

Primary Health Care Initiatives (PHCI) Project  
Contract No. 278-C-00-99-00059-00  
Abt. Associates Inc.

## **MEDICATION INFORMATION**

### **LEARNING OBJECTIVES**

- Describe the most common side effects for commonly used medications
- Determine necessity of laboratory monitoring due to side effects
- Determine necessity of discontinuation of the medication due to side effects
- Appropriately counsel the patient and their family regarding possible side effects of medications

### **TEACHING STRATEGIES**

- Case studies, to stimulate thinking and application of knowledge learning
- Didactic lectures for presentation of information

### **LEARNING POINTS**

#### **Diabetes and Anti-diabetics**

- Definition of diabetes – a relative deficiency of insulin, which allows the body's cells to absorb and use glucose (sugar) as a source of energy
- Two types of diabetes
  - Type I
    - usually begins in children, often after a viral infection.
    - Almost complete lack of natural insulin – must be treated by insulin injections for life
    - About 10% of all diabetics have type I
  - Type II
    - usually begins in adults, often after age 40
    - strong family history of diabetes
    - most common in overweight or obese people
    - decreased amount of natural insulin, and relative resistance to effects of insulin in cells of the body
    - can be treated with medications that increase the body's production of insulin, or increase the responsiveness of the cells to insulin
    - 90% of all diabetics have type II
- Common symptoms of untreated diabetes
  - Increased thirst and urination
  - Weight loss in spite of increased appetite (Type I diabetes especially)
  - Frequent infections, especially vaginal yeast infections in women
  - Fatigue and tiredness
  - Blurring of the vision
  - Numbness or loss of sensation in the feet
- Risk factors for diabetes (Type II)
  - Positive family history of diabetes

- Obesity
- Decreased exercise
- Diabetes during pregnancy
- Potential complications of diabetes (Type I or II)
  - Vision loss and blindness
  - Problems with circulation in the foot and foot ulcers
  - Increased blood cholesterol and fats
  - Early onset of heart attack or stroke
  - Neurological problems such as painful feet, numbness, weakness of muscles, problems with the digestion
  - Frequent bacterial and fungal infections
  - Kidney failure
- Anti-diabetic medications
  - Insulin
    - Replaces normal body production of insulin
    - Must be given in amounts to balance intake of calories, and level of physical activity
    - Significant risk of hypoglycemia (too much insulin) or hyperglycemia (too little insulin)
    - Side effects – hypoglycemia, infection from poor injection technique, dimple at site of injection
    - Several types of insulin, each with different onset and length of action

<b>INSULIN PREPARATIONS</b>			
<b>Type</b>	<b>Onset (hours)</b>	<b>Peak (hours)</b>	<b>Duration (hours)</b>
<b>Short acting</b>			
Regular	0.1-1.0	2-5	4-6
Semilente	1-2	4-6	12-16
<b>Intermediate acting</b>			
NPH	1-2	4-14	18-24
Lente	1-2	6-14	18-24
<b>Long acting</b>			
PZI	6-8	12-18	36
Ultralente	4-6	12-18	36+

- Oral Hypoglycemics – glyburide, glibenclamide
  - Increase production of natural insulin in body
  - Given once to twice daily
  - Less risk of hypoglycemia than insulin, but still some risk. Must be balanced with diet and level of activity
  - About 20% of type II diabetics may require insulin in addition to oral medication
  - Common side effects – blurred vision (especially when beginning medication), hypoglycemia, weight gain
- Medications to reduce insulin resistance - metformin
  - Decrease resistance to insulin activity in cells
  - Usually does not cause hypoglycemia

- Can be taken together with oral hypoglycemic or insulin for added effectiveness
- Common side effects – nausea, vomiting, diarrhea
- Counseling issues with diabetic medications
  - All diabetic medications must be taken continuously – never run out of medications or stop without the doctor’s order
  - When beginning insulin therapy, patient should have careful instruction in injection technique from the nurse
  - The dosage of any diabetic medication must be balanced with the patient’s diet and level of physical activity. A change in any of these could require a change in dosage and should be discussed with the doctor.
  - Any illness that may prevent the use of medication (such as vomiting) should require a consultation with the doctor regarding change in medication dose.

**Hypertension and Anti-hypertensives**

- Definition of hypertension – persistent elevation of the blood pressure above normal (140/90 in adults)
- Most people with hypertension have NO symptoms; they feel normal
- Causes of hypertension
  - Only about 5-10% of all patients have an identifiable cause – most have no known cause
  - Most cases of hypertension are NOT caused by stress or psychological trauma
  - Obesity, lack of exercise, smoking all increase risk of hypertension
- Complications of untreated hypertension
  - Increased arteriosclerosis
  - Increased incidence of heart attack and stroke at an earlier age
  - Kidney failure
  - Heart failure
- Treatment of Hypertension
  - First step in treatment is stop smoking, lose weight, and exercise daily – can control up to 50% of all mild hypertensives with this alone
  - If this does not reduce blood pressure to normal, medication needed
  - Medications with several different mechanisms of action are available.
  - May need to combine two or three medications with different actions to control blood pressure in some people
- Anti-hypertensive medications

<b>Type of Medication</b>	<b>Medication</b>	<b>Activity</b>	<b>Side Effects</b>
ACE inhibitor	captopril, enalapril	Affect kidney to block chemicals that increase BP	dry cough (20%)
Beta-blocker	atenolol, propranolol	Decrease heart rate and decrease resistance in blood vessels	bradycardia, fatigue, depression, congestive heart failure, bronchospasm
Calcium channel	nifedipine, verapamil	Decrease force of heart beat, decrease	dizziness, flushing, congestive heart

blocker		resistance of blood vessels	failure
Diuretic	Furosemide	Increased urine and sodium excretion	Very short duration of action (2-3 hours) Low potassium and platelets
Diuretic (thiazide)	hydrochlorothiazide	Increase urine and sodium excretion	dizziness, elevated blood sugar, lowered blood calcium or potassium
Vasodilator (enlarges blood vessels)	Hydralazine, prazosin	Dilates blood vessels and decreases resistance to flow	headache, flushing, edema, lupus-like syndrome
Centrally acting	Methyldopa	Stimulates brain receptors to lower blood pressure	orthostatic hypotension, headache, myocarditis

## Other Medications

### Analgesics and Anti-inflammatories

Medication	Indication	Side Effects
Cyclobenzaprine	Acute muscle spasm	commonly causes sedation, may also cause dizziness, orthostatic hypotension
NSAID (nonsteroidal anti-inflammatory drugs) – ibuprofen, diclofenac, naproxen, indomethacin	arthritis, acute pain, inflammation, fever, dysmenorrhea	GI upset, ulceration or bleeding, renal and hepatic damage if used chronically
Paracetamol (acetaminophen)	fever, pain, inflammation, arthritis	hepatotoxicity (nephrotoxicity, agranulocytosis and pancytopenia rarely)
Aspirin (salicylic acid)	fever, pain, MI, TIA, arthritis, rheumatic fever	GI bleeding, Reye's syndrome (avoid in children), thrombocytopenia
Narcotics, e.g. codeine, morphine	acute and chronic pain	dizziness, sedation, slowed thinking (warn patients and recommend they not drive or operate dangerous machinery), higher doses can cause respiratory depression

### Emergency Medications

Medication	Indication	Side Effects
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Epinephrine (IV, subcutaneously)	Severe allergic reaction, asthma in children, cardio-pulmonary resuscitation	Tachycardia, elevated blood pressure, heart attack in adults, anxiety
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Prednisolone (IV, IM)	Asthma attack, severe allergic reaction	Very few side effects when given as an emergency; when used chronically causes osteoporosis, hypertension, stomach ulcers, sleep disorders
Lidocaine (subcutaneously, IV for arrhythmias)	Local anesthesia, ventricular arrhythmias	Nausea and vomiting, Seizures when given in overdose
Diphenhydramine, promethazine (IV, IM)	Antihistamine for severe allergic reactions, nausea or vomiting	Drowsiness, dry mouth, difficulty urinating in older men
Prochlorperazine, Metoclopramide (IM, IV)	Severe nausea and vomiting	Drowsiness, dizziness, blurred vision, constipation, dystonic reaction (strange movements)
Digoxin (IV, IM)	Atrial fibrillation, severe heart failure	Heart block, bradycardia, nausea and vomiting, arrhythmias
Lasix (IV)	Heart failure, pulmonary edema	Decreased potassium and cardiac arrhythmias
Diazepam (IV, IM)	Acute seizures, severe anxiety	Drowsiness, respiratory arrest, phlebitis of vein into which injected
Pethidine (IM, IV)	Severe pain	Drowsiness, decreased reactions, respiratory depression
Anti-spasmodics (IM, IV) (Atropine, etc.)	Abdominal spasm, colic	Bradycardia, dry mouth, difficulty urinating in older men

### Antibiotics

\*\*Note: Any antimicrobial can cause pseudomembranous colitis (an infectious form of diarrhea caused by a bacterium resistant to most antibiotics) – most commonly associated with clindamycin, however highest incidence with ampicillin. Any antibiotic can also commonly cause a rash or even anaphylaxis, however it is more common with some drugs.

Medication	Indication	Side Effects
Aminoglycosides e.g. gentamycin, amikacin, tobramycin	bacterial infections (IV and IM only)	renal failure, hearing loss
Cephalosporins, e.g. keflex, ceftriaxone	bacterial infections (IV and PO)	pseudomembranous colitis. 20% of patient with penicillin allergy will also have allergy to cephalosporins
Erythromycin, Clarithromycin	bacterial infections, atypical pneumonia, amebiasis	GI distress e.g. nausea, vomiting, diarrhea, abdominal cramping

Metronidazole	bacterial infections, PID, bacterial vaginosis, amebiasis, <i>Clostridium difficile</i> colitis	metallic taste, dry mouth, bad reaction if taken with alcohol (advise patients to abstain from alcohol while taking this medication)
Chloramphenicol	bacterial or rickettsial infections	aplastic anemia, agranulocytosis, gray baby syndrome in neonates
Penicillins, e.g. ampicillin, amoxicillin, penicillin VK	bacterial infections	: rash (very common with concurrent mononucleosis), anaphylaxis, diarrhea, pseudomembranous colitis
Sulfonamides, e.g. trimethoprim/sulfamethoxazole	bacterial infections, <i>Pneumocystis carinii</i> (PCP)	rash, anaphylaxis, interstitial nephritis
Tetracycline	bacterial infections, acne vulgaris	photosensitivity, discolored teeth (if less than 8 yrs old), skeletal retardation in infants
Clindamycin	bacterial infections	pseudomembranous colitis, diarrhea

### Asthma and Allergy

Medication	Indication	Side Effects
Albuterol, terbutaline	All asthma	bronchospasm, nervousness, palpitation
Inhaled steroids, e.g. beclomethasone	Persistent asthma	cough, oral candidiasis
Prednisolone	asthma, inflammatory disorders, adrenal insufficiency	adrenal insufficiency, immunosuppression, Cushing's syndrome, osteoporosis (long term use)
Diphenhydramine	allergic reactions, antihistamine	sedation (may cause hyperactivity in children)
Pseudoephedrine	decongestant	may cause sedation or CNS stimulation

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### Dermatologic

Medication	Indication	Side Effects
Antifungal, e.g. miconazole	topical fungal infections	rash, burning, urticaria
Topical steroids, e.g. betamethasone	inflammatory skin conditions	Atrophy of delicate skin or skin in children, adrenal insufficiency (with large areas)

## Gastrointestinal

Medication	Indication	Side Effects
Cimetidine	Peptic ulcer disease, GERD, Zollinger-Ellison Syndrome	headache, diarrhea, elevated transaminases
Metoclopramide	nausea/vomiting, GERD, diabetic gastroparesis	anxiety, confusion, extrapyramidal effects
Promethazine	nausea/vomiting, motion sickness, allergic rhinitis	dry mouth, drowsiness, extrapyramidal effects
Sulfasalazine	inflammatory bowel disease	headache, depression, nausea/vomiting, diarrhea, agranulocytosis

## Neurologic

Medication	Indication	Side Effects
Carbamazepine	seizure disorder, trigeminal neuralgia	dizziness, drowsiness, unsteadiness, hepatitis
Diazepam	anxiety, alcohol withdrawal, seizure disorder	drowsiness, fatigue, respiratory depression, tremor
Ethosuximide	absence seizures	anorexia, dyspepsia, gingival hyperplasia, SLE
Phenobarbital	seizure disorder, sedation	drowsiness, hyperactivity in children, respiratory depression
Phenytoin	seizure disorder	nausea, vomiting, tremor, ataxia, hepatitis
Valproic Acid	seizure disorder, mania	nausea, headache, somnolence

## OB/Gyn

Medication	Indication	Side Effects
Ethinylestradiol	postmenopausal, atrophic vaginitis, osteoporosis prevention	menstrual irregularities, peripheral edema, weight changes, thromboembolism
Combined oral contraceptives	contraception	nausea, vomiting, edema, weight gain, rarely blood clots in leg or lung *Not recommended for smokers > 35 years, or history of breast, endometrial or hepatic cancer

## Psychiatric

Medication	Indication	Side Effects
Anti-psychotics, e.g. chlorpromazine, haloperidol	: psychosis	drowsiness, hypotension, tardive dyskinesia, neuroleptic malignant syndrome
Amitriptyline	Depression, chronic pain, sleep problems	dry mouth, drowsiness, anticholinergic effects, e.g. urinary retention, confusion, blurred vision, increased Q-T interval
Lithium carbonate	Bipolar disorder, mania	tremor, polyuria, diarrhea, seizures

### CASE STUDIES

1. A 68-year-old female with type 2 Diabetes mellitus has continued elevation of blood pressure readings, and has taken enalapril 20 mg daily for the past 6 weeks. She is given an additional prescription for atenolol to take with the enalapril. What side effects do you counsel her to expect from both medications?
2. A 4-year-old, 20 kg. female complains of ear pain and sore throat. She is diagnosed to have an acute otitis media (ear infection). She has been prescribed amoxicillin to take for 7 days. What do you tell the mother about possible side effects?
3. A 28-year-old female complains of “dry and itchy skin” at a health maintenance exam. It has come and gone for years, and does not respond to hydrocortisone cream 1%. She is seen by the doctor and then the dermatologist, and diagnosed with psoriasis. She is given betamethasone ointment to use 2-3 times daily on the areas of psoriasis. What side effects could this medication cause?
4. A 17-year-old male complains of pain in the shoulder area after a fall. X-ray shows a fractured left clavicle, and he is placed in a splint for comfort. He is given ibuprofen 400 mg TID. What do you tell the young man as he picks up his medication?
5. A 23-year-old, 62 kg female is having an asthma exacerbation. She is using her albuterol inhaler 2-3 puffs every 3-4 hours, but is still wheezing. She is prescribed oral prednisone, 40 mg daily for five days. She says “Doctor, I have heard that this drug has really bad side effects. What will it do to me?” What do you tell her?
6. An 26-year-old woman is asking for a prescription for combined oral contraceptives. She has two children, but wants to wait another year or two before another child. She has no medical problems and there is no evidence of

sexually transmitted infection on exam. What do you tell her to expect in terms of potential side effects?

7. A 31-year-old female complains of pain on urination and frequent urination for 3 days. She was diagnosed with a urinary tract infection (UTI). Her only other UTI was 5 years ago, during which she developed a rash to amoxicillin treatment. She is given a sulfa antibiotic (Cotrimoxazole). She asks you, "Doctor, will this cause a rash like my last antibiotic did?" What do you tell her?

### **PREVENTION ISSUES AND PATIENT EDUCATION**

- Provide education to patients and families on common side effects of medications before they occur
- Provide patients and families with printed information or direct patients to other resources regarding medication side effects

### **CRITICAL ELEMENTS FOR REFERRAL**

- Any patient that has not tolerated usual medication therapies due to severe side effects, and may need a different drug or other therapy from a specialist

### **CRITICAL ELEMENTS FOR EVALUATION OF COMPETENCE**

- Able to correctly identify the most common and clinically relevant side effects of medications used routinely in the health center
- Able to clearly understand when the need for referral arises due to significant or persistent medication side effects.