- Surgical: Indications for surgery are failure of medical management, intestinal obstruction, intra-abdominal abscess, fistulas, fulminant colitis, toxic megacolon, massive hemorrhage, cancer, and growth retardation; 70–90% of Crohn disease patients will need surgical intervention at some point.
- Surgical procedures may include stricturoplasty, bowel resection, and abscess drainage.
- Main surgical principle is to preserve bowel length to avoid short bowel syndrome.
- Both medical and surgical management of Crohn disease are aimed at providing long-lasting symptomatic relief while avoiding excessive morbidity.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Hypovolemia	Bowel prep, wt loss, diarrhea	Hypotension, tachycardia	Lytes, Hct
GI	Bowel perforation Malabsorption	Abdominal pain Diarrhea, weight loss	Abdominal tenderness, fever Cachexia	WBCs Albumin
MS	Ankylosing arthritis	Joint mobility	Decreased ROM of joints	

Key References: Baumgart DC, Sandborn WJ: Crohn's disease, *Lancet* 380(9853):1590-1605, 2012; Patel S, Lutz JM, Panchagnula U, et al.: Anesthesia and perioperative management of colorectal surgical patients—a clinical review (Part 1), *J Anaesthesiol Clin Pharmacol* 28(2):162–171, 2012.

Perioperative Implications

Preoperative Preparation

- Optimization of nutritional status preop can improve operative outcomes.
- Ensure volume status and lytes are normalized.
- If pt is on hyperalimentation preop, continue it during the case; monitor glucose.
- Assess current or recent steroid use and need for periop supplementation.
- Discontinue methotrexate at least 1 wk before surgery because it has been shown to decrease wound healing; resume after wound healing occurs.
- Pts with significant anemia should be transfused preop.
- Careful pt positioning and padding of extremities.

Monitoring

- Standard monitoring.
- Large-bore PIV access.
- Consider CVL if pt has difficult IV access or if patient is hypovolemic or large fluid shifts are anticipated.
- Consider arterial line if significant comorbidities exist.
- Foley catheter to monitor urine output.

Airway

- Aspiration risk if bowel obstruction present

Induction

- Rapid sequence induction in patients with gastric outlet or bowel obstruction.
- Consider preinduction placement of NG tube to suction gastric contents.

Maintenance

- Avoid nitrous oxide if bowel obstruction present.
- Abdominal relaxation with nondepolarizing muscle relaxants usually needed. If liver disease is present, avoid muscle relaxants dependent on hepatic metabolism.
- Check glucose regularly if on hyperalimentation.
- Consider need for significant fluid administration (open abdomen, long case).
- Maintain normothermia; fluid warmer and forced air warming device.

Extubation

- Awake extubation

Postoperative Period

- Consider epidural analgesia or IV PCA for pain control.
- Monitor fluid status carefully in the postop period.

Anticipated Problems/Concerns

- Possibly long surgery due to adhesions and multiple strictures
- May need aggressive fluid replacement due to hypovolemia and anemia worsened by third space losses
- May have severe nutritional deficiency, especially with short bowel syndrome from extensive resection
- Need for stress dose steroids if patient treated with steroids for medical management

Croup (Laryngotracheobronchitis)

Maurice S. Zwass | Jeffrey D. Roizen

Risk

- Children between 6 mo-6 y are at risk (6 mo–3 y at greatest risk).
- Children with underlying airway abnormalities (e.g., subglottic stenosis) or difficult intubations (e.g., micrognathia) and symptoms are at increased risk and require particular planning.

Perioperative Risks

- Difficulty with intubation because of very narrowed subglottic region
- Obstruction of the small tracheal tube because of airway secretions.

Worry About

- Risk of rebound tracheal edema several hours after racemic epinephrine treatment.
- Cardiorespiratory crisis in progressive or severe Sx, agitation, younger pts, difficulties with oxygenation or ventilation, failure to oxygenate.
- Bacterial superinfection of airway.

Overview

- Common childhood ailment with prodromal illness accompanied by a characteristic cough (which often sounds like seal barking).
- Sx and respiratory compromise from progressive swelling of subglottic region tracheal mucosa.
- Frequently present when inspiratory stridor and respiratory distress develop.
- Radiographs of the neck often demonstrate gradual progressive tracheal narrowing; most narrow just below level of vocal cords (referred to as steeple sign). Upper glottis on a lateral neck radiograph is normal.
- When obtained, evaluation of CBC is consistent with viral illness.

Etiology

- Viral agents are typical etiologies and include parainfluenza viruses (most common). Adenoviruses, influenza virus, RSV, and measles virus also associated.

Usual Treatment

- Cool mist often greatly improves Sx; supplemental O_2.
- If symptoms more severe, aerosolized racemic epinephrine can dramatically reduce airway swelling (rebound tracheal edema risk several hours after administration necessitates observation in hospital).
- Steroid administration controversial; may decrease severity of disease and decrease need for tracheal intubation or hasten improvement in first 24 h of illness.
- Small percentage of pts with this disease require tracheal intubation.
- Parenteral steroids (dexamethasone) and inhaled steroids (budesonide) have been used.
- Breathing helium-oxygen mixtures has been reported as helpful in some cases (lower density and viscosity).

Assessment Points

Differentiation Between Croup (Laryngotracheobronchitis) and Epiglottitis

	Croup	Epiglottitis
Age	3 mo–3 y	1–7 y
Onset	Gradual	More rapid (usually <24 h)
Fever	Low grade	High
Cough	Characteristic barking	None
Sore throat	Occasional	Frequently severe
Posture	Any	Frequently sitting forward, mouth open, drooling
Airway sound	Inspiratory stridor	Inspiratory stridor
Voice	Normal	Muffled
Appearance	Nontoxic	Toxic
Seasonality	Peak winter, epidemic	Year-round

Key References: Jenkins I, Saunders M: Infections of the airway, *Paediatr Anaesth* 19(Suppl 1):118–130, 2009; Tibballs J Watson T: Symptoms and signs differentiating croup and epiglottis, *J Paediatr Child Health* 47:77-82, 2011.

Perioperative Implications

Airway

- Airway support with good mask fit and positive pressure ventilation can generally overcome obstruction from swelling of airway.
- Identification of larynx is generally routine, but a tracheal tube 0.5–1.0 mm diameter smaller than usual may necessitate having available extra-long or micro-laryngeal tracheal tubes.
- Tracheotomy rarely needed as therapy for these pts with current management and reserved only for unusual cases.

Induction

- Induction common when IV access has already been obtained.

Anticipated Problems/Concerns

- Symptomatic pts who require intubation of trachea need tubes 0.5–1.0 mm smaller in diameter than pts without croup.
- Pts who require tracheal intubation usually require sedative management to tolerate ventilation; this is often followed for development of leaks around the tracheal tube as a sign of improvement of edema; most pts improve within 2–4 d. When leak is present at 20–25 cm H_2O of pressure, extubation can be considered; complicated cases and pts with prolonged courses may benefit from examination of airway in operating room at time of extubation.
- Although a viral illness, some pts may acquire bacterial superinfection of airways and require antibiotic therapy.

Crouzon Syndrome

Geoff Frawley

Risk

- Represents approximately 4.8% of cases of craniosynostosis at birth.
- Birth prevalence of 1.6:100,000 births.
- Estimated prevalence in general population of Europe is 0.9:100,000.
- No race predilection.

Perioperative Risks

- Difficult BMV, difficult intubation, massive blood loss, arterial gas embolism

Worry About

- Difficult airway
- Intraop blood loss
- Inadvertent dural sinus injury
- Postextubation subglottic edema
- External facial fixation devices

Overview

- Crouzon syndrome is an autosomal dominant disorder characterized by craniosynostosis causing secondary alterations of the facial bones and facial structure.
- Common features include hypertelorism, exophthalmos and external strabismus, parrot beak nose, short upper lip, hypoplastic maxilla, and a relative mandibular prognathism.
- Synonyms: Craniofacial dysostosis type II, FGFR deficiency.

Etiology

- Due to mutation in FGFR2 gene on chromosome 10.
- Normal function of FGFRs is to restrain limb growth. FGFR mutations are hypermorphic, causing excessive cranial bone formation.
- Inherited in autosomal dominant fashion, but de novo mutations account for 50% of cases.
- High penetrance but variable expressivity.
- Male to female preponderance of 3:1.

Usual Treatment

- In neonatal period tracheostomy for UAO or ventriculoperitoneal shunt for hydrocephalus may be required.
- Posterior vault expansion may be carried out in first 6 mo to achieve cranial decompression of intracranial venous hypertension.
- Fronto-orbital advancement to protect orbitae from subluxation at 6–12 mo.
- Complex hypoplasia of cranial vault, orbits, and midface may require frontofacial advancement (Le Fort III osteotomy) and/or distraction osteogenesis with application of RED frame.