ECMO Initiation:
Technical and Physiologic Considerations

Presented by
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Disclosures:

- I have no disclosures

Pre-Initiation Considerations

MDR
- Multi-discliplinary rounds/call
- Determine candidacy and staffing/equipment needs

VA or VV

Patient weight
- Circuit size
- Right size circuit for lowest prime and lowest surface area
- ¼ circuit up to 24kg
- 3/8 circuit 25 kg and above
- Hybrid line setup
- Shunt for access
- We don't use a Bridge

Cannula selection
- Cannulation site
- Size appropriate for required flow
  - Sepsis
  - Low cardiac output

Checklist

Circuit Prime Considerations

Circuit Prime Considerations

Blood or Crystalloid

- Whole blood emergency access
  - Calcium and clotting considerations
  - HCT and volume concerns
- Washed blood
  - Time delay
- Unwashed RBC
  - Storage lesions
  - Potassium levels

Balanced prime

- CO2 in neonates

  Respiratory disease
- Congenital Diaphragmatic Hernia(CDH)
  - Neuro protective
- Oxygen level appropriate
- Terumo CDI inline blood gas analyzer

Circuit Prime Considerations

Other prime constituents

- Albumin
- Sodium Bicarbonate
- Calcium
- Heparin?

Hemofilter

- Wash blood prime
- Hemo-concentrate prime volume

Cannulation Considerations

Cannulation Considerations

Cannulas are selected and appropriate

- Extra supplies
- Cannula
  - Size up or down if anatomically challenging
- Connectors
- Tubing
- Scissors

Heparin

- Patient condition
- Bleeding, post surgical
- Low bleed risk
  - 50-100u/kg loading
  - 100-200u prime

Gas flow

- Blender settings appropriate for ECMO modality
- Plugged into wall
  - Not on tank
- Electric plugged in to RED
- Heater Cooler temp
- Shunt to recirculate prime during cannulation

Initiation of flow considerations

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Clamps off

- Establish target flow slowly
- 30-60 seconds

Initiation of flow considerations

Difficulties establishing flow: Circuit

- Obstructions to flow/drainage
- Alarms
  - High Venous inlet pressure
  - P1 P2 pressures, Delta P
- Clamps
  - Surgeon or you
- Bridges/Shunts open/closed affecting flow
  - Flow probes pre/post shunt
- RPM in a centrifugal pump
  - High enough to establish forward flow
- Roller pump
  - Servo-regulator
- Cannula
  - Placement/depth
  - Size
  - Anatomy
  - Patient positioning
- Tubing kinks

Initiation parameters: Patient VA

Initiation parameters: Patient VA

Blood pressure Adequate

- Flow requirements met?
  - Lactate load requires higher flow to clear Lactate
  - VA Target Flow of 100ml/kg may not be enough
  - Inotropes weaning or needed
  - Intra operative failure to wean from CPB

Arterial Sats

- Pre and Post Ductal sats
  - Higher flows required?

SVO2 appropriate range

Arterial line:Venous line color change?

Initiation parameters: Patient VA

Heart Rate

- Cardiac Stun
  - Ischemia
  - Calcium low
  - Potassium high
  - Need for a vent or decompression

Hemodilution

- Low HGB
  - DO2 monitored

Fluid overload

- Over resuscitation
- May need to pull volume off circuit to regain pulsatility on Art Line

Initiation Parameters: VV

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Recirculation

- Dual Lumen cannula position
  - Increasing flows can increase the problem, not fix them
  - Access and return cannulas in close proximity in traditional 2 cannula VV configurations

- Saturations
  - Arterial sats achieved?
    May need to accept lower initial levels
  - Venous saturations unusually high indicate recirculation

- Heart Rate
  - Cardiac function
    - Essential for VV support
    - Arrythmia
    - May need to convert to VA
    - Do you have cannulas to switch modes in an emergency

- Ventilation settings
  - Maximum vent settings adjusted to Safe vent settings

Special populations and true emergencies

Special populations and true emergencies

Palliative shunts

- Central shunt should be clipped to avoid overperfusion of the pulmonary system
- Coronary steal/ diastolic runoff to the pulmonary system
    - Compromising coronary perfusion

Cavo-pulmonary anastomosis(Glenn)

- Neck cannulation not advised due to difficult drainage/flow issues from anatomy
- Bi-Directional Bi-Lateral Glenn?

Fontan circulation

- Central cannulation in fresh procedure
- May need extra venous limb to drain VV-A
- Older failing Fontan vs a fresh extra-cardiac

Impella or other LVAD

- Impella can be used to offload LV if currently on support.
- IABP

Special population and True Emergencies

Special population and True Emergencies

Air introduction into circuit

Source

Patient

- Lines not secured or improper cannula connection at sterile field
- Accessing a venous port with high venous line negative pressure

Circuit

- Connection failure
- Accessing or Turning a stopcock incorrectly
  - Need for non occlusive caps on all port
- Infusions to venous side of circuit
- Avoid Arterial line

Air Embolism to patient

Cannula dislodgment/cannulation site failure

- Improper cannula suturing
- Frail tissue tear/failure
- Peripheral artery/vein tear or upon introduction

Special population and True Emergencies

Failure to Oxygenate

- Gas source
- O2 line disconnection
- Membrane Failure

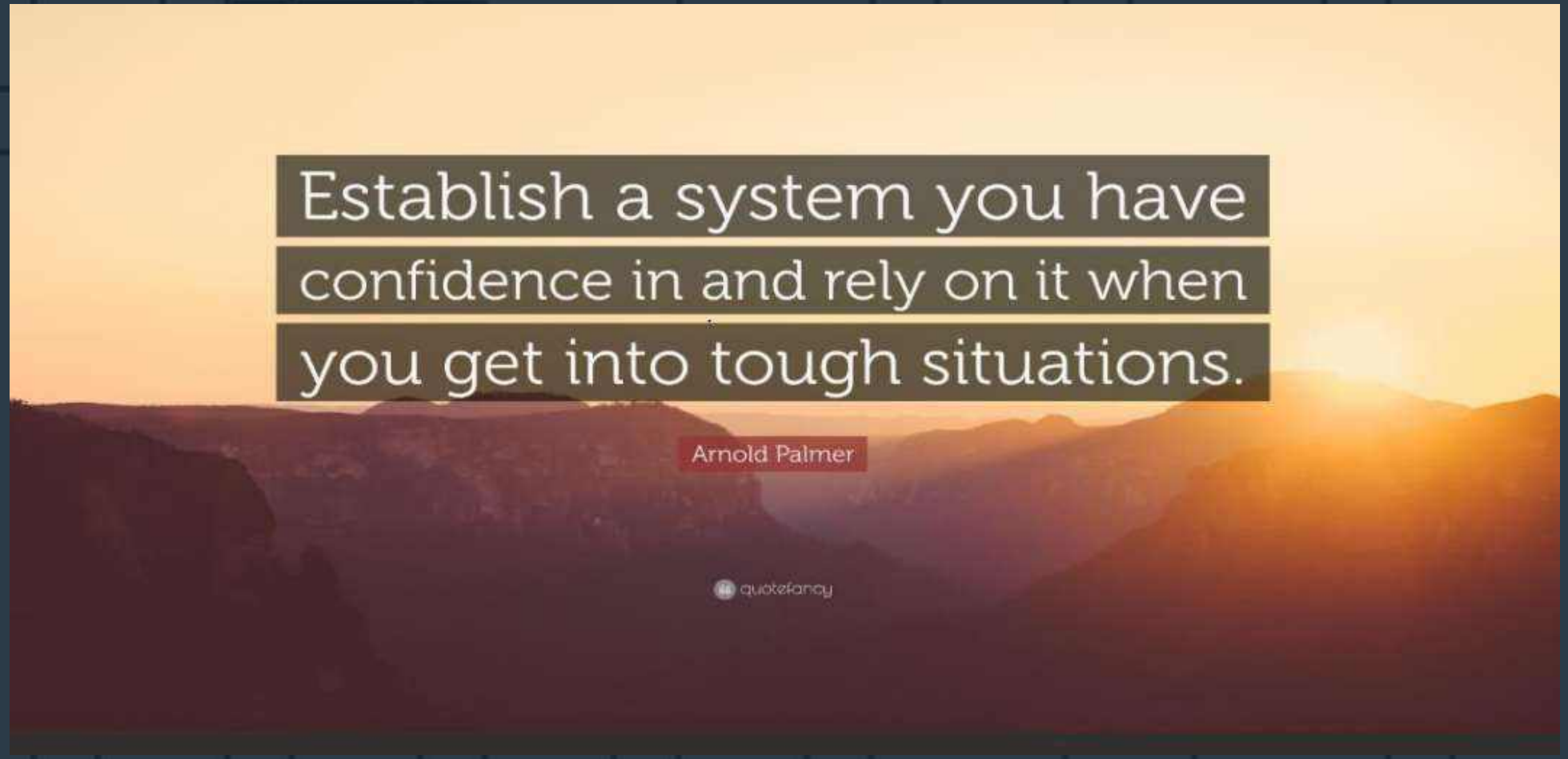
Pump failure

- Decoupling/improper placement in motor housing
- Mechanical console failure
- Pump boot rupture

Bleeding

- Intra/post operative
  - No anticoagulation
  - MTP may be required to maintain circuit flow

Thank You


Establish a system you have
confidence in and rely on it when
you get into tough situations.
Arnold Palmer
quotefancy

Great moments are born from Great Opportunity- Herb Brooks

February 22,1980

References

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ECMO Initiation

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