



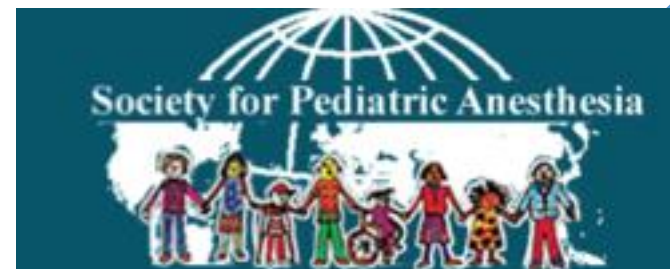
Anesthetic Considerations for Pediatric Patients with Anterior Mediastinal Masses (AMM)

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Disclosures



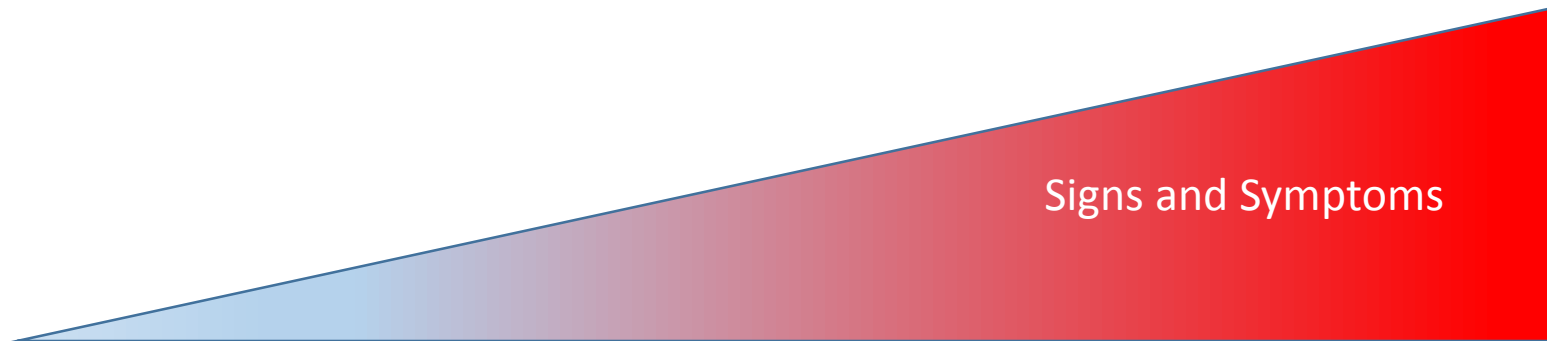
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Learning Objectives:

- Identify anatomical and physiological perturbations that occur with mediastinal masses
- Identify perioperative complications likely to occur in these patients and discuss their management
- Discuss pre-operative testing used for anesthetic planning and risk stratification
- Present anesthesia techniques helpful for management of anterior mediastinal mass

Introduction



Transient decrease in
blood pressure

Airway
obstruction

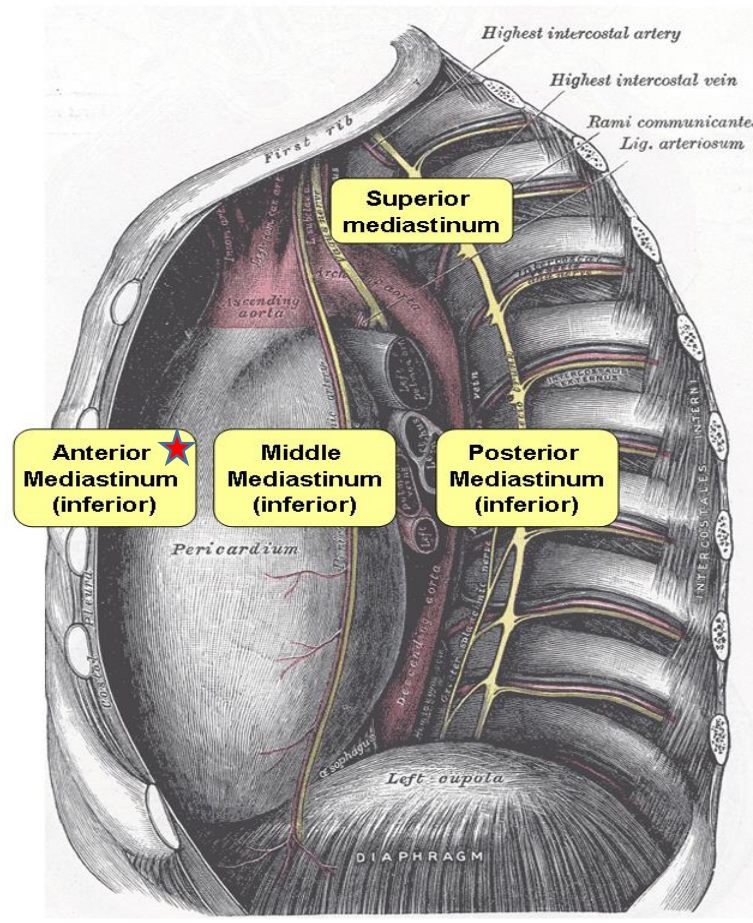
Complete
cardiovascular
collapse

Death

Perioperative complications are estimated to occur during 9% to 20% of anesthetic procedures.^{1, 2}

The differences between adult and pediatric populations relate to the **histology**, **location**, and **symptomatology** of the mediastinal masses.³

Anatomy



★ Most masses in the pediatric population are found in the anterior compartment, which are associated with **increased** perioperative risks. ⁴⁻⁶



Mediastinal Masses

Anterior		Middle		Posterior	
Benign	Malignant	Benign	Malignant	Benign	Malignant
*Thymoma	Thymic carcinoma	Adenopathy	*Lymphoma	*Neurofibroma	Neuroblastoma
Thyroid	Thyroid carcinoma	Cysts	Esophageal Cancer	Schwannoma	
Cystic hygroma		Esophageal mass	Thyroid carcinoma	Chemodectoma	
Thymic cyst	Seminoma	Vascular structures	Metastasis		
Thymic hyperplasia	Mixed Germ Cell	Hiatus hernia			
	Lymphoma				

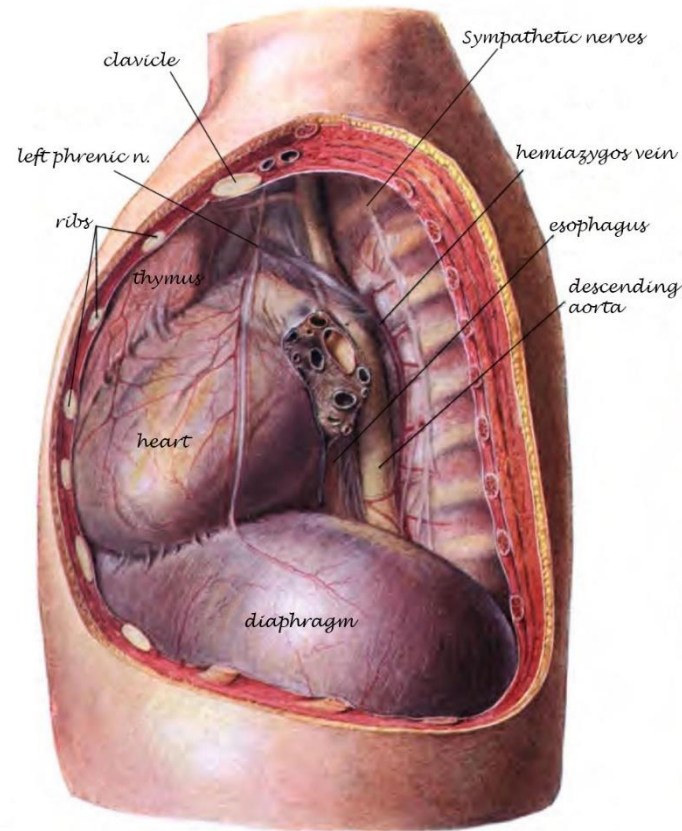
Anterior Mediastinal Mass (AMM)



	Children (%)	Adults (%)
Lymphomas	45	23
Germ cell tumors	24	14
Thymomas	16	47
Others	15	16

T-cell lymphoblastic leukemia, non-Hodgkin's lymphoma, and neurogenic tumors have an increased incidence, as well as, increased risk of perioperative complications in children.^{4,7,12}

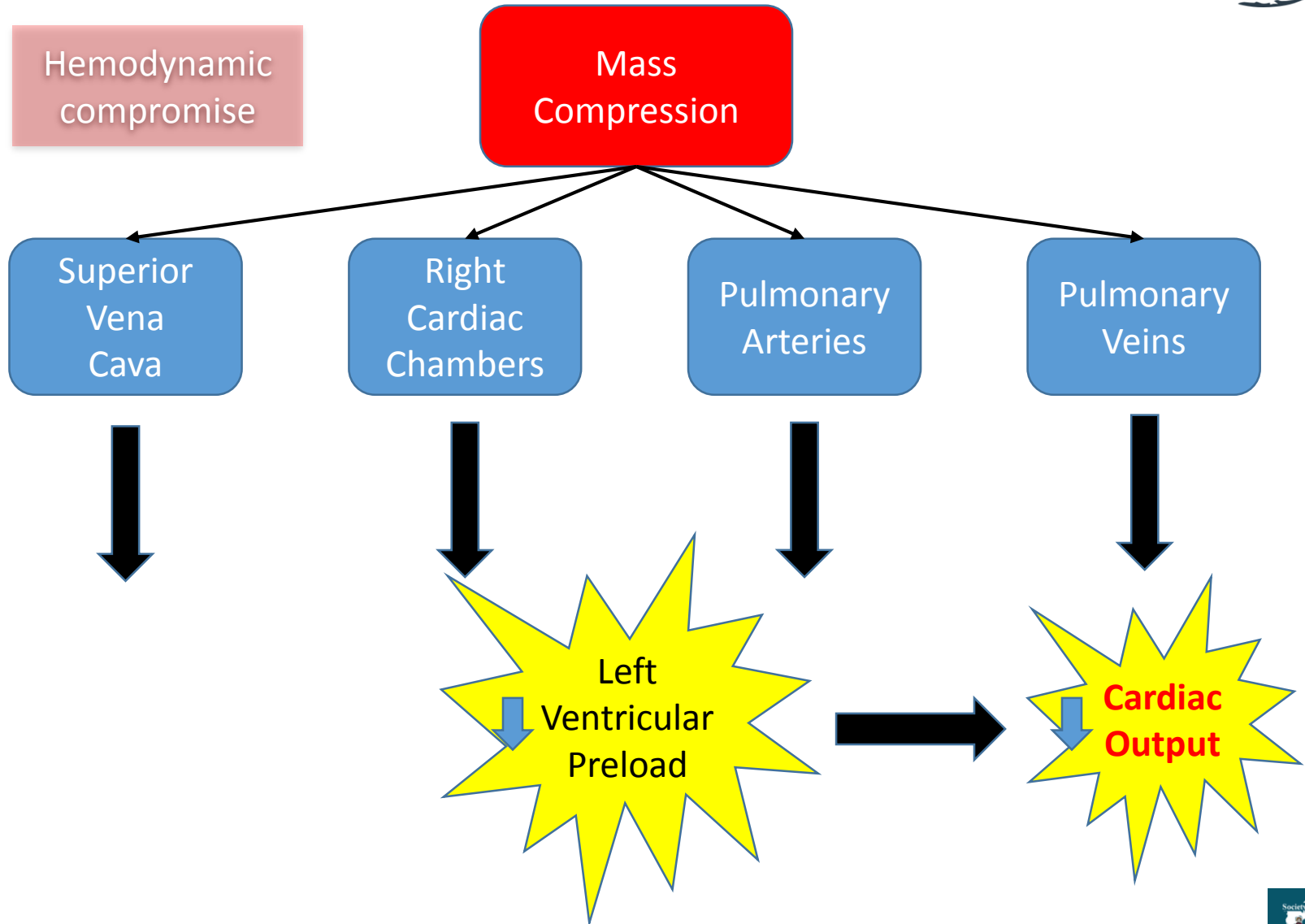
Physiology



Cardiopulmonary symptoms can be explained by compression of airway, cardiac, or major vessels by the mass.

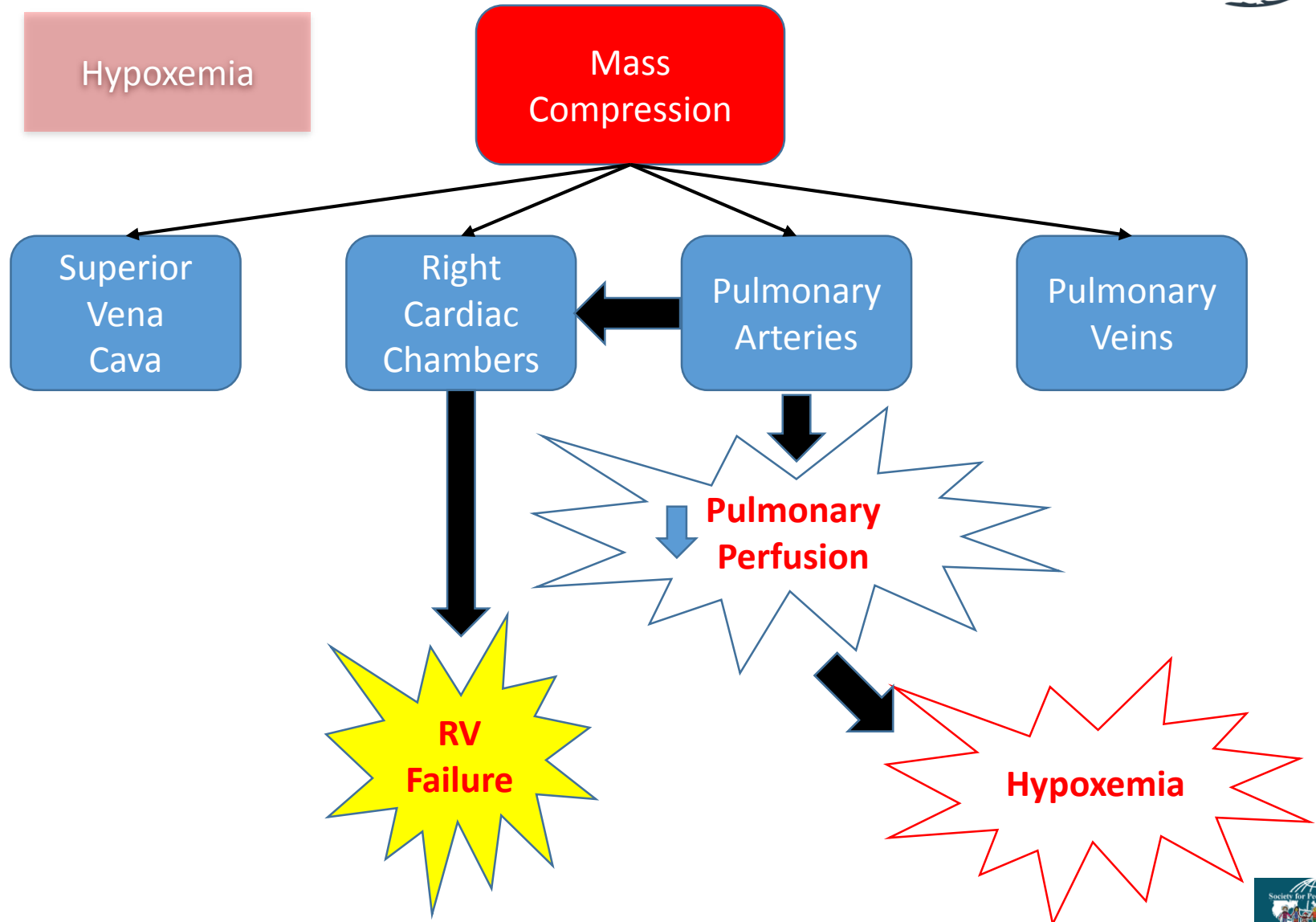


Physiology



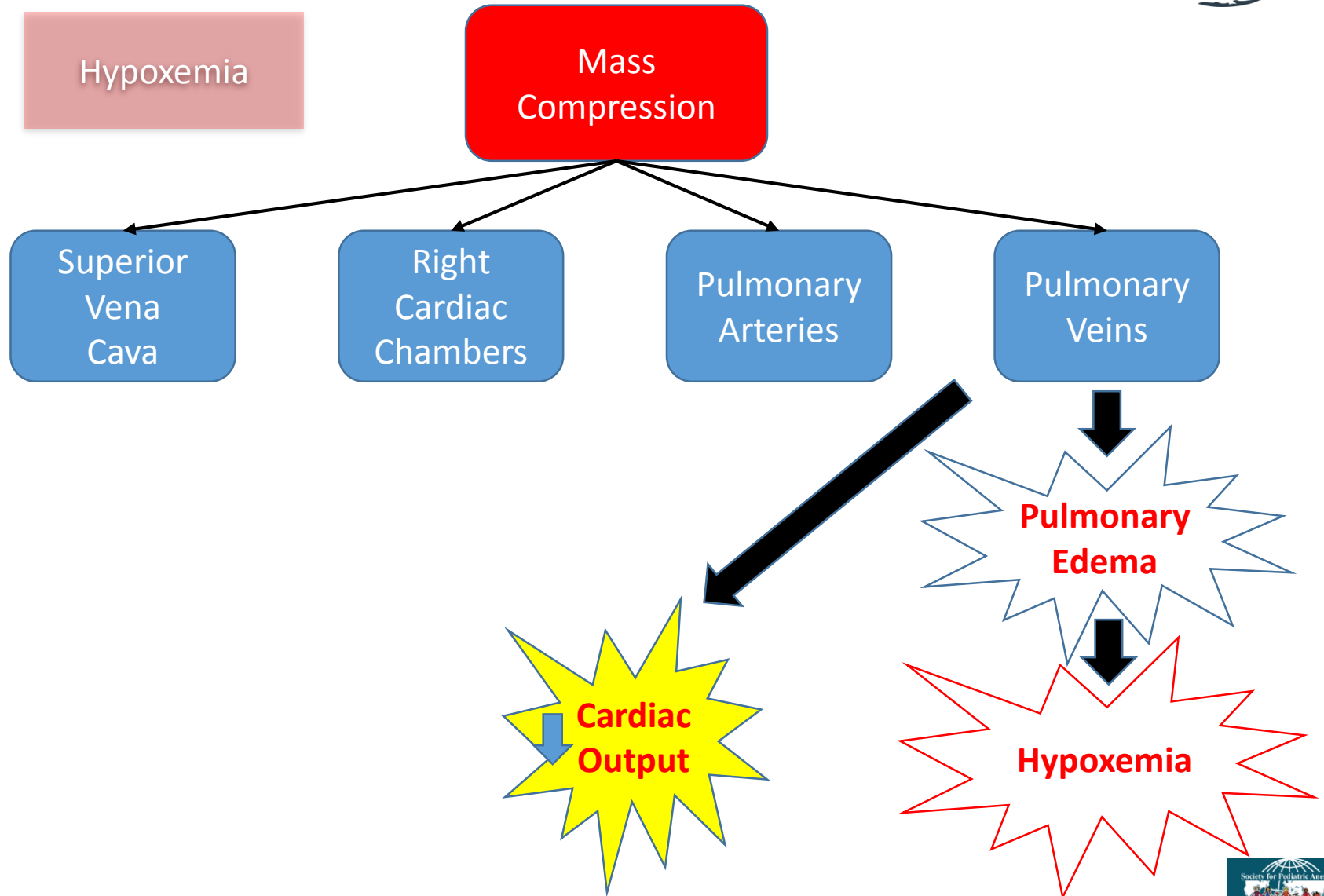


Physiology





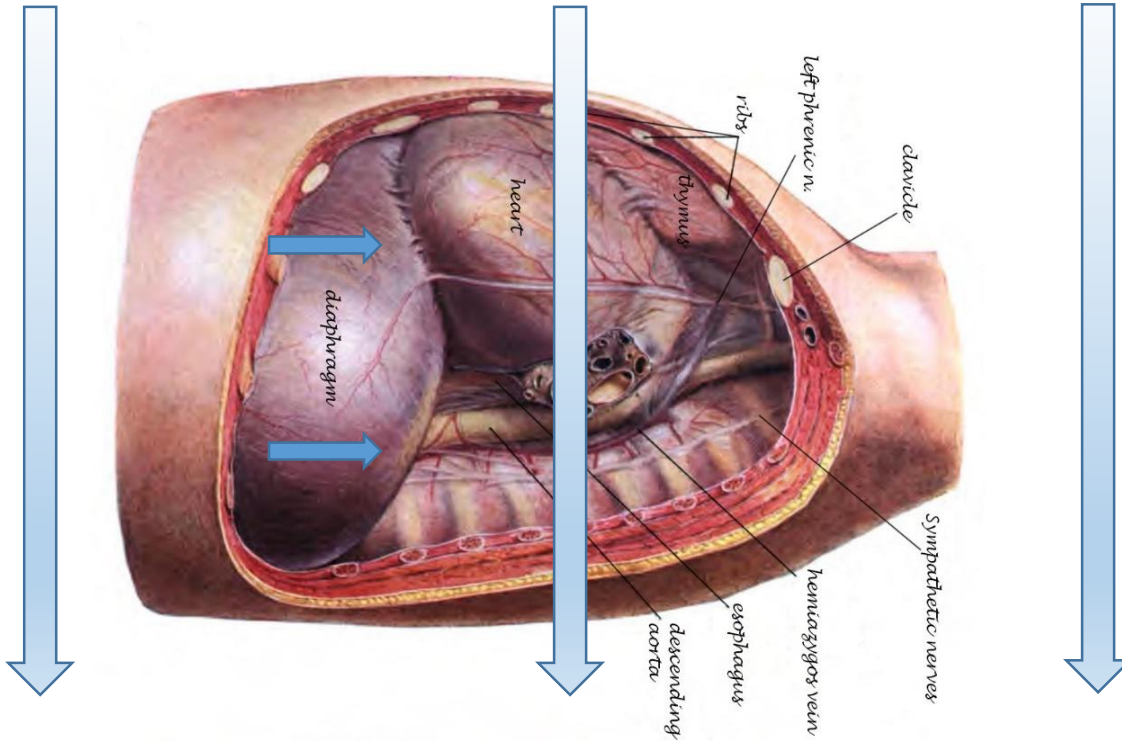
Physiology





Physiology

Gravity



Worsening V/Q mismatch

Increased Intrathoracic Pressure

Airway Collapse

Supine position



Signs and Symptoms

Airway	Cardiovascular	Constitutional
Shortness of breath Stridor Pleural effusion Accessory muscle use Orthopnea Cough Dyspnea Hoarseness Hx of respiratory arrest	Cyanosis Syncope Tachycardia SVC syndrome Upper body edema Jugular venous distension arrhythmias	Weight loss Fever Night sweats

Dependent on size, location, and the rate of growth

Systemic effects of the tumor

Thyroid function abnormalities

Myasthenic Crisis

Signs and Symptoms



As compared to adults, children experience more signs and symptoms

- AMM tend to be more central
- More likely to compress on the softer airway and vascular structures
- More likely to be malignant and grow/infiltrate at a faster rate
- Smaller intrathoracic volumes may not be able to accommodate the mass as easily

Pre-operative testing



I. Anatomic Testing

- Anterior-posterior and lateral chest X-rays
- CT scan
- MRI
- Positron Emission tomography
- Angiography
- Echocardiography

Pre-operative testing



II. Physiologic Testing

- Complete blood count, electrolytes
- Pulmonary function tests
- Transthoracic echocardiography (ECHO)
- Thyroid scan

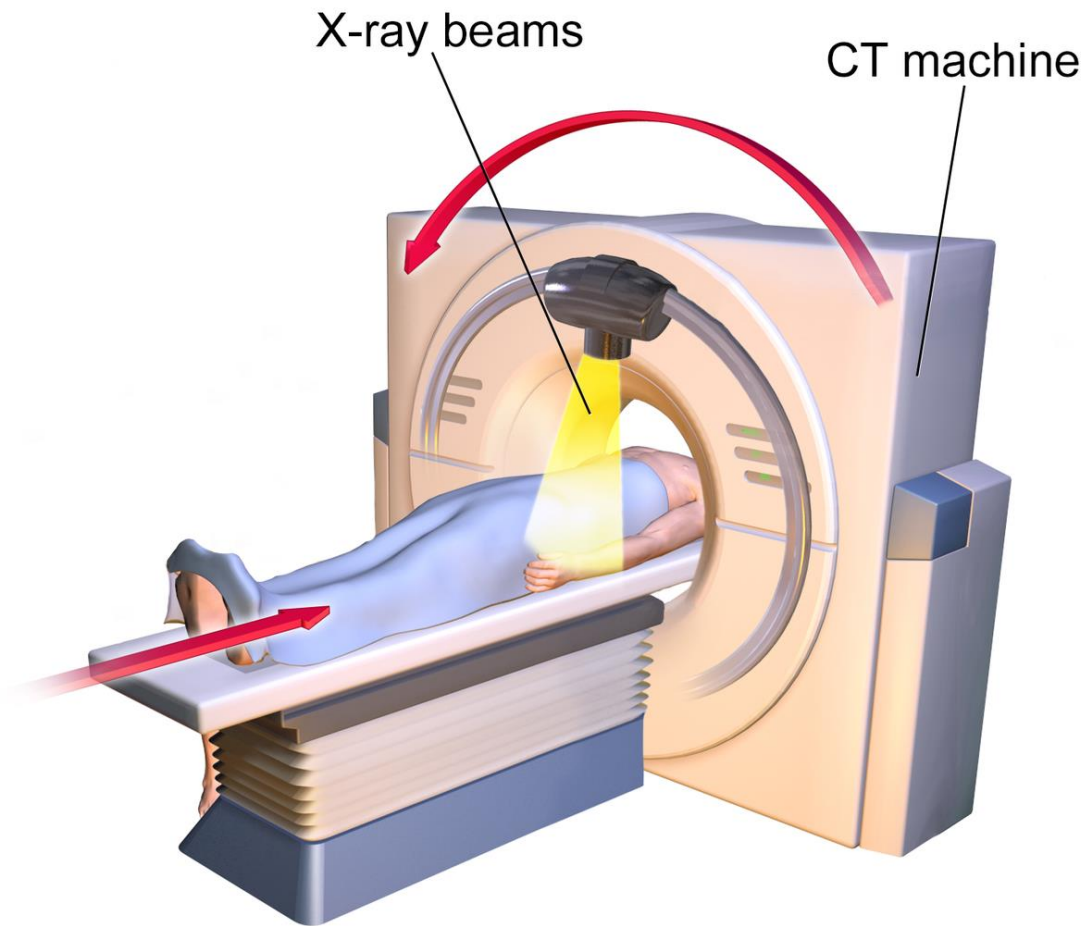
Pre-operative testing



III. Tumor markers

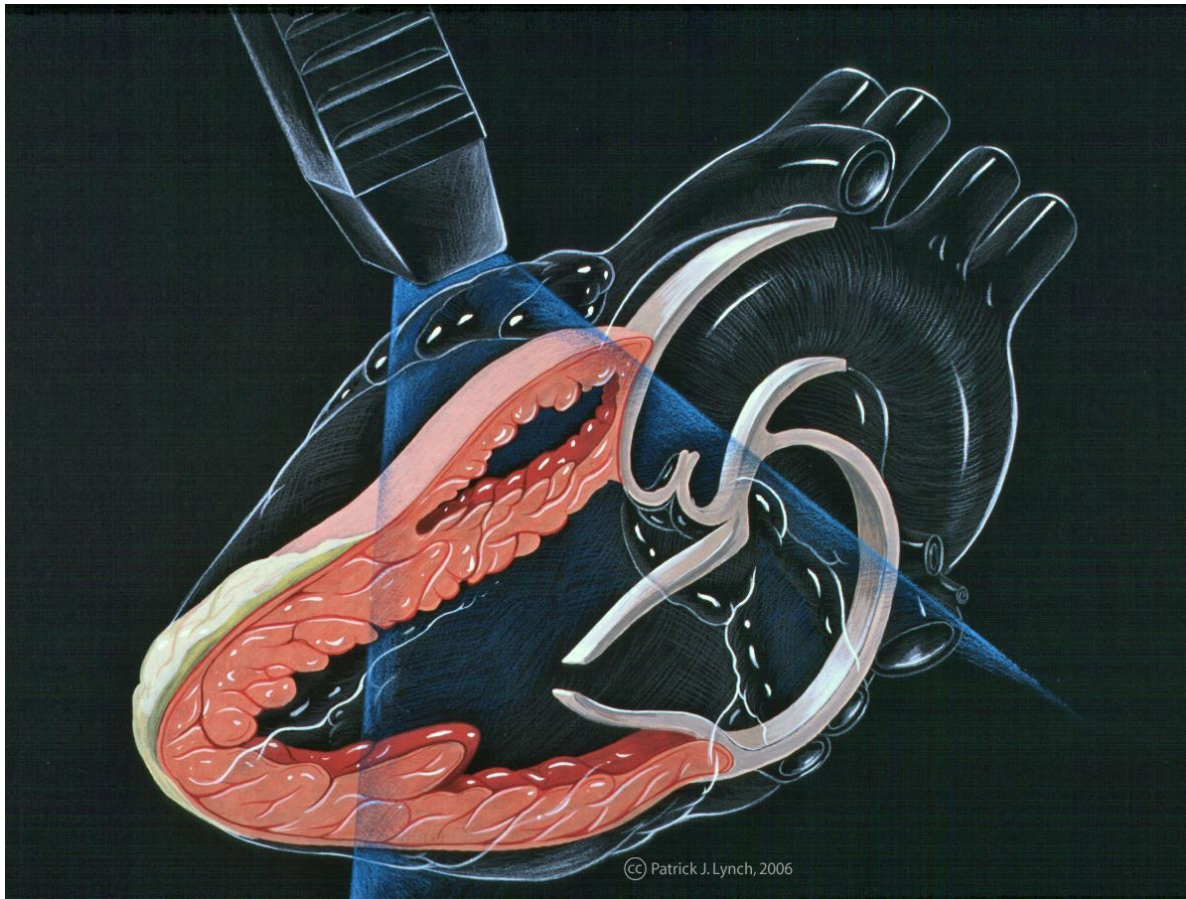
- Uric acid, LDH, β -HCG, α -fetoprotein, thyroid function test
- Flow cytometry
- Lumbar puncture
- Bone marrow aspirate and biopsy

Computed tomography Scan



It is imperative that patients undergo a CT scan to further delineate the **exact location** of the mass, as well as the **degree of** airway and cardiovascular structure **compression**.

Transthoracic echocardiography



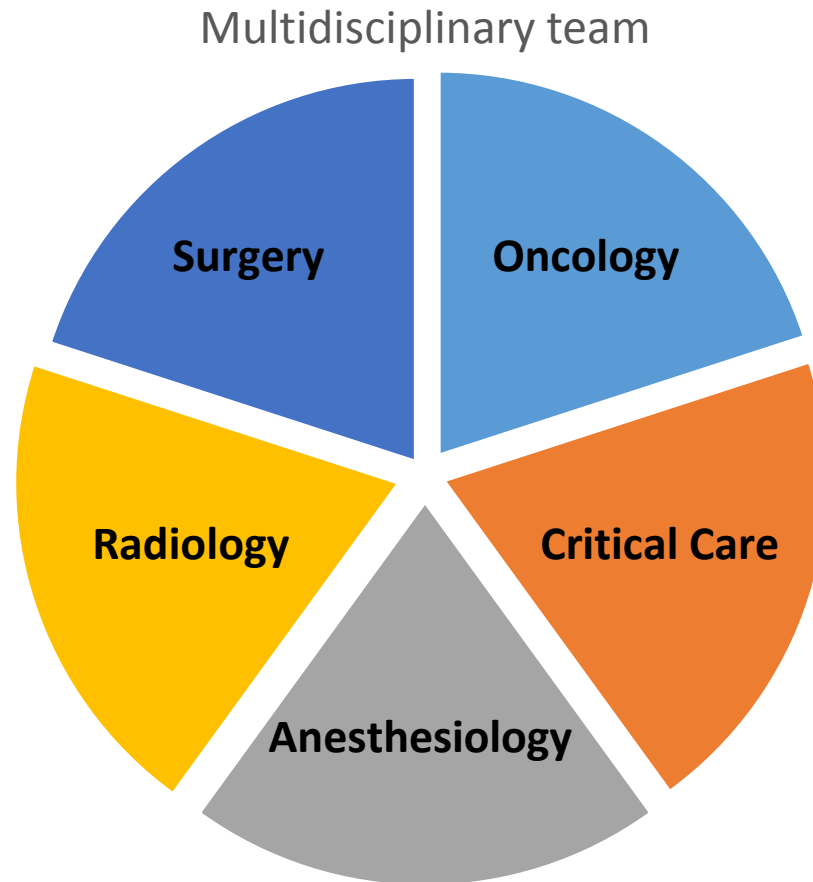
ECHO done in the **supine position** will evaluate cardiovascular compression, reduction of pulmonary blood flow, cardiac output, and pericardial tamponade physiology.

Risk Stratification



	Low Risk	Intermediate Risk	High Risk
Signs	No airway, cardiac, or vascular compression	Mild tracheal compression (<70%) No bronchial compression	Tracheal compression (>70%) Bronchial compression Great vessel compression Tamponade physiology
Symptoms	None	Mild to moderate Postural	Orthopnea Stridor Cyanosis

Anesthetic Management



Consider referring to a high-level pediatric surgery center

Anesthesia Type



Local Anesthesia
+/- Sedation



General Anesthesia

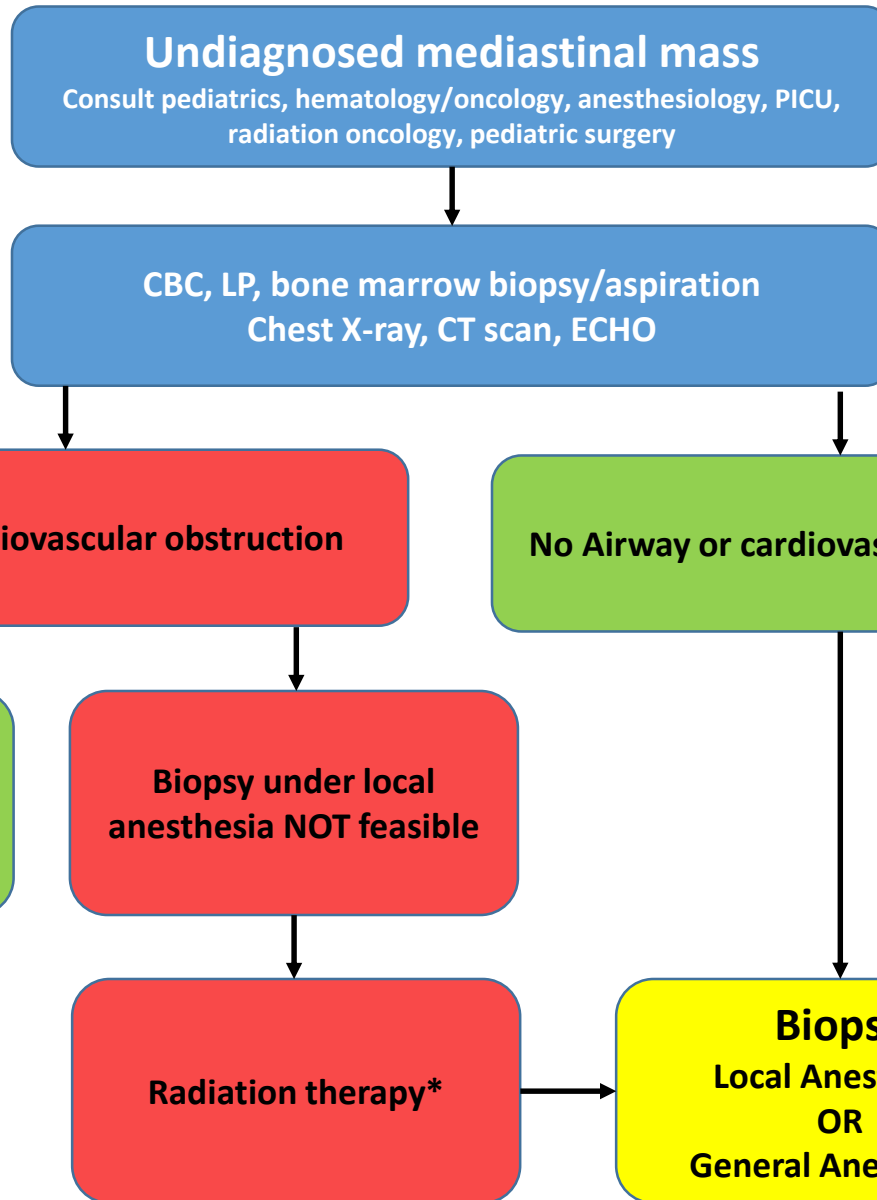
Procedures

Extrathoracic
lymph node
biopsy

Percutaneous
needle
aspiration of
mass,
pericardial
fluid, or pleural
fluid

Open
biopsy or
resection
of the mass

Thoracoscopic
biopsy of the
mass



*If radiation therapy is NOT available, proceed with multidisciplinary operative plan

Anesthesia Techniques



Volatile Agents

Ketamine

Positive pressure
ventilation?

Dexmedetomidine

Muscle relaxation?

Propofol



Airway management

Posture

- Induce in sitting position
- Change supine position to lateral or prone

Spontaneous Respiration

- Inhalational induction
- Intravenous induction
- Awake fiberoptic intubation

Airway Stenting

- Long ETT
- Double-lumen ETT
- Rigid bronchoscope
- Insertion of tracheobronchial stents

CPB

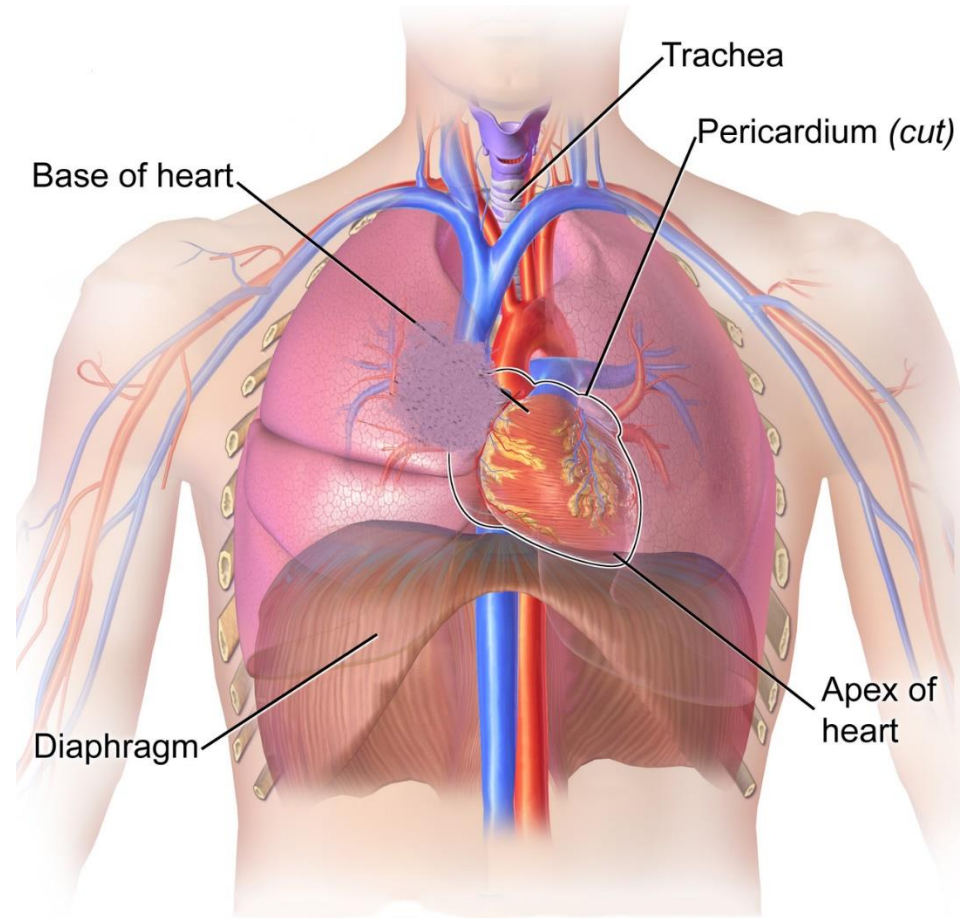
- Commenced under local anesthesia before induction
- Vessels prepared under local anesthesia → GA



Vascular involvement

SVC Syndrome

Intraoperative Hemorrhage



It is prudent to place a large bore intravenous cannula in the lower body, preferably in the femoral vein, to facilitate transfusion if the SVC is breached surgically.

Intraoperative Considerations



**Large-bore IV X 2
(SVC Syndrome: place in the lower limbs)**

Blood in OR

Arterial line (left radial artery)

+/- CVP/PA

Managing Intraoperative Complications



Rescue position

Rigid bronchoscopy

Cardiopulmonary bypass

Emergent sternotomy

Postoperative Considerations



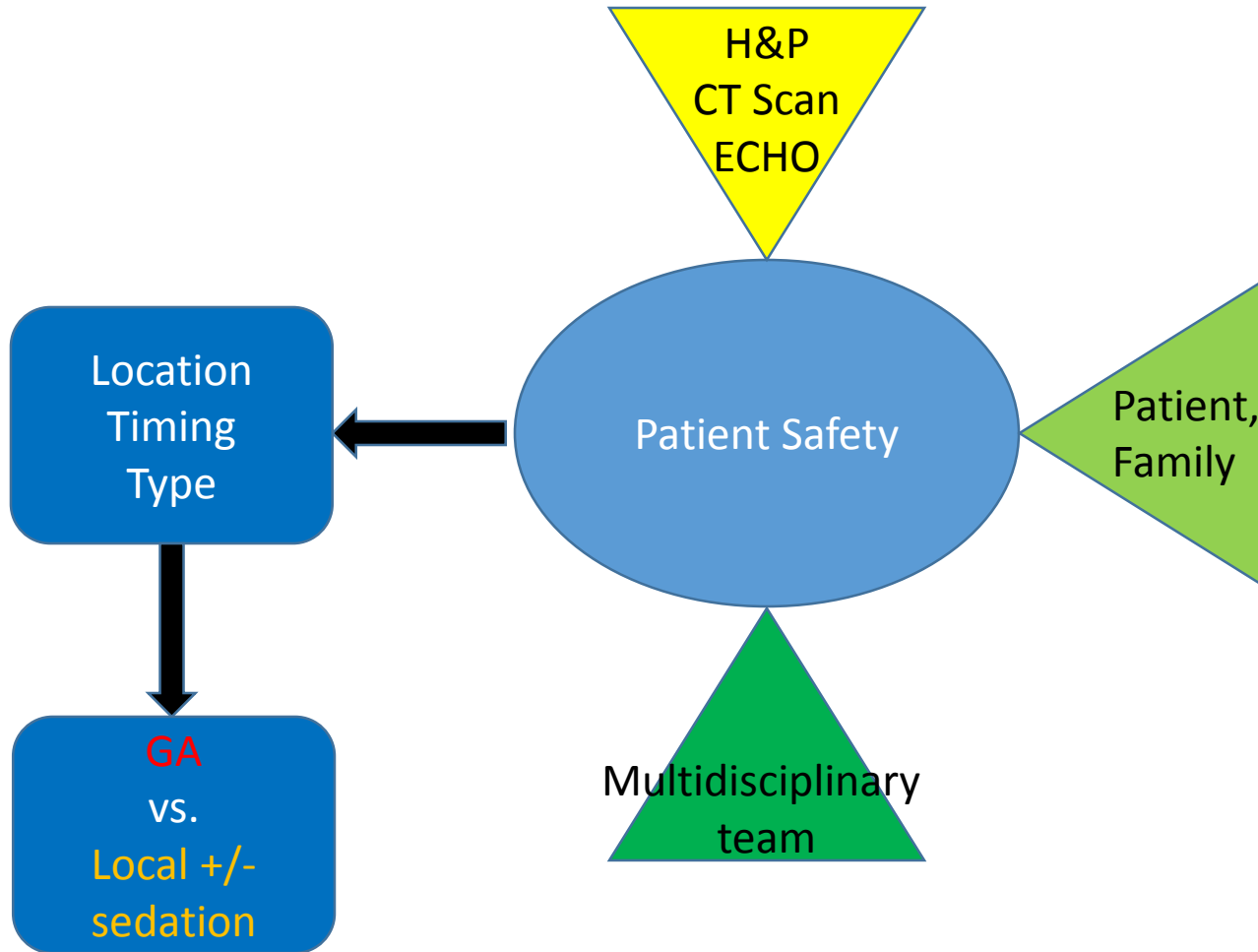
Pain management

Parenteral opioids

+/- Epidural catheter

+/- Peripheral nerve block

Conclusion





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