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# COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

**NSNS319: Pharmacology**

**END OF FIRST SEMESTER FINAL EXAMINATIONS**

**May 2020**

**LECTURER: Mr Blessing Dzingirai**

**DURATION: 3 HRS**

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## INSTRUCTIONS

Answer any **one (1)** question from a total of three

All questions carry equal marks (100).

DO NOT repeat material.

Write legibly.

**Question 1a**

i. Giving real examples discuss the difference between
   a. Efficacy and potency [5]
   b. Efficacy and effectiveness [5]

ii. The doctor orders 400mg of amoxycillin for a 2-year-old patient to be administered orally three times a day. In the ward there is 100mls of 250mg/5ml Amoxycillin suspension. Showing your calculation how much of the suspension should be administered per dose [5]

iii. The doctor orders 0.05mg dose of thyroxine for Mr Mahachi to be taken orally. In the clinic you realize you have 25mcg tablets of thyroxine. Showing your calculation how many tablets will you administer to Mr Mahachi [5]

**Question 1b**

**You are presented with following case at hospital in Mahusekwa. Read through the case notes and answer the questions that follow.**

**Chief Complaint**
"My boy has trouble breathing and he keeps coughing. His salbutamol inhaler isn't helping."

**History**
Harrison Makumbi is a 3-year-old boy who presents to the emergency department with a 3-day history of cough and congestion. The mother was giving him salbutamol, 2.5 mg via nebulization twice a day since the cough started. She was also giving him an allergy medicine. He did have a fever 3 days prior to admission, and he was given ibuprofen. The previous night before admission, he seemed to be gasping for air and during the day today, he has had an increased work of breathing. Mother also notes that he has been fussy, not eating well, and has had only two to three urinations in the past 24 hours. His assessment in the emergency department revealed him to have laboured breathing that was more difficult with activities. He had mild retractions with tachypnoea at 52 breaths per minute. His other vital signs were a heart rate of 137 beats per minute, blood pressure of 100/68, temperature of 38.9°C, and a weight of 14.4 kg. The initial oxygen saturation was 88%, and he was started on oxygen at 1.5 liter/min via nasal cannula. His breath sounds were noted to have fair air exchange but with expiratory wheezes. His chest x-ray revealed patchy infiltrates consistent with pneumonia. Harrison was complaining of a runny nose and sore throat. He did not have any ear pain. While in the emergency department, he was given three salbutamol/ipratropium nebulisations and one dose of prednisolone 15 mg orally. He received one dose of acetaminophen 210 mg. His breath sounds and oxygenation did not improve so he was started on hourly salbutamol nebulisations at 5 mg. Harrison was then transferred to the Paediatric Intensive Care Unit for further treatment and monitoring.

**Past Medical History**
Asthma, unknown if previous hospitalizations, S/P tonsillectomy/adenoidectomy at 2 years of age

**Family history**
Unknown

**Social History**
Lives with foster mother and two siblings. Birth mother has visitations. Unclear as to reason for foster placement. Positive tobacco exposure in current home.

**Meds**
Salbutamol 2.5 mg via nebulizer as needed
Phenylephrine/chlorpheniramine/ methscopolamine (Dallergy®), dose unknown

**Allergies**
NKA

ROS
(+) Fever, cough, congestion, increased work of breathing

Physical Examination
*Gen*
NAD, moderate increase in work of breathing
*VS*
BP 103/55, P 154, T 36.4°C, R 29, O2 sat 94% at 1.5 L/min nasal cannula
*Skin*
No rashes, no bruises
*HEENT*
NC/AT, PERRLA
*Neck/Lymph Nodes*
Soft, supple, no cervical lymphadenopathy
*Chest*
Slight decrease in breath sounds bilaterally, minimal wheezing
*CV*
RRR, no MRG
*Abd*
Soft, NT/ND

*Ext*
No clubbing or cyanosis
*Neuro*
A & O, no focal deficits

**Labs**

| | |
|---|---|
| Na 134 mEq/L | WBC 6.5 × 103/mm3 |
| K 3.0 mEq/L | RBC 3.84 × 106/mm3 |
| Cl 103 mEq/L | Hgb 10 g/dL |
| CO2 19 mEq/L | Hct 34% |
| BUN 6 mg/dL | Plt 252 × 103/mm3 |
| SCr 0.4 mg/dL | |
| Glu 140 mg/dL | |

Respiratory viral panel nasal swab: positive for parainfluenza 3

**Chest X-Ray**
Patchy infiltrates throughout lung fields

**Assessment**
Asthma exacerbation with pneumonia and dehydration

**Questions**

**Assessment and Diagnosis**

i. List the patient's drug related problems. [2]
ii. What information (signs, symptoms, laboratory values) indicate severity of an acute asthma attack. [5]

**Planning**

i. Write down the goals of therapy for this patient. [4]
ii. What non pharmacologic might be useful for this patient [5]
iii. What pharmacologic options are available for the management of acute asthma [15]
iv. What drug, dosage form, dose, schedule, mechanism of action and duration of therapy are best for this patient's acute asthma exacerbation? [5]

**Evaluation**

i. What laboratory or clinical parameters will you use to evaluate the outcome of the pharmacologic therapy plan you instituted on this patient. [5]

**Patient Education**
i. Describe the information that should be provided to the family regarding nebulization technique, the differences between quick relief and controller medications, and possible asthma triggers. [10]
ii. What should the family monitor for regarding the potential adverse effects from the drug therapy? [5]

**Bonus question**

i. Should cough and cold products be used for asthma symptoms? Why or why not? [4]

**Question 1c.**

You are the Director of clinical services in the Ministry of health. A herbalist applies to your office claiming he has found a herb that can prevent and cure covid-19 disease. The application is if you can approve use of the herb in the hospitals for covid-19 patients.

i. Write a review of the pharmacologic or herbal agents that are under clinical trials for the prevention and or treatment of covid 19 [10]

**ii.** Discuss the evidence/data that you will require to consider the herbalist's application for clinical use of the herb. [10**]**

**QUESTION 2**

a. You are presented with following case. Read through it and answer the questions that follow

**Chief Complaint**

"I just moved to town, and I'm here to see my new doctor for a checkup. I'm just getting over a cold. Overall, I'm feeling fine, except for occasional headaches and some dizziness in the morning. My other doctor prescribed a low-salt diet for me, but I don't like it!"

**History of presenting illness**

Sam Katoko is a 62-year-old African male who presents to his new family medicine physician for evaluation and follow-up of his medical problems. He generally has no complaints, except for occasional mild headaches and some dizziness after he takes his morning medications. He states that he is dissatisfied with being placed on a low sodium diet by his former primary care physician. He reports a"usual" chronic cough and shortness of breath, particularly when walking moderate distances (states, "I'm just out of shape").

**Past Medical history**
Hypertension × 15 years
Type 1 diabetes mellitus
Chronic obstructive pulmonary disease, Stage 2 (Moderate)
Benign prostatic hyperplasia
Chronic kidney disease

**Family history**
Father died of acute MI at age 71. Mother died of lung cancer at age 64. Mother had both Hypertension and Diabetes mellitus .

**Social History**
Former smoker (quit 3 years ago; smoked 1 ppd × 28 years); reports moderate amount of alcohol intake. He admits he has been nonadherent to his low sodium diet (states, "I eat whatever I want.") He does not exercise regularly and is limited somewhat functionally by his COPD. He is retired and lives alone.

**Meds**

Triamterene/hydrochlorothiazide 37.5 mg/25 mg po Q AM
Insulin 70/30, 24 units Q AM, 12 units Q PM

Doxazosin 2 mg po Q AM
Albuterol INH 2 puffs Q 4–6 h PRN shortness of breath
Tiotropium DPI 18 mcg 1 capsule INH daily
Salmeterol DPI 1 INH BID
Entex PSE 1 capsule Q 12 h PRN cough and cold symptoms
Acetaminophen 325 mg po Q 6 h PRN headache

**Allergies**
Paracetamol—Rash

**Review of systems**
Patient states that overally he is doing well and just getting over a cold. He has noticed no major weight changes over the past few years. He complains of occasional headaches, which are usually relieved by acetaminophen, and he denies blurred vision and chest pain. He states that his shortness of breath is "usual" for him, and that his albuterol helps. He denies experiencing any hemoptysis or epistaxis; he also denies nausea, vomiting, abdominal pain, cramping, diarrhea, constipation, or blood in stool. He denies urinary frequency, but states that he used to have difficulty urinating until his physician started him on doxazosin a few months ago.

**Physical Examination**
***Gen***
WDWN, African male; moderately overweight; in no acute distress
***VS***
BP 168/92 mm Hg (sitting; repeat 170/90), HR 76 bpm (regular),
RR 16 per min, T 37°C; Wt 95 kg, Ht 6'2"
***HEENT***
TMs clear; mild sinus drainage; AV nicking noted; no hemorrhages,
exudates, or papilledema
***Neck***
Supple without masses or bruits, no thyroid enlargement or lymphadenopathy
*Lungs*
Lung fields CTA bilaterally. Few basilar crackles, mild expiratory wheezing
***Heart***
RRR; normal S1 and S2. No S3 or S4
***Abd***
Soft, NTND; no masses, bruits, or organomegaly. Normal BS.
*Genit/Rect*
Enlarged prostate; benign
*Ext*
No CCE
*Neuro*
No gross motor-sensory deficits present. CN II–XII intact. A & O × 3.

**Labs**
Na 142 mEq/L  Ca 9.7 mg/dL
*Fasting Lipid Panel :* Total Chol 169, LDL 99mg/dL, HDL 40 mg/dL (38% pred)

*Spirometry:* FVC 2.38 L, CO2 27 mEq/L, FEV1 1.21 L, FEV1/FVC 51%

K 4.8 mEq/L Mg 2.3 mEq/L *(6 months ago),* Cl 101 mEq/L, HbA1C 6.2% ,Alb 3.5 g/dL (54% pred)
BUN 22 mg/dL, Hgb 13 g/dL, SCr 1.6 mg/dL, Hct 40%
Glucose 136mg/dL
WBC 9.0 × 103/mm3 TG 151 mg/dL
Plts 189 × 103/mm3

**Urine analysis**
Yellow, clear, SG 1.007, pH 5.5, (+) protein, (–) glucose, (–) ketones, (–) bilirubin, (–) blood, (–) nitrite, RBC 0/hpf, WBC 1–2/ hpf, neg bacteria, 1–5 epithelial cells

**ECG**
Normal sinus rhythm
_ ECHO (6 months ago)
Mild LVH, estimated EF 45%
Assessment
1. Hypertension, uncontrolled
2. Type 1 diabetes mellitus, controlled on current insulin regimen
3. Moderate COPD, stable on current regimen
4. Benign prostatic hyperplasia, symptoms improved on doxazosin

**Questions**
i. Create a list of this patient's drug-related problems, including any medications which may be contributing to the patient's uncontrolled hypertension. [5]
ii. How would you classify this patient's hypertension [2]
iii. What are the patient's known cardiovascular risk factors, and what is the patient's Framingham risk score? [20]
iv. What evidence of target organ damage or clinical cardiovascular disease does Mr Katoko have? [5]
v. List the goals for treatment for this patient [5]
vi. What lifestyle modifications should be encouraged for this patient to achieve and maintain adequate blood pressure
reduction? [5]
vi. What reasonable pharmacotherapeutic options are available for controlling this patient's blood pressure, and what comorbidities and individual patient considerations should be taken into account when selecting pharmacologic therapy for his HTN? How might Mr Katoko HTN medications potentially affect his other medical problems? [15]
Plan
vii. Outline a specific and appropriate pharmacotherapeutic regimen or this patient's uncontrolled hypertension, including drug(s), dose(s), dosage form(s), and schedule(s). [10]

viii. Based on your recommendations, what parameters should be monitored after initiating this regimen and throughout the treatment course? At what time intervals should these parameters be monitored? [10]
ix. Based on your recommendations, provide appropriate education to this patient [3]

**Question 2b**

Describe the nursing process in the pharmacologic management of a diabetic patient. [20]

**Question 3**

a. Giving clear examples of classes of drugs tell us your considerations when administering drugs to the following groups of patients

i. A six month old baby
ii. An 80 year old man
iii. A 27 year old pregnant woman
iv. A 32 year old lactating mother [20]

b. The following case of major depression is presented to you as the chief clinical officer at a non-governmental organisation. Read through it apply your clinical and pharmacology knowledge to answer the questions that follow

**Chief Complaint**
"I don't know if I can handle this anymore."

**History of presenting illness**
Geneva Murambinda is a 41-year-old woman who is referred by her family physician to an outpatient mental health clinic. She c/o feeling down and sad, with crying spells, trouble sleeping, increased eating, depression, impaired concentration, and fatigue. She has not worked in over 2 months and has used up her vacation and sick leave. She went through treatment for alcoholism over a year ago. Things were going fairly well for her after her treatment and she remarried approximately 8 months ago. Arguments with her teenage sons about family issues and past incidents have made her increasingly depressed over the last few months. Her older son, 17, moved out to live with his father. Her younger son, 12, moved to live with his paternal grandparents. She divorced the boys' father after approximately 10 years of marriage when she discovered he was having an affair with another woman. She left her second husband after approximately 2 years because of problems involving his children that caused increasing conflict with her then husband. Without a second income in the household, she accumulated large credit card debts. She began drinking and soon developed a pattern of using alcohol to relieve stress. Just before entering alcoholism treatment, there was a sexual fondling incident involving one of her son's friends while the friend was visiting her son at her house, but she was amnestic for the incident. Her present husband, her third, has been supportive of her, but she feels guilty about her failed previous marriages and her sons, worries about her debt, and has become more despondent. She has taken a leave of absence from her job as a school secretary. The patient sought treatment for depression 3 months ago from her family physician, who prescribed mirtazapine. Her spirits have not improved, and she says the medication made her gain weight.

Because of vague references the physician believed could possibly indicate suicidal ideas, she has been referred for psychiatric evaluation.

**Past Medical history**
Childhood illnesses—she has had all of the usual childhood illnesses. She was hospitalized at age 3 for bacterial meningitis but
knows of no residual effects.
Adult illnesses—no current nonpsychiatric adult illnesses; no previous
psychiatric treatment.
Trauma—fractured arm due to bicycle accident at age 9, otherwise
unremarkable.
Surgeries—Hx childbirth by C-section; tonsillectomy at age 6.
Travel—no significant travel history.
Diet—no dietary restrictions. Despite not having much of an
appetite, reports eating more since taking mirtazapine.
Exercise—no regular exercise program.
Immunizations—no personal records of childhood vaccinations ;had tetanus booster 9 years ago.

**Family History**
Mother and father are in good health except father's well-controlled HTN. A sister has depression and anxiety, takes antidepressant medication; G.F. doesn't know its name. A second sister committed suicide.

**Social History**
High school graduate; works as a school secretary but on leave of absence for approximately 2 months. Married approximately 8months, two previous divorces. Lives with husband and sons until sons moved out in the last few weeks. Health insurance is through the school district; includes adjusted copay on prescriptions. Mental health care is covered 50%. Reports heavy credit card debt. Attended church regularly in the past (Protestant), but not recently.
Attends AA weekly. Denies drinking alcohol since treatment. Denies smoking. Drinks three to four cups of caffeinated coffee per day; usually drinks iced tea with evening meal; drinks colas as leisure beverage. Used marijuana a few times after high school, denies any use in more than 10 years; denies use of other illicit substances.

**Meds**
Mirtazapine 30 mg at bedtime (started on mirtazapine 15 mg at
bedtime approximately 3 months ago)
Ortho-Novum 1/35-28, 1 po daily; hasn't taken for 2 months
St. John's wort 300 mg po TID for the last 2 weeks at suggestion of husband (purchased at health food store)
APAP 1,000–1,500 mg as needed for headaches, 2 or 3 times a week
Uses OTC antihistamines and decongestants for colds or allergies; none in recent months
**Allergies**
NKDA

**Review of systems**

General appearance—pt c/o feeling tired much of the time
HEENT—wears contact lenses; no tinnitus, ear pain, or discharge; no c/o nasal congestion; Hx of dental repair for caries
Chest—no Hx of asthma or other lung disease
CV—reports occasional feelings of "pounding heart"; no Hx of heart disease
GI—reports infrequent constipation; takes MOM PRN; has gained 9 lbs in last 2 months
GU—has regular menses; LMP ended a week ago
Neuromuscular—occasional headaches, worse over the past few months; no syncope, vertigo, weakness or paralysis, numbness or tingling
Skin—no complaints

**Physical Examination**
Performed by nurse practitioner
*Gen*
Overweight WF, slightly unkempt
*VS*
BP 132/78, P 88, RR 22, T 36.9°C; Wt 187 lbs, Ht 5'8"
*Skin*
Normal skin, hair, and nails
*HEENT*
PERRLA; EOM intact, no nystagmus. Fundus—disks sharp, no retinopathy; no nasal discharge or nasal polyps; TMs gray and shiny bilaterally; minor accumulation of cerumen
*Neck/Lymph Nodes*
Supple without thyromegaly or lymphadenopathy
*Chest/Lungs*
Frequent sighing during examination, but no tachypnea or SOB; chest CTA
*Breasts*
No masses or tenderness
*Heart*
RRR without murmur
*Abd*
Soft, nontender; (+) BS; no organomegaly
*Genit/Rect*
Deferred
*Ext*
Unremarkable
*Neuro*
CN—EOM intact, no nystagmus, no weakness of facial or tongue muscles. Casual gait normal. Finger-to-nose normal. Motor—normal symmetric grip strength. DTRs 2+ and equal. Sensory—intact bilaterally.
*Mental Status*

When seen in the clinic, the patient is pale and appears moderately overweight, dressed in casual slacks and sweater. Grooming is fair and without makeup. She speaks slowly, often not responding to questions for approximately 30 seconds before beginning answers. She describes depressed mood and lack of energy and says she feels no pleasure in life. Her husband is good to her, but she feels everyone else she loves has left her. She has no social contacts other than occasional visits by her parents. She spends most of her time in bed. She feels worthless and blames herself for her problems. She feels particularly anguished about the incident with her son's friend even though she doesn't remember it. She is often anxious and worries about the future. She wonders if her sons love her and if they will ever return. She worries how she will repay her financial debts. Her speech is logical, coherent, and goal-oriented. She denies suicidal intent but says the future seems dim to her, and she wonders sometimes if life is worth living. She admits she sometimes wishes she could just go to sleep and not wake up. She denies hallucinations. Paranoid delusions, flight of ideas (FOI), ideas of reference (IOR), and loss of awareness
(LOA) are absent. There is no dysarthria or anomia

Urine Analysis
Glucose (–); ketones (–); pH 5.8; SG 1.016; bilirubin (–); WBC 1/hpf, protein (–), amorphous—rare, epithelial cells 1/hpf; color yellow; blood (–), RBC 0/hpf; mucus—rare; bacteria—rare; casts 0/lpf; appearance clear

**Assessment**
Major depressive disorder, single episode, with melancholic features

Labs

| | | | |
|---|---|---|---|
| Na 139 mEq/L | Hgb 14.0 g/dL | AST 34 IU/L | |
| K 4.2 mEq/L | Hct 46.2% | ALT 42 IU/L | |
| Cl 102 mEq/L | MCV 92 μm3 | | GGT 38 IU/L |
| CO2 24 mEq/L | MCH 29 pg | T. bili 0.8 mg/dL | |
| BUN 12 mg/dL | Plt 234 × 103/mm3 | T. prot 7.0 g/dL | |
| SCr 0.9 mg/dL | WBC 7.3 × 103/mm3 | Alb 4.4 g/dL | |
| Glu 98 mg/dL | Segs 49% | CK 57 IU/L | |
| Ca 9.5 mg/dL | Bands 1% | T4 8.6 mcg/dL | |

**Questions**
**Assesment**

**i.** Create a list of this patient's drug therapy problems. [5]
ii. What signs, symptoms, and laboratory values indicate depression in this patient? [10]
iii. What factors in the family history support a diagnosis of depression? [3]
iv. Is there anything in the patient's medication history that could cause or worsen depression? [2]

**Planning**

v. What are the goals of pharmacotherapy in this case? [5]

vi. What nonpharmacologic treatments are important in this case? Should nonpharmacologic treatments be tried before beginning medication? [3]
vii. Describe pharmacology options are available for the treatment of depression? [15]
viii. What drug regimen (drug, dosage, schedule, and duration) is best for this patient? [10]

**Evaluation**

ix. What clinical and laboratory parameters are necessary to evaluate the therapy for efficacy and adverse effects? [12]

**Patient Education**

x. What information should be provided to the patient to enhance compliance, ensure successful therapy, and minimize adverse effects? [10]
xi. Comment on the use St John's wort in management of depression [5]

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