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| **SYMPTOM(s) /****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Nausea and/or vomiting****/**GASTROINTESTINAL | Anti-TB:**Eto/Pto, PAS, Bdq,** Inh, Emb, Pza, Amx/Clv, Cfz, DlmARVs:**RTV, d4T,** NVP, and most others | **Observe for signs of:*** Hepatitis (fatigue, abdominal pain, yellowing of eyes and skin)
* GI bleeding (vomit with red blood or “coffee ground” appearance, abdominal pain, dizziness)
* Dehydration (dry/tenting of skin, sunken eyes, decreased urination, confusion)

**Ask the patient:*** What medicines are you taking?
* When does the nausea or vomiting start?
* How long does it last?
* What makes it better or worse?
* How is your appetite?
* What have you had to eat/drink today?

**If significant vomiting, check:*** Vital signs and serum electrolytes
* If febrile, refer for medical evaluation
 | **Refer for urgent medical evaluation** when signs of hepatitis, GI bleeding or dehydration are observed.**Counsel patient on:*** Nutrition support strategies including good hydration
* Relaxation techniques
* Some nausea and vomiting is expected during the first few weeks of treatment but will lessen over time.

**When nausea and/or vomiting is considered troublesome to the patient, discuss with the doctor:*** Anti-emetic 30 min. before DR-TB medication
* Slow ramping of suspect drug (Eto/Pto, PAS)
* Timing of suspect drug dose (larger dose at bedtime)
* Use of anti-anxiety medication for anticipatory nausea
 | Nausea and vomiting may also occur with:* Acute viral illness
* Hepatitis
* Gastritis
* Pancreatitis
* Hepatotoxicity
* Disease of the gall bladder
* Disease of the bile ducts
* Peptic ulcer
* Lactose intolerance
* Acute renal failure
* Alcohol withdrawal
* Pregnancy
* Bowel obstruction
* CNS TB
 |
| **Nausea, vomiting PLUS abdominal pain, fatigue, and loss of appetite.** *Later stage symptoms* may include: **fever, rash and jaundice** (yellowing of the eyes and skin) /HEPATOTOXICITY | Anti-TB:**Inh, Rif, Emb, Pza, Bdq, PAS,** FQs (Lfx, Mfx), Eto/PtoARVs:**NVP, EFV, PIs** (RTV> others) **all NRTIs** | **Same as above plus:** **Ask:*** On a scale of 1 to 10, how would you rate your pain (1= mild and 10 =severe)?

**Check:*** Latest liver function test (LFT), total bilirubin and serum albumin
* Viral hepatitis panel results
* Urine and stool color
* Patient’s nutritional status (weight and BMI) and nutritional intake
 | **Refer for urgent medical evaluation** when these symptoms are present together.**Counsel the patient on:*** Comfort measures to minimize pain
* Limited activity to conserve energy
* Frequent small meals to maintain optimal energy metabolism; avoid alcohol

**Discuss with the doctor:*** Whether oral or IV rehydration needed if patient shows signs of dehydration
* Nutrition consult if available
* Whether blood tests should be obtained/ repeated (LFT, T. bili, albumin, Hep panel)
 | Abdominal pain may be an early symptom of severe side effects, such as pancreatitis, hepatitis or lactic acidosis.HIV coinfection may increase risk of hepatitis.Viral causes of hepatitis (hepatitis A, B, C, and Cytomegalovirus) should be evaluated. |

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| **SYMPTOM(s) /****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| One or more of the following symptoms:**Pain or burning sensation in abdomen or esophagus, sour taste in mouth, bloating** /GASTROINTESTINALGastritis | Anti-TB:**PAS, Eto/ Pto, Cfz,** FQs (Lfx, Mfx), Inh, Emb, PzaARVs:**Most ARVs**  | **Observe for signs of:*** Hepatitis (fatigue, abdominal pain, yellowing of eyes and skin)
* GI bleeding (blood in vomit or stool)

**Ask the patient:*** What medicines are you taking?
* When do the symptoms occur?
* How long does it last?
* What makes it better or worse?
* How is your appetite?
* What have you had to eat/drink today?

**Check** for symptoms of gastritis (epigastric burning, sour taste in mouth, bloating) | **Seek urgent medical evaluation** when signs of hepatitis or GI bleeding (presence of blood in vomit or stool) are observed.**Counsel the patient:*** Gastritis is a common side effect of DR-TB treatment and can be treated
* Try eating small, frequent meals
* Try relaxation techniques

**When gastritis is troublesome, discuss with the doctor:** * Use of adjuvant medication (H2-blocker or proton-pump inhibitor)
* Minimize or discontinue use of any NSAIDs
* Starting an antacid; NOTE: antacids must be taken 2 hours before or after TB medications
 | Symptoms are often exacerbated in the morning or prior to eating. Patients who take nonsteroidal anti-inflammatory drugs (NSAIDs) or drink a lot of alcohol are at increased risk.Abdominal pain is a common side effect of ARVs.Abdominal pain can also occur with:* Pancreatitis
* Lactic acidosis
* Infection with *H. pylori*

Cfz has been associated with severe acute abdomen. In such cases, Cfz should be stopped. |
| **Frequent and/or loose stool; may be accompanied by abdominal cramping**/GASTROINTESTINALDiarrhea | Anti-TB:**PAS, Lzd, Eto/Pto,** FQs (Lfx, Mfx), Amx/ClvARVs:**All PIs, ddI** (buffered formulation) | **Observe for signs of:*** Dehydration (dry/ tenting of skin, sunken eyes, decreased urination, confusion, fatigue and extreme weakness)

**Ask the patient:*** When did this start?
* How many times a day are you passing stool?
* What makes it better or worse?
* What does the stool look like?
* Is there blood or mucous in the stool? (**if yes**, refer immediately for medical evaluation)

**Check:*** Vital signs - if febrile, refer for medical evaluation
 | **Seek urgent** **medical evaluation** when signs of dehydration are observed.**Counsel the patient:*** Loose stools are common early on in treatment for DR-TB when second-line drugs are used but usually resolve after the first few weeks.
* The medications that may cause diarrhea are also very important to take to cure MDR-TB.
* Drink plenty of fluids throughout the day
* Lactobacillus or foods such as yogurt (not given within 2 hours of the FQ) may improve symptoms by replacing normal flora

**When diarrhea is considered troublesome to the patient, discuss with the doctor:*** Use of adjuvant medication (loperamide)
* Slow ramping of the suspect drug (PAS)
 | Diarrhea is a common adverse effect, particularly with PAS and Lzd, but usually resolves or improves after several weeks on DR-TB treatment.The presence of fever or blood in the stool suggests diarrhea may be due to a cause other than the anti-TB drugs or ARVs. Diarrhea may also occur with:* Inflammatory bowel disease
* Water-borne bacterial and parasitic infections
* *Clostridium difficile* (pseudomembranous colitis)
* Lactose intolerance
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| **SYMPTOM(s) /****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **May be asymptomatic early on.** *Later stage symptoms* may include: **decreased production of urine, lower limb edema, mental status changes, and shortness of breath**/Renal toxicity Acute renal failure | Anti-TB:**Am, Km, Cm, Sm**ARVs:TDF (Rare) | **Observe for signs and symptoms** such as changes in the pattern of urination, edema, impaired mental status, and shortness of breath.**Check:*** Serum creatinine, electrolytes and BUN at least monthly while receiving Am, Km, or Cm and more frequently when indicated.
 | **Seek urgent** **medical evaluation if:*** Serum creatinine, electrolytes or BUN are outside the normal range
* Serum creatinine result doubles from baseline result even if still wnl; track with monitoring tool
* Discuss with physician the results and whether to adjust/stop offending drug

**Counsel the patient:*** Importance of these blood tests to monitor how well the patient’s kidneys are clearing the medication
 | Patients with pre-existing kidney disease, diabetes or HIV are at **high risk of renal toxicity** and should be monitored more frequently (serum creatinine, electrolytes and BUN recommended).**NOTE:**  In the presence of renal insufficiency, ARVs and anti-TB drugs need doses adjusted. |
| **May be asymptomatic.** Some may c/o >1 of the following: **fatigue, weakness, muscle aches/spasms, behavior or mood changes, nausea, vomiting, confusion** /Renal toxicity Electrolyte disturbances | Anti-TB:**Cm, Am, Km, Sm**ARVs:TDF (Rare) | **Observe for signs of** confusion, fatigue and extreme weakness.**Ask the patient:*** How have you been feeling?
* Have you been vomiting or having episodes of diarrhea? If yes, how frequently?
* Are you having any aches or pains? If yes, have patient describe further.

**Check:*** Serum electrolytes
* Vital signs- if pulse is irregular, bring to the doctor’s attention for further evaluation
 | **Seek urgent** **medical evaluation** when signs of confusion and extreme weakness are observed.**Counsel the patient:*** Nutrition support strategies (e.g., bananas, oranges, tomatoes, grapefruit juice or other good sources of potassium)
* Drink plenty of fluids throughout the day
* Importance of monthly blood tests

**When patient shows signs of dehydration, discuss with the doctor:*** Whether oral or intravenous rehydration is needed
* Whether electrolyte replacement (oral or IV) is indicated
 | Diarrhea and/or vomiting can contribute to electrolyte disturbances.Renal toxicity and electrolyte disturbances are more common and severe in HIV-infected patients often requiring hospitalization to closely monitor and correct**NOTE:** Severe electrolyte disturbances can lead to uncontrollable muscle spasms, paralysis and life-threatening cardiac arrhythmias.**NOTE:** Oral electrolytes should not be administered within 2 hours before or after the FQ as it can interfere with FQ absorption. |

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| **SYMPTOM(s) /****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Vision changes (color and acuity)** /Neurotoxicity:Optic Neuritis | Anti-TB:**Emb, Lnz,** Eto/Pto (rare)ARVs:ddI | **Observe for signs of** acute vision changes.**Ask the patient:*** Any changes or problems with your eye sight?
* If so, describe the changes you’ve noticed.

**Check:*** Visual acuity and color vision
* Check serum glucose and HgbA1c
 | **Seek medical evaluation** for acute vision changes.**Counsel the patient:*** To watch for and report any changes in the vision

**Discuss with the doctor:*** Whether referral for ophthalmologist evaluation may be indicated
 | Stop drug responsible for optic neuritis permanently and replace with a drug that does not cause optic neuritis.Baseline + monthly monitoring of visual acuity and color vision is indicated when patient is taking daily Emb.Retinopathy may occur with the use of Cfz.In diabetic patients, work towards improving glucose control. |
| Some combination of the following symptoms:**Hearing loss, tinnitus (ringing in the ears), dizziness, loss of balance, abnormal gait**/oTOTOxicity ANDVESTIBULAR TOXICITY | Anti-TB:**Am, Km, Sm, Cm**ARVs:TDF (Rare) | **Observe for signs of:*** Loss of balance or abnormal gait (e.g., weaving or staggering)
* Hearing loss

**Ask the patient:*** How is your hearing?
* Any ringing or fullness in your ears? If yes, one side or both sides?
* Are you feeling dizzy, weak or unsteady?

**Check at baseline and monthly:** * Hearing with audiogram (if available)
* Balance (standing and walking)
 | **Seek medical evaluation** when signs of hearing loss or change in balance are observed. **Counsel patient on the importance of:** * Hearing tests to assess for early signs of hearing loss (usually high frequency loss occurs first)
* Reporting any changes in hearing or balance

**When a patient experiences or is troubled by progressive hearing loss, discuss with the doctor:*** Frequency of injectable (able to decrease to twice or thrice weekly?)
 | Hearing loss and vestibular dysfunc-tion are generally not reversible on discontinuing therapy. Check and document hearing and vestibular function at baseline and monthly for patients on Am, Km, Cm or Sm.High frequency hearing loss usually occurs first but rarely has an effect on conversational speech.Other causes of mild dizziness may include Cs, FQs, Eto/ Pto, Inh or Lzd. Stopping all anti-TB drugs for several days can help to distinguish the cause.Concomitant use of furosemide may exacerbate ototoxic effects (particularly with renal insufficiency). |

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| **SYMPTOM(s)/****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Tingling, prickling, burning or numbness sensation in toes, balls of feet, fingers or hand’s.****As symptoms progress weakness and gait instability may result**/Neurotoxicity:Peripheral neuropathy | Anti-TB:**Lzd, Inh,** Cs, Sm, Am, Km, Cm, FQs (Lfx, Mfx), rarely Eto/Pto, EmbARVs:**d4T, ddI** | **Observe for signs of** neuropathy (change in sensation in lower extremities).**Ask the patient:*** When did you first notice these symptoms?
* Do you drink alcohol?
* Have you been tested for or do you have diabetes? HIV? Hypothyroid?
* When was your last menstrual period?

**Check:*** If HgbA1c is high
* If TSH is abnormal
* Pregnancy test if female of child-bearing age
* Physical exam: assess sensation in the feet and hands (e.g., with a pin) and reflexes
 | **Refer for further medical evaluation** when a patient reports these symptoms.**Counsel the patient on:*** Importance of good nutrition
* Strategies for blood sugar control if diabetic
* Avoiding alcohol (detox/rehab if indicated)
* Importance of reporting any numbness, tingling or pain in hands/feet

**When a patient experiences or is troubled by peripheral neuropathy, discuss with the doctor:*** Vitamin or nutritional supplement needed?
* Whether dose of likely offending drug can be decreased or discontinued
* Other medical interventions that may help
 | Avoid use of d4T or ddl in combi-nation with Cs or Lzd because of an increased risk of peripheral neuropathy. If these agents must be used in combination and peripheral neuropathy does develop, replace ARVs with a less neurotoxic agent.Patients taking Inh, Lzd or Cs should receive pyridoxine (vitamin B6).Neuropathy is more likely to occur in patients with HIV, diabetes, alcoholism, hypothyroidism, poor nutrition and/or pregnancy. |
| Some combination of the following symptoms:**Mood changes, agitation, irritability, difficulty concentrating, and/or sleep disturbances** /Central nervous system (CNS) toxicity:Depression | Anti-TB:**Cs,** FQs (Lfx, Mfx), Inh, Eto/PtoARVs:**EFV** | **Observe for and refer immediately** if the patient shows signs of acute depression or reports thinking of hurting him/herself.**Ask the patient:*** When did you first notice these symptoms?
* Have you had thoughts of hurting yourself or that you would be better off dead?
* Other psychosocial stressors?

**Check for signs of depression:*** Where available, use a depression screening tool (baseline and monthly if patient is taking Cs)

**Check:*** Recent TSH result
 | **Seek urgent medical evaluation** when signs of acute depression or suicidal ideation.**Counsel the patient (and family):*** To watch for and report any changes in the patient’s mood or behavior
* Importance of avoiding alcohol use while on MDR-TB treatment (detox/rehab if indicated)

**When a patient shows signs of depression, discuss with the doctor and/or social worker:*** How to address other psychosocial stressors if present
* Whether antidepressant therapy is needed
* Whether dose of Cs can be decreased
* Psychiatric evaluation
 | Severe depression can be seen in 2.4% of patients receiving EFV. Consider substitution of EFV if severe depression develops.Some situational depression can be expected for patients who have been dealing with the challenges accompanying DR-TB and treatment.Some patients taking Cfz with resulting skin color changes have experienced reactive depression.PHQ-9 depression screening tool translated in multiple languages:http://www.multiculturalmentalhealth.ca/clinical-tools/assessment/screening-for-common-mental-disorders/phq-in-different-languages/ |

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| **SYMPTOM(s)/****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Headache** | Anti-TB:**Cs, Bdq,** InhARVs:**AZT, EFV** | **Observe for signs of** severe or persistent headache.**Ask the patient:*** When did the headaches start?
* When do you usually notice the headache?
* What activity are you doing prior to the onset of the headaches?
* How long do the headaches last on average?
* What makes it better or worse?

**Check:*** Vital signs including blood pressure
 | **Refer for further medical evaluation if** the patient reports severe or persistent headache.**Counsel the patient:*** Headaches are common in first few months of treatment but should lessen over time
* Importance of keeping well hydrated
* Use of relaxation techniques

**When headache is considered troublesome to the patient, discuss with the doctor:*** Use of analgesic as needed
 | To minimize headaches at the start of treatment, Cs is often started at lower dose and gradually increased to target daily dose over 1-2 weeks and B6 provided (50mg B6 for every 250mg Cs prescribed).Headaches secondary to AZT, EFV and Cs are usually self-limited.When persistent or severe, rule out more serious causes, such as bacterial meningitis, cryptococcal meningitis, CNS toxoplasmosis, CNS TB, etc.  |
| Some combination of the following symptoms:**Nightmares; insomnia, agitation, delusions, hallucinations, and/or severe mood swings**/CNS toxicity: Psychosis | Anti-TB:**Cs**, FQs (Lfx, Mfx), Inh, Eto/PtoARVs:**EFV** | **Observe for signs of** psychosis.**Ask the patient (and family):*** How well are you sleeping? Any insomnia?
* Have you noticed any changes in behavior? If so, describe.
* Do you drink alcohol? (If yes, describe typical use)
* Do you take drugs for recreational use? (describe)

**Check:*** Serum creatinine and TSH
 | **Refer for hospitalization and psychiatric consult** if evidence of psychosis.**When a patient shows signs of psychosis:*** Hold Cs until psychotic symptoms are brought under control

**Discuss with the doctor:*** Psychiatric evaluation
* Anti-psychotic therapy
* Whether dose of pyridoxine (B6) can be increased to maximum daily dose of 200mg
 | EFV has a high rate of CNS side effects; usually occurring in first 2-3 weeks of use then resolves. If persistent, consider substitution of the agent.Patients with decreased renal function may have elevated serum drug concentrations of Cs.There are limited data on the use of EFV with Cs; concurrent use is the accepted practice as long as there is frequent monitoring for CNS toxicity. TMP/SMX has also been reported to be associated with psychosis |

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| **SYMPTOM(s)/****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| Some combination of the following symptoms:**Fatigue, weight gain, dry skin, constipation, muscle aches, hair loss, impaired memory or concentration, feeling cold even in warm environments**/ENDOCRINE: Hypothyroidism | Anti-TB:**Eto/Pto, PAS**ARVs:d4T | **Ask the patient:*** Does your fatigue prevent you from doing your normal daily activities?
* Any changes from normal bowel movement pattern?
* For female patients, any changes in menstruation?
	+ If yes on any of the above, describe.
* When did you first notice these symptoms?

**Check:*** Vital signs with attention to temp and respirations
* Serum thyroid stimulating hormone (TSH)
* O2 saturation
 | **Refer for further medical evaluation if** the patient shows signs of hypothyroidism.**Counsel the patient:*** Importance of keeping well hydrated and eating foods high in fiber to prevent and/or address constipation
* Use of extra clothing or blankets to keep warm; avoid external heat sources
* Deep breathing and exercise as tolerated
* Usually able to stop thyroid medication once MDR-TB treatment is completed

**Discuss with the doctor:*** Whether thyroid replacement is needed (e.g., if TSH > 1.5-2 times uln)
 | PAS and Eto/Pto, especially in combination, can commonly cause hypothyroidism. Obtain baseline TSH and monitor again every 3-6 months during treatment when patient is taking Eto, Pto, or PAS.Some evidence showing subclinical hypothyroidism associated with some ARVs, particularly d4T.  |
| Some combination of the following symptoms:**Fatigue, unusual thirst, frequent urination, confusion, headache, dizziness** /ENDOCRINE: Dysglycemia(disturbed blood sugar regulation) | Anti-TB:**Gfx, Mxf,** Lfx, Eto/PtoARVs:**Protease inhibitors** | **Observe for signs of** confusion.**Ask the patient:*** Have you had problems with your blood sugar in the past?
* What have you had to eat today? What are the usual foods you eat/fluids you drink?
* Are you taking any medication for your blood sugar? If so, what medicine?
* Are you taking any herbs or traditional medicine? If so, what and how often?

**Check:*** Serum glucose and HgbA1c
* Nutrition and medication assessment
 | **Counsel the patient on:*** Healthy nutrition and goal setting; refer for nutrition counseling if available
* Importance of adherence to treatment and coordination of care for both TB and diabetes in known diabetic patients

**Discuss with the doctor:*** Whether adjustment to diabetes medication may be needed if patient is also a diabetic on treatment
* Where symptoms of gastroparesis (e.g., nausea and vomiting along with abdominal pain, feeling of fullness after eating only a few bites) accompany the other symptoms of dysglycemia, **discuss with the doctor** whether gastric motility treatment may be beneficial (e.g., metoclopramide).
 | Some herbs have been shown to interact with anti-diabetic drugs impacting blood sugar regulation.Patients with diabetes tend to have slower GI motility increasing risk for nausea and vomiting with medications like Eto/Pto making glucose regulation more difficult. |

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| **SYMPTOM(s)/****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Skin rash or allergic reaction** /HYPERSENSITIVITY | Anti-TB:**Inh, Rif, Pza, PAS, FQs (Lfx, Mfx)**, and othersARVs:**ABC, NVP, EFV, d4T** and others | **Observe for signs of serious rash/allergic reaction** (fever, hives, blistering of the skin, lips or eyes swelling)**Ask the patient:*** Are you allergic to any medicines?
* What other medicines or remedies have you been taking or using?
* When did you first notice the reaction?

**Check:*** If LFTs are within normal range
 | **Refer for further medical evaluation if:*** Patient shows signs of serious allergic reaction
* LFTs are abnormal

**For minor skin reactions:*** Moisturizing lotion may be helpful if skin reaction is due to dry skin and itching (common with Cfz)

**Discuss with the doctor use of:*** Antihistamine
* Hydrocortisone cream for local rash
* Low dose prednisone (e.g., 10-20mg daily for several weeks) if no response to other measures
 | Any of the drugs can cause hives (urticaria). **Consider other potential causes of rash:*** Other medication patient may be taking including herbal or traditional medicine
* Scabies or other infectious agent
* Environmental agent

Some rashes may be accompanied by hepatitis so LFT should be checked.Any drug determined to cause a serious reaction should not be used again and should be documented as a known drug allergy in the patient’s Medical record. Never rechallenge with a drug that may have caused Stevens-Johnson syndrome. |
| **Rapid onset of rash, swelling of airway, hypotension and gastrointestinal symptoms**/HYPERSENSITIVITYAnaphylaxis | Anti-TB:Any drugARVs:**ABC, NVP, EFV, d4T** and others | **Observe for and refer for immediate medical attention** if patient shows signs/symptoms of anaphylaxis (rapid development of rash, swelling of airway, hypotension and gastrointestinal symptoms) | **Initiate standard emergency protocol** including performing basic life support by maintaining the patient’s airway, breathing and circulation.Once the allergic reaction has been controlled, **document the reaction**. If a specific drug is identified as the culprit, document on the Treatment Card or patient’s medical record as a known drug allergy.**Counsel the patient:*** Never to use the offending drug again and to avoid drugs from the same drug class.
 | Anaphylaxis is rare but one of the most severe manifestations of allergic reactions. If a particular drug has been identified as the likely culprit, do not re-challenge with this drug and suspend its use permanently.  |

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| **SYMPTOM(s)/****POTENTIAL TOXICITY** | **POSSIBLE OFFENDING DRUG** | **NURSING ASSESSMENT** | **NURSING INTERVENTIONS** | **COMMENTS** |
| **Muscle pain or joint pain**/MUSCULOSKELETAL | Anti-TB:**Pza, FQs (Lfx, Mfx), Eto/Pto, Bdq**ARVs:**Indinavir**, other PIs | **Observe for signs of** acute swelling, erythema and warmth at the site of muscle or joint pain **Ask the patient:*** What medicines are you taking for the muscle or joint pain?
* When does the pain start?
* On a scale of 1 to 10, how would you rate your pain (1= mild and 10 =severe)?

**Check:*** If TSH, serum electrolytes and uric acid blood tests are wnl
 | **Refer for further medical evaluation if:*** Acute swelling, erythema, and warmth are present to evaluate for infection or inflammatory disease
* TSH, electrolytes or uric acid blood tests are abnormal

**Counsel the patient:*** Some pain/tenderness of muscles and joints is common during first weeks of treatment but will lessen over time.
* Exercise and physical activity may help lessen the pain

**When a patient experiences or is troubled by muscle or joint pain, discuss with the doctor:*** Use of ancillary analgesic /NSAIDs
 | Protease inhibitors can cause joint pain and there have been case reports of more severe rheumatologic pathology. Joint pain is very common with Pza and FQ use and has been reported as one of the most frequent adverse effects (>10%) in controlled clinical trials with Bdq.Electrolyte disturbances associated with the aminoglycosides and Cm may also cause muscle pain and cramping. Hypothyroidism may also contribute. |
| **Change in heart beat, dizziness, fainting, and/or palpitations**/CARDIAC | Anti-TB:**Bdq, Dlm, Gfx, Mfx,** Lfx, Ofx, CfzARVs:EFV, nelfinavir | **Observe for and refer for immediate medical attention** if patient shows signs/symptoms of cardiac toxicity including tachycardia, syncope and/or weakness and dizziness.**Check:*** Vital signs
* If serum electrolytes (potassium, calcium and magnesium) have been obtained and if wnl
* If serum creatinine and liver function tests are wnl
 | **Refer for immediate medical attention** if patient shows symptoms of cardiac toxicity including tachycardia, syncope and/or weakness and dizziness.**Counsel the patient:*** Report any symptoms of irregular heartbeat

**Discuss with the doctor:*** Whether electrolyte replacement may be indicated if serum electrolyte abnormalities develop
* Whether adjustment to drug dosages may be indicated if renal or hepatic impairment develops
 | Bdq can affect the heart’s electrical activity leading to an abnormal and potentially fatal heart rhythm. Serum electrolyte abnormalities may lead to QT prolongation and sudden death.Patients receiving Bdq or Dlm or a combination of other QTc prolonging drugs (e.g., Mfx+Cfz) should have baseline ECG and ECG monitoring during treatment.For a list of other drugs possibly associated with QT prolongation risk, s**ee** [www.qtdrugs.org](http://www.qtdrugs.org)**.** |

***Adapted from:*** *WHO Companion handbook to the WHO guidelines for the programmatic management of DR-TB 2015. Medications more strongly associated with the adverse effect appear in bold text.*

# Abbreviations

ABC Abacavir

Am Amikacin

Amx/Clv Amoxicillin/Clavulanate

ARVs Antiretrovirals

AZT Zidovudine

Bdq Bedaquiline

BMI Body mass index

Cm Capreomycin

Cfz Clofazimine

CMV Cytomegalovirus

CNS Central Nervous System

c/o Complain of

CPT Cotrimoxazole

Cs Cycloserine

d4T Stavudine

ddI Didanosine

Dlm Delamanid

DR-TB Drug-resistant tuberculosis

EFV Efavirenz

Emb Ethambutol

Eto/Pto Ethionamide/ Prothionamide

FQ Fluoroquinolone

Gfx Gatifloxacin

GI Gastrointestinal

Hgb Hemoglobin

HgbA1C Blood test used to diagnose diabetes and how well

one’s diabetes is controlled; this test provides the 8 – 12 week average blood glucose.

HIV Human immunodeficiency virus

Inh Isoniazid

IV Intravenous

Km Kanamycin

LFT Liver function test

Lfx Levofloxacin

Lzd Linezolid

Mfx Moxifloxacin

N/V Nausea and vomiting

NRTIs Nucleoside reverse transcriptase inhibitors

NSAIDs Non-steroidal anti-inflammatory drugs

NVP Nevirapine

PAS Para-aminosalicylic acid

PIs Protease inhibitors

Pza Pyrazinamide

Rif Rifampin

RTV Ritonavir

Sm Streptomycin

TB tuberculosis

TDF Tenofovir

TMP/SMX trimethoprim/ sulfamethoxazole (Bactrim)

TSH thyroid-stimulating hormone

uln upper limit of normal

wnl within normal limits