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Expanding the Role of Nurses in TB Prevention, Care, and Treatment

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Introduction

- **A team approach to tuberculosis prevention and control is very important in the successful management of tuberculosis**
- **Although each member is considered an essential player, nurses play a critical role in the care and treatment of co-infected tuberculosis clients**



Challenges of Co-Infected TB Patients

- **Drug interactions**
- **Complex medication regimens and side effects**
- **Resistance/increased risk for relapse**
- **Immune reconstitution**
- **Adherence**
- **Co-morbidities**
- **Other social aspects**



TB Elimination

- **TB elimination could be accomplished as we know:**
 - Etiology
 - Transmission
 - Diagnosis
 - Treatment
 - Prevention
 - Curable



A Global Perspective on Tuberculosis

- **TB is one of the world's deadliest diseases**
- **One third of the world's population is infected with TB**
- **Each year, nearly 9 million people around the world become sick with TB**
- **Each year, there are almost 2 million TB-related deaths worldwide**

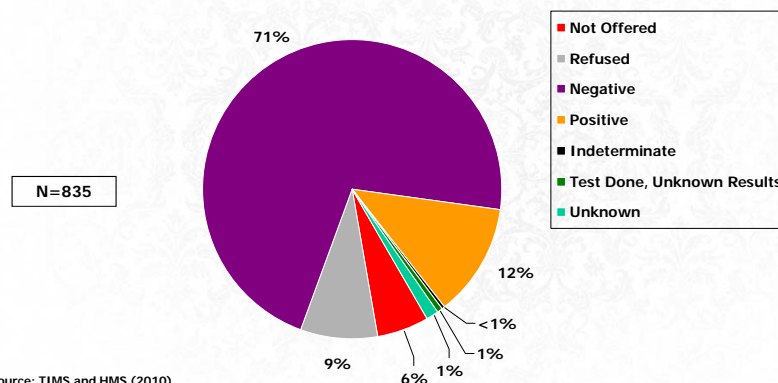


A Global Perspective on Tuberculosis

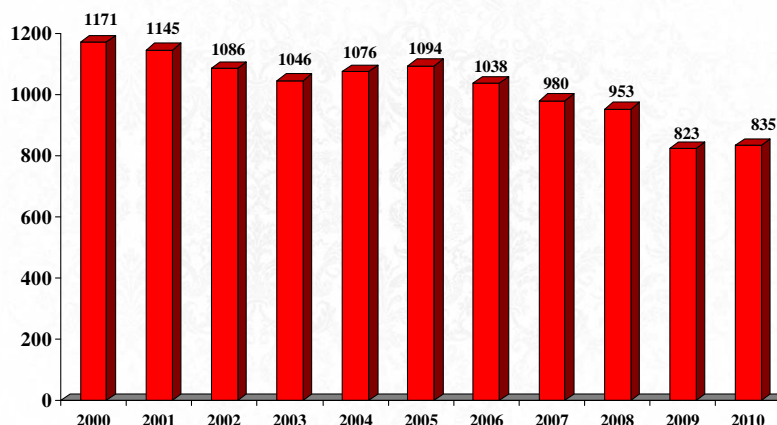
- TB is the biggest curable infectious killer of young people and adults in the world
- TB is clearly a major accelerator of HIV disease
- Susceptibility to TB is one of the earliest manifestations of immune suppression in HIV infection



Tuberculosis Cases by HIV Test Status, Florida, 2010



TUBERCULOSIS CASES FLORIDA, 2000-2010



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Top Three Priorities of TB Control Program

1. Identify and treat all active cases to cure
2. Screen and evaluate all close contacts and assure that they complete an adequate course of preventive therapy
3. Targeted testing of high-risk groups
4. Identify HR settings in which the transmission of TB may exist and apply/develop IC measures



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What is Tuberculosis?

- TB is caused by an organism called *Mycobacterium tuberculosis*, usually reported as MTB complex.
- TB is transmitted by the respiratory route; the principal risk factor for acquiring infection is breathing
- Most infected individuals develop a latent infection that can reactivate at any time during the individual's lifetime

Pathogenesis

- Droplet nuclei containing tubercle bacilli are inhaled, enter the lungs, and travel to small air sacs (alveoli)
- Tubercle bacilli multiply in alveoli, where infection begins
- A small number of tubercle bacilli enter bloodstream and spread throughout body
- Within 2 to 8 weeks the immune system produces special immune cells called macrophages that surround the tubercle bacilli
- These cells form a barrier shell that keeps the bacilli contained and under control (LTBI)
- If the immune system **CANNOT** keep tubercle bacilli under control, bacilli begin to multiply rapidly and cause TB disease

Probability TB Will Be Transmitted

- **Infectiousness of person with TB**
 - AFB+ vs. negative
 - Cavitory vs. noncavitory
 - Symptoms
- **Environment in which exposure occurred**
- **Duration of exposure**
 - Prolong, frequent, intense exposure
- **Virulence of the organism**
- **Extra-pulmonary usually non-infectious**
 - Exception: Laryngeal TB
 - During aerosol producing procedures such autopsies



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Disease Progression

- **Progression from infection to disease caused by an inability to contain infection**
- **The most important characteristics determining disease progression once infected are age and immune status**
- **The risk of developing TB for immunocompetent individuals is approximately 10% in a lifetime, for HIV infected individuals the risk is increased to 10% annually**



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LTBI

- Identifying persons with LTBI is an important goal of TB elimination because LTBI treatment can:
 - Prevent the development of TB disease
 - Stop the spread of TB



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Targeted Tuberculin Testing “Who Should You Test”

- Following that principle, targeted tuberculin testing programs should be conducted among groups at risk of recent infection with *M. tuberculosis* and those who, regardless of duration of infection, are at increased risk of progression to active TB



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Diagnosis of LTBI

- **Mantoux tuberculin skin test (TST)**
- **Blood tests known as interferon-gamma release assays (IGRAs):**
 - If infected with *M. tuberculosis*, blood cells will recognize antigens and release interferon gamma (IFN- γ) in response
 - Less likely to have incorrect reading of results as compared to TST
 - BCG vaccination does not affect results

Classifying the Tuberculin Reaction

≥ 5 mm is classified as positive for the following:

- HIV-positive persons
- Recent contacts to TB case
- Persons with fibrotic changes on chest radiograph consistent with old healed TB
- Patients with organ transplants and other immunosuppressed patients

Classifying the Tuberculin Reaction ≥ 10 mm is classified as positive for the following:

- Recent arrivals from high-prevalence countries
- Injection drug users
- Residents and employees of high-risk congregate settings
- Mycobacteriology laboratory personnel
- Persons with clinical conditions that place them at high risk
- Children < 4 years of age, or children and adolescents exposed to adults in high-risk categories



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Medical Evaluations

- Medical evaluations should be done in order to exclude possibility of TB disease
- Medical history
 - History of TB and/or HIV treatment
 - TB exposure
 - PMH
 - Signs and Symptoms of TB
- Chest x-ray
 - Rule out TB disease
- Laboratory tests
 - 3 sputum samples for smear, culture, and susceptibility testing if TB symptoms or findings on chest x-ray
 - HIV testing if documented status unknown



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Treatment of Latent Tuberculosis Infection

- **Preferred regimen:**
 - Isoniazid (INH) daily or twice-weekly for 9 months for all groups (HIV-, HIV+, fibrotic x-rays) and also children
 - Isoniazid (INH) daily or twice-weekly for 6 months
 - Maybe cost effective
 - Not recommended for children, HIV infected patients or fibrotic x-rays.
 - Rifampin daily for 4 months
- **Always rule out active tuberculosis prior to initiating treatment for LTBI**



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Diagnosis of Active TB Disease

Key:
THINK TB



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Diagnosis of Tuberculosis



- Medical history
- Physical examination
- TB skin test (Mantoux tuberculin skin test)
- Chest radiograph
- Bacteriologic or histologic exam

Medical History

- Symptoms of TB disease
- Exposure to a person with infectious TB or have risk factors for exposure to TB
- Any risk factors for developing TB disease
- Had LTBI or TB disease before
- Previous treatment for LTBI/TB Disease
- Past/current medical conditions including HIV
- Current medications

Chest X-ray

- **When a person has TB disease in lungs, the chest x-ray may show the following findings :**
 - Infiltrates -collections of fluid and cells in lung tissue
 - Hilar lymphadenopathy
 - Cavities -hollow spaces within lung
 - Help rule out possibility of pulmonary TB disease in persons who have a positive TST or IGRA result
 - Chest x-rays cannot confirm TB disease
 - Chest x-ray may appear unusual or even appear normal for persons living with HIV

Bacteriologic Testing

Bacteriologic examination steps:

- **Specimen collection**
- **Examination of acid-fast bacilli (AFB) smears**
- **Direct identification of specimen (nucleic acid amplification)**
- **Specimen culturing and identification**
- **Drug susceptibility testing**

Types of Mycobacterium

- *M. tuberculosis* causes most TB cases in U.S.
- Mycobacteria that cause TB:
 - *M. tuberculosis*
 - *M. bovis*
 - *M. africanum*
 - *M. microti*
- Reported as *M.tuberculosis* complex
- Mycobacteria that do not cause TB
 - e.g., *M. avium* complex

Drug Susceptibility Testing

- Conducted when patient is first found to have positive culture for TB
- Determines which drugs kill tubercle bacilli
- Tubercle bacilli killed by a particular drug are susceptible to that drug
- Tubercle bacilli that grow in presence of a particular drug are resistant to that drug

Drug Resistant

- **Mono-resistant:** Resistant to any one TB treatment drug
- **Multidrug-resistant (MDR TB):** Resistant to at least isoniazid and rifampin, the two best first-line TB treatment drugs
- **Extensively drug-resistant (XDR TB):** Resistant to isoniazid and rifampin, PLUS resistant to any fluoroquinolone AND at least 1 of the 3 injectable second-line drugs (e.g., amikacin, kanamycin, or capreomycin)



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Drug Resistance

Drug resistance can develop when:

- Patient has spent time with someone with active drug-resistant TB disease
- Patient does not take their medicine regularly
- Patient does not take all of their medicine
- Patient develops active TB disease after having taken TB medicine in the past
- Patient comes from area of the world where drug-resistant TB is common
- When patients are prescribed an inappropriate regimen



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Treatment of TB

- Treatment with a single drug can lead to the development of drug-resistant TB
- Include four drugs in initial regimen
 - Isoniazid (INH)
 - Rifampin (RIF)
 - Pyrazinamide (PZA)
 - Ethambutol (EMB) or streptomycin (SM)
- Adjust regimen when drugs susceptibility results are known
- Initial phase VS continuation phase
- Treatment completion is defined by number of doses patient takes within a specific time frame



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Treatment of TB (cont.)

- TB disease must be treated for at least 6 months; in some cases, treatment last even longer.
 - Regimens which exclude PZA
 - Prolonged culture conversion
 - Areas that are hard to penetrate
 - Brain, bone, miliary
 - Drug resistant TB



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Adverse Reactions

- **EMB**
 - Eye damage
- **INH**
 - Hepatitis, peripheral neuropathy
- **PZA**
 - Hepatitis, increased uric acid
- **RIF**
 - Hepatitis, bleeding problems, discoloration of body fluids, drug interactions, sensitivity to the sun
 - It is important to be aware of the interaction of RIF with some ARV drugs
- **Drugs that should not be used in pregnant women**
 - Pyrazinamide (PZA)
 - Streptomycin (SM)
- **EMB is not recommended for children unless TB is resistant to INH, child is a contact of patient with INH-resistant TB, or TB manifestation is similar to TB in adults**



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Monitoring Adverse Drug Reaction

- **Patients should be educated about symptoms caused by adverse reactions to drugs**
- **Patients should be seen by clinician at least monthly during treatment and evaluated for possible adverse reactions**
- **Public health workers who have regular contact with patients should ask about adverse reactions to treatment**
- **Baseline/follow up laboratory testing**
- **Vision screening**



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Infectiousness

- **Patients should be considered infectious if they**
 - **Are coughing**
 - **Are undergoing cough-inducing or aerosol-generating procedures, or**
 - **Have sputum smears positive for acid-fast bacilli and they**
 - **Are not receiving therapy**
 - **Have just started therapy, or**
 - **Have poor clinical response to therapy**



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Special Considerations in TB/HIV Treatment

- **Concurrent administration of ARV'S and treatment for tuberculosis is complicated by:**
 - **Common/overlapping toxicity of both agents**
 - **Drug-Drug Interactions**
 - **IRIS**
 - **Adherence/Poly Pharmacy**



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Drug-Drug Interactions

- Drug-drug interactions can result in changes in concentration of one or both of the drugs
- Major concern is the bi-directional interaction of Rifampin with ARV agents
- Rifabutin has the potential for fewer drug-drug interactions and may be substituted for RIF in some situations. When Rifabutin is combined with antiretroviral agents, its dose and the dose of the antiretroviral agents may require adjustment.
- Use of Rifamycins in the treatment of TB is essential and despite common drug interactions should not be excluded from the treatment regimen



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Drug-Drug Interactions (2)

- ARV Therapy should not be withheld because the patient is being treated for TB however it is not advisable to begin both ARV's and chemotherapy for TB at the same time.
- The optimal timing to initiate ARV's is not completely known but the literature suggests that it should be at least after two weeks of initiation of anti-tuberculosis therapy but optimally within the first two months (during the initial phase) especially in those with low CD4 counts.



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Immune Reconstitution Inflammatory Syndrome

- Temporary exacerbation of symptoms, signs and manifestations of TB
- Results from immune reconstitution as a consequence of effective ARV therapy
- TB treatment failure and other etiology must be ruled out
- Although it may be life threatening it can be treated in most cases with NSAID'S/Prednisone and most cases ARV'S should be continued



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Adherence

- Non-adherence is a major problem in TB control
- DOT prevents mono therapy and drug resistance
- DOT is the preferred core management strategy for all patients with TB. Establishing a relationship with the patient and addressing barriers to adherence is the core of a successful DOT program.
- Treatment of LTBI patients with DOTS significantly delays the onset of AIDS and disease progression in people with HIV infection; decreases morbidity/mortality and risk for development of drug resistance and relapse in those with active disease.



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The Role of the Nurse

- **Prevention**
- **Assessment/Evaluation**
- **Coordination of care**
- **Collaboration and partnership**
- **Education and awareness**
- **Monitoring**
- **Advocacy**
- **Adherence Promotion**



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Conclusion

- **Managing complex TB patients requires a comprehensive framework that takes into account both the clinical and social circumstances relevant to the patient.**
- **It requires sound nursing judgment, independent critical thinking, analysis and problem solving skills in order to ensure treatment to cure, protect the public's health and decrease morbidity and mortality**
- **Education, training, awareness, guidance and consultation are essential PH functions that are crucial in the control and prevention of tuberculosis.**
- **Creating and strengthening relationships/partnerships and working in cooperation with community providers will allow us to use our resources wisely, share our knowledge and expertise, utilize multiple disciplines and promote a team approach to the prevention and control of TB within these special settings.**



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**"Unity is strength... when there is teamwork and collaboration, wonderful things can be achieved." - Mattie Stepanek ,
American Teenage Poet**



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