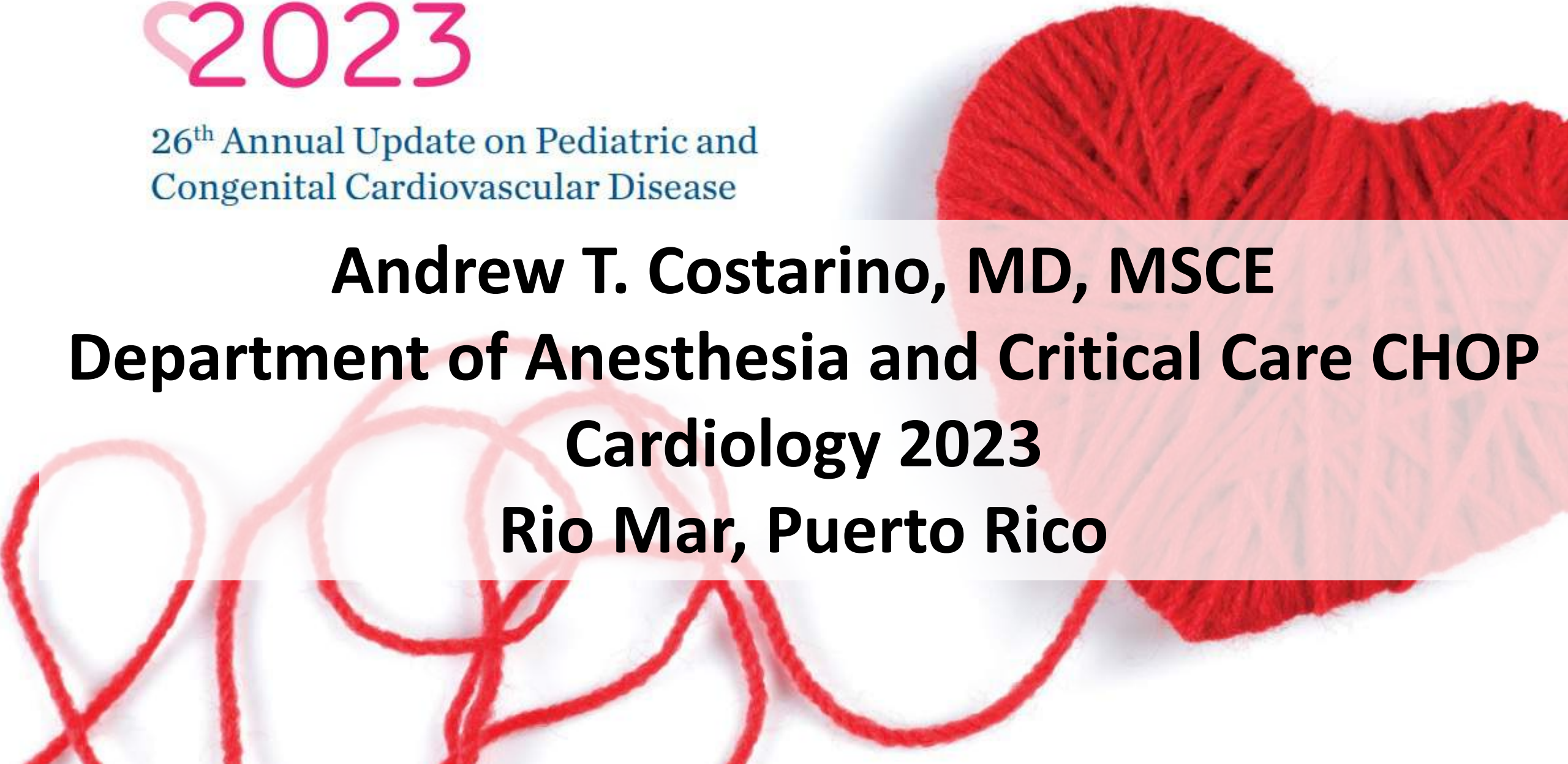
CARDIOLOGY 2023

26th Annual Update on Pediatric and Congenital Cardiovascular Disease



Andrew T. Costarino, MD, MSCE

Department of Anesthesia and Critical Care CHOP

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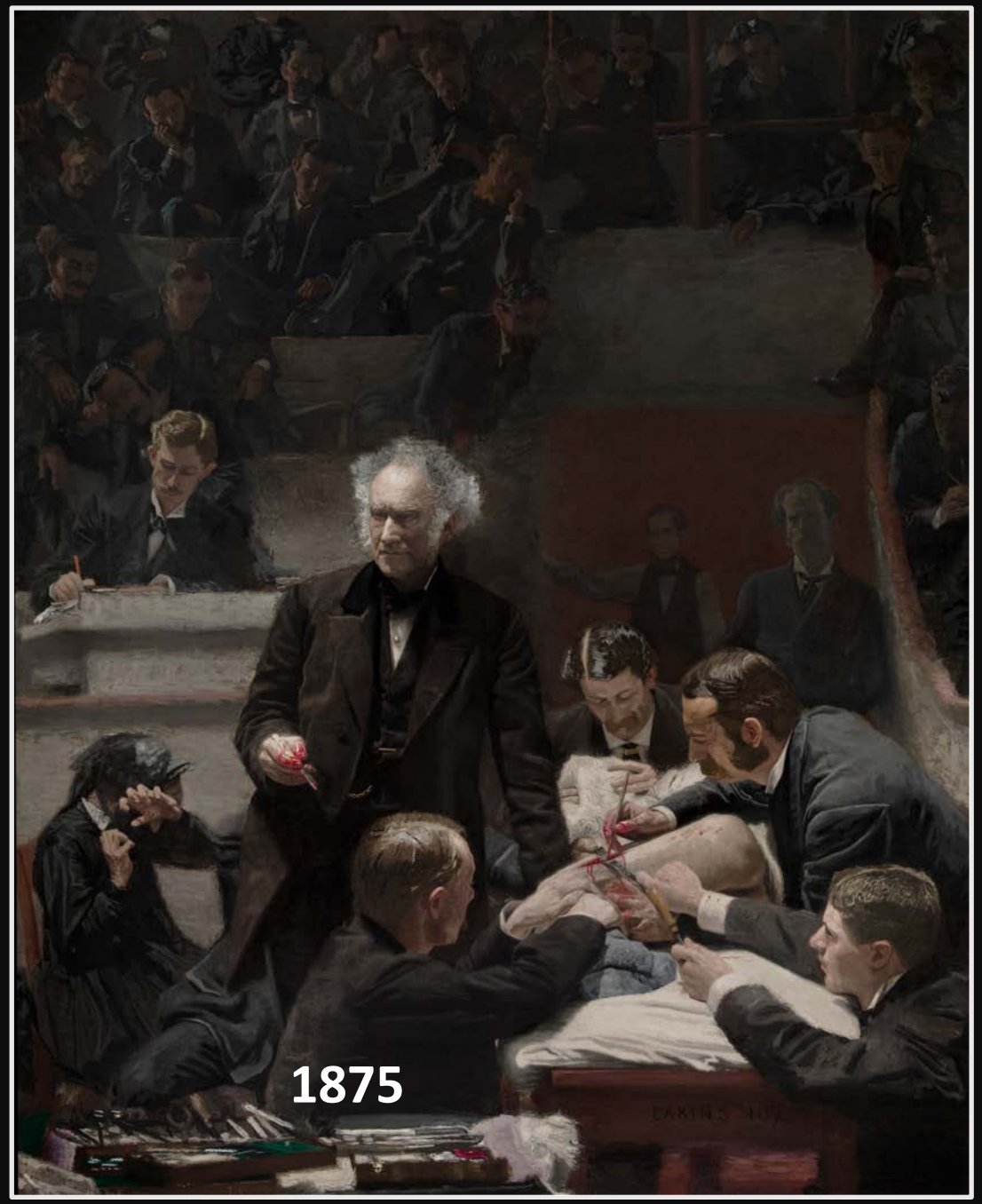
Rio Mar, Puerto Rico

No Disclosures

No Conflicts of Interest


1875

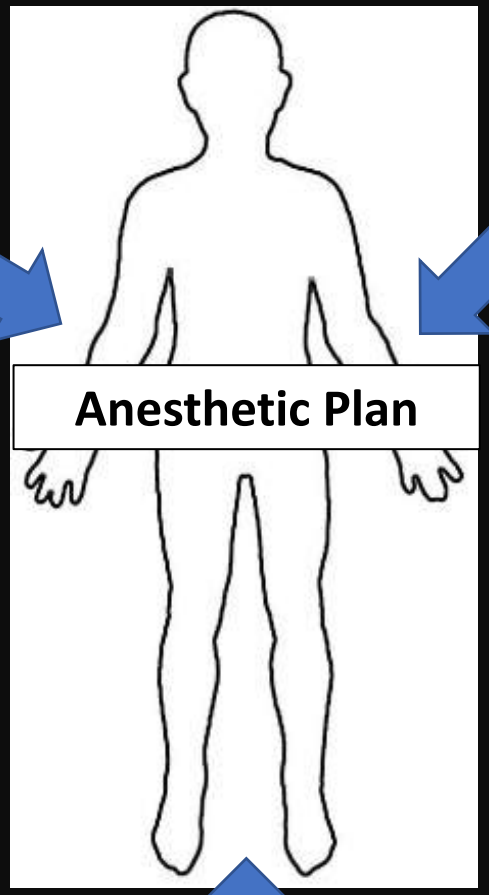

1889

Anesthesia Considerations for a Fragile Myocardium

- Anesthetic Care Plan:
  - How do we craft an anesthetic plan?
  - What needs to occur during an anesthetic?
- Teamwork
- Communicate

Age related size and physiologic differences

- Weight based dosing
- Organ development and function
- Volume of distribution
- maturity
- VO2 to FRC



Disease and physiology

- Fever
- Medications
- Inborn error of metabolism

Needs of the procedure/operation

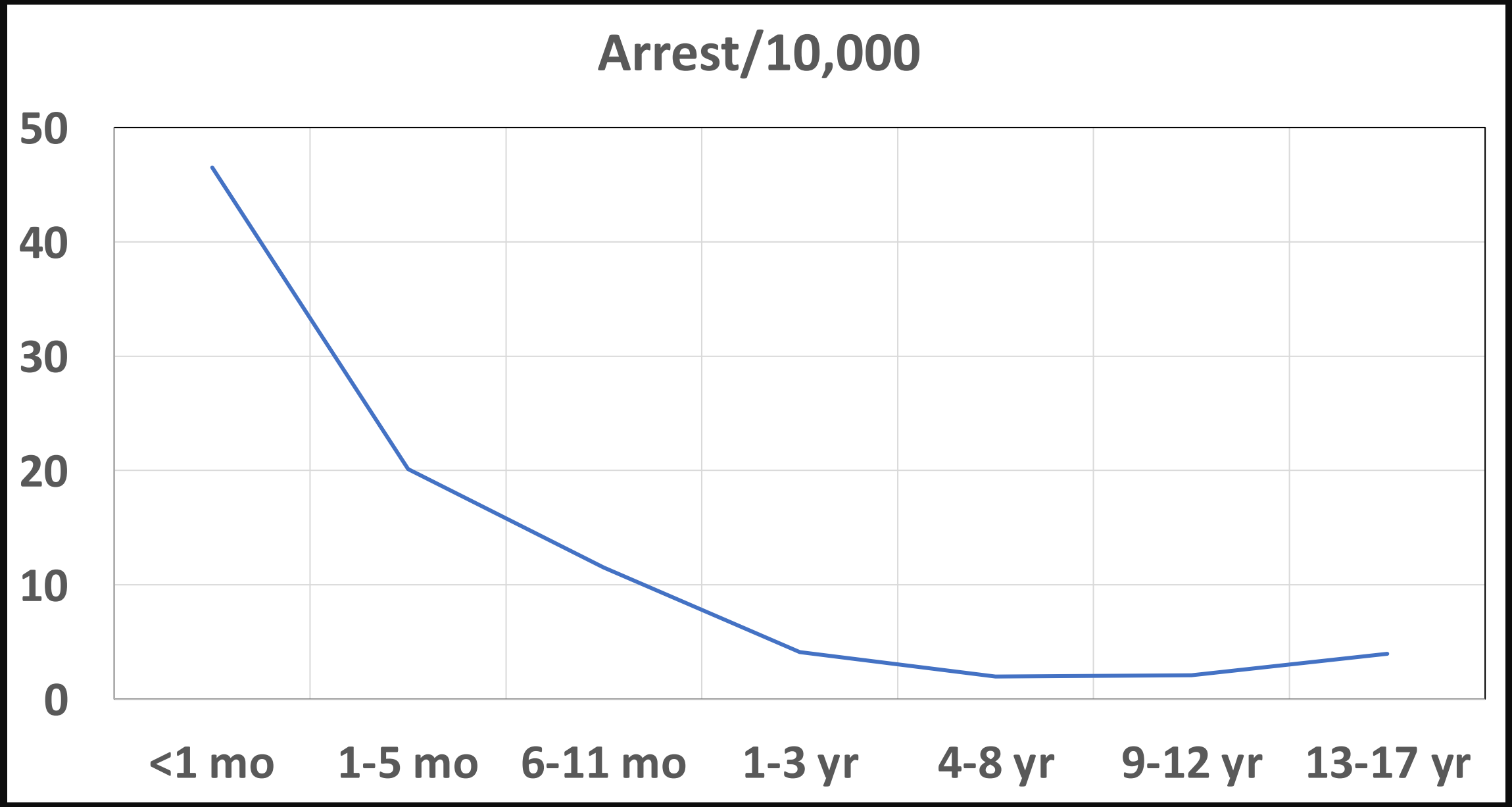
- Surgical time
- Positioning
- Site of incision
- Vascular access
- Electrocautery

Co-morbidities and physiology (HF)

- Circulation time
- Volume of distribution
- Respiratory function
- Renal function
- Anticoagulation treatment

Airway

- Anatomy
- Mouth opening
- Transition to PP


Arrest/10,000
50
40
30
20
10
0
<1 mo
1-5 mo
6-11 mo
1-3 yr
4-8 yr
9-12 yr
13-17 yr

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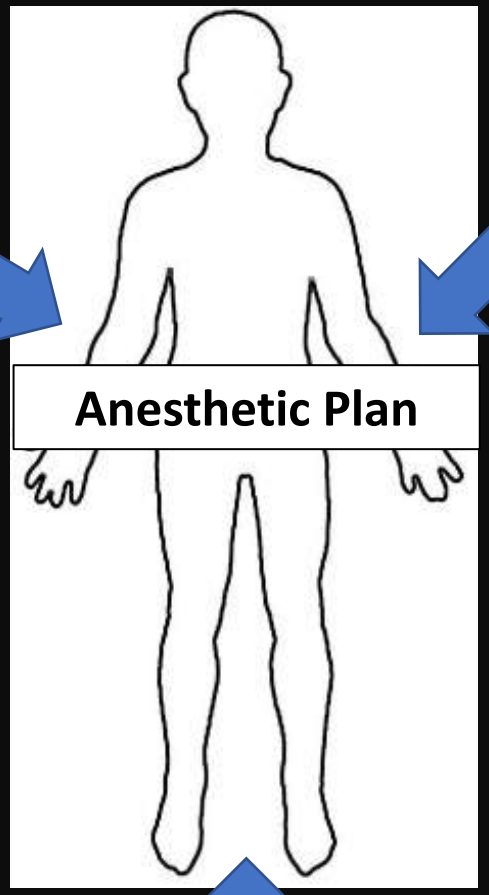

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Anesthetic Plan – Airway/Respiration

1. **Airway structure and function**
2. **The response to initiation of positive pressure ventilation.**
   - **Tidal volume is delivered to lung units that are already open.**
   - **Venous return to the thorax decreases.**
   - **Impedence to flow in the in the pulmonary circulation increases.**
   - **Afterload on the systemic ventricle decreases.**

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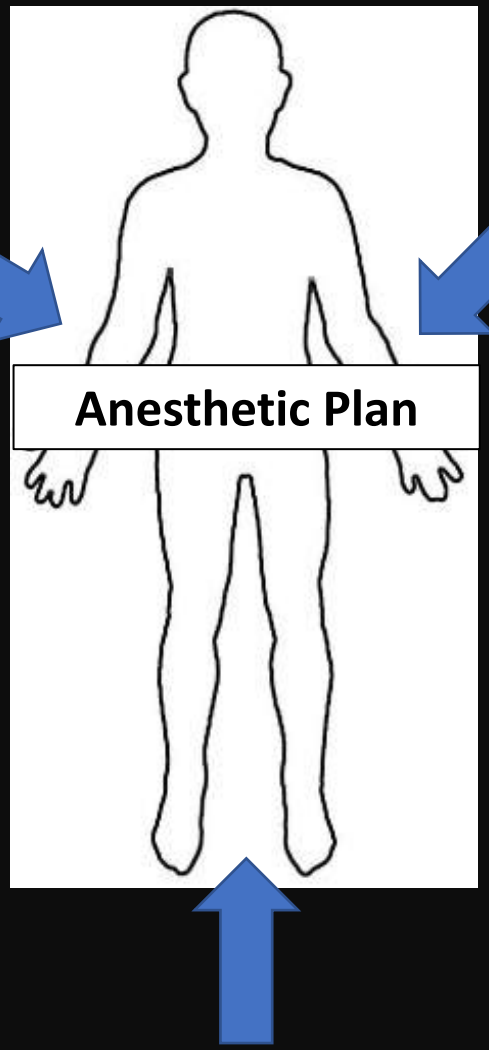

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Anesthetic Plan: Dx

- **Cardiomyopathy diagnosis** a few unique considerations.

1. No succinylcholine (rhabdomyolysis and hyperkalemia)
2. The volatile inhalational agents are contraindicated in Duchenne's and Becker's muscular dystrophies.
3. Propofol is to be avoided in carnitine deficiency and fatty acid oxidation defects.
4. There may be known or unknown issues with the coronary circulation.
5. Prone to arrythmia - place pads
6. There may be a pacemaker or ICD in place

Anesthetic Plan: HF Comorbidity

Heart failure comorbidity clinical pathophysiology that impacts the anesthetic plan.

1. High venous filling pressure - total body water overload
    - Directly
    - Indirectly via kidney
2. Diuretics other: electrolyte abnormalities
3. Low CO, slow circulation time:
    - Quick onset of inhalational agents
    - Slow onset of intravenous agents
4. Antithrombosis medication.

Anesthetic Plan: HF Comorbidity

Pulmonary venous congestion

- Decreased lung compliance.
- Increased the work of breathing.
- Increased minute ventilation
- Intrathoracic blood volume increases with supine posture
- Sx: Dyspnea, Orthopnea, Cough

Negative pleural pressure increased

- Associated with the deranged respiratory mechanics
- Equalizes with anesthesia and neuromuscular blockade

Q 2: General anesthesia a reversible state that includes:

1. Anxiolysis
2. Hypnosis
3. Amnesia
4. Akinesia
5. Analgesia
6. Autonomic blockade

Approach: Balanced Anesthetic

Balanced Anesthetic Goals

- Blunt response to procedural stimuli and airway management.
- Minimize side effects of Anesthetic agents
  - Negative inotropes
  - Vasodilators
  - Lower systolic BP
  - Decrease coronary perfusion pressure

Clinical Pathophysiology

- Low Cardiac Output
  - Anesthetic onset
- Increased TBW
  - Volume of distribution,
    - Reduced
    - Increased
- Modified drug dosage

Anesthetic Plan: HF Clinical Pathophysiology

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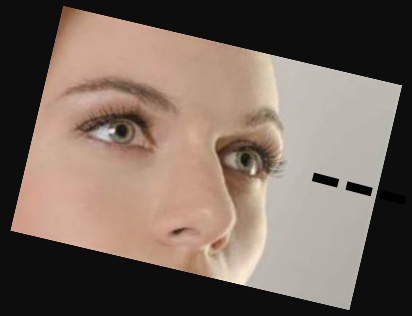
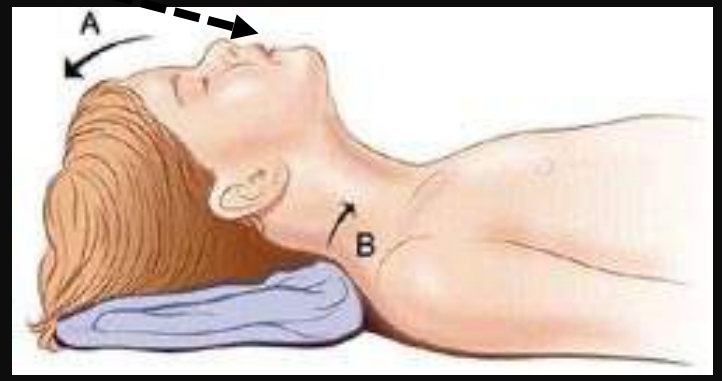
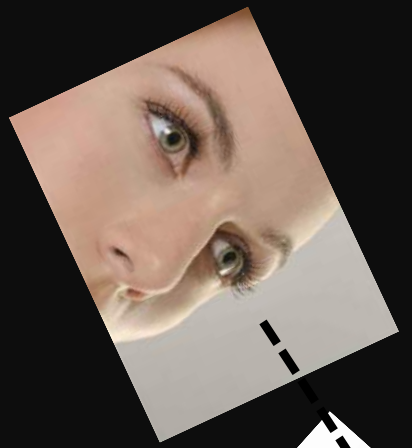



A
B




A
B

Anesthetic Management Cardiomyopathy/HF

- Premedication
  - Benzodiazepine (low dose)
  - Scopolamine
- Induction
  - Inhalational (Sevoflurane) - Be careful
  - Intravenous (Ketamine, Etomidate) - Wait
  - Neuromuscular blockade - No succinylcholine
- Intubation - helpers

Anesthetic Management Cardiomyopathy/HF

- Maintenance
  - Balanced: opioid, low dose inhalational agent,
  - NMB
  - Monitoring
- Emergence
  - Airway management
  - ICU vs other
  - Emergence delirium (dexmedetomidine)


Thank you

Anesthetic Considerations in Cardiomyopathy

- Anesthetic and intubation can be more physiologically challenging then the surgery.
- Balanced anesthetic: target the anesthetic affects you need, in order to limit unwanted side effects.
- Don’t make patients lie flat if they don’t want to.
- Make pacemaker asynchronous and turn off ICD tachyarrhythmia detection if electrocautery is to be used.
- Be very careful with inhalational inductions.
- Be patient with intravenous induction.
- NMB is helpful but be prepared
- Succinylcholine is contraindicated.
- Initiating positive pressure ventilation can be destabilizing to the respiration and circulation.
- Volatile inhalational agents are contraindicated in Duchenne’s and Becker’s muscular dystrophies.
- Propofol is to be avoided in carnitine deficiency of fatty acid oxidation defects

Anesthetic Considerations in Cardiomyopathy

- Cardiomyopathy: disease of the myocardium associated with cardiac dysfunction.
- Primary Cardiomyopathy
- Heart Failure: ≥ Class III

Anesthetic Plan Co-morbidity

Heart Failure Clinical Pathophysiology

1. **Pulmonary venous congestion**
2. **Low Cardiac Output**
3. **Negative pleural pressure increased**
4. **Effect of Anesthetic agents**
5. **Response to procedural stimuli and airway management**