Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Atlantooccipital dislocation Dentinogenesis imperfecta	Bone fragility	Abnormal oral cavity	Cervical x-ray
CV	Valvulopathies	SOB, cyanosis	Murmur, gallop	ECHO
RESP/GI	Restrictive pulm disorders		Dyspnea, thoracic deformities	CXR Spirometry
MS	Scoliosis Thoracic deformities			
CNS	Growth retardation			

Key References: Oakley I, Reece LP: Anesthetic implications for the patient with osteogenesis imperfecta, *AANA J* 78(1):47–53, 2010; Libman RH: Anesthetic considerations for the patient with osteogenesis imperfecta, *Clin Orthop Relat Res* 159:123–125, 1981.

Perioperative Implications

Preoperative Preparation
- Difficult airway management
- Peripheral IV lines difficult to place

Monitoring
- Avoid noninvasive BP monitoring because of the risk of fractures.
- Pay particular attention to temperature control and neuromuscular blockade.
- Avoid fast-acting relaxants; fasciculation can lead to bone fractures.
- Continuous temperature monitoring is mandatory under general anesthesia.

Airway
- LMA available.
- Fiberoptic bronchoscope ready to use before induction.
- A wide assortment of laryngoscope blades and ETTs should be available

Preinduction/Induction
- Sedation in a monitored setting.
- Rigid control of temperature.

Maintenance
- Monitor neuromuscular blockade.

Extubation
- Pt should preferably be extubated awake.

Anticipated Problems/Concerns
- Heart disease may be present, mainly valvulopathies; refer to cardiac assessment before inducing anesthesia.
- Airway management may be difficult.
- Repeated visits to the OR are frequent; try to avoid latex contact to prevent allergy.
- Avoid anesthesia in the ambulatory setting.

Osteoporosis

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Risk
- Most common metabolic bone disease in USA
- All elderly pts of European descent considered at risk
- Non-Hispanic white women and Asian women at highest risk
- Estimate is that over 200 million people worldwide are at risk. Approximately 30% of all postmenopausal women in USA and Europe have osteoporosis.
- At least 40% of these women and 15–30% of men will sustain one or more fragility fractures in their remaining lifetimes.
- Female incidence >male incidence: 3:1.
- Postmenopausal women with small frames and low weight especially vulnerable.
- Risk factors for osteoporosis, such as advanced age and reduced bone density, have been established by virtue of their direct and strong relationship to the incidence of fractures; however, many other factors have been considered risk factors based on their relationship to bone density value as a surrogate indicator of osteoporosis. Risk factors include advanced age, female sex, white or Asian ethnicity, family Hx of osteoporosis, body weight less than 127 lb, amenorrhea, late menarche, early menopause, nulliparity, physical inactivity, alcohol and tobacco use, androgen or estrogen deficiency, and calcium deficiency.
- Secondary osteoporosis is attributable to diseases (hyperparathyroidism, rheumatoid arthritis, sarcoidosis, thalassemia, idiopathic scoliosis, multiple myeloma, thyrotoxicosis) and drugs (lithium, anticonvulsants, excessive alcohol use, excessive thyroxine, prolonged unfractionated heparin use [>6 mo of >15,000 IU/d], glucocorticoids, cytotoxic drugs).

Perioperative Risks
- Pneumonia
- Coexisting metabolic or endocrine disorders
- Fractures

Worry About
- Positioning because of increased risk of bone fractures
- Vertebral fractures: Vertebral compression fractures associated with increased morbidity/mortality.
- Hip fractures: Significantly increased risk of morbidity/mortality in first year after fracture; men more vulnerable than women
- Pulm function/restrictive disease, especially if kyphosis present

Overview
- Osteoporosis is a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue with a consequent increase in bone fragility.
- Imbalance between bone resorption and formation causes loss of bone substance, resulting in bone fractures.
- Most common fracture sites: Vertebral body, neck of femur, distal radius, proximal humerus, pelvis.
- 1.5 million fractures due to osteoporosis occur each y: Spine (700,000), hip (300,000), wrist (200,000).
- Women who have sustained a hip fracture have a 10–20% higher mortality than would be expected for their age.
- Severe kyphosis common.
- Type I (postmenopausal) osteoporosis: Women 15–20 y after menopause; vertebral and Colles' fractures most common.
- Type II (age-related) osteoporosis: Men and women ≥70 y; hip and vertebral fractures most common; also pelvis, humerus, and femur.
- Biphasic pattern of bone loss:
  - Slow phase occurs in both sexes beginning at age 40 y; 0.6–1% per y affecting cortical and trabecular bone.
  - Accelerated phase in women after menopause; 2–3% per y affecting cortical bone; 4–6% per y for trabecular bone.

Etiology
- Insufficient accumulation of bone mass during skeletal growth.
- Age-related factors: Decreased bone formation at cellular level begins in the fourth decade and becomes more severe with age. Age-related increase in parathyroid function with age-related decrease in calcium absorption.
- Menopause: Accelerated phase of bone loss results from estrogen deficiency.
- Sporadic factors: Twofold increased risk with cigarette smoking and high alcohol consumption.

Treatment
- Vitamin D and calcium.
- SERMs: Raloxifene.
- Bisphosphonates: Alendronate, risedronate.
- Human recombinant PTH: Teriparatide.
- Calcitonin.
- Discontinue glucocorticoid (if osteoporosis due to chronic use).
- Surgical stabilization of fractures: Kyphoplasty/vertebroplasty for spinal fractures; ORIF for fractures of the hip or wrist.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Osteoporosis of skull Vertebral fractures	Pain		Skull x-ray Neck x-ray
RESP	Kyphosis	Dyspnea	Dowager's hump	Flow-volume loop ABG
ENDO	Parathyroid function Decreased in type I Increased in type II Calcium absorption decreased Metabolic disorders of vitamin D			Ca^{2+}
MS	Back pain Loss of height Spinal deformity Fractures	Acute back pain Remittance and recurrence until chronic	Dowager's hump Loss of height Multiple fractures	X-ray Vertebral bone density

Key References: O'Connor KM: Evaluation and treatment of osteoporosis, *Med Clin North Am* 100(4):807–826, 2016; Guay J, Parker MJ, Gajendragadkar PR, et al.: Anaesthesia for hip fracture surgery in adults, *Cochrane Database Syst Rev* 2:CD000521, 2016.

Perioperative Implications

Preoperative Preparation

- Move and position carefully owing to risk of bone fractures.
- Pulm function tests are indicated if kyphoscoliosis is present.
- Consider preop cervical x-rays if indicated by thorough evaluation of cervical spine. Document range of motion. Document any preop neurologic deficits.
- Detailed Hx to determine coexisting metabolic/endocrine disorders.

Monitoring

- Routine.
- Consider arterial line and frequent ABG if pulm disease or pneumonia is present.

Airway

- Cervical fractures may require neck stabilization and fiberoptic intubation.
- Acromegaly may occur with osteoporosis.

Musculoskeletal

- Vertebral collapse may make spinal/epidural anesthesia more difficult.

Anticipated Problems/Concerns

- Susceptible to fracture with routine positioning and moving.
- Restrictive lung disease if scoliosis is present may impair oxygenation.

Otitis Media

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Risk

- Age: Highest incidence occurs between 6–24 mo of age; incidence subsequently declines, except for an increase at the time of school entry (between 5–6 y of age).
- Day care attendance.
- Tobacco smoke and air pollution.
- Other factors: Poor social/economic conditions, cooler seasons (fall and winter), altered host defenses, and diseases with associated craniofacial abnormalities (cleft palate and Down syndrome).

Perioperative Risks

- Active or concurrent disease: Upper or lower respiratory infections, which may increase risk of airway reactivity, laryngospasm, bronchospasm, periop O_2 requirement, and postop mechanical ventilation
- Inherent risks of associated craniofacial abnormality may predispose to airway obstruction and/or difficult airway management
- N/V related to the infection, antibiotic therapy, and vestibular imbalance
- Chronic issues:
  - Chronic or recurrent OM can cause hearing loss (usually conductive) that may lead to problems in development of speech, language, and cognitive abilities in the child. In chronic/advanced disease, preop and postop communication may become impaired.
  - Rare but serious complications include mastoiditis, petrositis, labyrinthitis, meningitis, epidural abscess, brain abscess, lateral sinus thrombosis, cavernous sinus thrombosis, subdural empyema, and carotid artery thrombosis.
  - Pts with fever ≥38°C and/or concurrent disease, including upper and lower respiratory infections and associated challenges with general anesthesia/airway manipulation.
  - Pts with associated vestibular, balance, and motor dysfunctions.
  - Pts with adenotonsillar hypertrophy or craniofacial abnormality that may predispose to more severe airway obstruction and/or difficult airway management.

Overview

- AOM is a common infectious disease. It is defined by the presence of fluid in the middle air, accompanied by acute signs of illness, and signs or symptoms of middle ear inflammation, which is restlessness, pain, agitation, and decreased hearing in younger children.
- OME is defined by the presence of middle ear fluid without acute signs of illness or inflammation of the middle ear mucosa. OME may be caused by allergies but usually occurs after AOM. Chronic OME typically leads to a conductive hearing loss.
- OM is most prevalent in infancy, but it can occur at all ages.

Etiology

- Pathogenesis: ETD usually from nasal congestion associated with an upper respiratory infection or allergic rhinitis leads to negative pressure and accumulation of secretions in the middle ear. The middle ear secretions serve as a growth medium for viruses and bacteria that colonize the upper respiratory tract resulting in suppuration and clinical signs of OM.
- Most common bacterial pathogens in OM are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.
- Most common viral pathogens in OM are RSV, rhinoviruses, influenza viruses, and adenoviruses.

Usual Treatment

- Analgesics for the pain associated with swelling of the tympanic membrane (otalgia): Ibuprofen, acetaminophen, and auralgan (topical anesthetic drops)
- Antimicrobial therapy:
  - First-line therapy is amoxicillin (80–90 mg/kg orally per d divided into 2 doses). Others incl cephalosporins (cefuroxime, ceftriaxone), macrolides (erythromycin, azithromycin), and trimethoprim sulfa sulfamethoxazole.
  - Should be administered to any child younger than 6 mo.
  - Should be administered to children 6 mo to 2 y in whom the Dx of AOM is certain or if the Dx is uncertain but the illness is severe (moderate to severe otalgia or fever ≥39°C). If the Dx is uncertain and illness is not severe, the child may be observed without treatment with antibiotics.
  - Should be administered to pts older than 2 y if the Dx is certain and illness is severe. When the Dx is certain but illness is not severe, observation alone is an option.
- AOM usually resolves in 24–72 h with appropriate antimicrobial therapy; however, fluid may persist for weeks to months despite treatment. Placement of tympanostomy tubes is performed for pts with persistent middle ear effusion or severe and recurrent episodes of otitis media (>6 antibiotic courses/y). Adenoidectomy may be indicated in selected pts, and if chronic ETD is a major contributing factor.
- Prevention is an important management strategy for OM: Minimize risk factors (smaller day care groups and decrease smoke exposure), administer vaccines (influenza and pneumococcal), and encourage breastfeeding for at least 3 mo and ideally for 6 mo (diminishes colonization of the nasopharynx by bacterial pathogens and increased negative pressure in hypopharynx drain middle ear through ET).