



Pediatric Tuberculosis

Lana Yamba, MD, MPH, CCRC

September 24, 2026

TB Nurse Case Management • September 23 – 25, 2026 • Edinburg, Texas



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Has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this activity





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Physician Consultant
DSHS/PHR 11

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Learning Objectives

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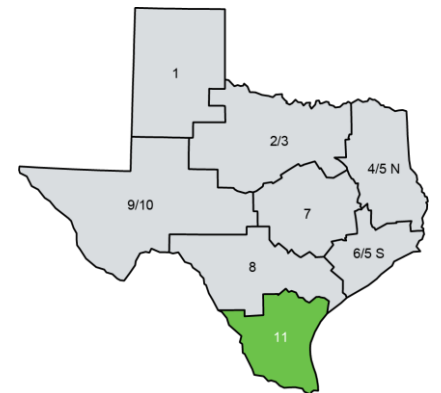
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- Describe the current recommendations and guidelines for the diagnosis, treatment, and management of TB in children.
 - Navigate the diagnostic process in children
 - Understand the progression from TB infection to TB disease
 - Discuss the management of TB disease in children



- Case study



Pediatric TB vs. Adult TB: The Critical Differences

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Pediatric patients are not "small adults" — they have unique physiology that affects how TB presents, progresses, and responds to treatment.



Immature immune systems in children significantly increase the risk of progression from TB infection to TB disease, especially in those under 2 years old.



Lower bacterial loads in pediatric TB cases make diagnosis more challenging — standard tests are less sensitive, requiring clinical vigilance.

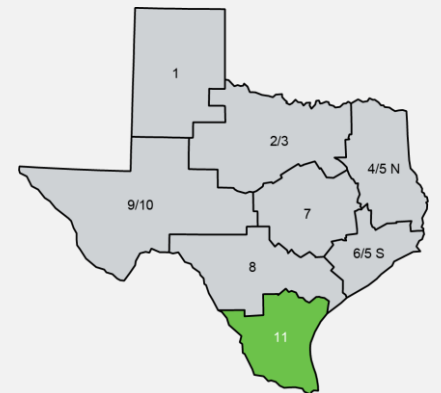


Unique Diagnostic Challenges of TB in Children

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- More difficult diagnosis
- Nonspecific signs and symptoms
- Fewer mycobacteria
- Fewer positive bacteriologic tests
- Increases risk of progression to disease
- Higher risk of extrapulmonary and TB meningitis

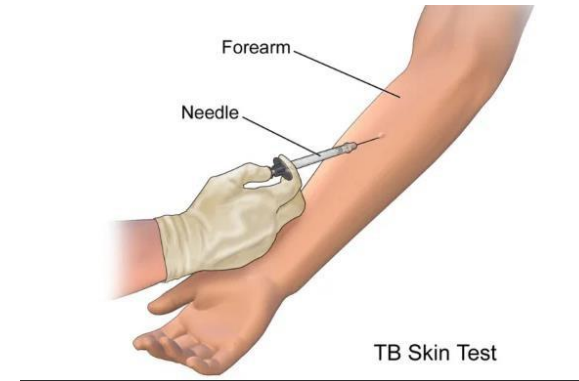


Standard Diagnostic Tools

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Tuberculin Skin Test (TST)
aka PPD (Mantoux test)



Interferon-Gamma
Release Assays (IGRA)



TST

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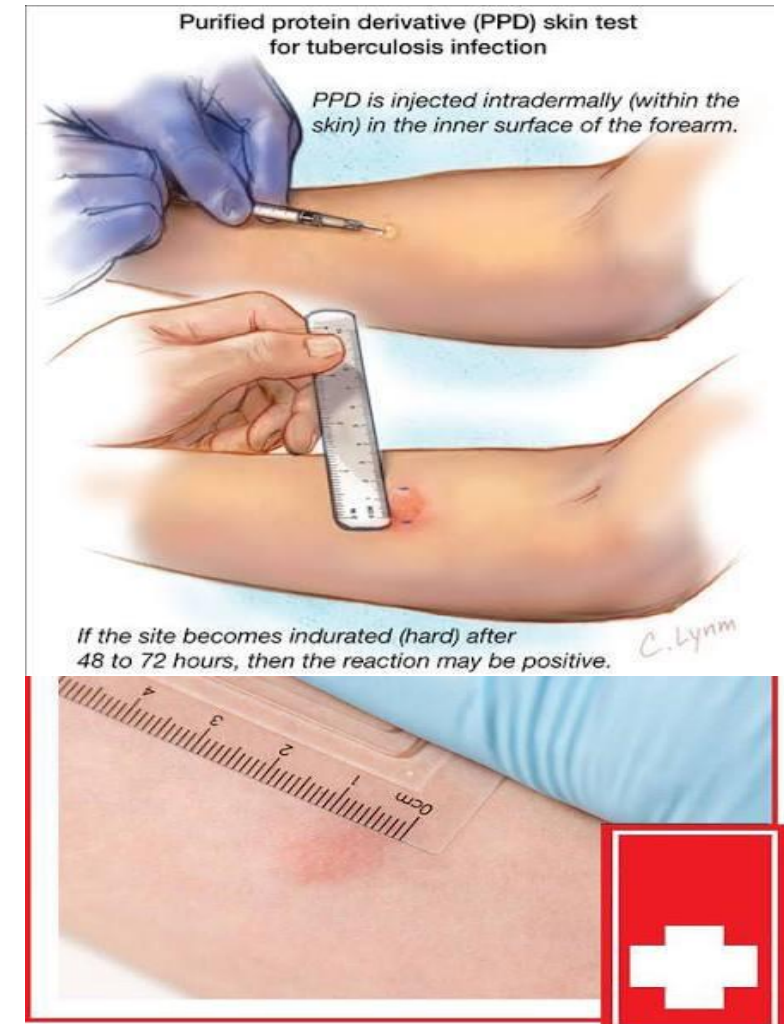
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Administer via intradermal injection on the volar forearm, creating a 6-10 mm pale wheal. Proper technique ensures the tuberculin is deposited correctly in the dermis, not subcutaneously.



Read induration 48-72 hours after administration. Measure the hardness (induration) by palpation, not the redness (erythema). Accurate measurement technique is critical for reliable diagnostic results.



Interpreting Results



Classification of the Tuberculin Skin Test (PPD) Reaction

≥ 5 mm



- HIV positive
- Recent contact with an active TB patient
- Nodular or fibrotic changes on chest X-ray
- Organ transplant

≥ 10 mm



- Recent arrivals (< 5 yrs) from high-prevalence countries
- IV drug users
- Resident/employee of high-risk congregate settings
- Mycobacteriology lab personnel
- Comorbid conditions
- Children < 4 yrs old
- Infants, children, & adolescents exposed to high risk categories

≥ 15 mm



- Persons with no known risk factors for TB

IGRA (Interferon-Gamma Release Assay)

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Single visit testing with higher specificity than TST. Results are not affected by prior BCG vaccination, making IGRA the preferred choice for BCG-vaccinated children.



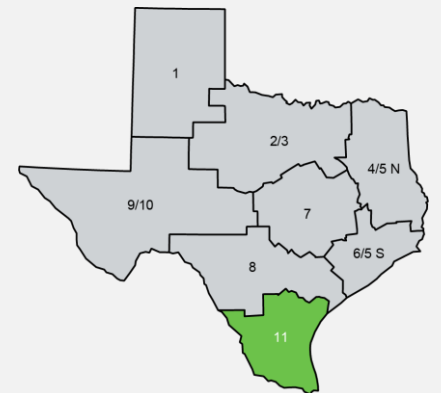
Requires a blood draw, which can be challenging in very young children.

TST vs IGRAs

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- Either TST or IGRA testing is acceptable for children of any age
- IGRA is preferred for children who have received a BCG vaccine or who are unlikely to return for the TST reading
- TB screening tests are especially unreliable in:
 - Very young infants
 - Very sick infants
 - Immune suppressed children



Diagnosis of TB in Children

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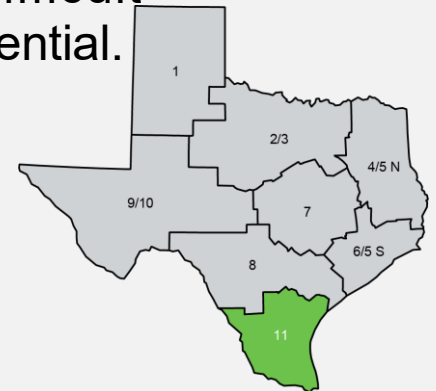
Clinical Symptoms:

- Persistent cough lasting more than 2-3 weeks
- unexplained fever
- progressive weight loss
- failure to thrive are key indicators requiring further evaluation.

Radiologic Findings:

- Chest X-ray typically reveals hilar or mediastinal lymphadenopathy, pulmonary infiltrates, or cavitary lesions that support clinical suspicion of TB disease.

Positive TST/IGRA or Bacteriologic Confirmation: Microbiologic confirmation is often difficult in children due to lower bacterial loads, making clinical and radiologic correlation essential.

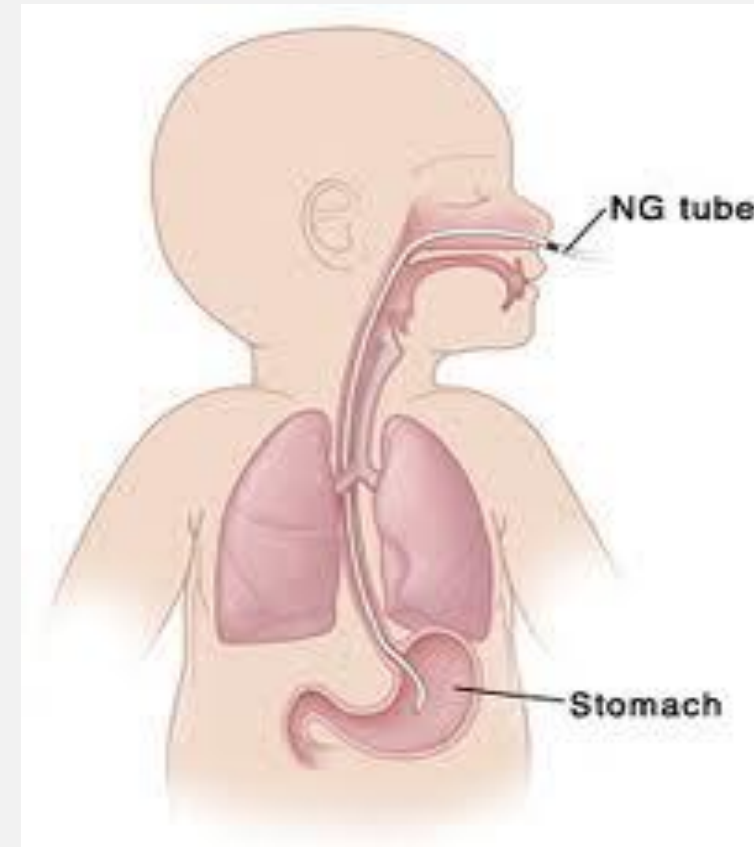


Consider Gastric Aspirates If no source identified

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- Usually inpatient but can be collected outpatient
- performed on 3 consecutive mornings and is the standard approach in young children.
- AFB smear yield: minimal <5%
- TB Culture yield: 40% average (20-50% range)



Protocol: Curry International TB Center

<https://www.currytbcenter.ucsf.edu/product/guide/pediatric-tuberculosis-a-guide-to-the-gastric-aspirate-procedure>

Induced Sputum

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- Collection is used for older children who can cooperate with the procedure.
- Outpatient procedure
- Pretreatment:
 - Nebulized bronchodilator and hypertonic saline
 - Chest physiotherapy (CPT)
- One specimen sufficient
- Culture yield 40%



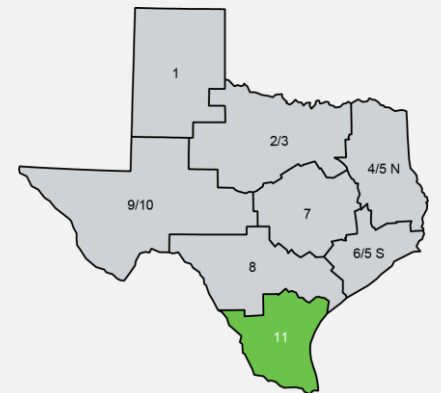
Definitions: LTBI vs. TB Disease

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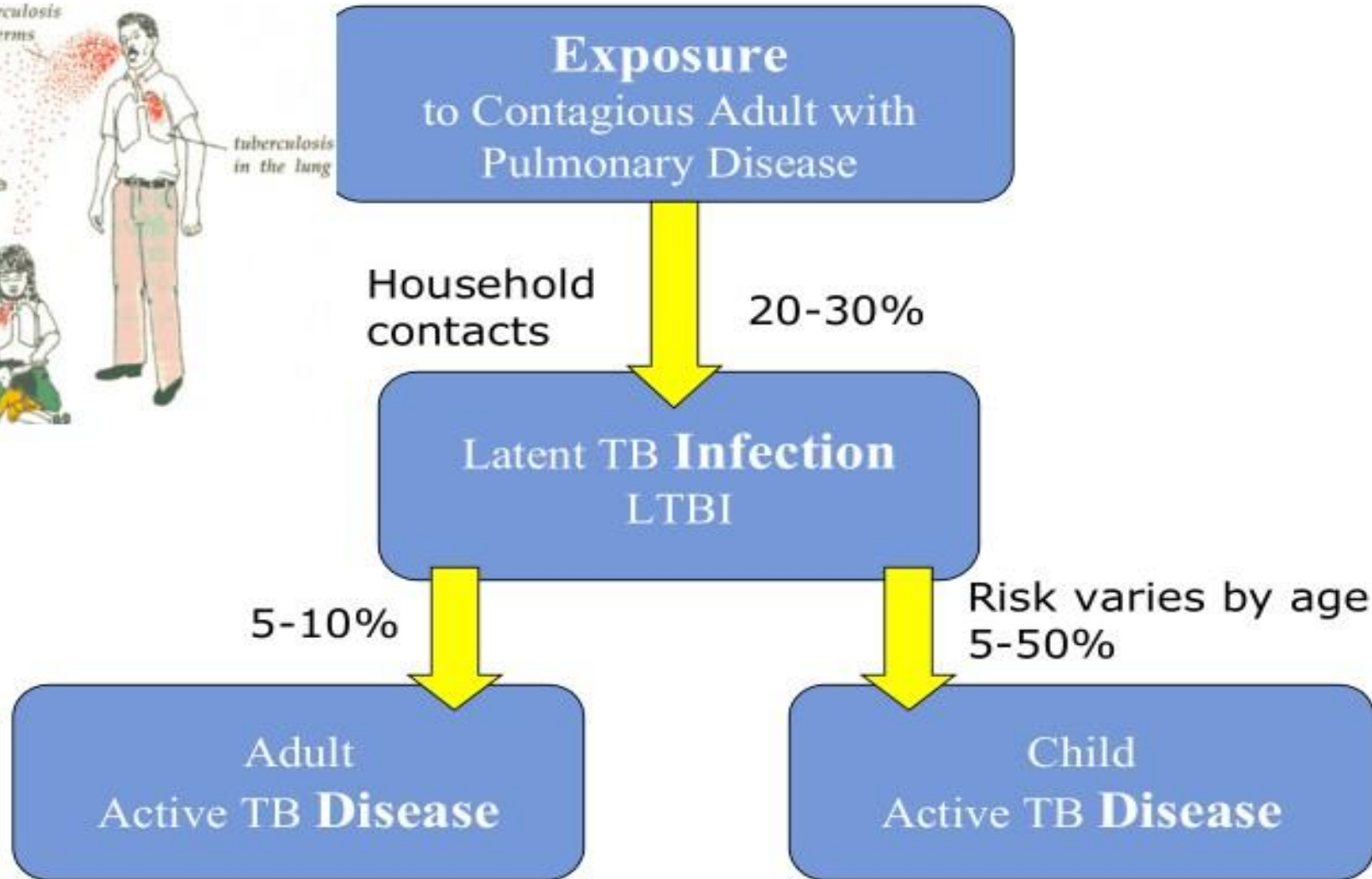
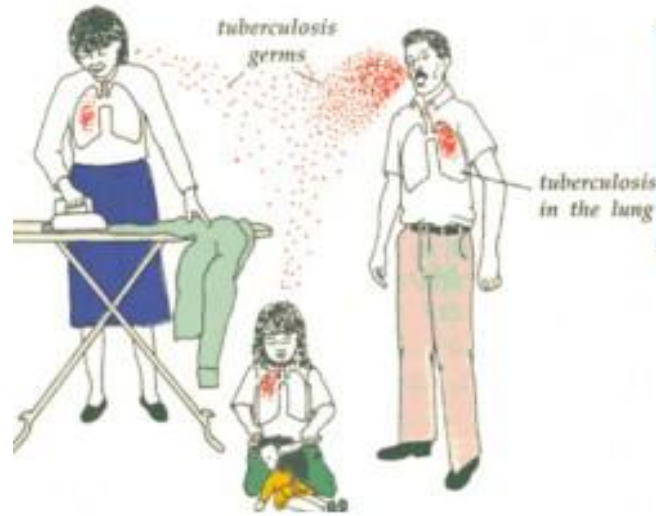
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Latent TB Infection (LTBI): Patient is infected but asymptomatic and non-contagious. No active disease present. Primary goal is prevention of progression to active disease through prophylactic treatment.

TB Disease: Patient is symptomatic with clinical manifestations and is contagious to others. Risk of severe morbidity if untreated. Primary goal is cure through multi-drug therapy and infection control.

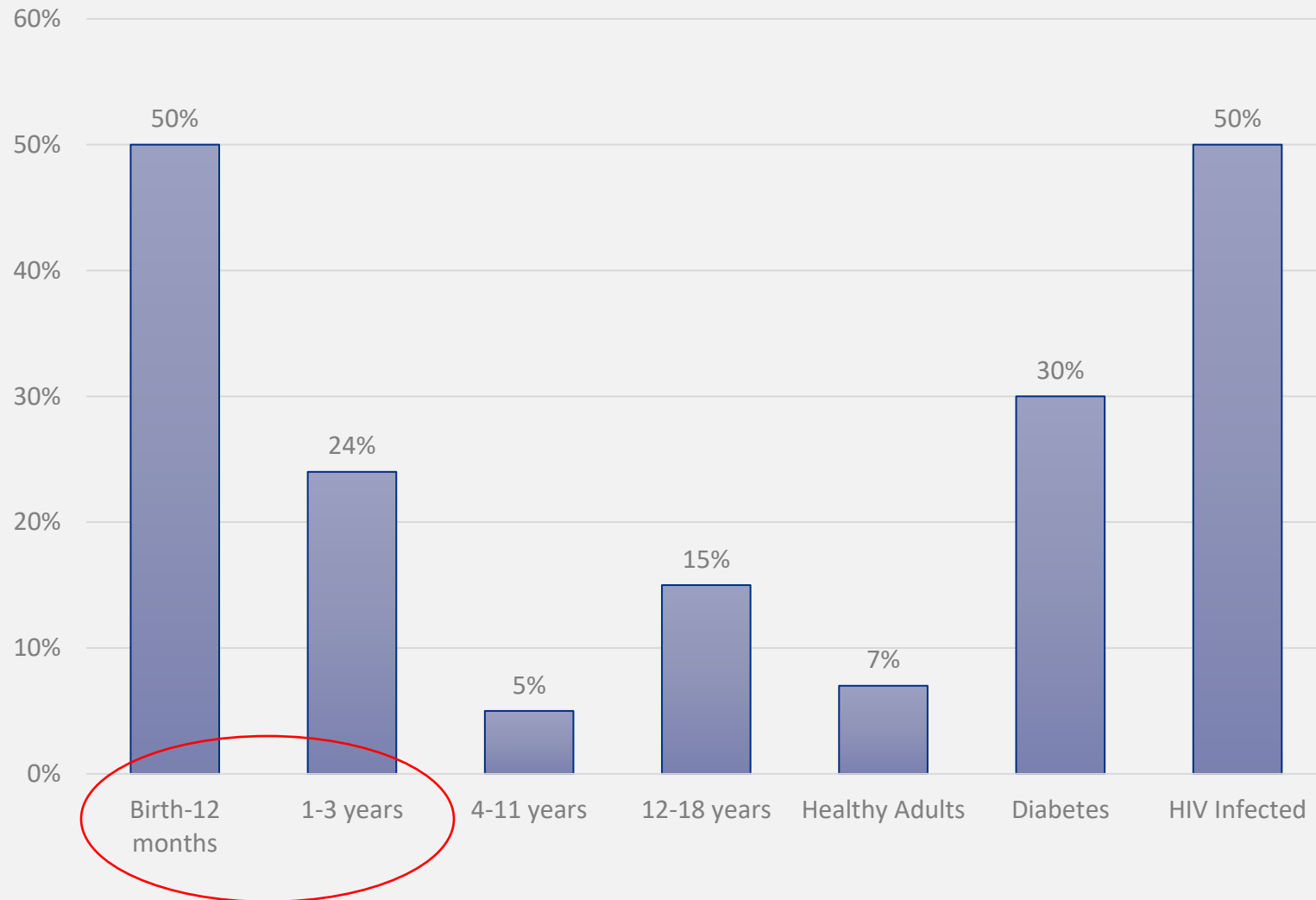


STAGES OF TUBERCULOSIS



Risk of Progression to TB Disease if no Treatment

by Age Infected or Medical Condition



Warning Signs for Pediatric patients

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- ❖ Non-specific signs: Failure to thrive, unexplained persistent fever, and lethargy. These subtle symptoms often delay diagnosis as they mimic common childhood illnesses.
- ❖ Specific signs: Persistent cough lasting more than 2-3 weeks, night sweats, and unexplained weight loss. These classic TB symptoms warrant immediate diagnostic workup.
- ❖ Red flags: Irritability or vomiting may indicate TB meningitis—a medical emergency requiring urgent evaluation and intervention. Early recognition is critical.

Chest X ray Findings

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- **Hilar/Mediastinal Lymphadenopathy:** The hallmark of pediatric TB. Enlarged lymph nodes near the airway (often unilateral).
- **Airway Compression (Atelectasis):** Enlarged nodes compress airways, causing partial or full lung collapse (atelectasis) or hyperinflation (air trapping).
- **Primary Complex (Ghon Focus):** A small focal lesion in the lung parenchyma associated with regional lymph node involvement.
- **Miliary Pattern:** "Millet seed" appearance—tiny, diffuse, scattered nodules throughout the lungs (a sign of severe, disseminated disease).

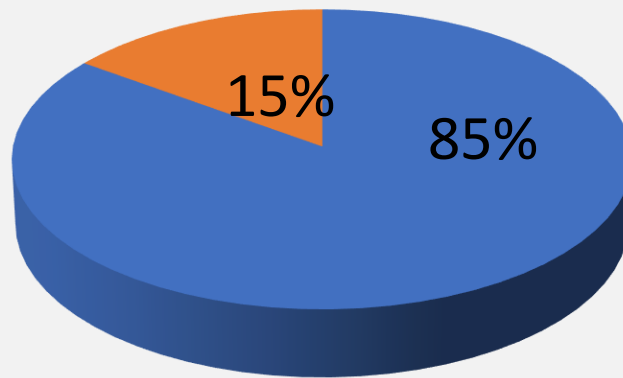


TB Disease

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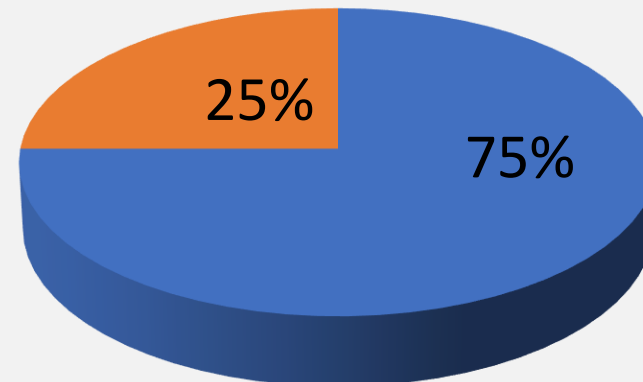
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Adult TB Disease



■ Pulmonary
■ Extrapulm

Pediatric TB Disease

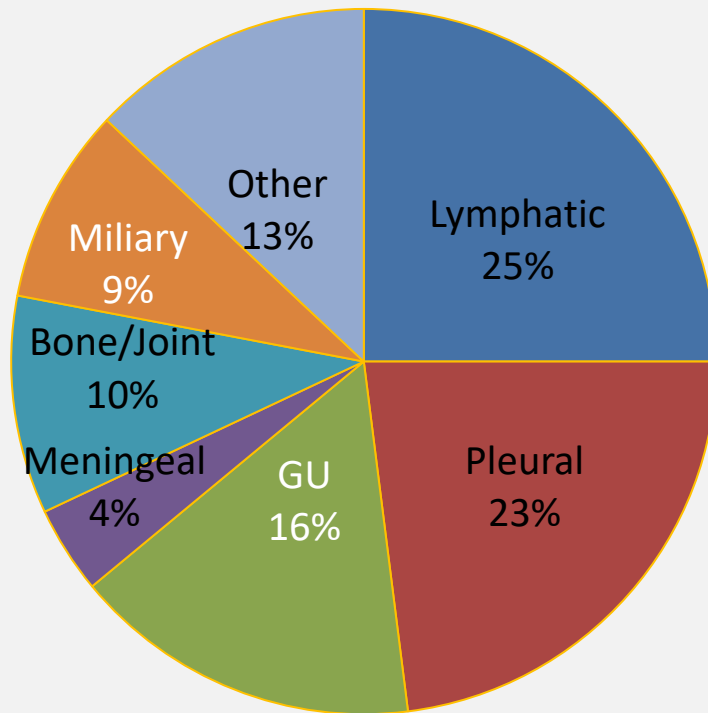


■ Pulmonary
■ Extrapulmonary

Source: U.S. Cases CDC

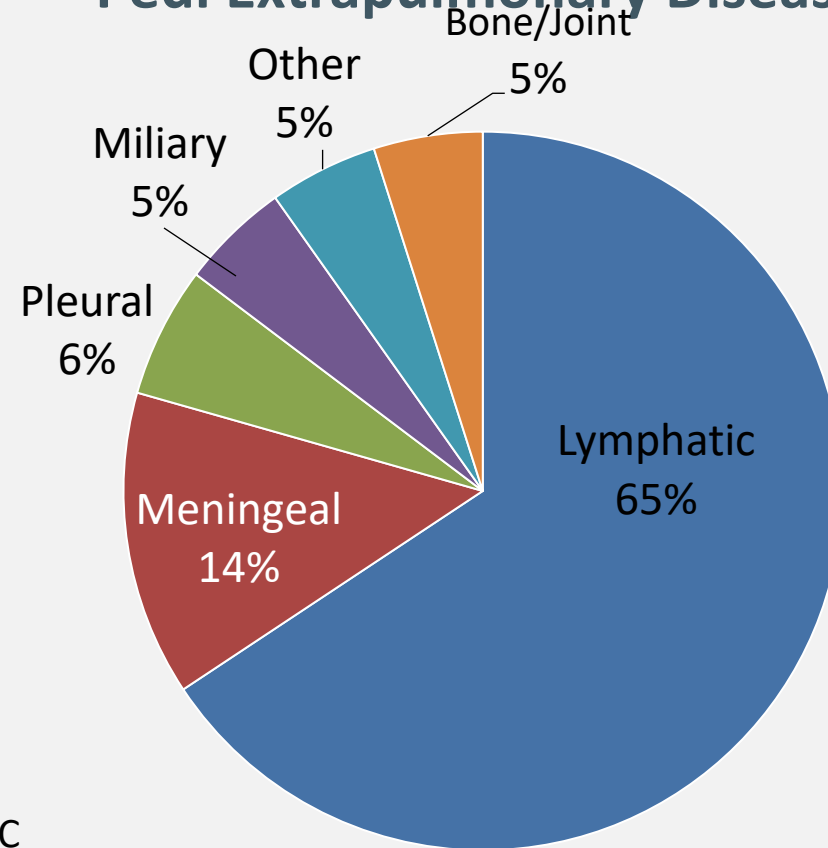
TB Extrapulmonary Disease

Adult Extrapulmonary Disease 15%



Source: U.S. Cases CDC

Pedi Extrapulmonary Disease 25%



Extrapulmonary TB diseases

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TB Meningitis (The medical emergency):

- Subtle onset. Irritability, behavioral changes, persistent vomiting, headache, lethargy.

TB Lymphadenitis (Scrofula):

- The most common form of EPTB. Slowly enlarging, firm, non-tender, "cold" lymph nodes, usually in the cervical/submandibular region.
- Differentiation: Unlike bacterial lymphadenitis (which is "hot," red, and acute), TB lymphadenitis is indolent, chronic, and often painless until it develops a sinus tract.

Skeletal TB (Pott's Disease):

- TB of the spine. Presents with back pain, spinal deformity (gibbus), or refusal to walk.

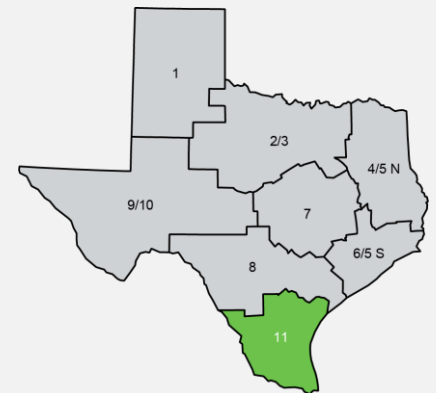


Common symptoms of TB disease in children

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- Cough and/or other respiratory symptoms
- Wheezing, crackles or decreased breath sounds on lung examination
- Lymphadenopathy / lymphadenitis
- Persistent fever
- Weight loss or failure to thrive
- Signs and symptoms of meningitis
 - Headache, vomiting, irritability, or seizures
- Unlike adults, half of children with TB disease have no symptoms



Peripheral Lymphadenopathy

- Physical exam, carefully check for
 - Cervical, supraclavicular, axillary and inguinal nodes
- TB diseased lymph nodes usually measure > 1 cm
- Diagnosis: Fine needle aspirate or excisional biopsy for pathology and culture recommended
- May progress to necrosis, caseation or chronic drainage
- Nodes may become more inflamed with TB treatment



TB Prevention After Exposure

Children who should be considered for treatment after exposure:

- Household contact with contagious person
- Initial TST negative in the window period for conversion
- CXR and physical exam normal

Window prophylaxis recommended:

- For children < 5 yrs of age
- Immunosuppressed patients
- Patients on tumor necrosis factor-alpha blockers
- May prevent progression to disease during window period

TB treatment Options for LTBI

3HP - INH & Rifapentine once weekly for 12 doses

- High completion rates
- Must be directly observed therapy (DOT)
- Lots of pills to swallow may be issue for younger children
- Approved for children ≥ 2 years

Rifampin daily for 4 months

- High completion rates
- May be compounded to liquid or capsules sprinkled
- Potential drug interactions
- Red/orange urine in most patients

INH for 6-9 months

- Inexpensive
- Low completion rates (50%) for self administered treatment
- INH indicated if contraindications to Rifampin

Treatment Options for Pediatric TB Disease



Standard multi-drug regimens spanning 6 months total. Treatment duration and intensity depend on disease severity and patient response to therapy.



Initial intensive phase uses 4 drugs (typically RIPE: Rifampin, Isoniazid, Pyrazinamide, Ethambutol) for 2 months to rapidly reduce bacterial load.



Continuation phase with 2 drugs (Rifampin and Isoniazid) for 4 months. Monitor closely for adverse effects including hepatotoxicity and ensure strict adherence.



Newer options for Pediatric TB Disease



4-month RIP +/- E therapy for uncomplicated pediatric disease (SHINE study)

- WHO endorsed
- CDC expected to endorse



4-month Rifapentine, Moxifloxacin, INH and PZA

- Adults and children ≥ 12 yr of age
- For uncomplicated, mostly pulmonary TB, including cavitary disease
- CDC and WHO endorsed



MONITORING CHILDREN ON TB TREATMENT

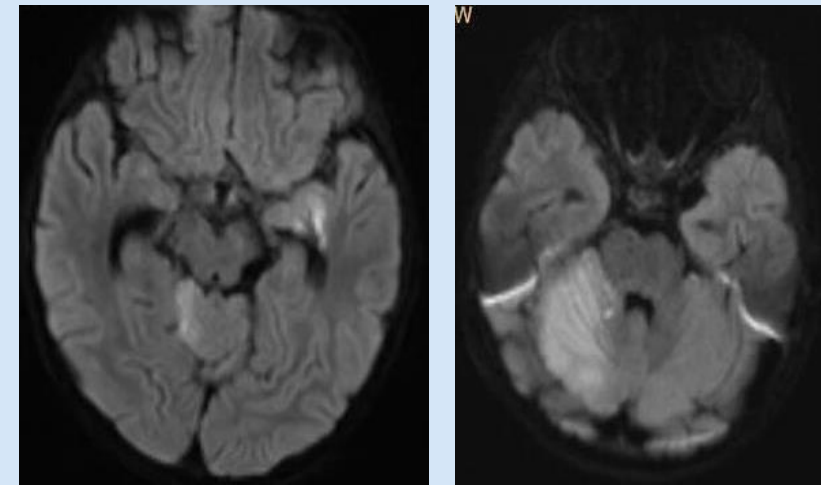
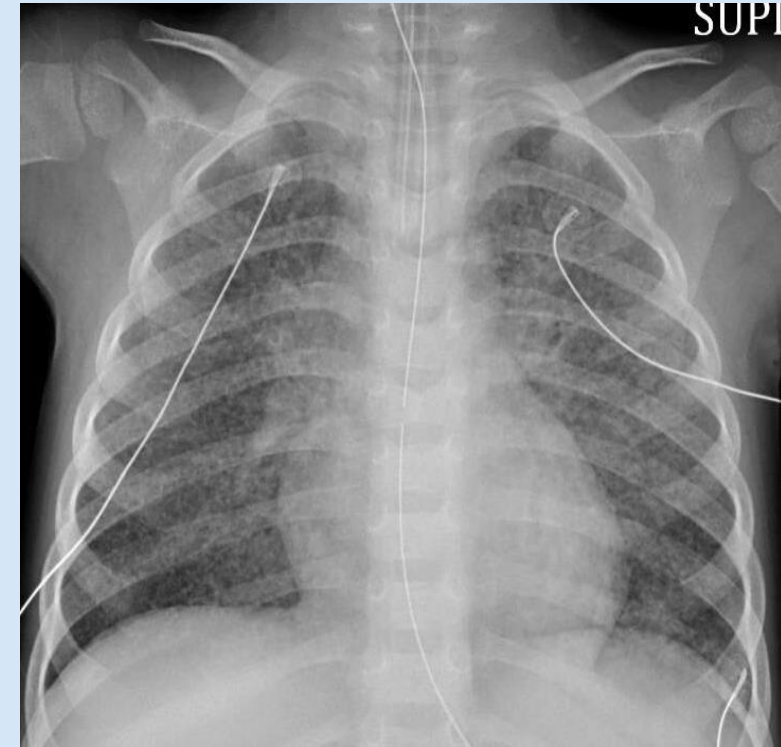
- ❖ Risk of drug toxicity very low
- ❖ Monitor clinical signs
 - ▢ Regular clinical visits (4-6 wks)
 - ▢ Patient education
- ❖ Routine blood work not necessary unless
 - ▢ Signs or symptoms of toxicity
 - ▢ Risk factors for toxicity (obesity, other hepatotoxic medications)
- ❖ Follow up to monitor symptoms and reinforce adherence



Case Study

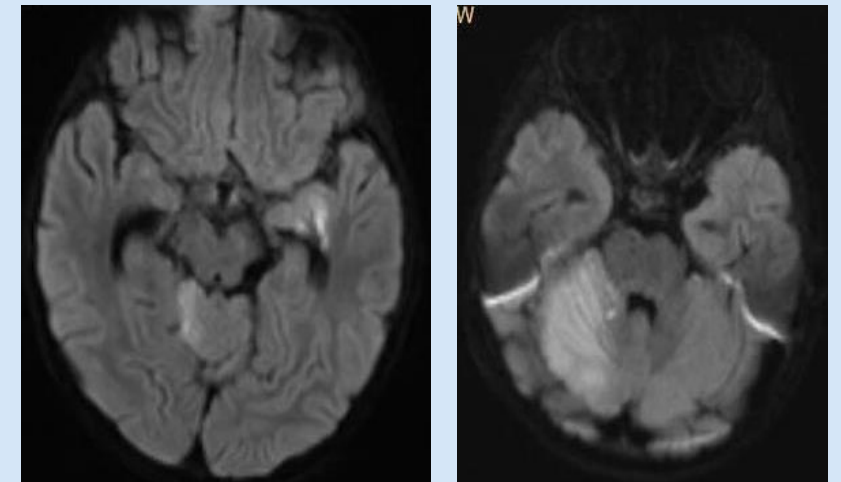
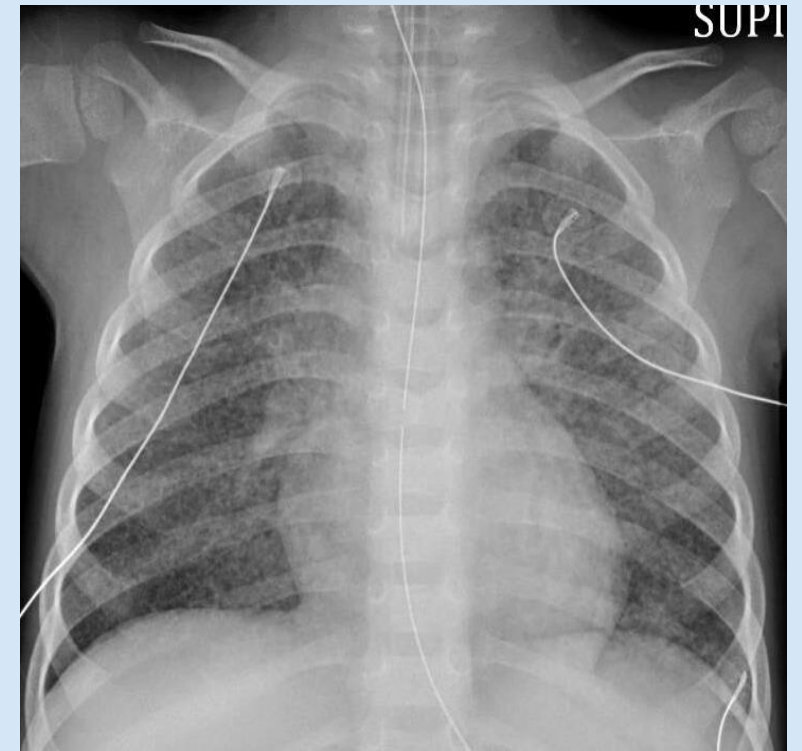
13 months old baby w/ multiple recurrent ear infections p/w

- Fever
- Swollen cervical lymph nodes
- (L) Earache.
- Fussiness
- Recently b/l otomastoiditis s/p mastoidectomies
- Was being followed up by private ENT in Reynosa 4 months prior to hospital admission
- **CXR** w/ Bilateral lower lobe micronodular opacities.



Case study

- **MRI Brain W WO Contrast:** – nonspecific T2 hyperintense content w/in middle ear cavities & mastoid air cells suggestive of bilateral Ost mastoiditis; sm. arachnoid granulation w/in (R) transverse sinus; age-inappropriate global brain atrophy w/secondary mild to moderate ventriculomegaly; innumerable ring-enhancing lesions within upper neck bilaterally.
- **CT Chest w/ contrast:** bilateral cervical lymph nodes; multiple calcified lymph nodes w/in mediastinum and left hilum,. Multifocal pulmonary opacification (nodular, tree-in-bud, confluent/consolidative



Case 3

- IGRA : positive
- CSF negative for smear, NATT TB by report from Medical notes
- CSF :
 - 1 WBC,
 - 8 lymphocytes ,
 - Glucose 60,
 - Protein 12
- Gastric aspirate AFB smear and culture positive for MTB.

- Dx with Disseminated TB/Clinical evidence of TB meningitis
- RIPE started on 10/17/2024
- Dexamethasone on 10/6/2024 and 10/7/2024
- “The hospital wants to discharge patient tomorrow”. “The mother wants to go back to Reynosa tomorrow”. Requesting guidance for outpatient TB regimen and follow up requirements.

Case study

- Planned hospital visit
- We were worried about treating the baby as an outpatient in Reynosa.
- No Source Identified yet
- The hospital has set up follow-up appointments with ID doc, ENT and Oncologist in Hidalgo Co., but mom has voiced that that she can't come to Hidalgo too often.
- Contacted the physician at the hospital to coordinate care (keep pt a little bit longer); ID physician found out about other siblings in Mexico
- Consider keeping steroids (2 months for suspicion of Clinical TB Meningitis)
- Planned family referral to GSF Reynosa Binational TB Program and supervised DOT treatment only in the clinic. (No Home visit allowed because previous father's violent behavior)

Case study-EOT

- Completed 12 months of treatment
- Mother has been good in giving treatment during all these months;
- Good clinical, bacteriological and radiological response to treatment
- Weight at start of treatment 7,460 kg and at the EOT 12 kg.
- Gastric culture sample(EOT) was negative AFB smear and culture
- CXR showed no evidence of active TB
- CT scan of the skull done EOT reported no evidence of acute intracranial abnormalities with bilateral mastoiditis.
-

Exposure History

- Father was the source case.
- He was diagnosed with Pulm. TB
- Previously abandoned treatment for Susceptible Pulm TB 3x with National TB and BNTB programs
- Father restarted on TB treatment again (susceptible TB)
- Mother reports they live with other siblings at home

Family

❖ Father: Pulm TB

- restarted on TB treatment for susceptible TB
- Completed treatment this time

❖ 4 yo child: Pulm TB

- IGRA positive
- Gastric aspirate confirmed MTB with a negative NAAT
- Had TB s/s in 2021, abnl CXR, father refused treatment
- Now in 2024, still has TB s/s, but CXR is normal.
- Treatment : RIPE
- Improved

Family

❖ 4 yo child: Pulm TB

- IGRA positive
- Gastric aspirate confirmed MTB with a negative NAAT
- Had TB s/s in 2021, abnl CXR, father refused treatment
- Now in 2024, still has TB s/s, but CXR is normal.
- Treatment : RIPE
- Improved

❖ 2 yo child Pulm TB

- Completed RIPE successfully

❖ Mother: LTBI

- Completed rifampin course

Pediatric TB Disease Summary

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Higher risk for

- Progression to disease - Especially infants and children < 2 years
- Extrapulmonary and disseminated disease including TB meningitis

Most common TB disease sites in children

- Pulmonary and lymph nodes

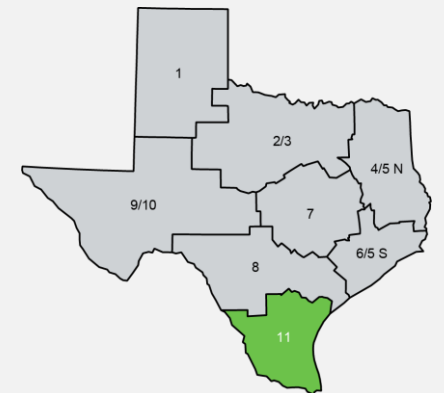
Symptoms may be subtle or absent in children

Children < 10 years

- Have low bacterial load (paucibacillary disease)
- Usually are not contagious - Unless cavitary or AFB smear positive disease

AFB smears and TB cultures

- Often negative in children

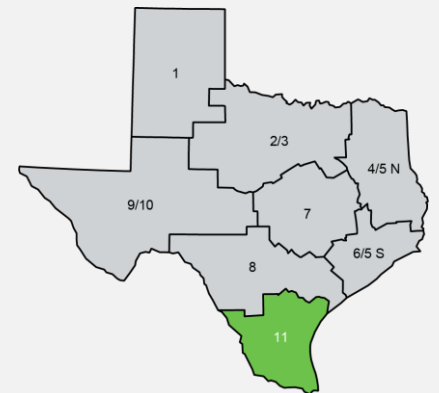


Prevention of TB in Children

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- **Screen with TB Questionnaire**
 - Order PPD or IGRA if TBQ positive
- **Window prophylaxis**
 - For kids $\leq$ 4 years with TB exposure
- **Treat latent TB infection**
 - Shorter course therapies preferred due to higher completion rates



Thank You



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Key Takeaways

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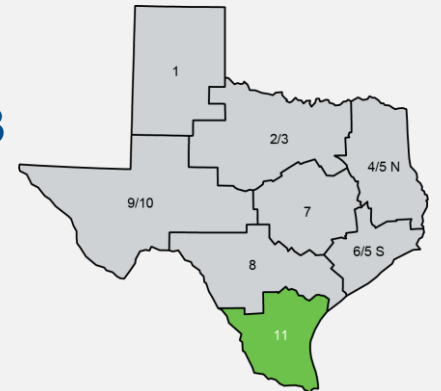
Pediatric TB diagnosis is **challenging but manageable** with proper tools



Early recognition and risk stratification are essential. **Children under 2 years face the highest progression risk.** Timely identification of infection and appropriate risk-based interpretation of screening results enables prompt intervention and prevents disease progression.



Nursing roles are pivotal in all stages of care. From patient education and medication adherence support to monitoring side effects and coordinating multidisciplinary follow-up, nurses drive successful outcomes in pediatric TB management.



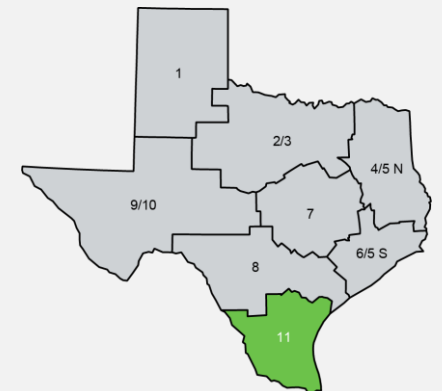
Side effects of RIPE

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Adverse effects of ATT drugs

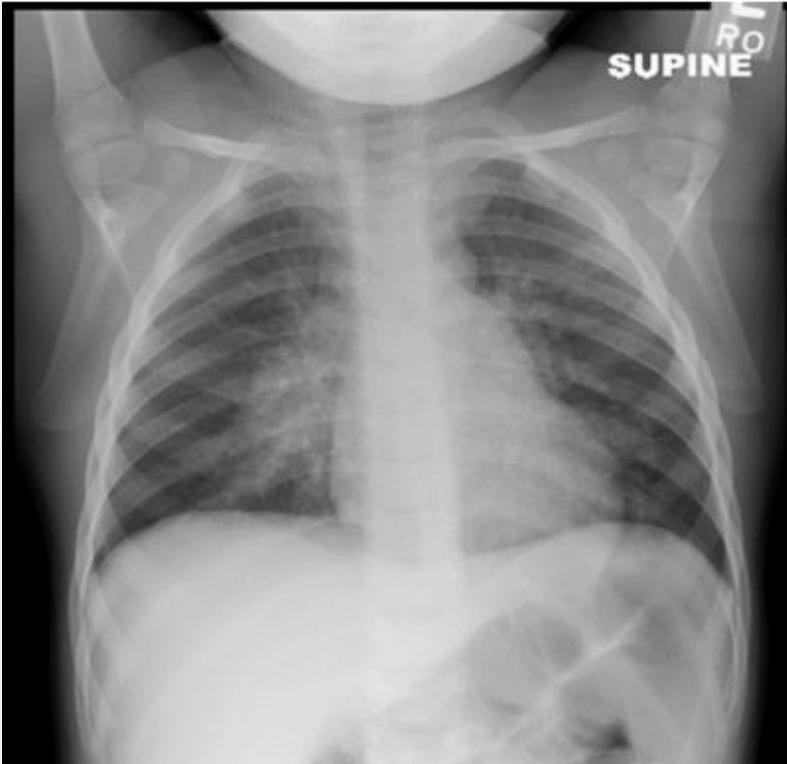
Drug	Adverse effects
Isoniazid	Hepatotoxicity, peripheral neuritis , hypersensitive reactions may precipitate epilepsy, drug induced lupus, psychotic changes
Rifampicin	Hepatotoxicity , gastrointestinal, autoimmune reactions (more with intermittent administration), which include flu syndrome, thrombocytopenias, purpura, respiratory shock syndrome, acute hemolytic anemia, ARF)
Pyrazinamide	Hepatotoxicity , arthralgia, hyperuricemia , gastrointestinal, allergic reactions
Ethambutol	Optic neuritis , colour blindness, gastrointestinal, allergic reactions, hyperuricemia
Streptomycin	Vestibular dysfunction , deafness, nephrotoxicity , neuromuscular blockade, peripheral neuritis



PRIMARY TB DISEASE

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- Typical of childhood TB
- Usually not cavitary
- **Classic x-ray:**
- Hilar lymphadenopathy Infiltrates or Miliary pattern
 - Low numbers of organisms
 - AFB smears negative (95%)
 - Cultures negative in 60%
 - Most children <10 yrs are not contagious
- Often asymptomatic (50%)

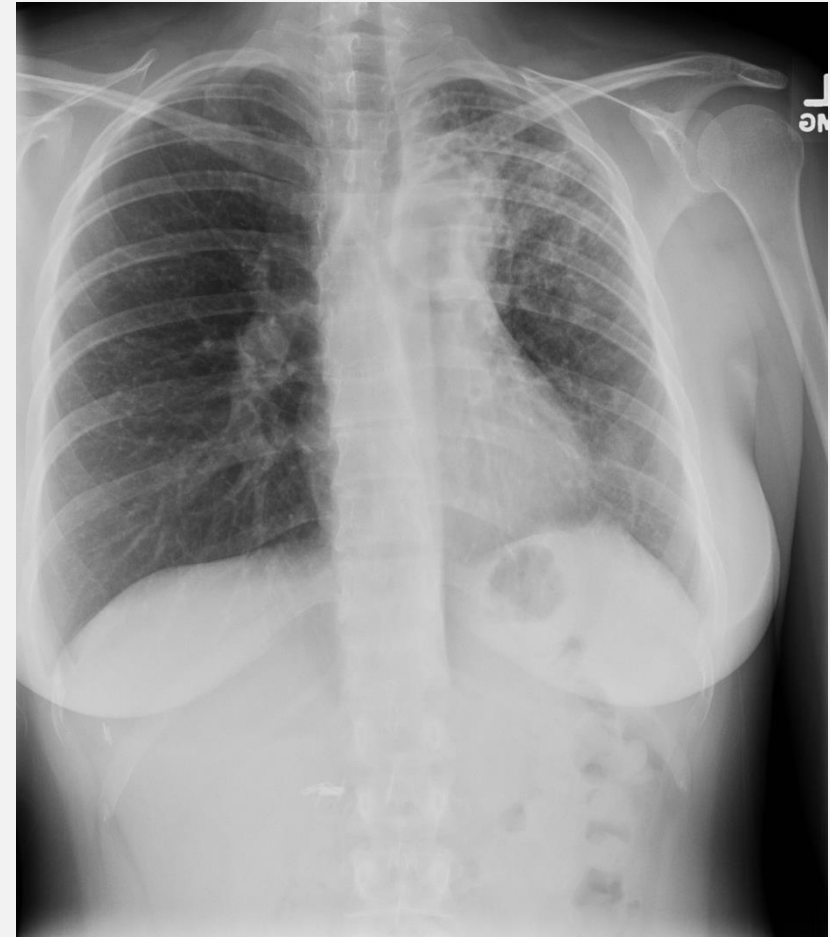
Reactivation Disease

Adults and older children

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- Occurs years after infection
- Occasionally seen in teens
- May have cavitory disease
- High numbers of organisms (AFB +)
- Usually symptomatic and contagious



Principles of TB Management



Consistency and adherence to long-term therapy are crucial for successful treatment outcomes and preventing drug resistance.



Follow AAP Red Book and CDC guidelines for evidence-based treatment protocols and dosing recommendations.



Multidisciplinary approach including nursing support ensures comprehensive patient care and family education.



TREATMENT OF TB IN CHILDREN

Stages of TB	TST/IGRA	CXR/Lab Physical	Symptoms	Treatment
Exposure Child ≤ 4 yrs (adult source)	Negative	Normal	None	Window CPX Rifampin or INH 8-10 wks Repeat TST 8-10 wks after last contact
LTBI Latent TB Infection	Positive	Normal	None	- Rif x 4-6 mo or • 3HP wkly x 12 wks, DOT (directly observed therapy) or • INH x 9 mo
Disease	90% Positive 50% false neg with miliary and TBM	Abnormal CXR, PE or labs	50% of children have symptoms	RIPE x 4-12 months, duration depends on site

Window
Prophylaxis

Comparing LTBI Treatment Options

Regimen	Isoniazid x 9 months	Rifampin x 4 months	INH/Rifapentine x 3 months (3HP)
Completion Rates	62% (self admin)	93% (self admin)	90% (DOPT)
Administration	Daily self meds x 9 months	Daily self meds x 4-6 months	Once weekly x 12 weeks DOPT only
Adverse Events	2-6%	3%	0.4-5%
Total Drug Cost	\$40-100	\$400	\$120-350
Considerations	Long successful track record Poor completion rates	Possible drug interactions Expensive (insurance or Health Dept may cover)	Shortest regimen Age ≥ 2 yr Lots of pills once wkly

Nursing Role in Management



Patient and family education on medication adherence, ensuring understanding of treatment regimens, dosing schedules, and importance of completing full course of therapy.



Monitoring side effects and clinical response throughout treatment, including hepatotoxicity screening, vision changes, and tracking symptom improvement.



Coordinating care and follow-up appointments with multidisciplinary team while supporting psychosocial needs of patients and families during long-term treatment.

