

## Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Hypotension Tachycardia Hemodynamic instability	Fatigue Weakness Angina	Auscultation	ECG BP Pulm artery cath
RESP	Hypoxemia	Tachypnea Dyspnea	Auscultation	SpO <sub>2</sub> ABGs CXR
GI	Perforation Obstruction Abscess Fistula Hemorrhage	Abdominal pain N/V Fever Abdominal rigidity Rectal bleeding	Diffuse abdominal tenderness Rebound Absent bowel sounds Abdominal rigidity	Free air under diaphragm if perforation CT scan Ultrasonography
HEME	Anemia, leukocytosis, DIC with sepsis			CBC with differential PT/ PTT, FSP, plt count, fibrinogen
RENAL	Colovesicular fistula	May pass air with urine if perforation into urinary bladder		Urinalysis Urine output
CNS	Disorientation with sepsis			

**Key References:** Young-Fadok TM, Sarr MJ: Diverticular disease of the colon. In Yamada T, Alpers DH, Kaplowitz N, et al., editors: *Textbook of gastroenterology*, ed 4, Philadelphia, PA, 2003, Lippincott Williams and Wilkins, pp 1843–1863; Tantawy H, Myslajek T: Diseases of the gastrointestinal system. In Hines R, Marschall K, editors: *Stoelting's anesthesia and co-existing disease*, ed 6, Philadelphia, PA, 2012, Saunders, pp. 301–304.

### Perioperative Implications

#### Monitoring

- Routine, including urine output.
- With sepsis, monitor arterial pressure; consider PAC monitoring.

#### Maintenance

- Optimize intravascular volume and high O<sub>2</sub> content.

### Postoperative Period

- Maintain intravascular volume.
- Continued monitoring of CV variables and urine volume.

#### Adjuvants

- Antibiotics
- Volume expanders
- Component therapy if DIC develops
- Vasopressor support if required; no interactions

### Anticipated Problems/Concerns

- Condition is chronic so flare-ups may occur. Diverticulosis may progress to uncomplicated diverticulitis and evolve to the complicated form (abscess, perforation, obstruction, bleeding, fistula).
- Any surgical intervention and bowel resection would therefore have the anticipated side effects and complications expected from that procedure.

## Do Not Resuscitate Orders

Alanna E. Goodman

### Risk

- Violation of pt autonomy and self-determination if DNR orders are not reconsidered and honored for the periop period.
- Increasing numbers of pts have some form of advance directive.
- Approximately 15% of surgical pts have DNR orders.

### Perioperative Considerations

- Resuscitation preferences can change based on pt status and prognosis.
- DNR orders do not become automatically suspended or continued when a pt goes to surgery.
- Intraop arrests tend to have better outcomes because they are witnessed, acted upon quickly, and are often due to reversible causes.
- Pts with DNR orders often undergo vascular access procedures, gastrostomy tube placement,

tracheostomy, palliative procedures, repair of pathologic fractures, and surgery for emergent conditions (e.g., bowel obstruction, appendicitis).

### Worry About

- Ethical and legal obligation to honor and follow pt's wishes and provide optimal medical care
- Appropriateness of the DNR order
- Delineation of anesthesia care and resuscitation
- Iatrogenic events
- Intraop deaths
- Liability

### Overview

- The Patient Self-Determination Act (1990) was established to allow pts to avoid undesired medical interventions. It requires federally funded healthcare institutions to ask pts about advance directives when admitted and provide information about their right to have one (Medicare and Medicaid are federally funded).

- The 1983 Report of the President's Commission for the Study of Ethical Problems in Medicine justified the "favoring of resuscitation of hospitalized pts with unexpected cardiac arrest"— which conveys implicit pt consent for CPR.
- CPR is the only medical intervention that requires a MD order to be withheld.
- A DNR order is a limited advance directive that prevents resuscitative intervention in the event of a cardiopulmonary arrest.
- Many pts with DNR orders are terminally ill or have advanced disease.
- Policies should be set in place for reevaluation of DNR orders for pts requiring surgery. These policies should be institutional, written, unambiguous, and flexible to individual pt needs.
- Anesthesiologists should be familiar with their institution's policies, as well as state and federal laws.

## Assessment Points

- What are the pt's wishes?
- When was the DNR order written/last updated?
- Why was the DNR order initiated?
- Did the pt have a terminal condition?
- Did the pt have correct prognostic information?
- Who discussed/wrote the DNR order with the pt?
- Did the physician influence the decision to have the DNR order?

**Key References:** *Ethical guidelines for the anesthesia care of patients with do not resuscitate orders or other directives that limit care*, Park Ridge, IL, 1993, American Society of Anesthesiologists; amended 1998; Waisel D, Burns JP, Johnson J, et al.: Guidelines for perioperative do-not-resuscitate policies, *J Clin Anesth* 14(6):467–473, 2002.

### Perioperative Implications

- Review “required reconsideration” of the DNR orders.
- All changes to DNR status must be communicated to all members of the periop team and documented in the pt’s medical record.
- Best if discussion of DNR orders can be done preop to develop a better pt-doctor relationship, avoid production pressure influences, and to allow time to contact all appropriate parties (surrogate, surgeon, primary care physician).
- This discussion should include what procedures are essential for the anesthetic and operation (e.g., intubation paralysis); iatrogenic arrest; and if the DNR order is modified, when and if it should be reinstated.
- The document for *Informed Consent for Anesthesia Care in The Patients with An Existing Do-Not-Resuscitate*

Order created by The American Society of Anesthesiologists Committee on Ethics provides three resuscitation options during the periop period:

- Full resuscitation.
- Limited resuscitation: Procedure-directed, documents specific procedures the pt refuses.
- Limited resuscitation: Goal-directed, allows resuscitation if the anesthesiologist and surgeon believe the adverse events are temporary and reversible. Allows resuscitation if the anesthesiologist and surgeon believe the resuscitation efforts support specified and documented goals of the pt.
- Consider consultation with an ethics expert if there is disagreement or concern about DNR orders and the surgery is not emergent.

### Anticipated Problems/Concerns

- Anesthesiologists rarely have an established relationship with the DNR pt but must discuss and clarify resuscitation wishes.
- Aspects of anesthesia care (intubation, vasopressors, IV fluid therapy, transfusion, etc.) are resuscitative therapies.
- Medications used for anesthesia may cause cardiac depression, respiratory depression, and cardiac arrest.
- Anesthesiologists may be morally conflicted with the pt’s desire for limited intervention. For a nonemergent case, the anesthesiologist can decide not to perform the anesthetic as long as there is another available physician and the change is not detrimental to the pt.

## Double Aortic Arch

Anthony J. Clapcich

### Risk

- Vascular rings account for <1% of cardiovascular malformations that require surgical correction. Double aortic arch is the most common form of complete ring that encircles both the trachea and the esophagus.
- Race/gender predilection: None.

### Perioperative Risks

- Recurrent respiratory infections often aggravate chronic airway obstruction.
- Baseline dynamic tracheal compression can progress to complete airway obstruction upon induction and muscle relaxation.
- Persistent postop airway obstruction requiring prolonged mechanical ventilation and CPAP.

### Worry About

- Esophageal obstruction: Dysphagia, choking, emesis, aspiration, FTT.
- Tracheal obstruction: Chronic cough, wheezing, barky-brassy cry, inspiratory/expiratory stridor; acute episodes of severe respiratory distress, apnea, cyanosis, and ALTE.
- Associated cardiac anomalies (10–20%): VSD, ASD, interrupted aortic arch, transposition of the great arteries, tetralogy of Fallot, truncus arteriosus, and complex univentricular lesions.
- Chromosome 22q11 deletion syndrome (20%): Genetic defect associated with syndromes, such as DiGeorge, velocardiofacial, CHARGE, and VACTERL; features include endocrine abnormalities

(hypocalcemia, thyroid/parathyroid dysfunction, short stature), palatal and laryngotracheal abnormalities, developmental delay/neurologic abnormalities, renal tract malformations, thrombocytopenia, T-cell deficiencies, and autoimmune disorders.

### Overview

- Vascular rings can be classified as complete or incomplete. Double aortic arch is the most common form of complete ring that encircles and compresses both the trachea and esophagus.
- Symptoms usually occur at birth or within the first 3 mo of life. The degree of tracheal and esophageal compression will dictate the severity of respiratory and GI perturbation.
- Initial work-up with CXR and upper GI can reveal tracheal deviation/narrowing and proximal esophageal distention/indentation. After the diagnosis is suspected, ECHO is used to examine arch anatomy and rule out other intracardiac anomalies. Both MRI and CT are very useful in further delineating vascular, airway, and GI anatomy. Cath is now reserved for assessing complex cardiac defects that require additional hemodynamic information. Bronchoscopy is often performed at the time of repair to evaluate the location, degree, and extent of airway obstruction, which may help to identify those pts at risk for postop respiratory compromise.

### Etiology

- During normal human development, six branchial arches are sequentially formed and penetrated by

six paired aortic arches that arise from the aortic sac and terminate in paired DA. These primitive arches largely regress (the fourth and sixth being the most persistent) and by the eighth week, the right DA largely involutes and forms the distal part of the right subclavian artery, leaving only the left DA to form the distal aortic arch and descending aorta. Failure of the right DA to involute results in a double aortic arch, whereby the ascending aortic arch divides into two arches, passes on each side of the trachea and esophagus, and joins posteriorly to form the descending aorta. The right carotid and subclavian arteries arise from the usually dominant, posterior right arch, whereas the left carotid and subclavian arteries arise from the smaller, anterior left arch.

### Usual Treatment

- Medical therapy: None.
- Surgery: The goal is to relieve tracheal and esophageal compression by dividing the vascular ring and dissecting any fibrous bands. A thoracotomy is usually performed on the side ipsilateral to the minor arch. Right (posterior) arch is dominant in >75% of cases; thus left posterolateral thoracotomy is commonly used to expose the left (anterior) arch. Video-assisted thoracoscopic repair is also an effective option. Median sternotomy with cardiopulmonary bypass is reserved for cases that require concomitant repair of associated cardiac anomalies.

### Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Chromosome 22q11 deletion features: Facial abnormalities Palatal abnormalities Velopharyngeal incompetence Congenital laryngeal web	Previous difficulties with anesthesia or intubation FTT Nasal regurgitation of formula; delayed speech/poor articulation (childhood) Noisy breathing, abnormal cry	Low set ears, short philtrum, hypertelorism, small mouth, small chin Cleft palate Hypernasal speech (childhood) Inspiratory/expiratory stridor, aphonia/ weak high-pitched cry Hoarseness (childhood)	Flexible bronchoscopy Direct laryngoscopy/ bronchoscopy
CV	Depends on presence of associated cardiac anomalies (10–20% cases); None if <i>only</i> double aortic arch present	Cyanotic spells, CHF, dyspnea, diaphoresis, FTT	Murmur, cyanosis, four-limb noninvasive BP discrepancy, grunting, rales/wheezes, hepatosplenomegaly	Pulse oximeter, ECG ECHO Cardiac MRI Cardiac cath
RESP	Airway obstruction Recurrent respiratory infection	Dyspnea, apnea, intermittent cyanosis, ALTE Coughing, wheezing	Insp/expiratory stridor (± positional), hyper-extended head, brassy-barky cry, intercostal retractions, nasal flaring	CXR Bronchoscopy MRI CT
GI	Esophageal obstruction	Dysphagia, FTT		UGI Esophagoscopy

**Key References:** Licari A, Manca E, Rispoli GA, et al.: Congenital vascular rings: a clinical challenge for the pediatrician, *Pediatr Pulmonol* 50(5):511–524, 2015; Backer CL, Mongé MC, Russell HM, et al.: Reoperation after vascular ring repair, *Semin Thorac Cardiovasc Surg Pediatr Card Surg Annu* 17(1):48–55, 2014.