HEALTH TECH ACADEMY

Pediatric Surgery

Additional Surgical Techniques

Lesson Objectives:

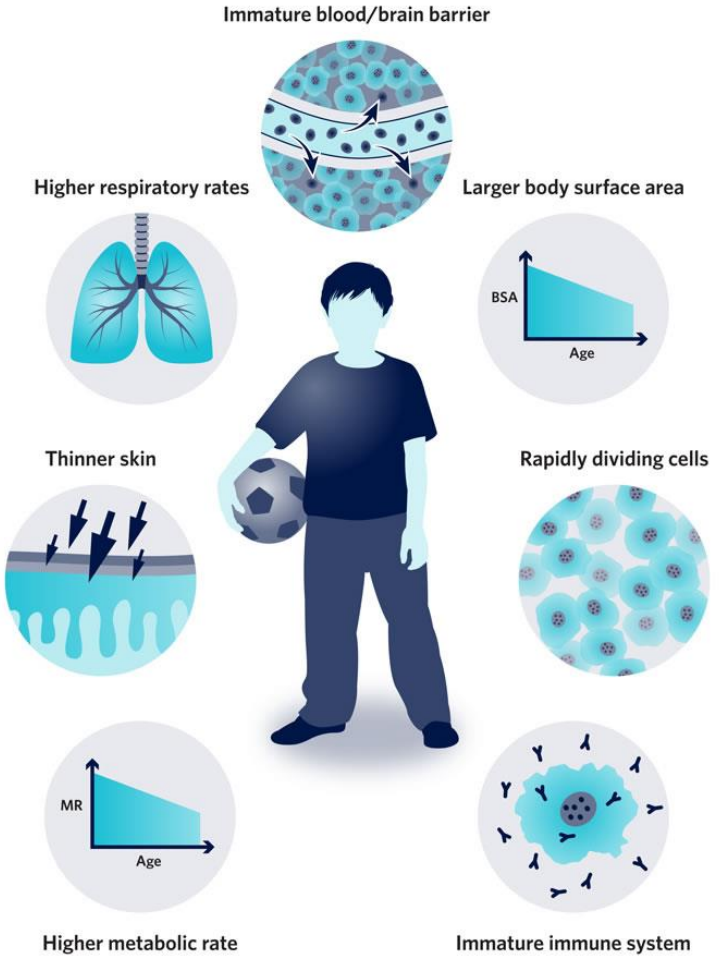
1. Identify key physiological and anatomical features in pediatric surgery
2. Discuss pediatric pathology with respect to surgery
3. Discuss key elements of case planning for pediatric surgery
4. Describe psychosocial care of the pediatric patient
5. Discuss risk reduction techniques in pediatric surgery
6. List and describe common pediatric surgical procedures

Pediatric Surgery

- Encompasses congenital anomaly treatment, disease procedures, and trauma surgery.
- Care in pediatrics spans from neonate to late adolescence, often continuing into adulthood
- Family involvement is integral, requiring equal consideration in communication and psychosocial care.

Physiological and Anatomical Considerations

- **Physiological Differences in Pediatric Patients:**
  - Infants and children lack developed mechanisms for maintaining temperature balance.
  - Factors like skin surface area, weight, and circulation contribute to rapid heat loss.
  - Wide temperature variation compared to adults.



Hypothermia in Pediatric Patients

- **Hypothermia in Pediatric Patients:**
  - Risks include conduction, radiation, and anesthesia-induced effects.
  - Physiological response includes decreased metabolism, heart rate, and respiratory rate.
  - Infants lack shivering mechanism, leading to rapid hypoxemia and hypoglycemia.
- **Hyperthermia Concerns:**
  - Environmental and physiological factors contribute.
  - Misuse of warming devices and excessive covering can induce hyperthermia.

Table 2. Differential Diagnosis for Hypothermia

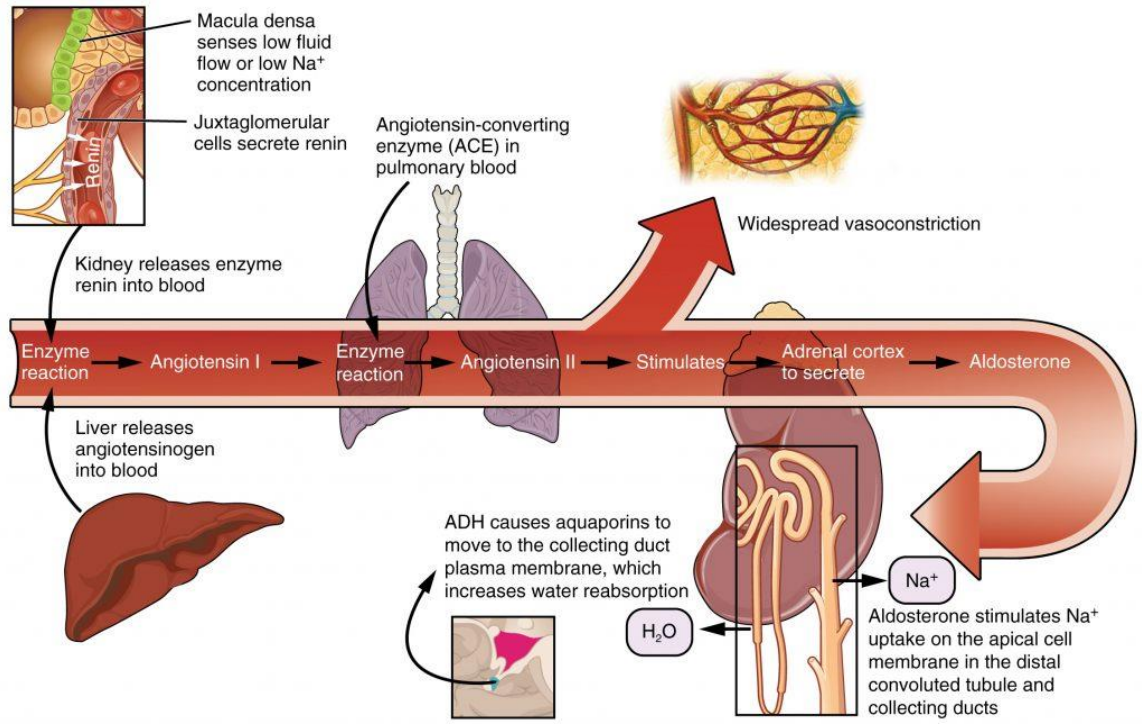
Category/ Organ System	Conditions that can result in hypothermia
Trauma	Burns, drowning, traumatic brain injury, spinal cord injury, intracranial hemorrhage, nonaccidental trauma
Toxicologic	Antidepressants, antipsychotics, barbiturates, clonidine, alcohol, opioids
Infectious disease	Sepsis, meningitis/encephalitis, brain abscess
Neurologic	Brain tumor, dysautonomia, stroke
Endocrine/metabolic	Hypoglycemia, hypothyroidism, organic acidemia, aminoacidemia, adrenal insufficiency, anemia
Cardiovascular	Cardiac arrest, cardiac arrhythmia, congenital heart disease

Physiological and Anatomical Considerations

- **Hemostasis in Pediatric Surgery:**
  - Critical due to limited blood reserve in children.
  - Monitoring blood loss and preparing for emergencies is essential.
- **Anatomical Considerations in Airway Management:**
  - Differences in tongue size, airway structure, and thoracic wall rigidity.
  - Infants are obligate nose breathers and have a shorter trachea compared to adults.

Fluid Balance

- Infants can become dehydrated rapidly, so maintaining the correct amount and types of fluids is important
- Even small amounts of fluid to an adult can have large changes in children

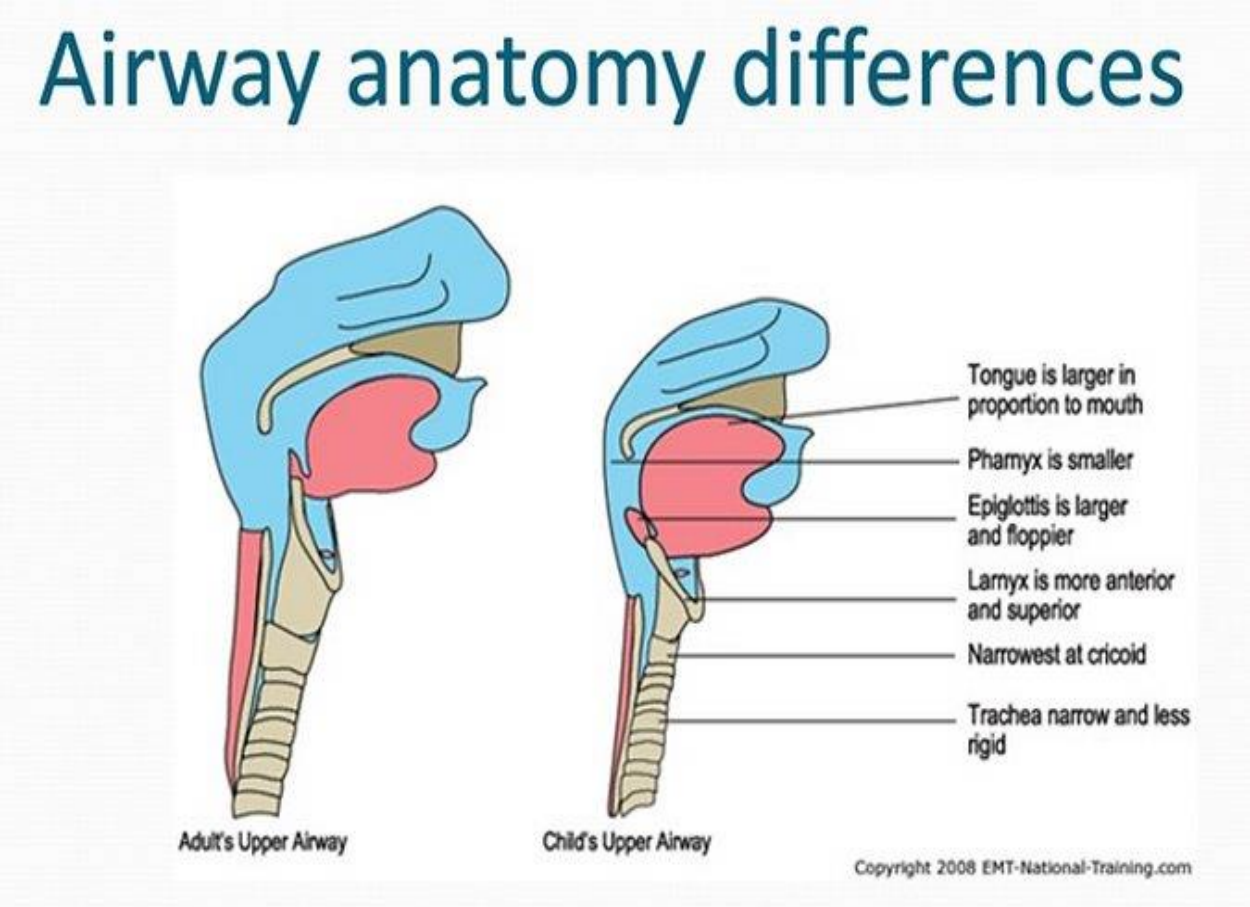


Pediatric Airway Features

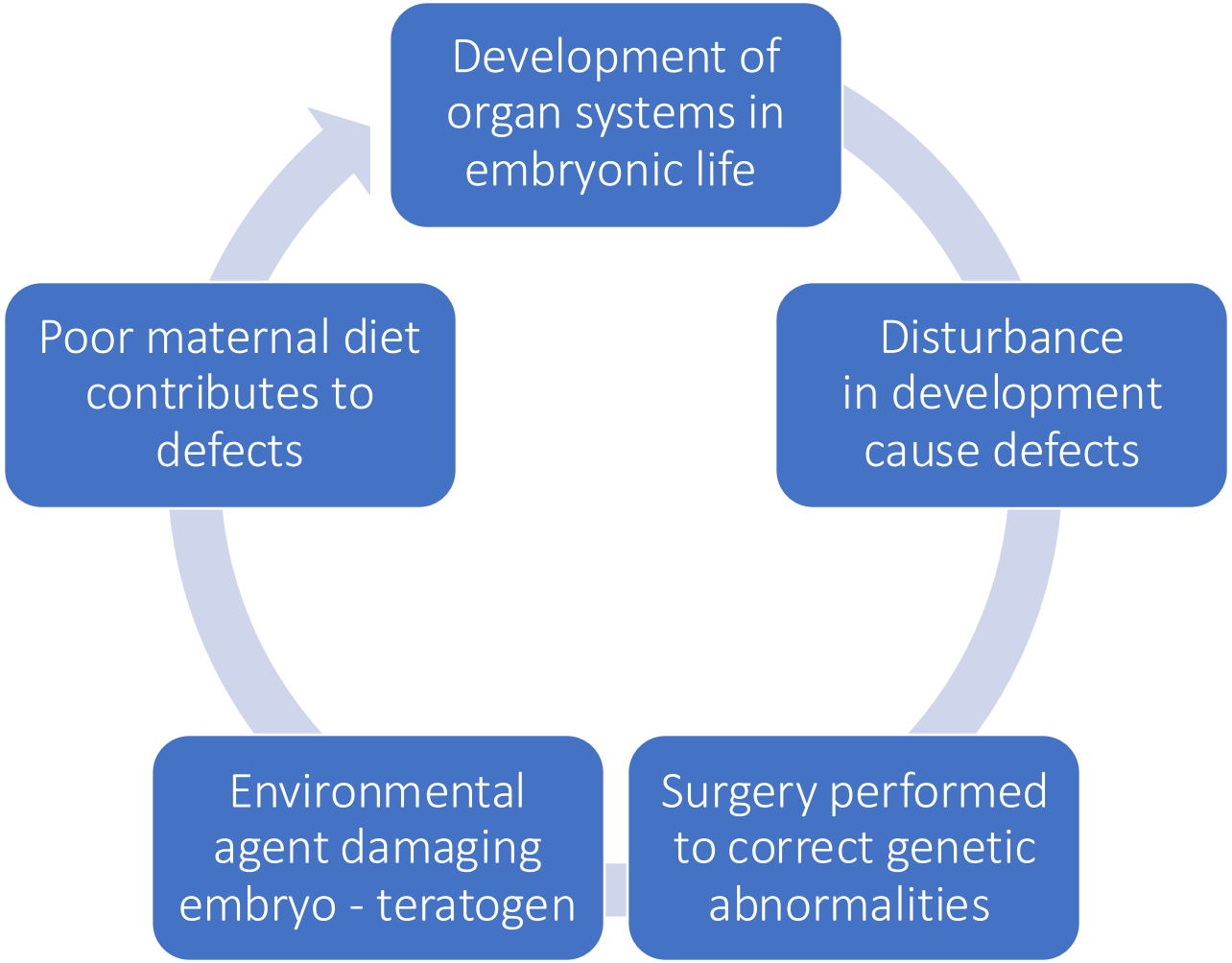
Difference exists between adult and pediatric respiratory systems in terms of structure of airways

Features of pediatric airway:

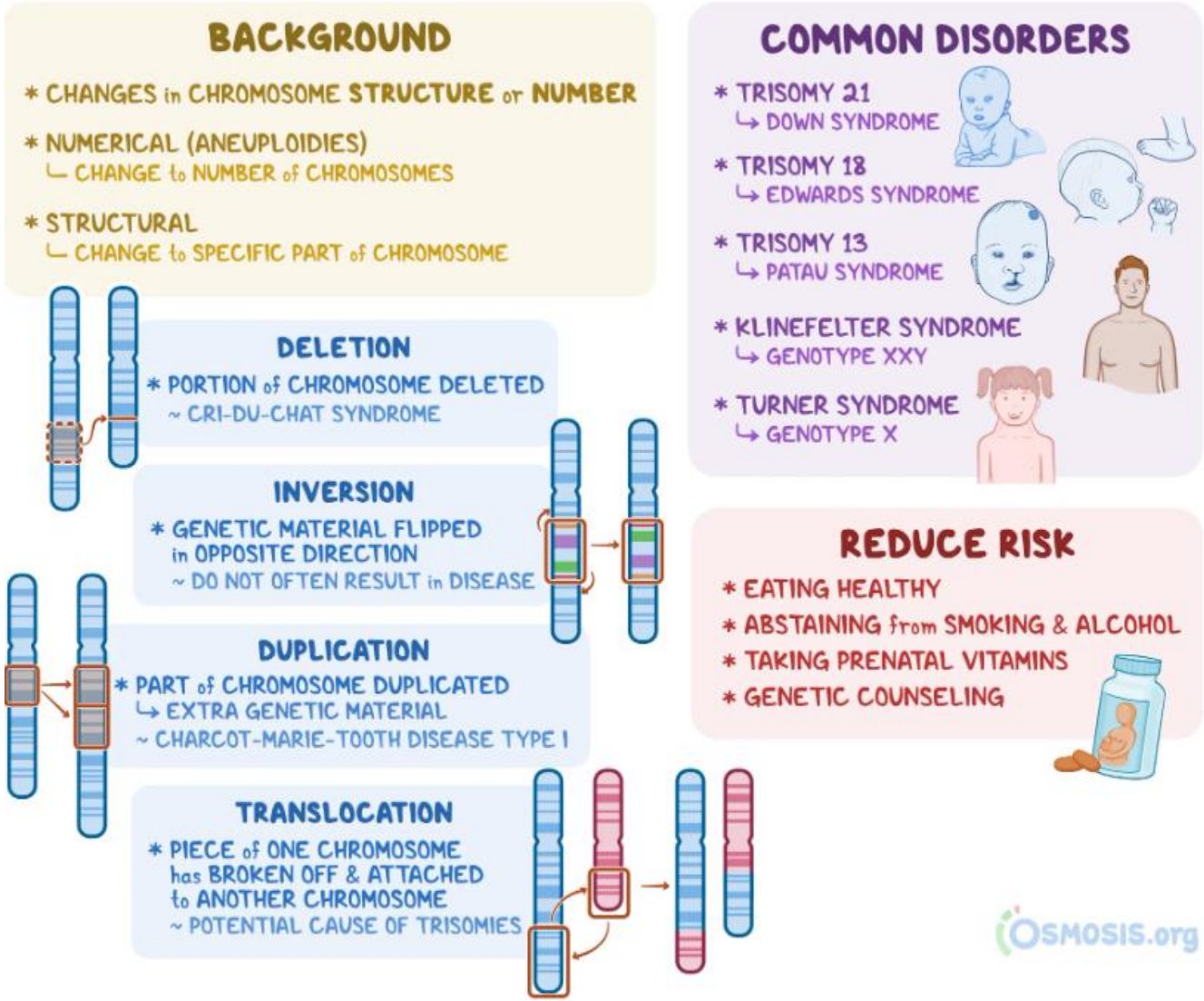
- Large tongue
- Obligate nose breathers
- Shorter trachea
- More delicate airway
- Weak thoracic wall
- Lower residual lung capacity



Pathology


Development of organ systems in embryonic life
Disturbance in development cause defects
Surgery performed to correct genetic abnormalities
Environmental agent damaging embryo - teratogen
Poor maternal diet contributes to defects

Genetic Abnormality



Watch the video "Preventing Genetic Defects Video?" to gain insights into prevention mechanisms

Preventing Genetic Defects Video

- Click Here to watch the video

Preventing Genetic Defects Video

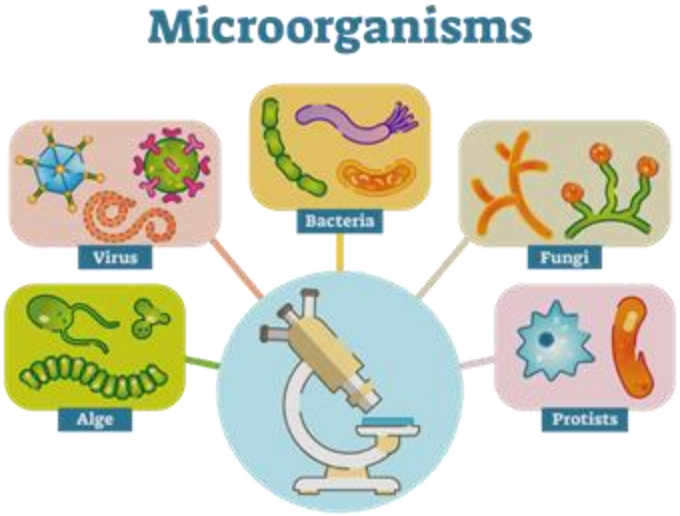
Summary of the Video:

- Breakthrough genetic technologies offer hope for babies with genetic abnormalities.
- Scientists estimate 1 in 200 babies suffer from single gene disorders, impacting families profoundly.
- Genetic testing advancements allow pre-implantation screening for thousands of diseases, offering potential life-saving options for parents.

Microorganisms Responsible for Genetic Abnormalities

The following infectious microorganisms cause significant congenital abnormalities (listed in parentheses):

- Toxoplasma gondii (cerebral calcifications, microcephaly, heart defects)
- Rubella virus—the causative agent of measles (cataract, glaucoma, deafness, heart defects, retinal defects)
- Cytomegalovirus (hydrocephalus, deafness)
- Herpes virus (microcephaly, microphthalmia, retinal defect)
- Varicella-zoster virus—the causative agent of chickenpox (muscle atrophy, mental retardation)
- Treponema pallidum—the causative agent of syphilis (hydrocephalus, deafness, bone defects)



Psychological Care

- Psychosocial care involves child, caretakers, and perioperative staff
- Goal: develop strategies for perioperative experience
- Consider child's developmental stage, emotional state, and social support
- Preoperative visit/counseling involving patient, caretakers, child life specialist
- Goal: reduce anxiety, allow questions before surgery
- Greatest fears: fear of unknown, separation, mutilation

Watch the "Communicating with Pediatric Patients" Video

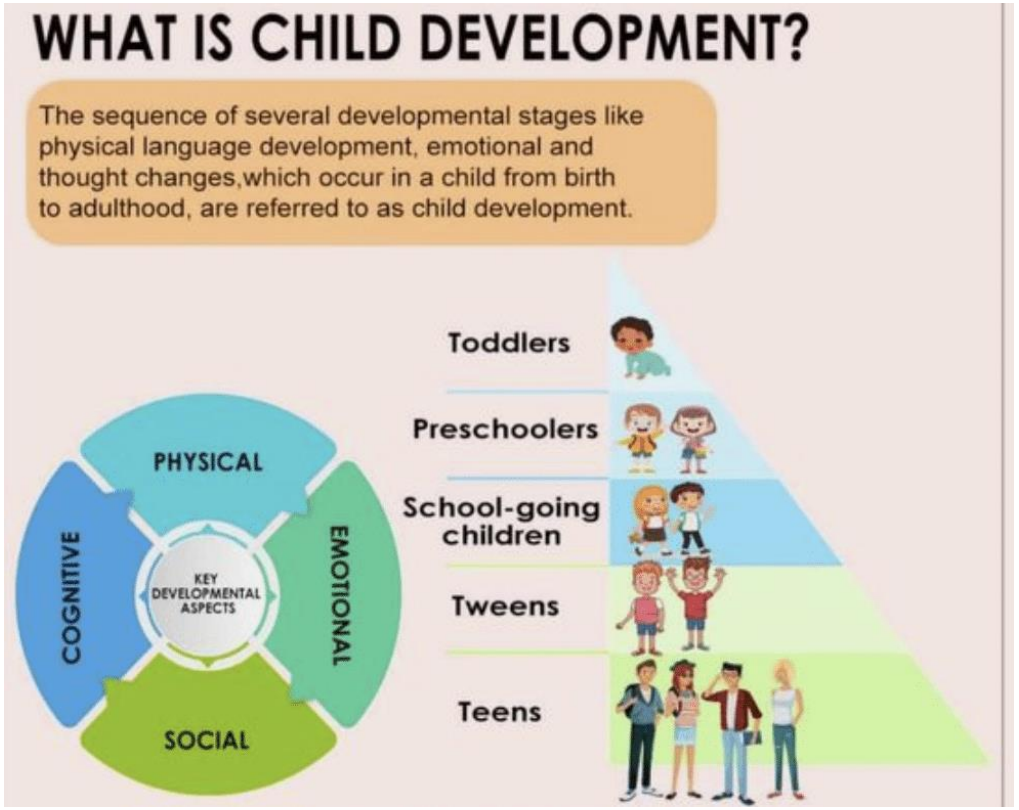
Communicating with Pediatric Patients Video

Communicating with Pediatric Patients Video

- **Summary of Video:**
  - Pediatric patients will often be nervous about going to the doctor
  - Find ways to relate to patients and help them feel at ease
  - Communicate on their level
    - Each developmental stage will communicate different
  - Explains things in advance and as they happen to help them feel at ease
  - Use simple terms or analogies they can relate to
  - Engage parents: children will trust their parents and they can help them warm up

Developmental Stages of the Child

- Infants: Birth to 12 months
- Toddlers: 13 months to 2 years
- Preschoolers: 3 to 5 years
- Middle Childhood: 6 to 11 years
- Early Adolescence: 12 to 14 years
- Late Adolescence : 15 to 17 years



Watch the "Growth and Development of Infants, Toddlers, Preschoolers and School Aged Children" video to gain insights into the development stages of the child and the physio-social changes associated with each stage

Growth and Development Video

Case Planning

- Anesthesia
- Safety of the pediatric patient
- Transport of the Pediatric Patient
- Positioning the Patient
- Electrosurgery
- Instruments
- Sponges
- Sutures

Anesthesia
(Slide 1 of 2)

- General anesthesia often necessary for pediatric patients due to airway control needs and inability to cooperate.
- Variances in anesthesia approach due to physiological and anatomical differences from adults.

Anesthesia
(Slide 2 of 2)

Preoperative Preparation:

- Psychological preparation involves family engagement and addressing child's fears.
- Assessment includes health history, medications, allergies, and lab tests.
- Parental presence during induction increasingly accepted and may reduce preoperative medication need.

Anesthesia Induction and Maintenance:

- Various induction methods based on age, IV access, and preferences.
- Inhalation anesthesia commonly used for induction and maintenance.
- Continuous monitoring and IV access secured during maintenance phase.

Emergence and Recovery:

- Recovery influenced by administered drugs, with opioids and sedatives potentially prolonging emergence.
- Post-anesthesia complications include nausea, vomiting, respiratory depression, and delirium in pediatric patients.

Pediatric Safety

- Maintain a safe environment
- Collaborate with other perioperative team members
- Address specific developmental stages

Transport and Positioning of Pediatric Patient

Transport

- Neonates and Infants: Transport Method
- Young Children: Transport Procedures
- Patients with Monitoring Devices: Special Considerations
- Challenges with Inpatient Toddlers: Safety Measures

Positioning

- Principles of Safe Patient Positioning
- Importance of Appropriate Padding
- Considerations for Surgical Positioning
- Avoiding Skin Injury: Tape Alternatives

Pediatric Surgical Procedures

- Repair of a cleft lip
- Repair of a cleft palate
- Choanal atresia
- Correction of esophageal atresia and tracheoesophageal fistula
- Pyloromyotomy
- Repair of an omphalocele
- Repair of bladder exstrophy/epispadias
- Orchiopexy for an undescended testicle
- Repair of pectus excavatum
- Radical nephrectomy: Wilms tumor
- Repair of a myelomeningocele
- Correction of syndactyly

Watch the "Pediatric Surgery" Video

Pediatric Surgery Video

Pediatric Surgery Video

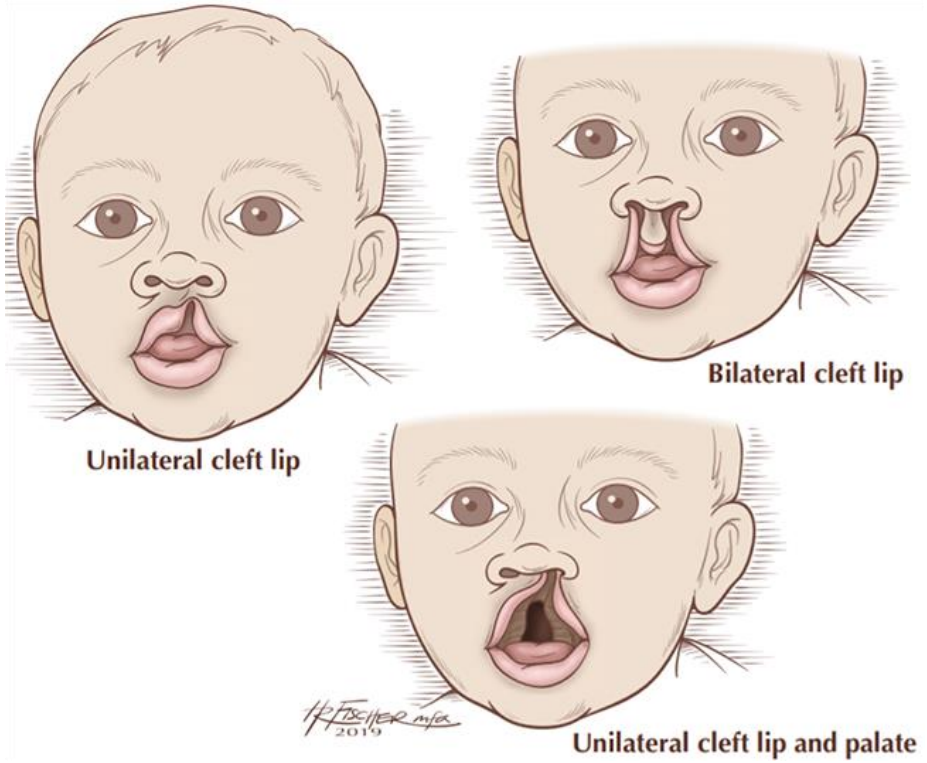
- Summary of Video:
  - Focus on individualism of pediatric patients and their needs
  - Each patient is unique
    - Developmental stage
    - Vital signs
    - Weight and Medication Dosing
    - Family Members

Repair of a Cleft Lip

Closure of cleft defect in the lip

Pathology

- Formation of philtrum and upper lip during embryonic development.
- Interruption leads to cleft lip.
- May be complete/incomplete, unilateral/bilateral.
- Often associated with clefts of the soft palate.
- Repaired in stages, initial at 10-12 weeks.
- Preoperative planning involves precise measurements.



Repair of a Cleft Lip Procedure

- **Preparation:** Patient prepped, draped; marked for incisions.
- **Incisions:** Made along vermilion border, mucosa separated from orbicularis oris muscle.
- **Z-plasty Flaps:** Created through skin, muscle, and mucosa; hemostasis maintained.
- **Closure:** Mucosa closed with interrupted absorbable sutures; muscle closed with subcuticular absorbable sutures; vermilion border and skin closed.
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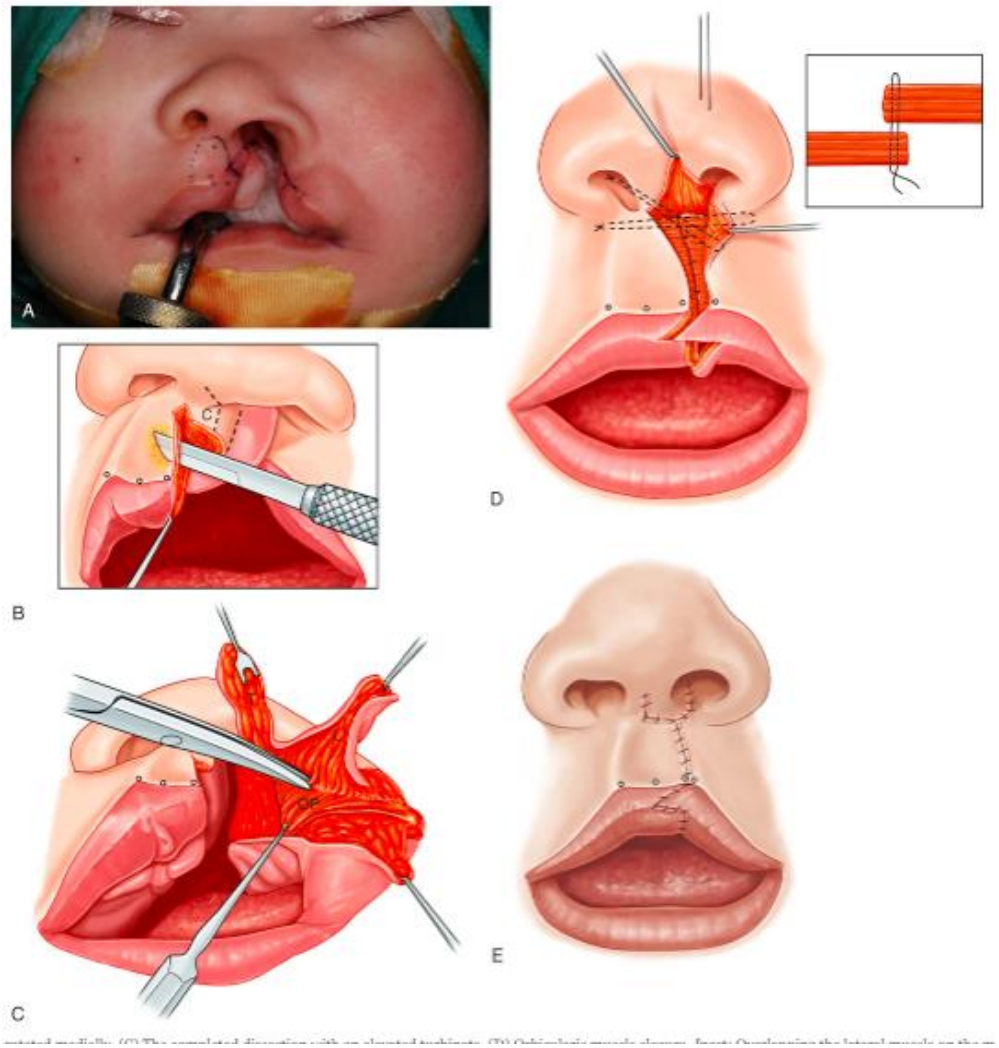


Watch the "Cleft Treatment" video to gain insights into the procedure!

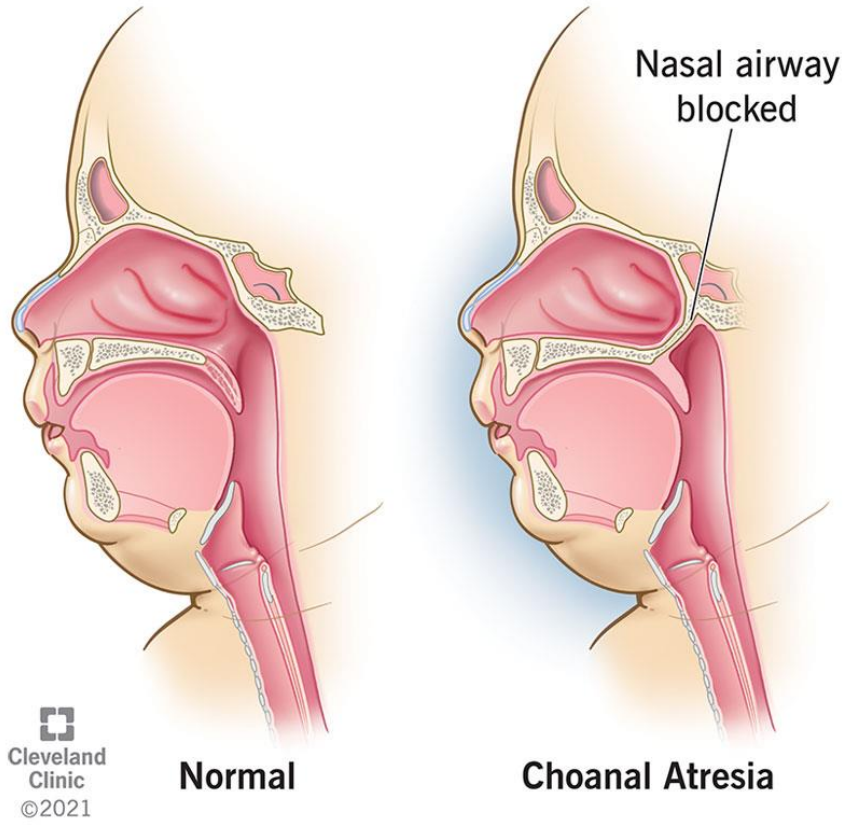
Cleft Treatment Video

Cleft Treatment Video

- **Summary of the video**
- Various types: Unilateral, Bilateral, Isolated Cleft Palate.
- Procedures at different ages: Lip repair at 4-6 months, Palate repair at 9 months.
- Treatment at Boston Children's Hospital: High-volume center, Multidisciplinary team available.

Chaonal Atresia

- Congenital blockage of the choana, the passage between the nasal cavity and the throat
- Surgery involves puncturing and removal of obstructing tissue
- Placement of a stent to maintain airway patency during healing
- Pediatric sinuscope for visualization and use of tissue-shaver and rongeur for obstruction removal



Correction of Esophageal Atresia and Tracheoesophageal Fistula (EA/TEF)

- Surgical procedure to address defects in the esophagus and abnormal connections between the esophagus and trachea
- Goal: Restore continuity of the esophagus and prevent aspiration of food and saliva into the lungs
- **Pathology of EA/TEF**
  - EA: Absence or closure of a normal esophageal opening
  - TEF: Abnormal connection between esophagus and trachea
  - Associated birth defects: Imperforate anus, cardiac defects, limb deformities, neural tube defects

Watch "Esophageal Atresia & Tracheoesophageal Fistula" video to gain insights into what this defect is in detail

Esophageal Atresia and Tracheoesophageal Fistula (EA/TEF) Video

Esophageal Atresia and Tracheoesophageal Fistula (EA/TEF) Video

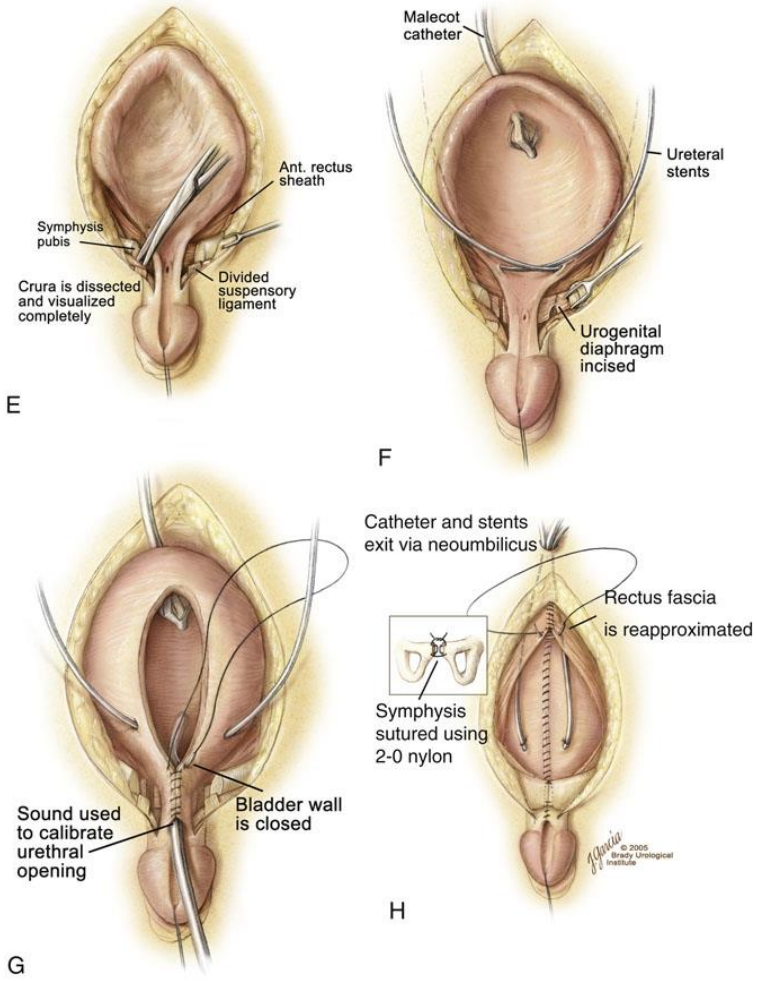
- **Summary of the Video**
- Introduction
- What is esophageal atresia and a tracheoesophageal fistula?
- Risk factors, signs/symptoms, diagnosis, treatment, and nursing care of esophageal atresia and a tracheoesophageal fistula.

EA/TEF Surgical Options and Post-Op Care

- **Surgical Options**
  - Dependent on type and severity of defect
  - Staged or delayed repair may be necessary
  - Primary closure preferred when possible
- **Postoperative Care**
  - Airway management
  - Pharyngeal suctioning
  - Monitoring for complications like infection and anastomotic leakage

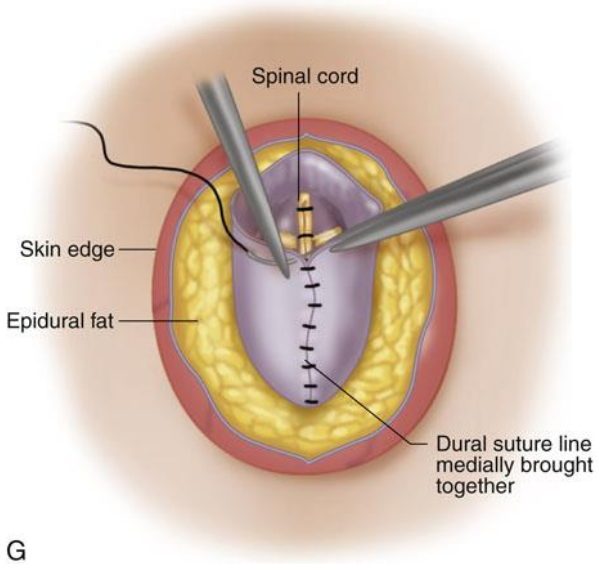
Repair of Bladder Extrophy/Epispadias

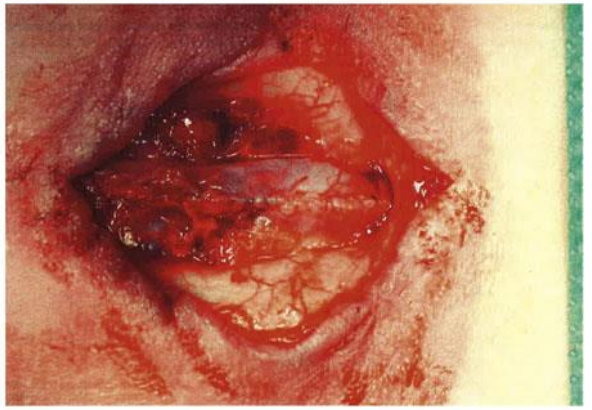
- **Surgical goal:** Restore normal functions of lower urinary tract.
- **Pathology**: Complex congenital anomalies involving lower genitourinary tract and skeletal system.
- **Anomalies include:**
  - Bladder exstrophy (exposed bladder wall outside the body)
  - Epispadias (urethra exposed or terminates on dorsum of penis)
- **Technical Points:**
  - Reconstruction usually in three stages:
    - Closure of bladder and abdomen (24-48 hours of life).
    - Repair of epispadias (2-3 years old).
    - Achieving urinary continence (4-5 years old).



Repair of a Myelomeningocele:

- Surgical goal: Close dural and cutaneous defect, preserving neural function.
- Immediate repair crucial for CSF leak prevention; otherwise, performed within 48 hours to prevent infection.
- Latex-free protocols often employed due to frequent surgeries and latex sensitization risk.
- Vulnerability to hypothermia requires warm solutions and delicate instrument use.
- Often accompanied by hydrocephalus, necessitating potential ventricular shunt placement.





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