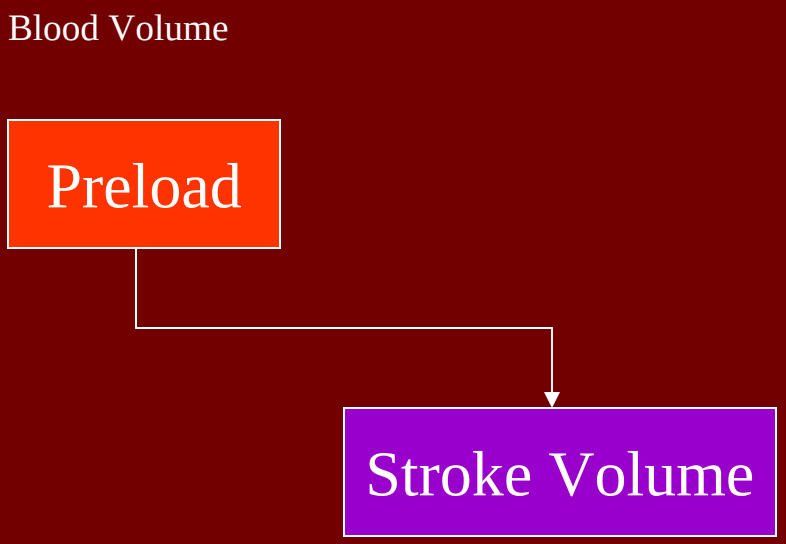
- CO = Stroke Volume (SV) x Heart Rate (HR)

Cardiac Output

- CO = Stroke Volume (SV) x Heart Rate (HR)

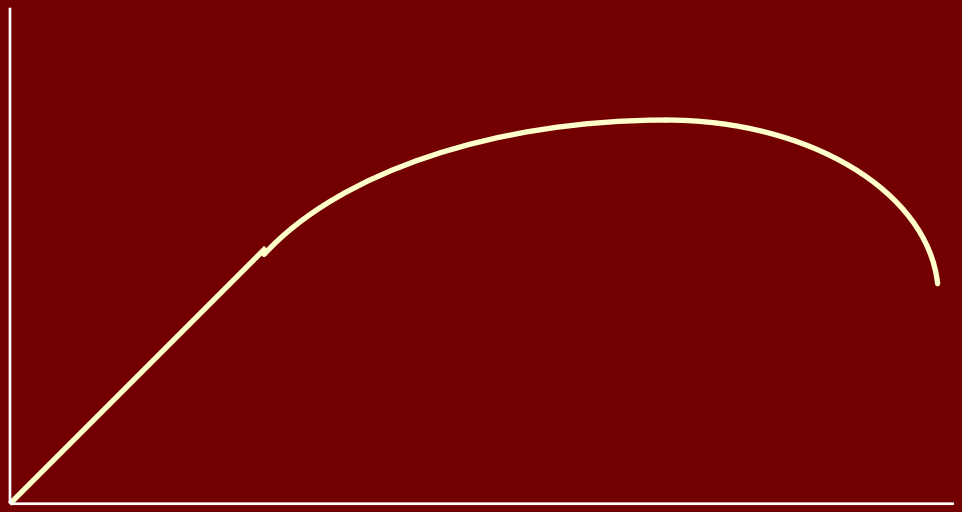
Control of stroke volume

- CO = SV x HR



Starling's Law of the Heart

Stroke volume
(BP, CO, UO)



Initial fibre length
(JVP, CVP)

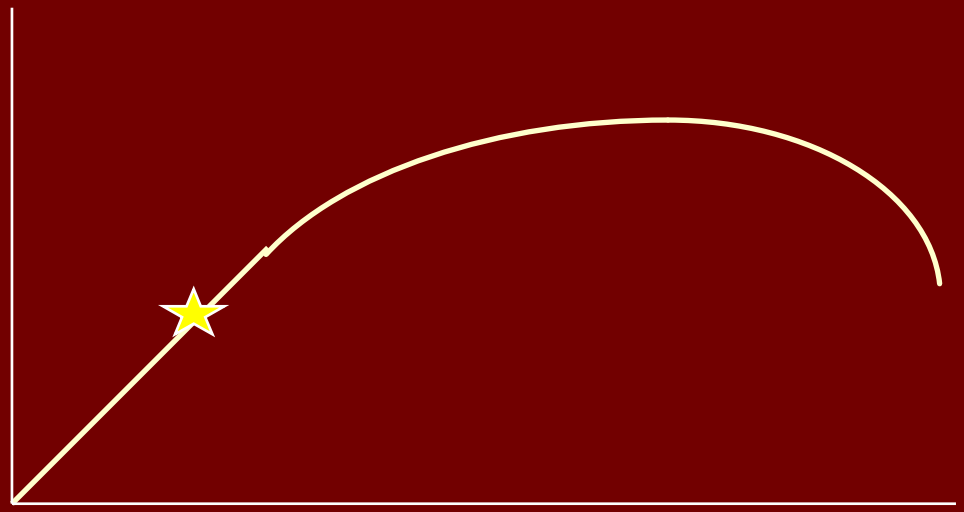
CVP – the dip stick

CVP measurement

- Zero taken:
  - 5 cm below sternum
  - mid-axillary line in the 4^{th} interspace
- Normal CVP - 3 to 12 cm H_2O

Starling's Law of the Heart

Stroke volume (BP, CO, UO)



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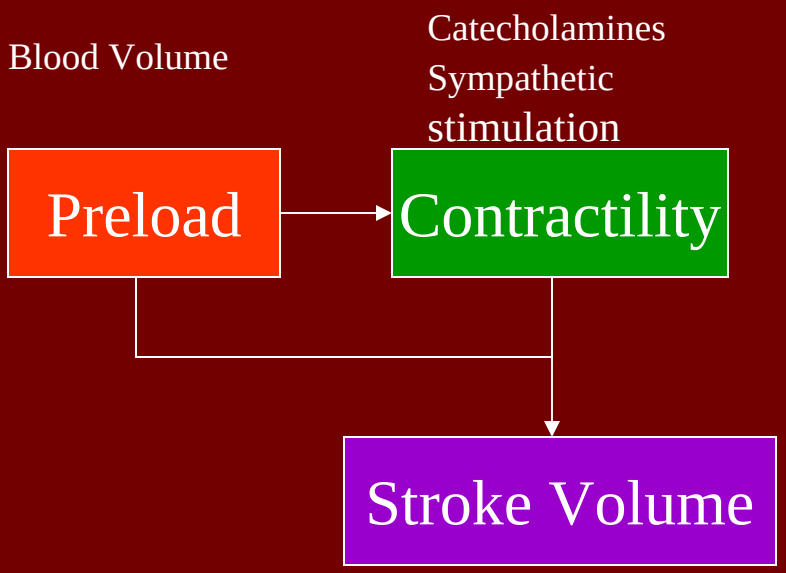

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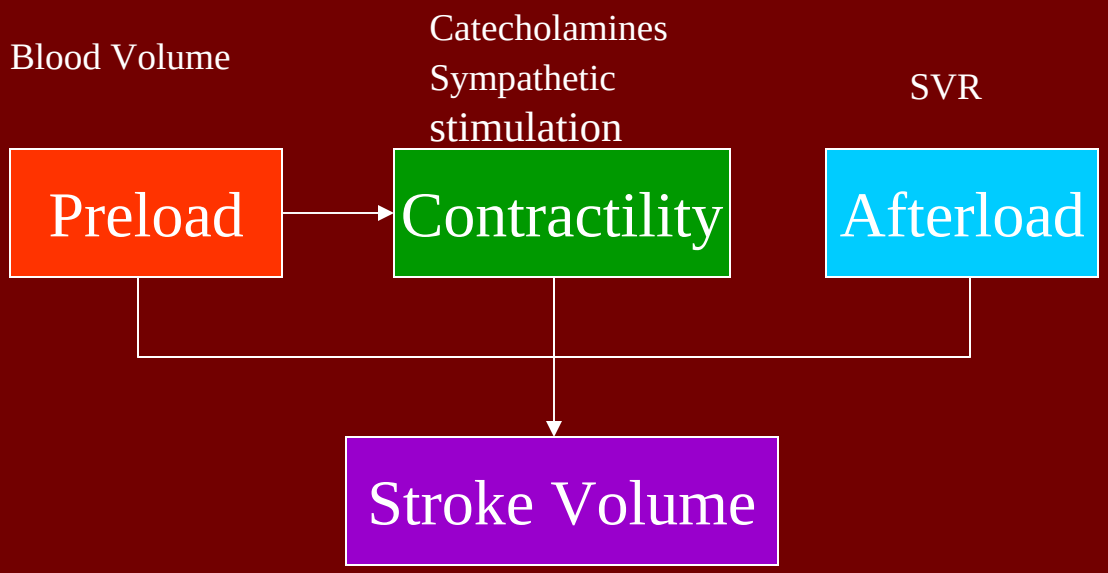
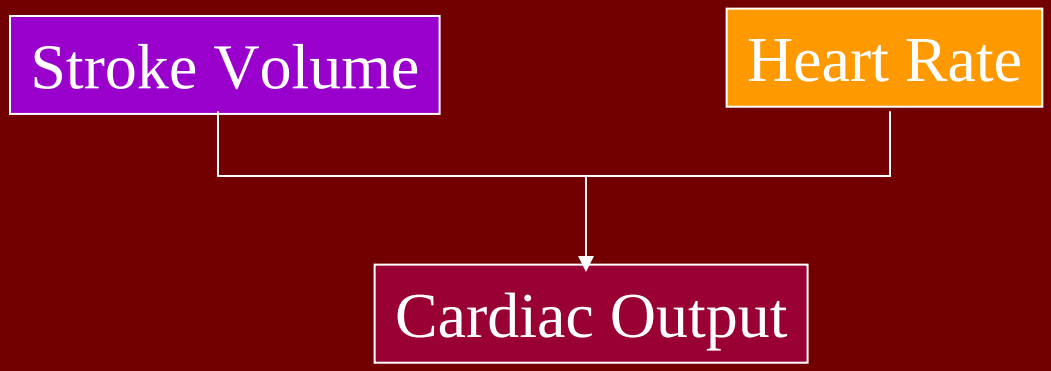


Control of cardiac output

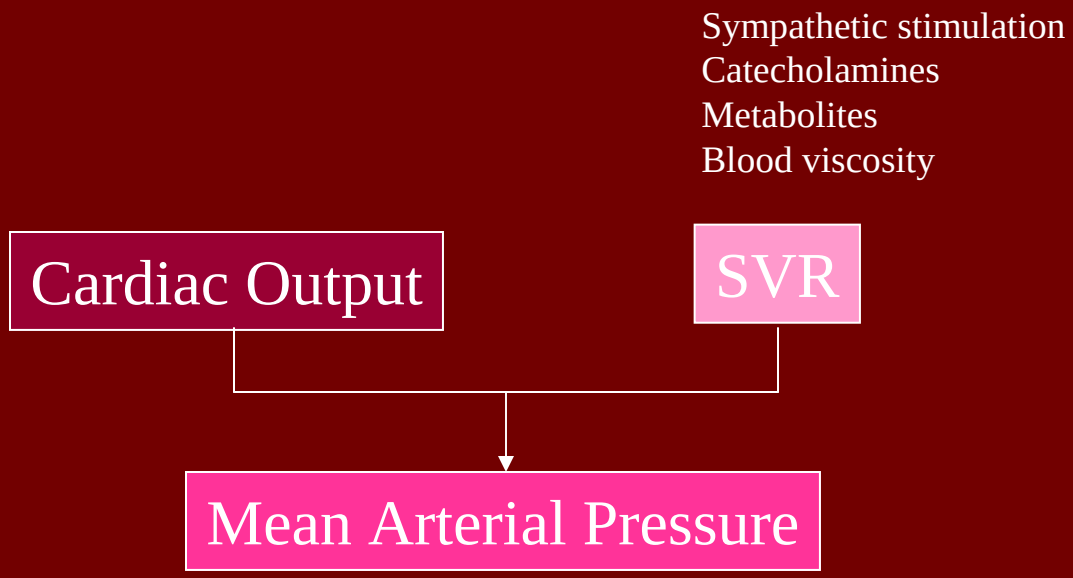
- CO = SV x HR

Sympathetic stimulation
Parasympathetic stimulation
catecholamines

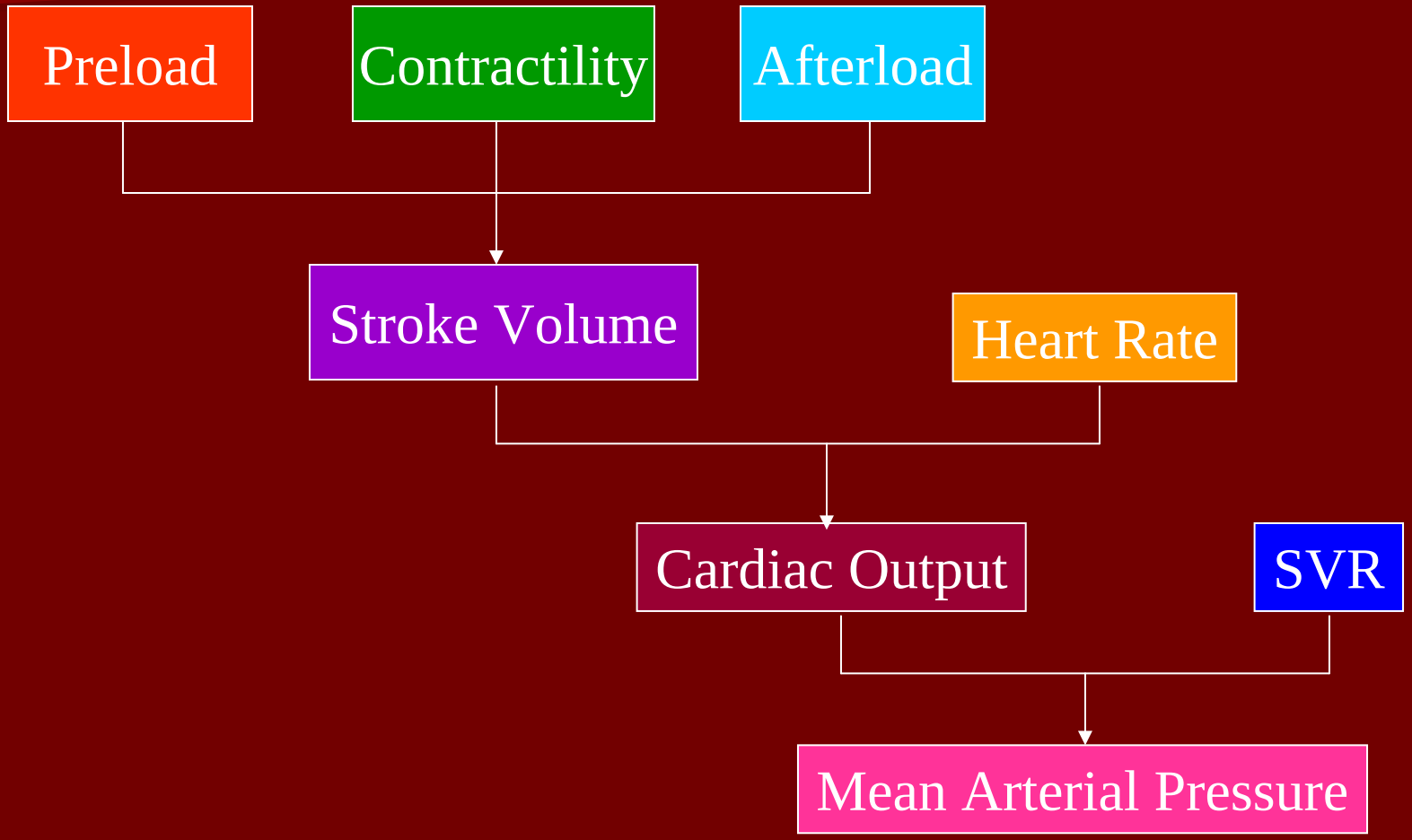


Control of MAP

- MAP = CO x SVR



Cardiovascular Physiology



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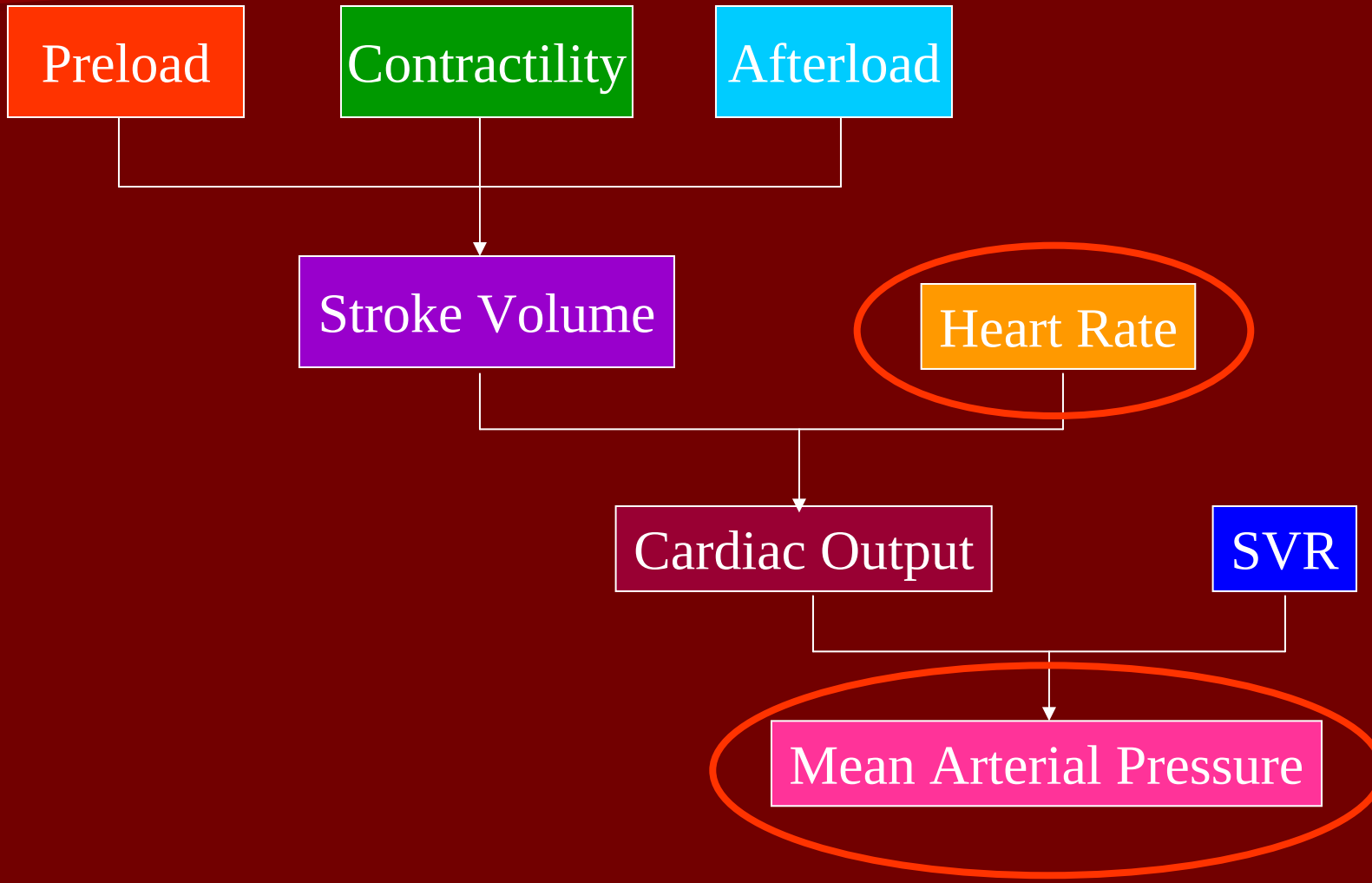

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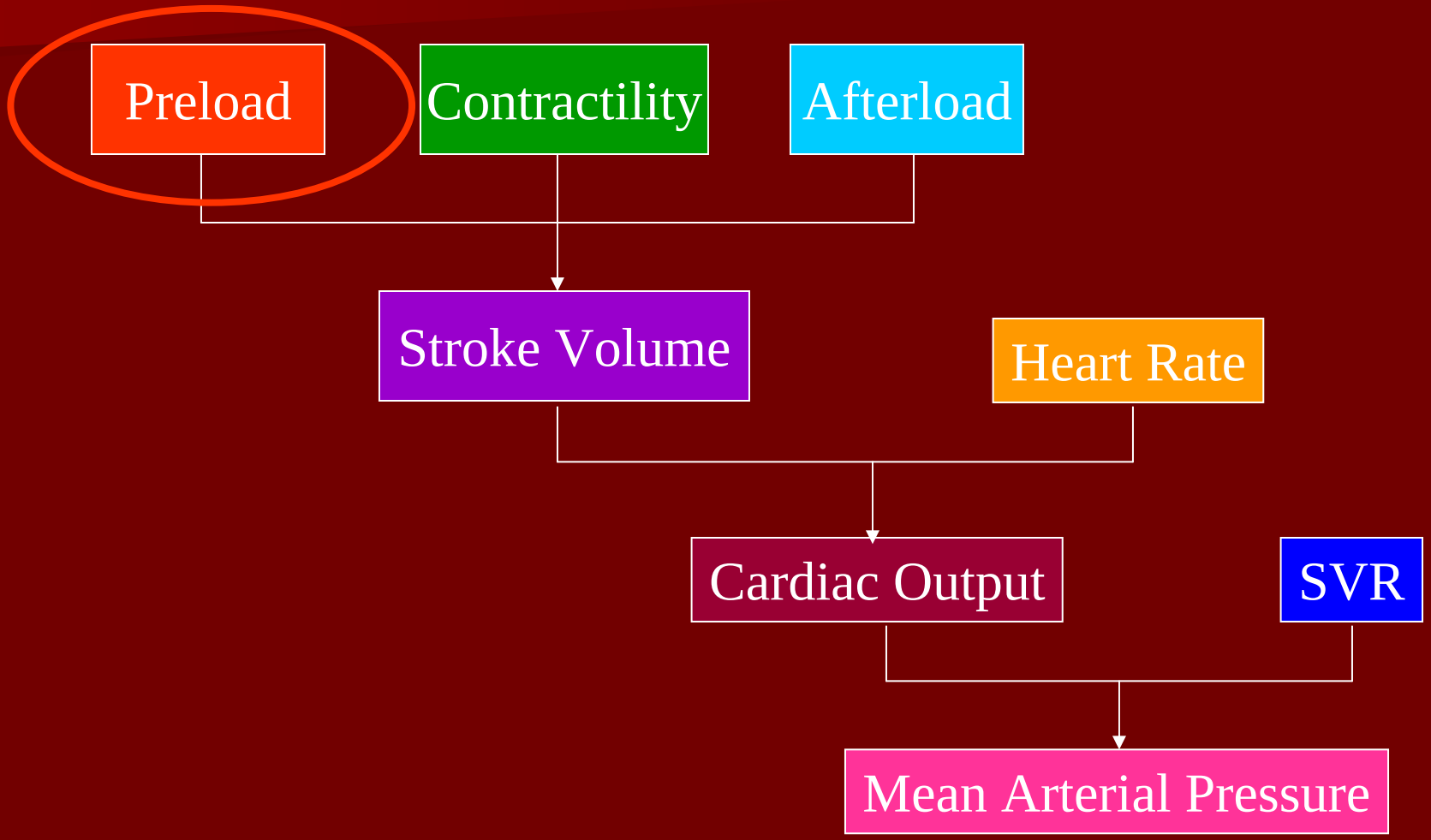
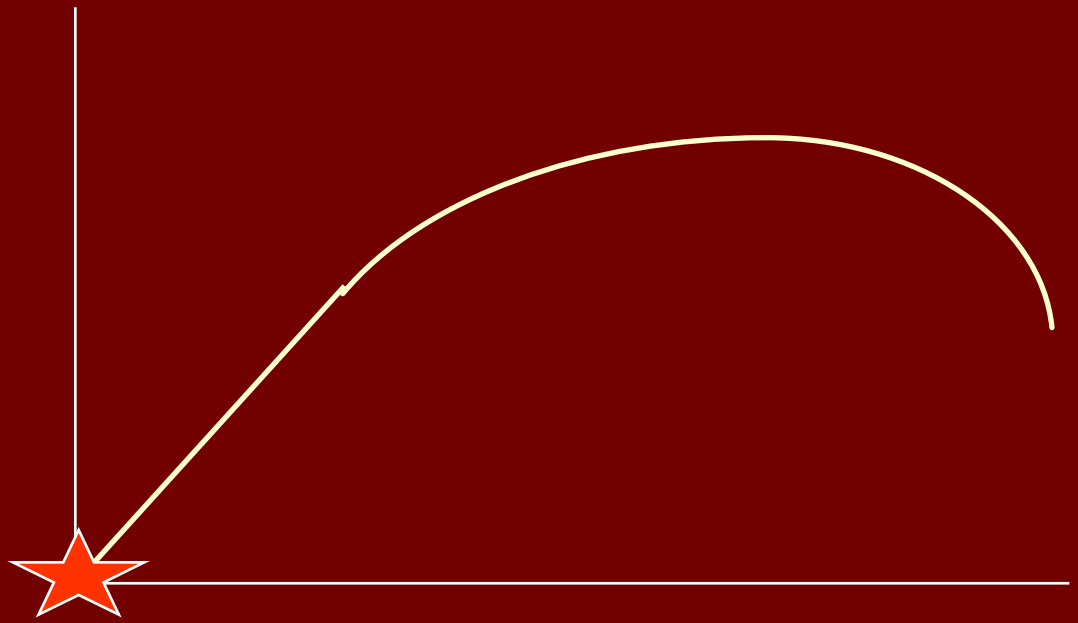
  - WHAT WILL YOU DO?

Cardiovascular Physiology



Treatment of shock

Starlings Law of the Heart



CVP measurement

- Zero taken:
  - 5 cm below sternum
  - mid-axillary line in the 4th interspace
- Normal CVP - 3 to 12 cm H_2O
- THE RULE OF 2's and 5's

Example 1

- Give fluid 200ml x5

Example 1

- Give fluid 200ml x5
  - BP 120/70
  - pulse 82
  - CNS: Improved level of consciousness
  - Skin: Warm, capillary refill
  - Respirations: Improved rate and depth

Oxygen delivery (VO_2)

- VO_2 = [Hb] x 1.34 x SaO_2 x CO

  = 150 (g/dl) x 1.34 x 100% x 5 (l/min)

  = **1000 ml/min**


If patient is losing blood....
GIVE BLOOD !!

Oxygen delivery (VO_2)

- VO_2 = [Hb] x 1.34 x SaO_2 x CO

  = 150 (g/dl) x 1.34 x 100% x 5 (l/min)

  = **1000 ml/min**

Example 2

- 55 year old with a high fever
  - UO 20 mls/hr

Renal

- Low urine output:
  - Appropriate response to dehydration.

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    - Intrinsic diseases of the kidney
  - Post-renal
    - Obstruction

Example 2

- 55 year old with a high fever
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- What do you do?

100%

O_2

Example 2

- 55 year old with a high fever
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- What do you do now?

Example 2

- 55 year old with a high fever
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- Give 200 mls of fluid

Example 2

- 55 year old with a high fever
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- Give 200 mls of fluid
- UO 60mls/hr


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Example 3

- 55 year old man following Myocardial Infarct (MI)
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries

Example 3

- 55 year old man following Myocardial Infarct (MI)
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- What do you do?

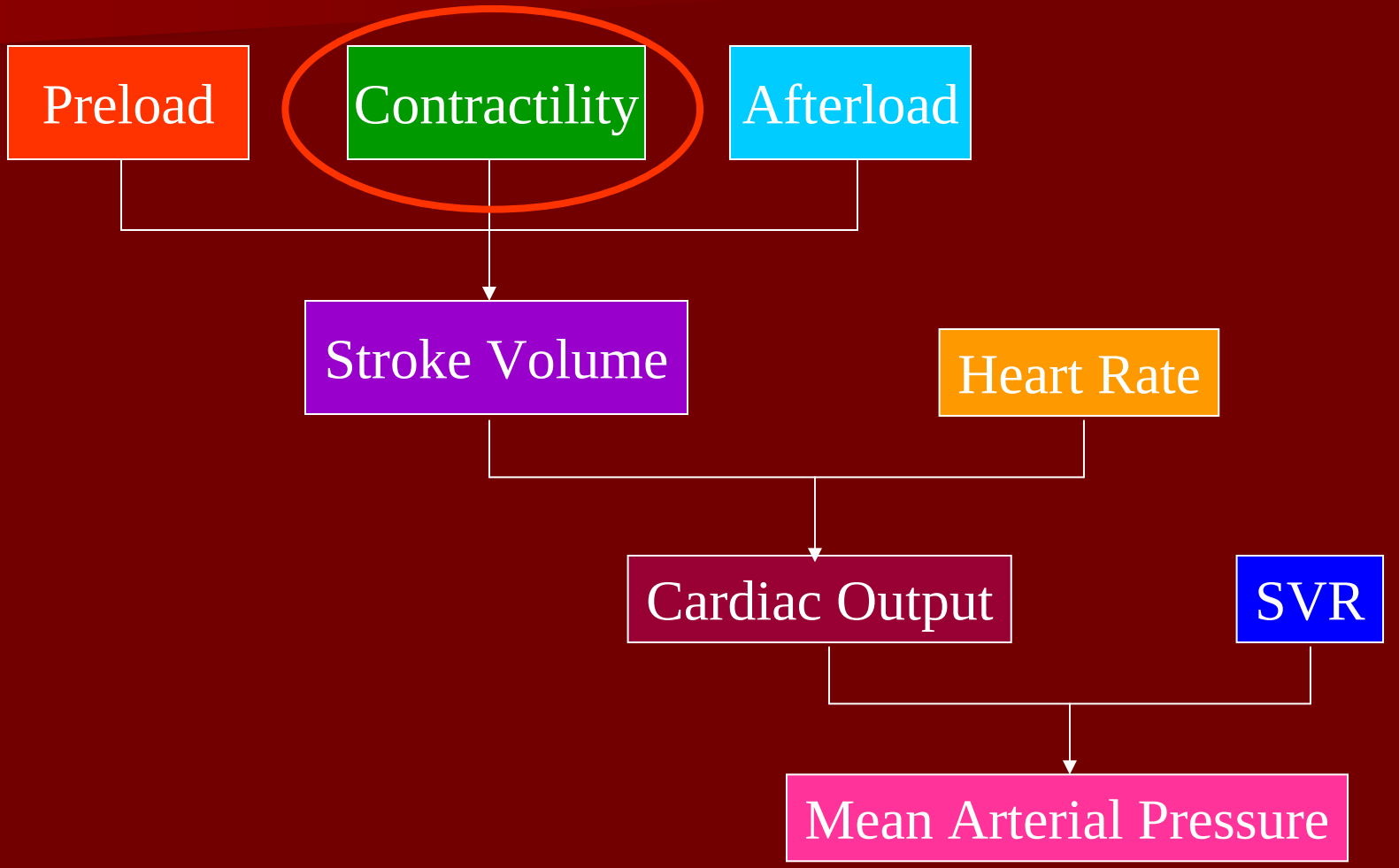
100%

O_2

Example 3

- 55 year old man following Myocardial Infarct (MI)
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- And Now?

Cardiovascular Physiology



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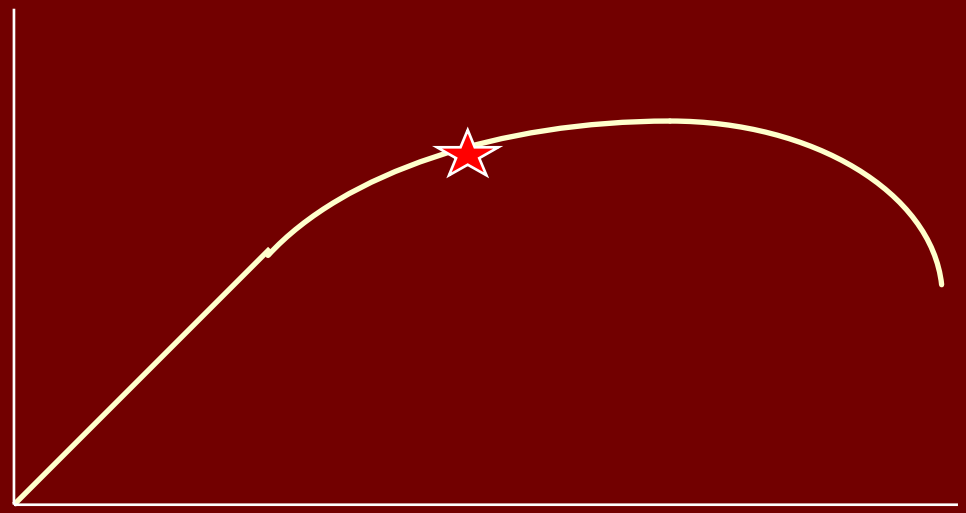

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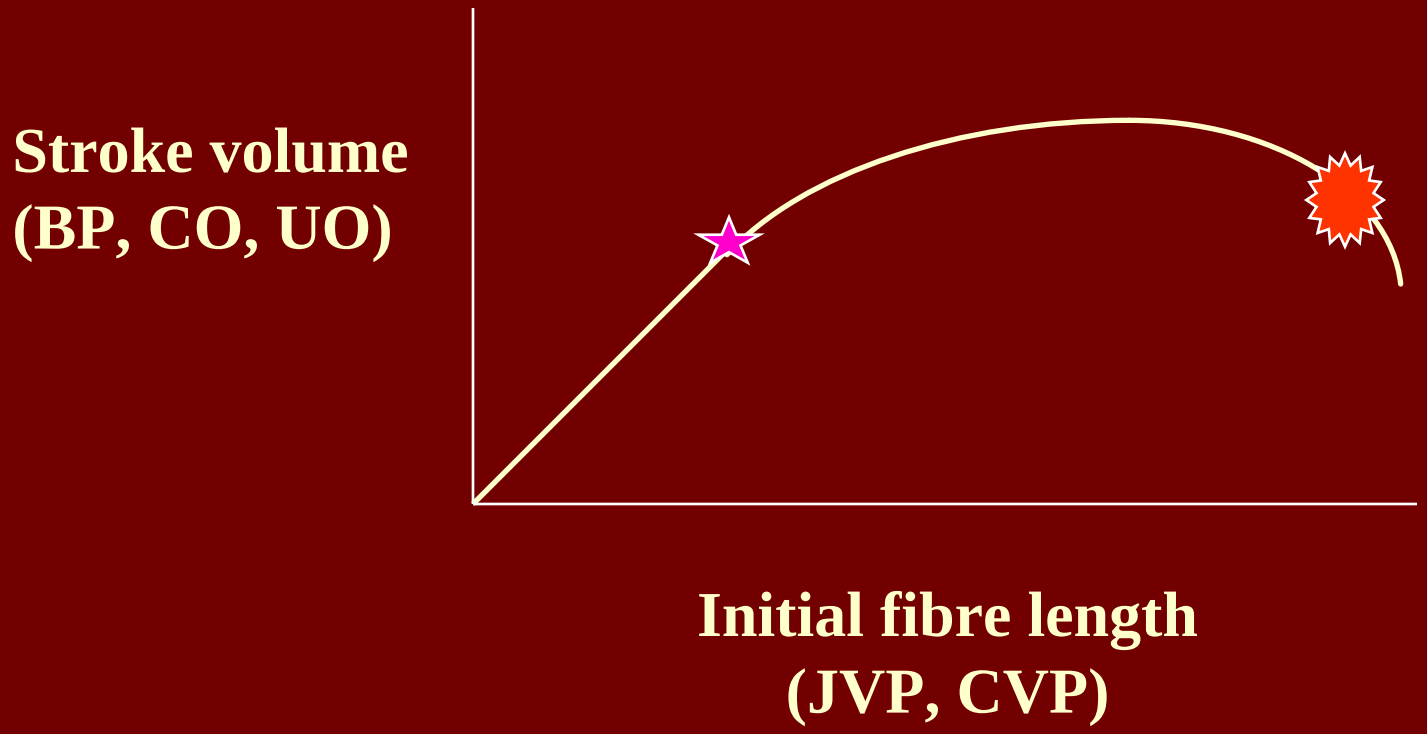

Example 3

- 55 year old man following MI
  - UO 20 mls/hr
  - BP 90/50, pulse 140
  - dry, clammy, cold peripheries
- Give inotrope

Example 3

- 55 year old man following MI
  - UO 70 mls/hr
  - BP 120/80, pulse 100
  - Warmer peripheries

Summary

- Patient tells you he is thirsty
- You feel he is sweaty/cold/clammy
- You see he is confused
- You measure
  - HR
  - BP
  - Temp
  - RR
  - UO

Summary

- If you always think of PHYSIOLOGY

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  - BP = CO x SVR

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  - Oxygen dissociation curve

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  - BP = CO x SVR
  - CO = SV x HR
  - Starling's law of the heart
  - Oxygen dissociation curve
  - VO_2 = [Hb] x 1.34 x SaO_2 x CO

Summary

- If you always think of PHYSIOLOGY
  - BP = CO x SVR
  - CO = SV x HR
  - Starling's law of the heart
  - Oxygen dissociation curve
  - VO_2 = [Hb] x 1.34 x SaO_2 x CO
  - THEN .....


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