



# **Managing and Monitoring Side Effects & Toxicities of Anti-TB Therapy**

*Debbie Davila, MSN, RN*

*April 30, 2026*

TB Nurse Case Management • April 29 – May 1, 2026 • Fort Worth, Texas



# Debbie Davila, MSN, RN

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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**Debbie Davila, MSN, RN**  
Nurse Consultant/Educator  
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# Objectives

- Discuss tools used for monitoring the patient on TB treatment
- Discuss methods used to identify toxicities to TB treatment



# Content:

- Discuss tools used for **monitoring the patient on TB treatment to recognize/identify serious side effects/adverse events/reactions**
- Work through case studies to become familiar with how to identify and manage patients that develop:
  - Hepatotoxicity
  - Vision toxicity
- Skin Condition Exercise: Review various rash images
  - Evaluate & describe a rash



# Monitoring Goals

- **Become familiar with monitoring tools to manage TB patient**
  - Find what works best for you
- **Recognize problems/address complaints quickly**
- **Intervene rapidly**
  - **Minimize treatment interruptions**

**Complete Adequate TB treatment Successfully!!!!**

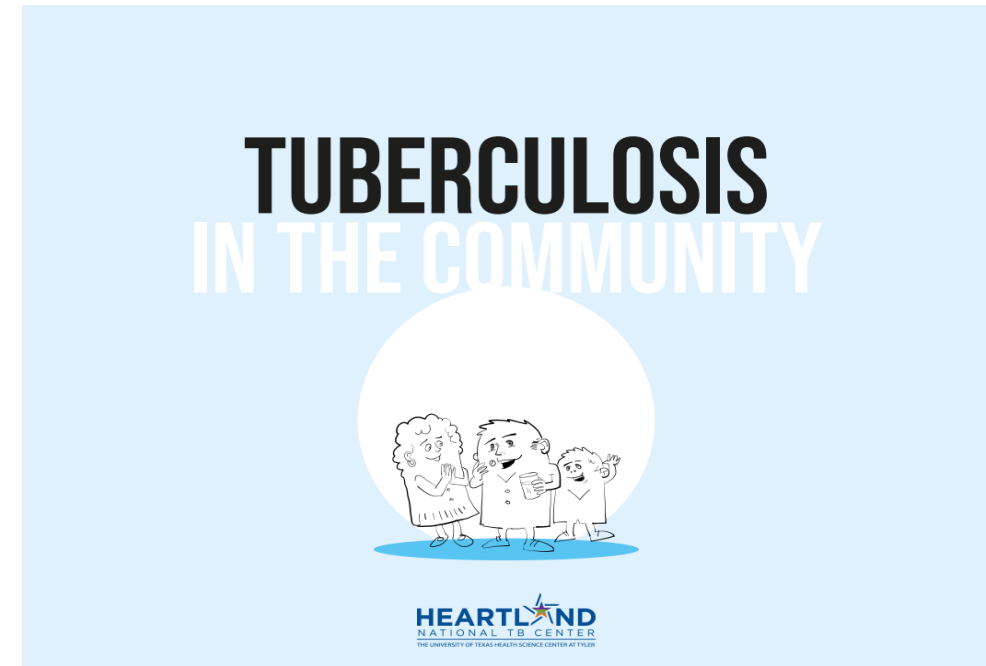


# The Monitoring Process

## Patient Education & Discussion

### Flip Chart

- Disease process
- Anticipated duration of therapy
  - Role of DOT
  - Importance of adherence
- Help patient develop clear “understanding” of potential Side Effects/Adverse Reactions
  - to recognize and report to nurse



## Side Effects

- Usually ***predictable*** effect of drug (that is not the principal effect) for which the drug was chosen.
- Maybe Desirable
- Undesirable/Unpleasant
  - Minor reactions
  - No long-lasting health effects
  - Do not usually require changes in therapy



# Examples of Minor Side Effects

- Gas
- Bloating
- Mild nausea
- Discoloration of body fluids
- Irritability
- Difficulty sleeping
- Photosensitivity



# Serious side effect/ **Adverse Drug Reaction**

- Unwanted & unpleasant
- Potentially Harmful
- Require modifying the dose or discontinuation of drug
- May require additional therapy and/or hospitalization



# Examples of Serious Side Effects

- Skin rash
- Blurred or changed vision
- Stomach pain
- Brown urine or light-colored stool
- Tiredness
- Fever for 3 or more days
- Flu-like symptoms
- Lack of appetite
- Nausea
- Vomiting
- Yellowish skin or eyes
- Dizziness
- Tingling or numbness around the mouth
- Persistent tingling sensation in the hands and feet
- Stomach upset
- Joint aches
- Easy bruising or bleeding



# Knowledge Check #1: What are the First Line TB Meds?

- Rifampin (RIF)
  - Rifabutin
- Isoniazid (INH)
- Pyrazinamide (PZA)
- Ethambutol (EMB)



## Knowledge Check #2: What are the Second-line Drugs?

- Cycloserine
- Ethionamide
- Levofloxacin
- Moxifloxacin
- Bedaquiline
- Pretomanid
- Delamanid
- PAS
- Streptomycin
- Amikacin
- Kanamycin
- Capreomycin
- Clofazamine
- Linezolid
- Meropenem



# First Line Drugs

<b>INH</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• Hepatotoxicity</li><li>• Peripheral neuropathy</li><li>• Mild CNS Toxicity</li></ul>	<b>Rifampin</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• Hepatotoxicity</li><li>• Thrombocytopenia, hemolytic anemia</li><li>• Renal toxicity</li><li>• Flu-like syndrome</li><li>• Orange staining of body fluids</li></ul>	<b>Rifabutin</b> <ul style="list-style-type: none"><li>• Rash/Skin discoloration</li><li>• Hepatotoxicity</li><li>• Leukopenia</li><li>• Thrombocytopenia</li><li>• Uveitis</li><li>• Arthralgias</li></ul>
<b>PZA</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• Hepatotoxicity</li><li>• Arthralgias</li><li>• Gout (rare</li></ul>	<b>Ethambutol</b> <ul style="list-style-type: none"><li>• Optic Neuritis</li><li>• Rash</li></ul>	



# Second in Line Drugs

<p><b>Linezolid</b></p> <ul style="list-style-type: none"> <li>• Peripheral neuropathy</li> <li>• Optic neuropathy (<i>reversible with early recognition</i>)</li> <li>• Anemia</li> <li>• Thrombocytopenia</li> <li>• Neutropenia</li> <li>• Headache</li> <li>• GI upset</li> <li>• Rash</li> <li>• Serotonin syndrome</li> <li>• Lactic acidosis</li> <li>• Acute pancreatitis</li> <li>• Black hairy tongue</li> </ul>	<p><b>Bedaquiline</b></p> <ul style="list-style-type: none"> <li>• QTC prolongation</li> <li>• Decreased appetite</li> <li>• Nausea</li> <li>• Hepatitis</li> <li>• Headaches</li> <li>• Arthralgias</li> <li>• Elevated amylases</li> <li>• Vivid dreams</li> </ul>	<p><b>Pretomanid</b></p> <ul style="list-style-type: none"> <li>• Hepatotoxicity, Myelosuppression</li> <li>• Peripheral</li> <li>• Optic neuropathy</li> <li>• Lactic acidosis</li> <li>• QTc prolongation</li> <li>• Pancreatitis (<i>side effects are for entire BPaL regimen</i>)</li> </ul>
<p><b>Clofazamine</b></p> <ul style="list-style-type: none"> <li>• Rash</li> <li>• G.I. upset</li> <li>• Discoloration and dryness of skin</li> <li>• Photosensitivity</li> <li>• Retinopathy</li> </ul>	<p><b>Levofloxacin/Moxifloxacin</b></p> <ul style="list-style-type: none"> <li>• GI upset</li> <li>• Dizziness</li> <li>• Photosensitivity</li> <li>• Arthralgias</li> <li>• Tendonitis/tendon rupture (rare)</li> <li>• QTc prolongation</li> <li>• Peripheral neuropathy</li> </ul>	<p><b>Ethionamide</b></p> <ul style="list-style-type: none"> <li>• G.I. upset</li> <li>• Hypothyroidism</li> <li>• Metallic taste</li> <li>• Hepatitis</li> <li>• Headache</li> <li>• Alopecia</li> <li>• Gynecomastia</li> <li>• Menstrual irregularity</li> <li>• Peripheral Neuropathy</li> </ul>



# Second in Line Drugs

<b>Cycloserine</b> <ul style="list-style-type: none"><li>• Rash</li><li>• CNS toxicity</li><li>• Depression</li><li>• Suicidal ideation</li><li>• Psychosis</li><li>• Peripheral neuropathy</li><li>• Skin changes (lichenoid eruptions, Stevens-Johnson Syndrome)</li></ul>	<b>Amikacin</b> <ul style="list-style-type: none"><li>• Ototoxicity</li><li>• Auditory/vestibular</li><li>• Renal toxicity</li><li>• Pain at infection site</li></ul>
<b>Meropenem</b> <p>GI upset</p>	<b>Delamanid</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Dizziness</li><li>• Insomnia</li><li>• Upper abdominal pain</li><li>• QTC prolongation</li></ul>



# Monitoring

- **Daily Monitoring**

- Assess tolerance to meds daily by nurse or outreach worker
- DOT/VDOT
  - DOT log

- **Monthly Toxicity checks**

- Assess patient
- Get updates
- Labs









# Tuberculosis Side Effects Questionnaire

*Laminated & Use Dry Erase Marker*

Place an “X” on each line to indicate how severe they are experiencing each of the following reactions

**Tuberculosis Side Effects Questionnaire**

Please place an **X** on each line to indicate how severe you are experiencing each of the following reactions recently or from the last visit:

	No nosebleed	_____	Severe nosebleed	
	Clear Vision	_____	Vision Changes	
	No Fever	_____	High Fever	
	Not Nauseous	_____	Extremely Nauseous	
	Not Fatigued	_____	Very Fatigued	
	No Joint Pain	_____	Joint Pain	
	No Rash	_____	Itchy Rash	
	No Abdominal Pain	_____	Severe Abdominal Pain	
	Normal Eyes + Skin	_____	Yellowing of Eyes or Skin	
	No Tingling of Fingers or Toes	_____	Tingling of Fingers or Toes	

Author: Taiwo Jacob Ajayi, DNP, BSN, RN  
Graphic Design: Elysium Gonzalez, BFA

**HEARTLAND**  
NATIONAL IN-CENTRE  
HEALTHCARE TRANSFORMATION CENTER

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# Laboratory Monitoring

- **Baseline**
  - **Complete blood count (CBC)**
  - **Comprehensive Metabolic Panel (CMP):** *AST, ALT, total bilirubin, alk phos, and creatinine.*
- **Monthly CBC, CMP repeat** if the baseline result is abnormal and/or have risk factors for hepatotoxicity or other complications, including but not limited to:
  - Pregnant patients
  - Female patients during the first three months postpartum
  - Patients with or at risk for HBV, HCV, or other liver disorder
  - Patients taking medications for other comorbidities or chronic medical conditions that may affect the liver or kidneys
  - Patients who use alcohol or recreational drugs (orally or by injection)
  - Patients with HIV infection/AIDS
  - Patients on medications that affect or are excreted by the liver



# Tuberculosis Case Management Care Plan

## TB 201 (monthly checklist for CM)

Outlines important toxicity monitoring events that *must* occur during TB treatment

### Tuberculosis Case Management Care Plan

Patient's Name/DOB: \_\_\_\_\_ Initial Report (Date/Source): \_\_\_\_\_  
 Nurse Case Manager (NCM): \_\_\_\_\_ Licensed Healthcare Provider (LHP): \_\_\_\_\_

**Directions:** Document TB case management activities\* for patients with known/suspected drug susceptible TB including the date and initials when a task is completed. The referenced [DSHS TB forms](#) contain key information for each activity. Programs may use an alternative form or electronic health record (EHR) template that contains *equivalent* information.

\*Refer to the [DSHS TB Standing Delegation Orders \(SDOs\)](#) and the [Texas TB Manual](#) for detailed information on these case management activities. Refer to **TB-701** form for documenting case management activities on patients that require a second line drug regimen.

Treatment Months		0	1	2	3	4	5	6	9	12
Weeks				8				26	39	52
Activity	Details									
<b>Responsibility</b>	Assign NCM and identify LHP and other team members. <b>TB-201</b>									
<b>Consents</b>	General <b>L-36</b> Acknowledgement of Understanding <b>TB-409</b> Hurricane Questionnaire <b>TB-209</b> HIPPA									
	Medical Information Release <b>L-30</b> • Obtain if requesting and sharing medical information with other providers.									
	Health Authority Control Order <b>TB-410</b> • Issue for all patients with known or suspected TB disease.									
	TB Medication Consent <b>TB-411</b> • Obtain before treatment initiation <i>and</i> anytime a drug is added to the regimen.									
	Client/DOT Provider Agreement <b>TB-206</b> Signed monthly by patient and DOT staff.									
	Video-DOT Client Agreement if using VDOT. <b>12-15762</b> Indicate when interpreter used.									
<b>Education</b>	Provide initial and ongoing patient education. Document specific education, at minimum monthly. <b>TB-203</b>									



# DSHS Texas TB Resources



About Tuberculosis >

How to Report Tuberculosis

TB News and Announcements

Frequently Asked Questions About TB

TB Data and Statistics >

TB Prevention and Care for Correctional Facilities >

Texas Binational Tuberculosis (TB) Program >

TB Funded Programs >

TB Forms Resources



TB Education, Training and Resources >

National Electronic Disease Surveillance System (NEDSS) for Tuberculosis Programs

## DSHS TB Program

the air. TB usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. A person with TB disease can die if they do not get treatment.



TB disease can be cured with medical care and the right medicine. [Learn more...](#)

## Recent News

- [DSHS TB Medication Availability Notification: April 9, 2024](#)
- [TB Standing Delegation Orders and Standing Medical Orders](#)
- [Enroll in Medicaid as a TB Medical Provider](#)

<a href="#">About Us</a>	<a href="#">For the Public</a>	<a href="#">TB Data and Statistics</a>	<a href="#">How to Report TB</a>
<a href="#">Resources for Healthcare Professionals</a>	<a href="#">TB Binational Program</a>	<a href="#">TB Funded Programs</a>	<a href="#">Correctional Facilities</a>

## Quick Links

<https://www.dshs.texas.gov/tuberculosis-tb>





Home / Tuberculosis (TB) / TB Forms Resources

### Tuberculosis (TB)

About Tuberculosis



How to Report Tuberculosis

TB News and Announcements

Frequently Asked Questions About TB

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Texas Binational Tuberculosis (TB)



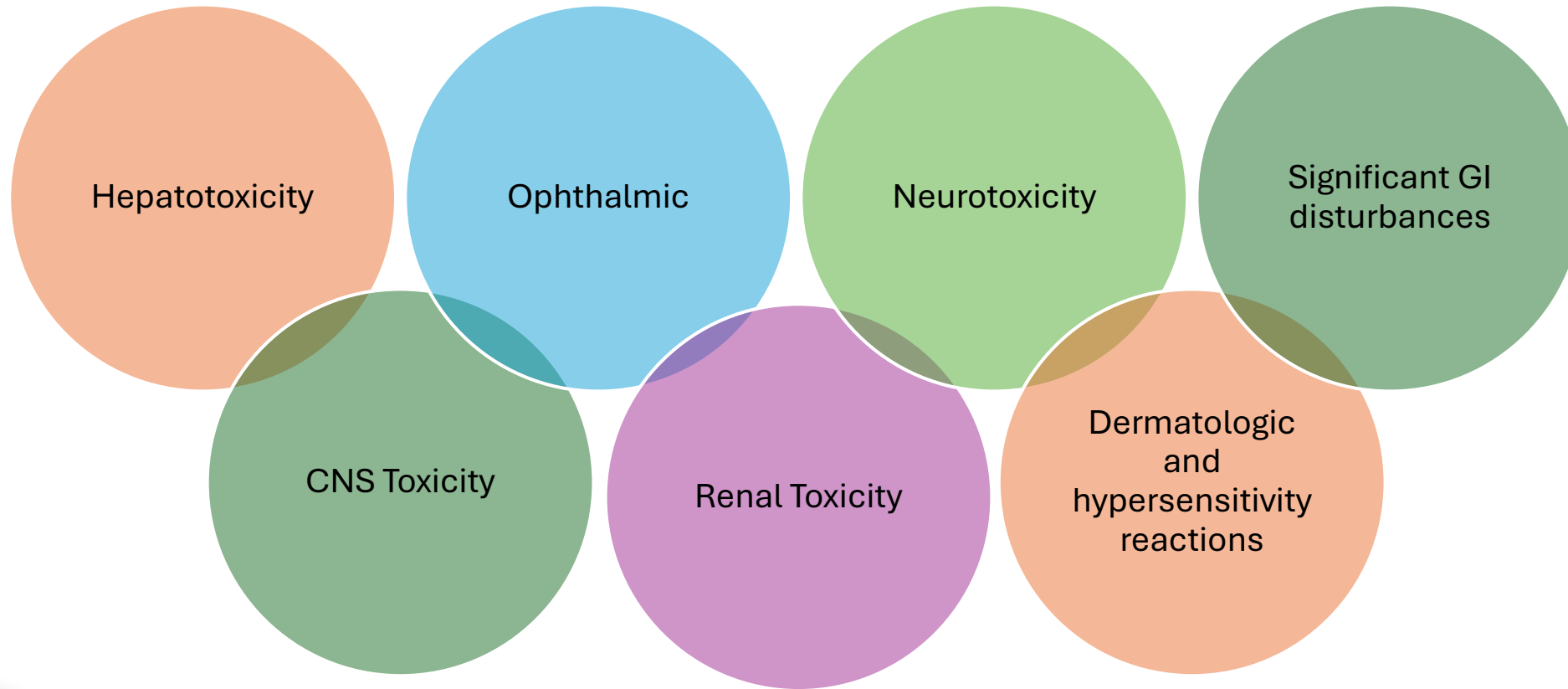
## TB Forms Resources

### Quick Links

- [Consent/Control Orders](#)
- [Case Management](#)
- [TB Public Health Follow-Up](#)
- [Cohort Review](#)
- [Court Ordered Management](#)
- [Healthcare Personnel](#)
- [Correctional Facilities](#)
- [Targeted Testing](#)



# At Risk for Developing Serious Adverse Reactions/ Toxicities



**TB NCM are the link to completing TB treatment Successfully**



# Potential Problem: Hepatotoxicity

- AKA liver toxicity, refers to liver damage caused by exposure to harmful substances like medications, toxins, or chemicals.
- Damage can impair liver function and, in severe cases, lead to liver failure.
- Can be caused by various factors, including prescription drugs, over-the-counter medications, herbal remedies, industrial chemicals, and even alcohol.



**Mayo Clinic.** (2023). *Toxic hepatitis*. Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/toxic-hepatitis/symptoms-causes/syc-20352202>



## Knowledge Check # 3:

# What are Some S/SX of Hepatotoxicity?

### Early Signs

- Fatigue
- Poor appetite
- Taste alteration
- Nausea
- Abdominal discomfort
- Bloating
- Minimal rash

### Later Signs

- Vomiting
- Abdominal pain
- Jaundice
- Change in color of urine and stool
- Changes in behavior, memory loss



## Knowledge Check #4:

**Which anti-TB medication has the potential of causing hepatotoxicity?**

- A. INH
- B. Rifampin
- C. PZA
- D. All of the above



## Knowledge Check #4:

Which anti-TB medication has the potential of causing hepatotoxicity?

- A. INH
- B. Rifampin
- C. PZA
- D. All of the above**



# First Line Drugs

<b>INH</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• <b>Hepatotoxicity</b></li><li>• Peripheral neuropathy</li><li>• Mild CNS Toxicity</li></ul>	<b>Rifampin</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• <b>Hepatotoxicity</b></li><li>• Thrombocytopenia, hemolytic anemia</li><li>• Renal toxicity</li><li>• Flu-like syndrome</li><li>• Orange staining of body fluids</li></ul>	<b>Rifabutin</b> <ul style="list-style-type: none"><li>• Rash/Skin discoloration</li><li>• <b>Hepatotoxicity</b></li><li>• Leukopenia</li><li>• Thrombocytopenia</li><li>• Uveitis</li><li>• Arthralgias</li></ul>
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# Case Study: Hepatotoxicity



# Case Study

- 38 year old male diagnosed with pulmonary TB in **March 2019**.
- Baseline labs indicate **ALT 38, AST 25, Alk. Phosphatase 37, T. bili 0.5.**
- **March 13** he started standard RIPE regimen
- He received medication by daily DOT that was provided by the local health department
- **May 15** (approx. 2 mos. later) susceptibility results indicate the isolate was pan susceptible and Ethambutol (EMB) was discontinued. Pyrazinamide (PZA) was also discontinued because he had already taken 40 doses.
- He was continued on INH & Rifampin
- **June 4 (approx. 3 months** after starting anti – TB therapy) follow-up lab results were **ALT 97, AST 304, Alk phos. 72, T. Bili 0.8. ;** pt denied any complaints



WHAT  
SHOULD  
I DO



# Let's Look at the Lab Results/ Calculate Elevated LFTs

Baseline LFT's: ALT 38, AST 25, Alk Phos 37, T. bili 0.5.

Follow up LFT's: **ALT 97, AST 304, Alk phos 72, T. bili 0.8**

## Normal Values:

AST: 10 - 42 u/L

ALT: 10 - 40 u/L

Alk. Phos: 35 - 104 u/L

T. Bili. : 0.3 - 1.2 ng/dL

Take a **closer** look!



# Let's Do the Math

## Reference Value:

- ALT: 10 - 40 u/l
- AST: 10 - 42 u/L
- Alk. Phos: 35 -104 u/L
- T. Bili: 0.3 -1.2 ng/dL

## Pt. Current Labs:

**ALT 97, AST 304, Alk phos 72, T. bili 0.8**

Investigation	Result	Reference Value	Unit
Primary Sample Type :	Serum		
AST (SGOT) <small>Uric Acid PIP</small>	15.00	15.00 - 40.00	U/L
ALT (SGPT) <small>Uric Acid PIP</small>	100.50	High 10.00 - 49.00	U/L
Alkaline Phosphatase (ALP) <small>PCZ</small>	15.40	Low 30.00 - 120.00	U/L
Bilirubin Total <small>U-3</small>	0.60	0.30 - 1.20	mg/dL
Total Protein <small>U-20</small>	6.39	5.70 - 8.20	g/dL
Albumin <small>U-20</small>	2.00	3.20 - 4.80	g/dL
GFR	120.00	> 60.00	mL/min/1.73 m <sup>2</sup>
Glucose, Fasting <small>Uric Acid</small>	100.00	70.00 - 99.00	mg/dL
Sodium <small>Indirect ISE</small>	140.00	135.00 - 145.00	mmol/L
Potassium <small>Indirect ISE</small>	4.00	3.50 - 5.00	mmol/L
Calcium <small>Direct ISE</small>	10.00	8.50 - 10.50	mg/dL
BUN <small>Unides U-1</small>	15.00	7.00 - 20.00	mg/dL
Creatinine <small>Modified Jaffe Kinetic</small>	1.00	0.60 - 1.30	mg/dL

**Divide abnormal lab result by higher number of reference value**



## Divide abnormal lab result by higher number of normal value

Reference Value:

ALT: 10 - 40 u/l

AST: 10 - 42 u/L

Alk. Phos: 35 -104 u/L

T. Bili: 0.3 -1.2 ng/dL

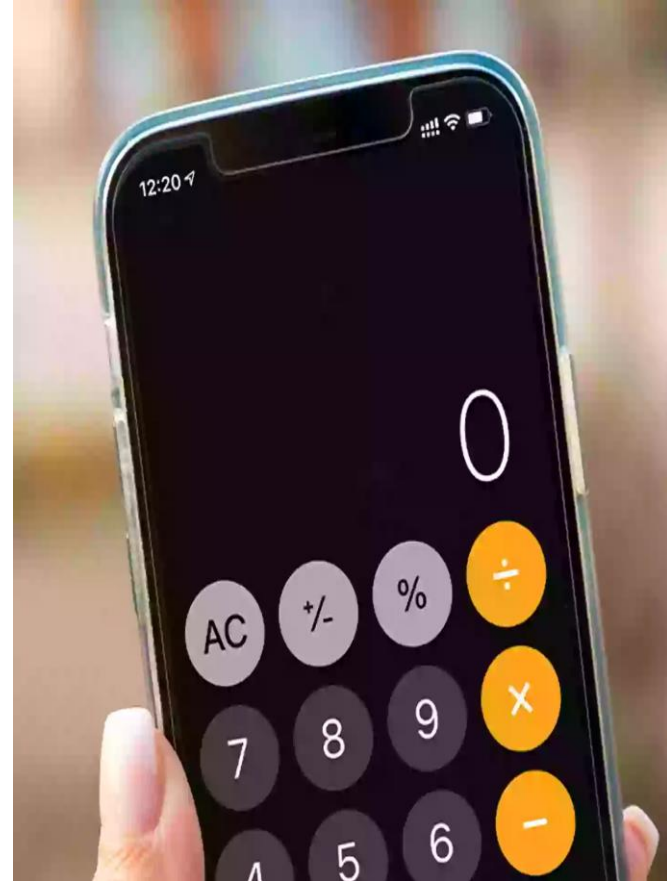
**Pt. Labs:**

Follow up/Current :

ALT 97, AST 304, Alk phos 72, T. bili 0.8

$$\text{ALT } 97/40 = ?$$

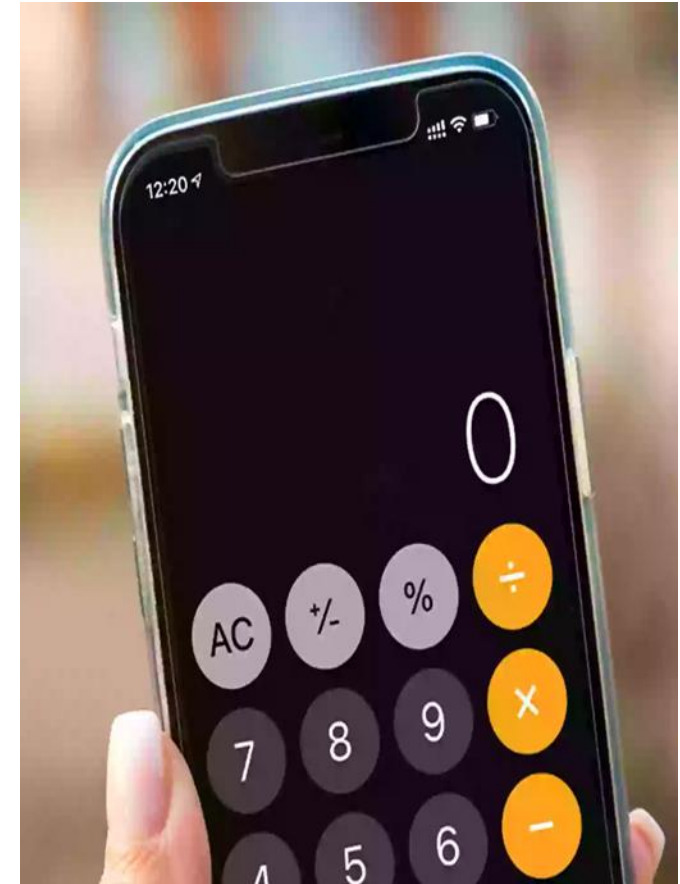
$$\text{AST } 304/42 = ?$$



Divide abnormal lab result by higher number of normal value

$$\text{ALT } 97/40 = 2.45 \times \text{ULN}$$

$$\text{AST } 304/42 = 7.23 \times \text{ULN}$$



As the nurse managing this patient's anti-TB therapy, what are you going to do?



# What Do We Do?

## Hold TB medications!

TB medications should be held if AST/ALT exceeds **3x** the ULN **with symptoms** present

*or*

**5x** the ULN **without symptoms**

*or*

T. Bilirubin **exceeds 2x** the UNL



Cannot restart anti-TB therapy until LFT's  **$\leq 2$  times** upper limit of normal

- Re-challenge medications
  - **Introduce one drug at a time**
  - **Monitor liver enzymes carefully**



## Case Study– Hepatotoxicity

Anti-TB therapy was re-started by re-introducing one medication at a time when liver enzymes  $< 2$  times upper limit of normal. Liver enzymes were monitored carefully. At a follow up appointment patient admitted to drinking 6 -12 oz. beers almost every day with his neighbor

**What risk factors can you identify that place this patient at risk for developing hepatotoxicity?**

**He drinks 6 - 12 oz. beers almost every day with his neighbor.**



# Most at Risk for Hepatotoxicity

- **Underlying liver disease**
  - Clarify preexisting conditions that may increase risk of hepatotoxicity
    - Hepatitis B and C
- **Alcoholism**
  - **Take a good social history**
  - Ask specific questions about daily ETOH use
- **Immediate (3 months) post-partum period**
- **Those on other hepatotoxic medications**
  - Prescribed
  - Over the counter



## Case Study - **Hepatotoxicity**

### How do we monitor him for the remainder of his treatment?

- While rechallenging/Monitor LFT's closely
- Review adverse effects
- Instruct patient to self monitor for side effects while on meds
- Re-educate patient to abstain from alcohol while on anti-TB medication
- Encourage adherence
- Consider a liver friendly regimen (Rifampin, Moxifloxacin/Levofloxacin, EMB)



**Case Study:**  
**Missed Opportunities for Identifying Visual Toxicity**



## Knowledge Check #5:

What anti-TB medications place the patient at risk for vision related toxicities?

- A. Rifampin
- B. Ethambutol
- C. Linezolid
- D. B & C only
- E. All of the above



## Knowledge Check # 5:

- What anti-TB medications place the patient at risk for vision related toxicities?
  - A. Rifampin
  - B. Ethambutol
  - C. Linezolid
  - D. B & C**
  - E. All of the above



# First Line Drugs

<b>INH</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• Hepatotoxicity</li><li>• Peripheral neuropathy</li><li>• Mild CNS Toxicity</li></ul>	<b>Rifampin</b> <ul style="list-style-type: none"><li>• G.I. upset</li><li>• Rash</li><li>• Hepatotoxicity</li><li>• Thrombocytopenia, hemolytic anemia</li><li>• Renal toxicity</li><li>• Flu-like syndrome</li><li>• Orange staining of body fluids</li></ul>	<b>Rifabutin</b> <ul style="list-style-type: none"><li>• Rash/Skin discoloration</li><li>• Hepatotoxicity</li><li>• Leukopenia</li><li>• Thrombocytopenia</li><li>• Uveitis</li><li>• Arthralgias</li></ul>
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# Second in Line Drugs

<b>Linezolid</b> <ul style="list-style-type: none"><li>• Peripheral neuropathy</li><li>• <b>Optic neuropathy (reversible with early recognition)</b></li><li>• Anemia</li><li>• Thrombocytopenia</li><li>• Neutropenia</li><li>• Headache</li><li>• GI upset</li><li>• Rash</li><li>• Serotonin syndrome</li><li>• Lactic acidosis</li><li>• Acute pancreatitis</li><li>• Black hairy tongue</li></ul>	<b>Bedaquiline</b> <ul style="list-style-type: none"><li>• QTC prolongation</li><li>• Decreased appetite</li><li>• Nausea</li><li>• Hepatitis</li><li>• Headaches</li><li>• Arthralgias</li><li>• Elevated amylases</li><li>• Vivid dreams</li></ul>	<b>Pretomanid</b> <ul style="list-style-type: none"><li>• Hepatotoxicity, Myelosuppression</li><li>• Peripheral</li><li>• Lactic acidosis</li><li>• QTc prolongation</li><li>• Pancreatitis (<i>side effects are for entire BPal regimen</i>)</li></ul>
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# Case Study

- 21 year old male arrested and incarcerated in county jail **January 2019**.
- **October 7, 2019** he began to have complaints of fever, chills, productive cough, chest pain, night sweats, and weight loss. He was evaluated and diagnosed with active pulmonary TB.
- He was started on a standard 4 drug regimen on **October 12, 2019**.
- In **November 2019**, an isolate was reported as **isoniazid and streptomycin resistant**. INH was discontinued once susceptibilities were known, and he continued on a modified regimen with RIF, PZA, EMB, Moxifloxacin with a plan to treat for 6 months



# Case Study

In **January 2020** he was released from jail and he started c/o difficulty driving and reading road signs (***he has now been on anti-TB therapy for 3 months***).

**As a nurse managing this patient's anti-TB therapy, what would you do?**

Review his anti-TB therapy

- RIPE started Oct. 12, 2019
- In Nov. he was switched to RIF, PZA, EMB, Moxifloxacin

**Which anti-TB medication is contributing to his vision problems?**

- Ethambutol

**What do we do now?**

- Evaluate further (snellen & Ishihara)
- Hold EMB
- Refer to the Ophthalmologist



# Case Study

Nurse made a referral, and a few weeks later he was seen by optometrist and given RX for corrective lenses.

- **Ethambutol continued**



# Case Study

- He continued to complain of worsening vision
- Nurse assessed his vision. Baseline visual acuity in October was 20/20 both eyes, follow up visual acuity was now 20/200 in both eyes
- EMB was discontinued; patient continued on RIF, PZA and Moxifloxacin to complete 6 mos of treatment and he was referred to a retinal specialist.



# Ophthalmic Toxicity

## Follow-up

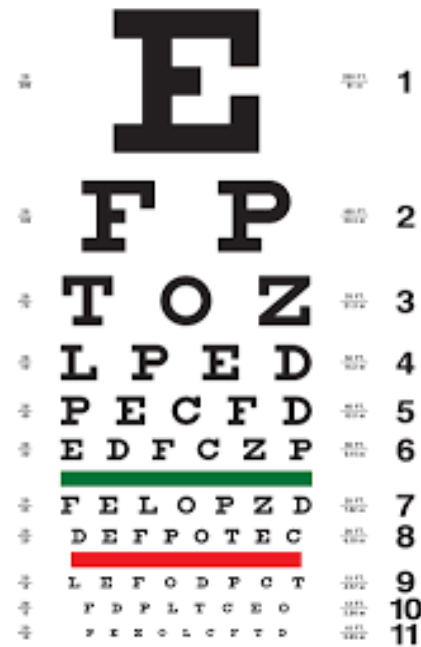
- Seen by retinal specialist
- DX: EMB optic neuropathy
  - Vision best corrected at: 20/60
  - Baseline vision was 20/20 OU

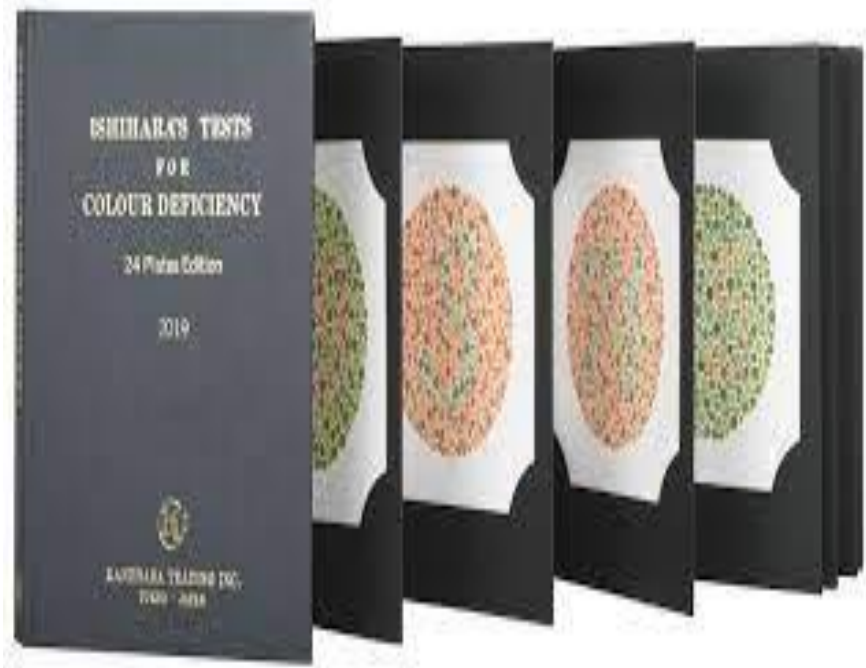


# Vision Screening

Ishihara Testing

Snellen Eye Exam





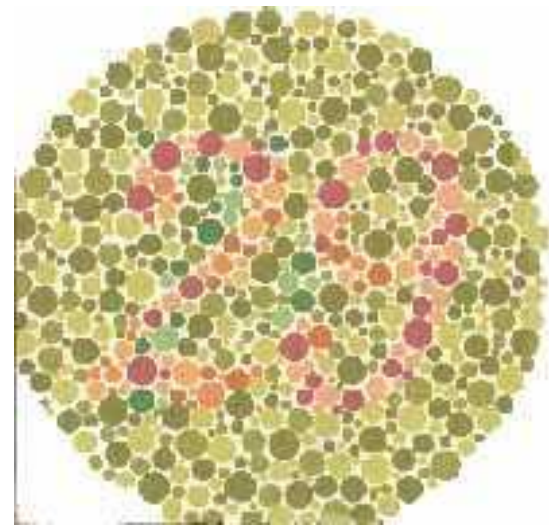
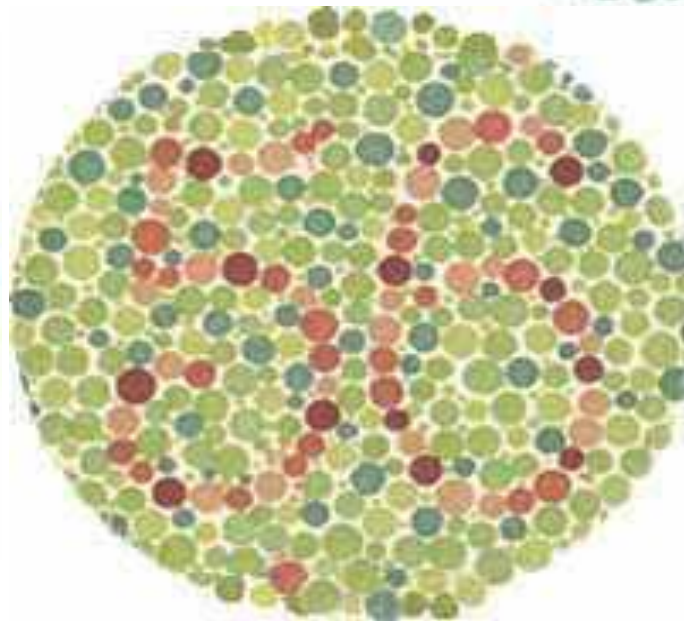
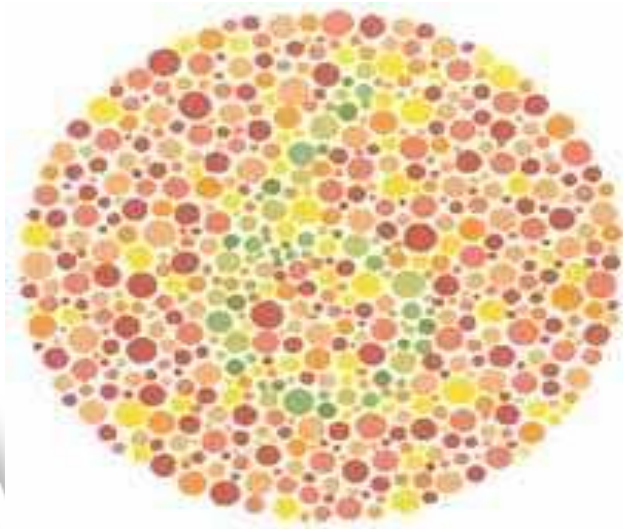
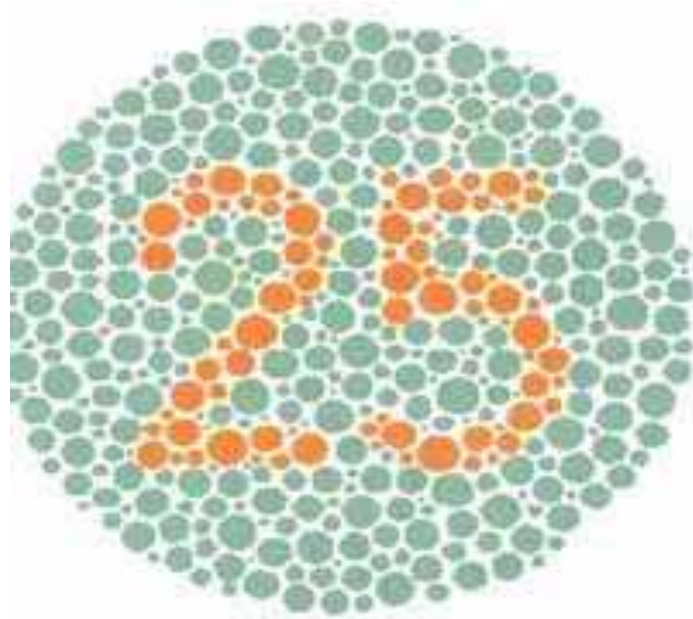
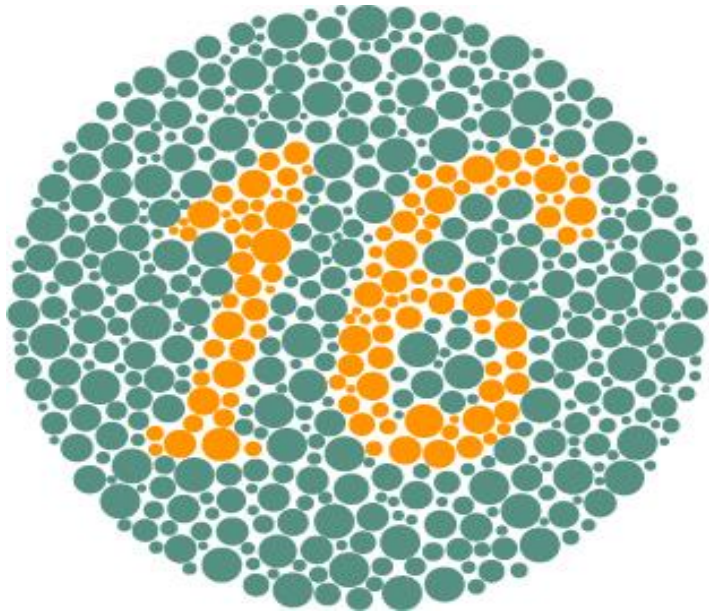
Screen for red-green color vision deficiencies.

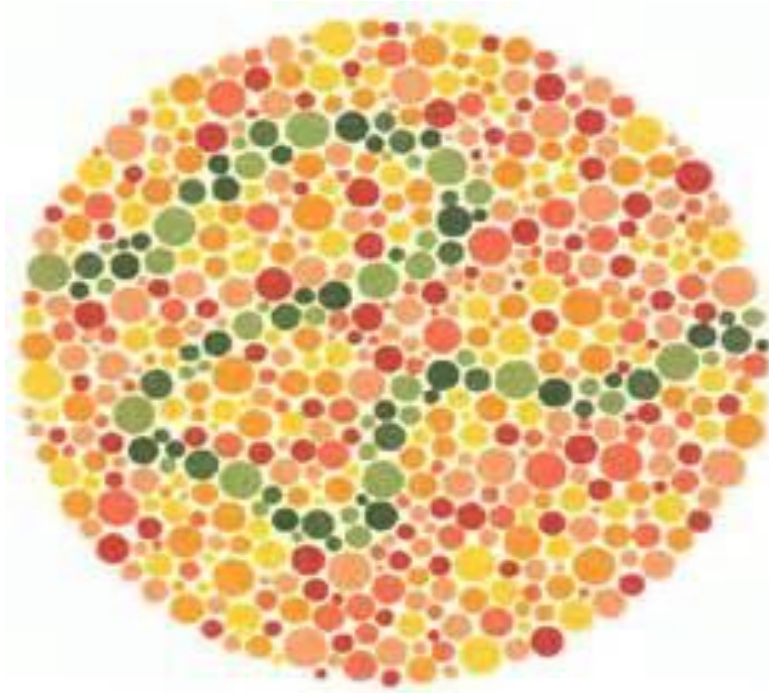
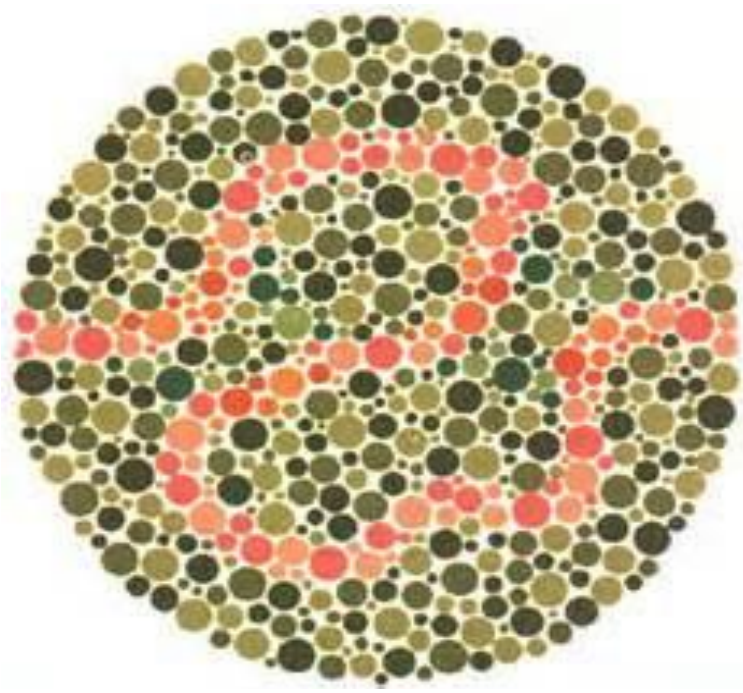


# Ishihara Instructions

- **Designed to give quick & accurate assessment of color vision**
- **Most effectively done in room with adequate daylight**
- Held 75 cm from the patient (approx. arm length)
- Sit & tilt plate at right angle to patients line of vision
- Screen all plates
- Must pass 10 of 11 plates to be regarded as Normal
- If unable to read numerals use winding lines and have patient trace between the 2 X's with a finger









# Snellen Eye Test

- Place Snellen Chart on wall
- Measure **20 feet** from wall to where chart is placed & mark line on floor
- Have patient stand on marked line
- Have patient cover one eye with an eye cover
- Have the patient read letters aloud
- **If patient misses only one letter have them continue reading the next line**
- **Record the last line the patient reads accurately**
- **Note the visual acuity measures marked at the end of each row of letters**
- Ask patient to repeat the process with the other eye
- Then repeat with both eyes
- Each time, recording the last line patient reads
- You are recording the visual acuity for each eye and with both eyes uncovered



# Visual Acuity

- If initial screen was conducted with corrective lenses (glasses/contacts), follow-up screens must be done the same.
- Change of 1 or more lines from initial screen in either one or both eyes must be reported to physician immediately



# Managing Visual Toxicities

- Baseline & monthly visual acuity test (Snellen chart)
- Baseline & monthly color discrimination test (Ishihara tests)
- If change from baseline:
  - Hold Rx
  - Refer for Ophthalmologic evaluation
  - Permanent vision impairment if the medication continued



# Managing G.I. Intolerance

- Give light snack before giving meds
- Evaluate for other causes of GI symptoms
  - Hepatotoxicity
- Hold Medications
- Repeat LFT's
- Administer antiemetics
  - Phenergan
  - Zofran



# Rash

## Assess Rash

- Location?
- When did it start?
- What does it look like?
- Does it itch?
- What makes it better or worse?
- Have you had an insect bite?
- Has the patient tried any new products
  - Food
  - Perfume
  - Laundry detergent



# Other possible causes

- Contact dermatitis
  - Question patient about new soaps, lotions, perfumes, laundry detergents, etc.
- Insect bites
- Sunburn
- Dry skin
- Other drugs, especially new agents
- Viral or fungal infections
- Scabies





## Rash Assessment and Description Guide



**1. Evaluate the Rash**

- 1) Identify the type of lesion (size, layers of skin involved, and characteristics)
- 2) Identify location and distribution of lesions
- 3) Identify the configuration
  - The shape of one lesion:
    - **Linear** – straight line
    - **Target** – Bullseye or iris appearance; rings with central duskiness; purplish center, surrounded by pale pink, outer ring darker pink
  - The arrangement of clusters of lesions:
    - **Confluent** – Flowing into or coming together
    - **Random**
    - **Patterned**
- 4) Evaluate the texture
- 5) Color
- 6) Warm to the touch
- 7) Inspect oral mucosa

*See back-side for terms and examples*

**2b. Investigative Considerations**

- 1) Is the eruption indicative of an infection, fungus, infestation, or drug rash?
- 2) HIV, Diabetes, Auto-Immune Disorders, Eczema, and Asthma increase rash prevalence, and drug-drug interactions
- 3) Is sunlight sensitivity a factor?

**2c. Types of Reactions**

**Exanthemata (external rash)** – Diffuse macule and papule, evolve over days after drug initiation

**Urticaria & angioedema** – Onset within minutes to hours after drug administration; potential for anaphylaxis

**Fixed drug eruption** – Hyper-pigmented plaques; upon drug re-exposure, plaques reoccur at same site.

- **DRESS** – Cutaneous eruption, fever, eosinophilia, lymphadenopathy
- **Anaphylaxis** – Urticaria, angioedema, bronchospasm, gastrointestinal
- **Stevens-Johnson Syndrome** – Lesions, ulcers on mucous membranes, mouth, lips, truncal area; fever, fatigue, sore throat, ocular involvement

*• Seek immediate medical attention*

**Consultations**

Heartland National TB Center's Toll-Free Warm-Line  
(800) TEX-LUNG or (800) 839-5864

<https://www.heartlandntbc.org/>



## Rash Assessment and Description Guide



Rash Terms with Photo Examples		
<p><b>Bullae</b> – Vesicle &gt;1cm in diameter</p>  <p><i>Photo Credit: writemay/Getty Images</i></p>	<p><b>Patch</b> – Irregular shaped macule; &gt;1cm in diameter</p>  <p><i>Photo Credit: jaojormam/Shutterstock</i></p>	
<p><b>Erosion</b> – Loss of epidermis; depressed, moist; follows rupture of vesicle</p>  <p><i>Photo Credit: https://www.medicinenet.com/skin_idr/article.htm</i></p>	<p><b>Plaque</b> – Elevated, firm, rough lesion; &gt;1cm in diameter</p>  <p><i>Photo Credit: https://www.medicalnewstoday.com/articles/323152#what-is-psoriasis</i></p>	
<p><b>Excoriation</b> – Loss of epidermis, linear, hollowed out, crusted area</p>  <p><i>Photo Credit: https://dermatna.org/topics/compulsive-skin-picking-images</i></p>	<p><b>Pustule</b> – Vesicle filled with purulent fluid</p>  <p><i>Photo Credit: https://www.healthdirect.gov.au/acne</i></p>	
<p><b>Erythema</b> – A redness of the skin caused by congestion of the capillaries in the lower layers of the skin</p>  <p><i>Photo Credit: https://dermatna.org/topics/sunburn</i></p>	<p><b>Scale</b> – Heaped-up accumulation of keratinized cells; flaky, can be dry or oily, varying in size</p>  <p><i>Photo Credit: AboutmyLow</i></p>	
<p><b>Lichenification</b> – Rough, thickened epidermis from scratching or rubbing; normal skin markings are observable; often found on flexor surface of extremity</p>  <p><i>Photo Credit: https://www.healthline.com/health/lichenification#pictures</i></p>	<p><b>Urticaria</b> – Hives, raised, itchy wheals; of varying size</p>  <p><i>Photo Credit: https://www.nidirect.gov.uk/conditions/urticaria-hives</i></p>	
<p><b>Macule</b> – Flat, non-palpable, circumscribed area; with change in skin color; &lt;1cm in diameter</p>  <p><i>Photo Credit: CRISTINA PEDRAZZINI/SCIENCE PHOTO LIBRARY/Getty Images</i></p>	<p><b>Vesicle</b> – Elevated, circumscribed, superficial, filled with serous fluid; &lt;1cm in diameter</p>  <p><i>Photo Credit: Jere Mammino, DO</i></p>	
<p><b>Papule</b> – Elevated, firm, palpable, circumscribed area; &lt;1cm in diameter</p>  <p><i>Photo Credit: https://www.healthline.com/health/skin/maculopapular-rash#pictures</i></p>	<p><b>Wheal</b> – Elevated, irregular-shaped area of cutaneous edema; solid well, pale red, transient; or varying diameters</p>  <p><i>Photo Credit: https://www.nidirect.gov.uk/conditions/urticaria-hives</i></p>	

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# Skin Condition Exercise





# Drug-Resistant Tuberculosis

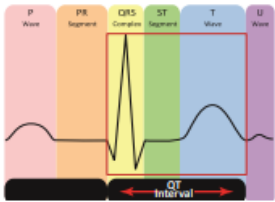
A Tool for TB Nurse Case Management

## Cardiac Toxicity

**QT interval prolongation:** Fluoroquinolones, bedaquiline, pretomanid, clofazimine, and delamanid may prolong the QT interval and may predispose patients to arrhythmias, torsade de pointes, and sudden death.

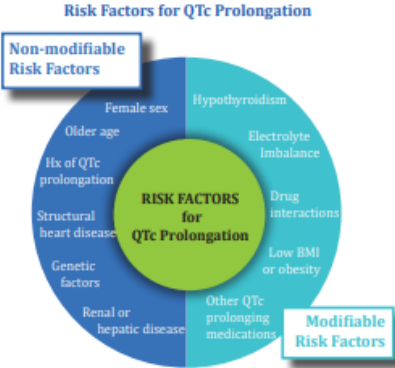
### What is the QT Interval?

It is the portion of the EKG that begins at the start of the QRS complex and ends at the termination of the T wave. The QT interval is longer in women and those with lower heart rates. The QTc is a correction for extremes in heart rates.



### What is the normal QTc Value?

Normal QTc is <450ms in men and <470ms in women. It can vary by up to 75ms in the same individual at different times during the same day. Therefore, it is recommended that EKGs be done at approximately the same time of the day.



Presence of multiple factors may increase the risk of QT prolongation.

**\*Note:** Many non-TB drugs may cause increased QTc prolongation. See [https://www.tbph.org/wp-content/uploads/2020/07/Guidance\\_on\\_ECG\\_monitoring\\_in\\_NDR\\_v2-1.pdf](https://www.tbph.org/wp-content/uploads/2020/07/Guidance_on_ECG_monitoring_in_NDR_v2-1.pdf)

### Assessment and Approach to Prolonged QTc

- QTc > 450ms**  
**Asymptomatic**  
**QTc > 470ms**
- Draw blood for and correct if abnormal:
    - Electrolytes (Ca++, K+, Mg++)
    - TSH
    - Hgb
  - Review other QTc prolonging drugs and stop these if possible
  - Perform EKG weekly until normal.

- QTc > 500ms**  
**Asymptomatic**
- Hospitalize patient, if possible
  - Draw blood for and correct if abnormal:
    - Electrolytes (Ca++, K+, Mg++)
    - TSH
    - Hgb (Blood transfusion if needed)
  - Stop QTc prolongation drugs sequentially\*
  - Repeat EKG 24-48 hours
  - Refer for cardiology consultation
  - Continue to monitor EKG weekly until normal

\* Starting with ancillary drugs, then DR-TB drugs with moxifloxacin/levofloxacin (clears rapidly), then pretomanid/clofazimine/delamanid (prolonged clearance), and then bedaquiline (longest half-life)

- QTc > 500ms**  
**Symptomatic:**  
 Palpitations, tachycardia, fainting, headache, chest pain, syncope
- Hospitalize patient (intensive or cardiac unit monitoring)
  - Draw blood for and correct if abnormal:
    - Electrolytes (Ca++, K+, Mg++)
    - TSH
    - Hgb (Blood transfusion if needed)
  - Stop ALL QTc prolongation drugs
  - Repeat EKG 24-48 hours
  - Refer for cardiology consultation
  - Continue to monitor EKG weekly until normal

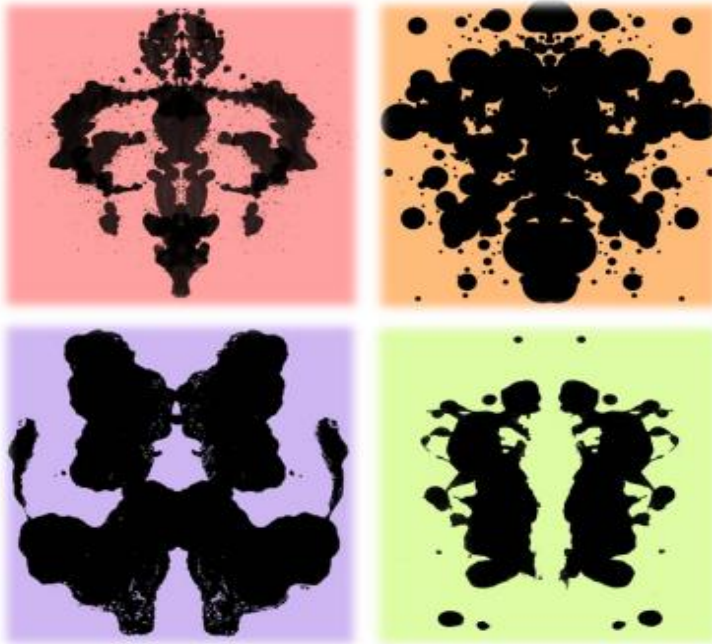
## Monitoring for Adverse Effects II



# Characteristics of Commonly-Used Second-Line Drugs for Drug Resistant TB

<b>Bedaquiline</b>	400 mg once daily, then 200 mg 3 times/wk for 22 wks (may give longer); 26 wks total duration as part of BPaL regimen	Can be safely used with moderate chronic kidney disease (CKD) or moderate liver disease; give with meal to increase bio-availability	GI prolongation, decreased appetite, nausea, hepatitis, headaches, arthralgias, elevated amylases, vivid dreams
<b>Moxifloxacin</b>	400 mg once daily, PO or IV	Good CNS penetration.	GI upset, dizziness, hypersensitivity, photosensitivity, headaches, arthralgias, tendonitis, tendon rupture (rare), CNS irritability, QTc prolongation, thrush, peripheral neuropathy, elevated liver enzymes (rare hepatotoxicity with moxifloxacin)
<b>Levofloxacin</b>	750-1,000 mg once daily, PO or IV	Good CNS penetration; adjust dose with creatine clearance < 30; avoid caffeine, milk-based products, antacids, or mineral supplements within 2 hrs of medication	Peripheral and optic neuropathy (reversible with early recognition), anemia, thrombocytopenia, neutropenia, headache, GI upset, rash, serotonin syndrome, lactic acidosis, acute pancreatitis, black hairy tongue
<b>Linezolid</b>	600 mg once daily, PO or IV	Good CNS penetration; trough < 2 µg/ml is associated with lower toxicity	Hepatotoxicity, myelosuppression, peripheral and optic neuropathy, lactic acidosis, QTc prolongation, pancreatitis <i>[side effects are for entire BPaL regimen]</i>
<b>Pretomanid</b> (As part of BPaL or BPaLM regimen)	200 mg once daily for 26 wks	No dose adjustment in patients with mild to moderate renal impairment; use with caution with severe renal impairment; should be taken with food	GI upset, dizziness, insomnia, upper abdominal pain, QTc prolongation
<b>Delamanid</b>	100 mg twice daily for 24 wks (longer is possible)	CNS penetration unknown; can be safely used with moderate CKD or moderate liver disease; should be taken with food	





## MENTAL HEALTH ASSESSMENT TOOL

NON SPECIFIC MENTAL HEALTH ASSESSMENT CHECKLIST		
BEHAVIOR		
Normal <input type="checkbox"/>	Abnormal	Comments
Alertness <input type="checkbox"/>	Hypervigilant Sleepy Confused	
Posture <input type="checkbox"/>	Slumped Rigid Jerky	
Walking Movement <input type="checkbox"/>	Abnormal	
Facial Expression <input type="checkbox"/>	Immobile Sad Worried Angry Happy Confused	
Eye Contact <input type="checkbox"/>	Poor	
Attention Span <input type="checkbox"/>	Poor Highly Distractible	
Motor Level <input type="checkbox"/>	Hypoactive Hyperactive	
Mannerisms <input type="checkbox"/>	Posturing Spontaneous Movements	
Physiological <input type="checkbox"/>	Tearful Crying Blushing Sweating Tremulous Drooling	
Response to Staff <input type="checkbox"/>	Seductive Indifferent Cold	
Cooperativeness <input type="checkbox"/>	Uncooperative Sarcastic Hostile Evasive Demanding Unfriendly	
APPEARANCE		
Normal <input type="checkbox"/>	Abnormal	Comments
Actual Age: _____	Appears Older Appears Younger	
Build <input type="checkbox"/>	Malnourished Obese	
Hygienic State <input type="checkbox"/>	Disheveled Unshaven Odorous	
SPEECH		
Normal <input type="checkbox"/>	Abnormal	Comments
Quantity <input type="checkbox"/>	Mute Answer's questions only Talkative	
Speed <input type="checkbox"/>	Slow Rapid Pressured	
MOOD AND AFFECT		
Normal <input type="checkbox"/>	Abnormal	Comments
Emotions <input type="checkbox"/>	Lack of emotion Overly relaxed Anxious Tearful Scared Angry Depressed	
Mood Intensity <input type="checkbox"/>	Moderate Extreme	
Affectation <input type="checkbox"/>	Uninterested Inappropriate	
SENSORIUM		
Normal <input type="checkbox"/>	Abnormal	Comments
Perception of: Person <input type="checkbox"/> Place <input type="checkbox"/> Time <input type="checkbox"/>		

Tool includes questionnaires and observations that can be documented during the assessment.

Significant issues should be addressed and shared with mental health professional.



# HNTC Products

<http://www.heartlandntbc.org/products.asp>

The screenshot shows the website [heartlandntbc.org/products/](http://www.heartlandntbc.org/products/). The navigation menu includes HOME, TB STIGMA, TRAINING, CONSULTATION, PRODUCTS (highlighted), and ABOUT US. The main content area features a collage of product covers, including:

- MENTAL HEALTH ASSESSMENT TOOL** (with a rainbow border)
- Spectrum of Tuberculosis from Infection to Disease** (with a human silhouette and colorful lungs)
- TB at a Glance 3rd Edition**
- TB Screening Tests in Children**
- PEDIATRIC RADIOLOGY FOR CLINICIANS**

Below the collage, there are two columns:

- Resources**: Includes a link for [Product Order Form](#).
- Products**: Features a product titled **Fighting Tuberculous Meningitis under 5 (New)** with versions in English and Spanish.





# Tuberculosis (TB)

SEARCH

About

Signs and Symptoms

Causes and Spread

Vaccine

Testing for Tuberculosis

Exposure

Risk Factors

Prevention

VIEW ALL >

[ESPAÑOL](#)



About

## Signs and Symptoms

Common symptoms of active tuberculosis disease include cough, chest pain, and coughing up blood.

## Testing for Tuberculosis

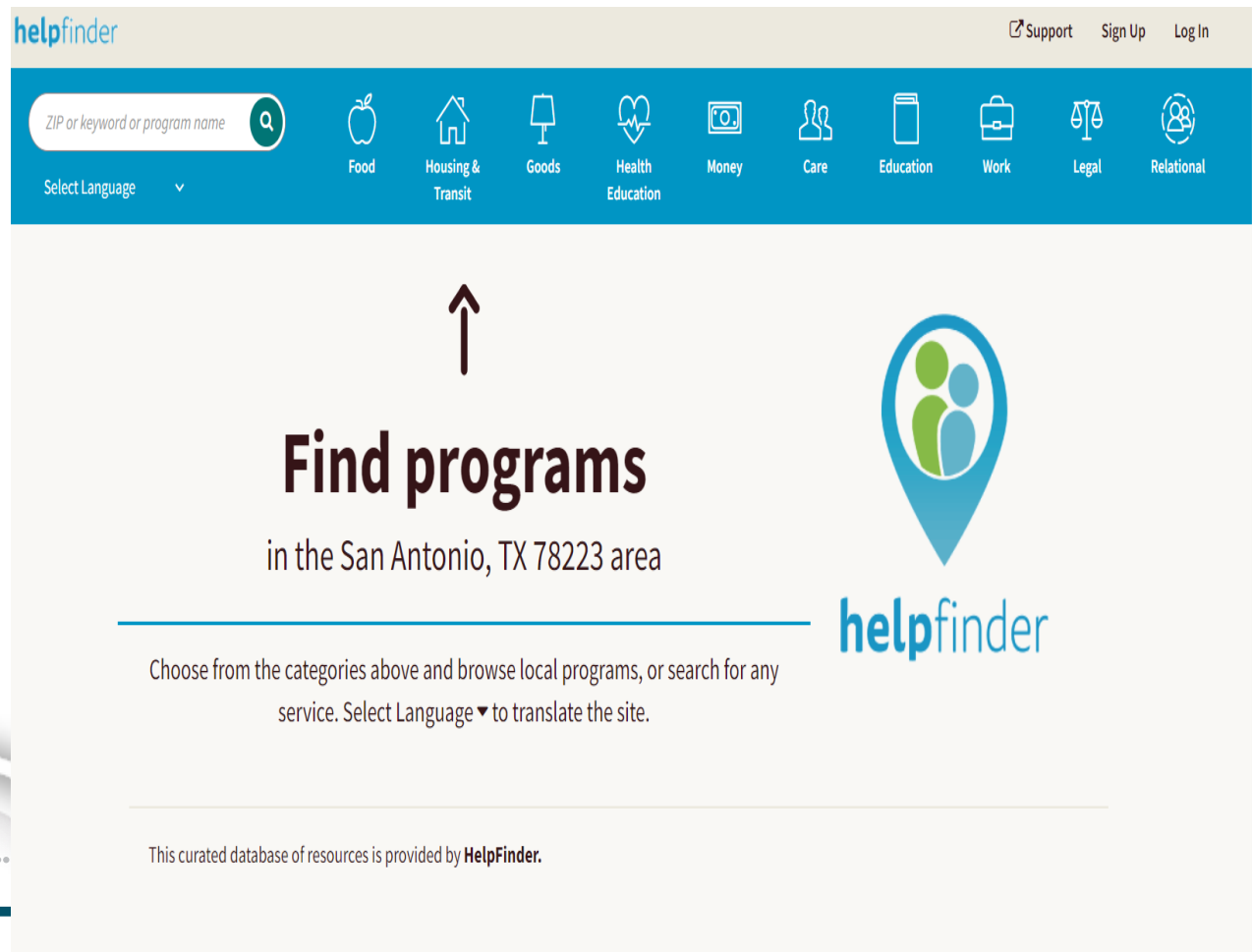
The tuberculosis (TB) blood test and the TB skin test are the two types of tests for TB infection.

## Treatment

Both inactive tuberculosis (TB) and active TB disease can be treated.



# Link Patients to Community Services Aunt Bertha



The screenshot shows the helpfinder website interface. At the top left is the 'helpfinder' logo. To the right are links for 'Support', 'Sign Up', and 'Log In'. Below this is a search bar with the placeholder text 'ZIP or keyword or program name' and a magnifying glass icon. To the left of the search bar is a 'Select Language' dropdown menu. To the right of the search bar is a row of eleven service category icons with labels: Food (apple), Housing & Transit (house), Goods (couch), Health Education (heart with pulse), Money (dollar bill), Care (two people), Education (book), Work (briefcase), Legal (scales), and Relational (group of people). Below the search bar, there is a large upward-pointing arrow, the text 'Find programs' in a large font, and 'in the San Antonio, TX 78223 area' below it. To the right of this text is a blue location pin icon containing a green and blue family silhouette, with the 'helpfinder' logo below it. A horizontal line separates this section from the text: 'Choose from the categories above and browse local programs, or search for any service. Select Language ▼ to translate the site.' Another horizontal line is below this text, followed by the footer text: 'This curated database of resources is provided by HelpFinder.'

<https://helpfinder.auntbertha.com/>



# San Antonio Resource Directory



78205

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[Places](#)

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[Donate](#)

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Search food, housing, medicine...



Care



Education



Food



Goods



Health



Housing



Legal



Partner

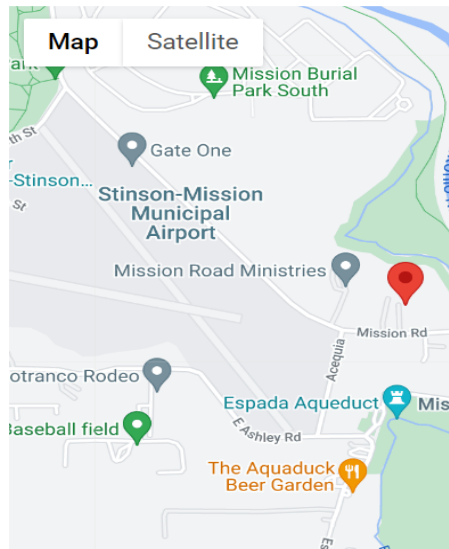


Transit



Work

Are you se



- Adult Care
- Bathrooms
- Bereavement & Grief
- Child Care
- Disability Support ▶
- Disaster Response
- End of Life
- Haircuts
- Health Screenings
- Help Escape Violence
- Help Navigating the System
- Home or Hospital Visits
- Marriage Counseling
- Medical Care
- Mentoring
- Parenting Classes

[D Portal to Mental Healthcare Services.](#)

[esta página en español](#)

[Independence Square, Inc.](#)

[Mission Road Ministries](#)

6.4 miles away, [8708 Mission Rd, San Antonio, TX, 78214](#), D3

Independence Square, Inc. is one of three apartment complexes in San Antonio sponsored by Mission Road Ministries that provide affordable housing and services for adults with intellectual and other developmental disabilities, but need minimal supports.

The apartments are Housing and Urban Development (HUD) subsidized apartment complexes, designed exclusively for adults with intellectual and other developmental disabilities, and are supervised by the Suzanne Smith Management Company.

The apartments have one or two bedroom options with a community room for gatherings and a laundry room.

- Adult with an intellectual developmental disability
- Low income

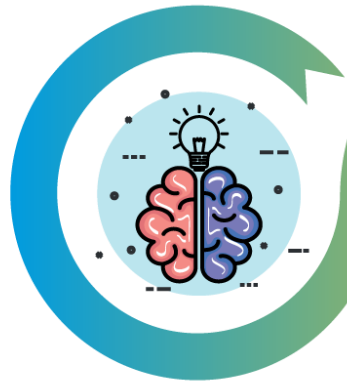
<https://www.sacrd.org/directory/program/292>



# TB Case Manager



## CASE MANAGEMENT



**DETERMINE  
NEEDS &  
STRENGTHS**



**DEVELOP  
INDIVIDUAL  
CASE PLAN**



**LOCATE  
COMMUNITY  
RESOURCES**



**DEVELOP  
& MONITOR  
TREATMENT  
PLAN**



**REASSESS  
& MEASURE  
PROGRESS**



# References

- Heartland National TB Center website
  - <http://www.heartlandntbc.org/products/> (to print out educational items)
- CDC TB website
  - <https://www.cdc.gov/tb/default.htm>
- Findhelp.org. (n.d.). Findhelp.org: Connecting people to social services. <https://www.findhelp.org/>
- Mayo Clinic. (2023). *Toxic hepatitis*. Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/toxic-hepatitis/symptoms-causes/syc-20352202>
- Treatment guidelines
  - [https://www.cdc.gov/tb/publications/guidelines/pdf/clin-infect-dis.-2016-nahid-cid\\_ciw376.pdf](https://www.cdc.gov/tb/publications/guidelines/pdf/clin-infect-dis.-2016-nahid-cid_ciw376.pdf)
- TB education resources
  - <https://findtbresources.cdc.gov/>



