Jordanian Clinical Skills Competition Program

Part 1

Case Study Problem Solving

"Model Case"

Demographic and Administrative Information		
Name: A.A		
Address: Amman		Room & Bed: CCU
Date of Birth: 1-1-1936	Date of admission:22/1/2012	Physician: Ahmad
Height: 165cm	Weight: 60 kg	Race: Caucasian
Gender: Male		Religion: Muslim
Case summary		**Past Medical History**
A.A presented to the Hospital 2 weeks ago with generalized weakness, and he was diagnosed as a case of severe bilateral internal carotid artery stenosis. A right internal carotid artery stent (CAS) was placed. Two days later, the patient was discharged and planned for left CAS later on. Today, A.A presented to the ED with right-sided weakness and cough. He was admitted to CCU for left CAS. Brain CT scan was performed and no ischemic changes were noticed. A Chest X-ray was done and showed bilateral well defined lung infiltrate seen more in the left peripheral middle zone. As a routine, CBC was performed and showed leukocytosis. According to all above observations, the patient was diagnosed as a case of pneumonia. On the day of admission, his blood glucose level was relatively high and did not fully respond to insulin sliding scale. On hospital day (HD) 3, K level was low, and he was started on potassium gluconate and spironolactone. On hospital day 5, stent was successfully placed in the intracranial artery. On hospital day 5, the patient developed nausea, vomiting and watery diarrhea. The physician suspected *C. difficile* infection and decided to discontinue antibiotic and to ask for *C. difficile* test.		Diabetes mellitus for the last 5 years Bilateral carotid artery stenosis S/P right CAS Diastolic Heart Failure. Chronic Kidney Disease
Family History		**Social History**
Positive family history of DM type 2		Occupation: Retired Status: married Children: 4 sons
Life style:		**Vitals & Other Tests**
Diet: Nothing notable ETOH: none Illicit Drugs: none Caffeine: Occasional Physical Activity: Moderate Smoking: Non smoker		BP 120/70 mmHg Pulse 70 p/m Temp Tmax 36.7C° Resp 20 BPM

Chemistry and CBC

	Day1	Day2	Day3	Day4	Day5	Normal values
Na	130		142	141	137	135-145 mmol/L
K		4.2	3.1	3.5	3.9	3.5-5.3 mmol/L
urea	70	66				7-20 mg/dL
SCr	1.2	1.22	1.2	1.2	1.5	0.7-1.2 mg/dl
Glucose	360	250	269	240	210	80-140 mg/dl
WBC	15.4					4×10^{9}-1.1×10^{10}/l
Hgb	14					13.8 to 18.0 g/dL
plt	228					140–440) $\times10^{9}$/L
Calcium	9.2		9.2			8.5-10.5 mg/dl
neutrophils	74%					45–62%
lymphocytes	14%					16–33%
monocytes	11%					2–10%
Albumin	3.7		3.6			3.5 to 5 g/dL.

Tests and Procedures

Day 1 ECG: no significant abnormalities

Day 1 Brain CT scan: no ischemic changes were noticed.

Day 2 Chest X-ray: showed bilateral well defined lung infiltrate seen more in the left peripheral middle zone.

Day 4: left CAS was placed.

Physical Exam

General – Elderly, man who has productive cough.
Skin –2+ edema in lower extremities
HEENT – PERRLA
Chest –decreased air entry bilateral.
CV – free
Abd – Soft, non-distended; no masses or obvious tenderness
Neuro – general weakness in the left side

Allergies/Intolerances

-NKDA
-Patient intolerant to statin as he has history of severe myopathy with increase in CPK.

PTA Medication

Glimepiride 3mg PO QD
Aspirin 100 mg PO QD
Clopidogrel 75mg PO QD
Metformin 850mg PO QD
Furosemide 20mg PO QD
Omeprazole 20mg PO QD

Notes:

-The patient received enoxaparin for 2 days, then D\C preoperatively.

Current Drug Therapy

Indication	Drug Name/Dose/Strength/Route Prescribed Schedule	Duration Start–Stop Dates
CAS	Aspirin, 100 mg, PO,QD	PTA-
CAS	Clopidogrel, 75 mg, PO,QD	PTA-
Edema/DHF	Furosemide, 40mg, PO,QD	PTA-HD#3
Edema/DHF	Furosemide, 40mg, IV TID	HD#3- HD#6
NSAIDS-induced ulcer prophylaxis	Omeprazole, 40mg, PO,QD	PTA-
Pneumonia (HCAP)	Gemifloxacin, 320 mg, IV, QD	HD#1- HD#6
Hypokalemia	Spironolactone,50 mg, PO,QD	HD#3- HD#4
Hypokalemia	Potassium gluconate 20cc, po, tid	HD#3- HD#4
Contrast-induced nephrotoxicity risk	N-acetylcysteine, 600 mg, PO, BID	HD#4- HD#6
DM	Sliding scale insulin	HD#1- HD#6
Pneumonia (HCAP)	Ceftriaxone, 2g, IV, QD	Stat on day 1
DVT prophylaxis	Enoxaparin, 40mg, SC, QD	HD#1- HD#2
Nausea and vomiting	Metoclopramide, 20 mg, IV	Stat on day 5

Pharmacist care plan for current medications

#	Date	Medical Problem or health care need	Treatment Related Issue	Pharmacotherapy Goals	Recommendations (Pharmacological, Non-pharmacological, Others)	Follow up and monitoring result
1	22/1/2012	Pneumonia (HCAP)	A need for additional diagnostic test (according to ATS guideline, all patients with HCAP should have lower respiratory tract culture).	Resolution of infection Relief of symptoms of pneumonia Prevention of complications (e.g.,sepsis, lung abscess, empyema) & mortality	Recommend collecting sputum sample for Gram stain and culture.[1]	Monitor for improvement of symptoms (cough), temperature 36.8°C) Monitor for respiratory rate &, in case of distress, for ABGs Follow daily WBC/differential – should trend downward Cultures – narrow antibiotic therapy according to the results. No need to perform follow-up sputum cultures. May repeat CXR after several days of therapy, but not a must
			More effective drug is recommended (for patient with HCAP double coverage of *Pseudomonas* should be insured and anti staph if *MRSA* is suspected)		D\C ceftriaxone stat dose.[1] D\C Gemifloxacin and start one of the following regimens: [1] Cefepime OR ceftazidime OR meropenem OR imipenem OR piperacillin-tazobactam PLUS Levofloxacin OR ciprofloxacin OR aminoglycoside PLUS Vancomycin to a targeted trough of 15-20 mcg/mL (if *MRSA* is suspected). Doses: Cefepime 2 gm IV Q 24 h or Ceftazidime 2 gm IV Q 12 h Meropenem 1gm IV Q 12 h Imipenem 250 mg IV Q 6 h Levofloxacin 750 mg IV Q 48 h Ciprofloxacin 400mg IV Q 12 h Vancomycin dosing is flexible, as long as the target trough of 15-20 mcg/mL is achieved.	
			Efficacy dosage regimen issue (the duration of antibiotic is short as the patient received it for 5 days only)		Treat for 7-8 days unless *Pseudomonas* is cultured (14 days for *Pseudomonas*).	

2	22/1/2012	Bilateral carotid artery stenosis	The patient requires additional drug therapy according to guideline recommendation (all patient with ICS should receive unfractionated heparin or Bivalirudin)	Prevention ofischemic stroke and other ischemic cardiovascular events	Before and for a minimum of 30 days after CAS, dual-antiplatelet therapy with aspirin (81 to 325 mg daily) plus clopidogrel (75 mg daily) is recommended. For patients intolerant of clopidogrel, ticlopidine (250 mg twice daily) may be substituted Intraprocedural management includes adequate anticoagulation. Adequate anticoagulation can be achieved with unfractionated heparin given in sufficient dosage to maintain the activated clotting time between 250 and 300 seconds. Bivalirudin may have advantages over heparin, including obviating the need for monitoring of activated clotting time Immediate postprocedural management includes aspirin (81 to 325 mg daily), it is conventional to administer clopidogrel (75 mg daily) for at least 4 weeks, mainly on the basis of experience gained in patients undergoing CAS. Smoking cessation and medications for control of hypertension, hyperlipidemia, and diabetes should be resumed or initiated. [2]	Absence of bleeding S&S (easy bruising, dark stool, etc.) Absence of S&S of TIA & stroke (both hemorrhagic & ischemic) HbA1c<7% LDL <70 mg/dL (because the patient has both DM and ICS) For niacin monitor blood glucose; baseline liver function test, then every 6-12 weeks for the first year, then periodically; platelets because of concomitant antiplatelet medications. Noninvasive imaging of the extracranial carotid arteries is reasonable 1 month, 6 months, and annually after revascularization to assess patency and exclude the development of new or contralateral lesions.
			The patient requires additional drug therapy according to guideline recommendation (all patient with ICS should receive a statin)		As the patient is intolerant to statins, he should be started on niacin or bile acid sequestrant according to guideline recommendations, either [2]: Niacin 500mg 3 times daily OR Colestipol 2g twice daily. OR Cholestyramine 4g once daily. OR Colesevelam 1.875g twice daily.	
3	24/1/2012	Hypokalemia	----------	Restore the normal K level. Prevent cardiac complications. Prevent further hypokalemia episodes.	Continue on potassium gluconate 20 CC *3 which is equivalent to 80 mEq K until reaching target potassium level.[3] **Note:** Each 15 CC of sopak contain 20 mEq of K. Continue on spiranolactone 50mg*1, as the cause of hypokalemia was renal wasting due to continued diuretic use.[3]	Monitor K level daily with a target level 3.5-5.3 mg/dL.

4	22/1/2012	Diastolic HF	---------- A need for additional therapy because of guideline recommendation. (all patient with DHF need to receive both ACEI & beta-blocker to improve survival & to be vaccinated)	Control symptoms and decrease fluid retention Improve survival	Continue on furosemide 40mg P.O after HD6. [4] Start patient on enalapril 2.5 mg twice daily and metoprolol 25 mg once daily Recommend influenza vaccine annually and pneumococcal vaccine every 5 years.[4]	Monitor S&S of HF (fatigue, SOB, PNDs, orthopnea, tachycardia, peripheral edema, rales on auscultation. Monitor KFT, electrolytes, urine output, BP
5	22/1/2012	DM	Efficacy dosage regimen issue (the patient is on insulin sliding scale which is not recommended by the guideline)	Blood glucose 80-140 mg/dL. Prevention of complications of hyperglycemia (e.g., further infection, DKA or HHS) and episodes of hypoglycemia	Start D5W at 100 mL/hr. Give 3.5 units IV initial insulin bolus (initial glucose was about 350 mg/dL which should be divided by 100=3.5 U) followed by insulin infusion at a rate of 3.5 unit/hr (using the same equation). Then adjust insulin infusion rate each hour after initial insulin bolus and infusion according to the algorithm 1 in reference 5. [5]	Monitor capillary (finger stick) glucose every hour Obtain lab glucose if finger stick BG is <40 or >400 mg/dL. HbA1c<7% every 3 months
6	26/1/2012	Nausea and vomiting	Additional diagnostic test is needed	Relieve nausea and vomiting and prevent dehydration & electrolyte depletion.	Check urine for ketones since N&V may be due to DKA Continue on metoclopramide PRN. [6] Control blood glucose by insulin infusion as above	Monitor nausea and vomiting frequency & severity Monitor for urine ketones & acetone odour from the mouth Monitor for hypoglycemia because of concomitant administration of metoclopramide with insulin.
7	25/1/2012	Contrast media induced nephropathy	Dosage regimen issue (the dose of N-acetyl cysteine is lower than the preferred dose by the latest evidence)	Prevent nephropathy as a result of contrast media.	Increase the dose of N-acetyl cysteine to 1200 mg twice daily on the day before the procedure and the day of the procedure. [7] Ensure proper hydration by IV fluid as above	Monitor SrCr and BUN pre- & post-stenting. Asses patient for nausea, vomiting and skin rash following oral administration of N-acetyl cysteine.
8	22/1/2012	NSAID induced ulcer	----------	Prevent NSAID induced ulcer and bleeding	Continue on omeprazole 40 mg PO [8]	Monitor daily for S&S of UGIB including: RBC and Hct decline, dizziness, orthostatic hypotension, black tarry stool, blood in gastric residuals, hematemesis.
9	22/1/2012	thromboembolic risk	Efficacy dosage regimen issue (the duration of enoxaparin use is short	Reduce the risk of thromboembolic	Continue enoxaparin 40 mg SC daily until ambulation[9].	Monitor daily for VTE S&S: difficulty in breathing, sudden chest pain, leg pain or swelling with redness Monitor for S&S of bleeding (as above)

References:

1. American Thoracic Society, Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. Am J Respir Crit Care Med. 2005;171(4):388.
2. 2011 ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease Circulation. 2011;124:e54-e130.
3. Mount, DB. Clinical manifestations and treatment of hypokalemia. In: UpToDate, Sterns, RH; Emmett, M (Ed), 2012.
4. Zile, MR; Gaasch, MH. Treatment and prognosis of diastolic heart failure. In: UpToDate, Colucci, WS (Ed), 2012.
5. IV Insulin Infusion Protocol for Critically-Ill Adult Patients in the ICU Setting , algorithms and recommendations of the Texas Diabetes Council's Medical Professionals Advisory Subcommittee, Revised 10/25/07. Available at: http://www.dshs.state.tx.us/diabetes/. Accessed on June, 25, 2012.
6. Longstreth, GF. Approach to the adult with nausea and vomiting. In: UpToDate, Talley, NJ (Ed), 2012.
7. Rudnick,MR; Tumlin,JA. Prevention of contrast-induced nephropathy. In: UpToDate, Palevsky PM (Ed),2012
8. Lanza FL, Chan FK, Quigley EM, Practice Parameters Committee of the American College of Gastroenterology. Guidelines for prevention of NSAID-related ulcer complications. Am J Gastroenterol. 2009; 104(3):728.
9. Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines, Chest, *Chest*, 2012 141:2 suppl 7S-47S.

Questions:

1. Develop an immunization program for prevention of pneumonia in AA.

Influenza vaccine: More than 90 percent of influenza-related deaths occur among people ≥60 years of age. Older adults also experience significantly increased morbidity from the disease.

While everyone should get a flu vaccine each flu season, it's especially important that certain people get vaccinated either because they are at high risk of having serious flu-related complications or because they live with or care for people at high risk for developing flu-related complications. Risk factors in AA include:

- Age 50 years and older;
- Cardiovascular disease & diabetes mellitus);

Pneumococcal vaccine: Pneumococcal disease is a significant cause of morbidity and mortality in older adults. Many studies found the vaccine to be cost-effective in preventing pneumococcal bacteremia, the incidence of hospitalization for pneumonia and invasive infection.
The CDC recommends pneumococcal immunization once at age 65 for most adults and need for routine revaccination for patients who have received the vaccine after age 65 and to revaccinate once after age 65 if an initial vaccination was given before age 65 and five years have elapsed since the first dose .

References:

1. CDC (Centers for Disease Control and Prevention). Influenza vaccination: a summary for clinicians. Available at www.cdc.gov. Accessed on June, 25, 2012.

2. CDC (Centers for Disease Control and Prevention). Brief description of pneumococcal disease and vaccine recommendations. Symptoms, treatment, transmission, vaccine recommendations for children and adults, etc. Available at www.cdc.gov. Accessed on June, 25, 2012.

2. Suggest two antibacterial options if VRSA is an issue in this case?

Linezolid: 600 mg twice daily IV (or orally if or when the patient is able to receive oral medications).

Telavancin: 10 mg/kg IV daily.(3)

Reference:

Lowy FD. Vancomycin-intermediate and vancomycin-resistant Staphylococcus aureus infections, In: UpToDate, Baron EL (Ed), 2012.

3. What are the latest injectable antidiabetic classes for the treatment of Type 2 diabetes?

Amylin Analog

Pramlintide, a synthetic analog of amylin, is an injectable antihyperglycemic agent that modulates postprandial glucose levels and is approved for preprandial use in persons with type 1 and type 2 diabetes. It is administered in addition to insulin in those who are unable to achieve their target postprandial blood sugar levels. Pramlintide suppresses glucagon release via undetermined mechanisms, delays gastric emptying, and has central nervous system-mediated anorectic effects. It is rapidly absorbed after subcutaneous administration; levels peak within 20 minutes, and the duration of action is not more than 150 minutes. Pramlintide is renally metabolized and excreted, but even at low creatinine clearance there is no significant change in bioavailability. It has not been evaluated in dialysis patients. The most reliable absorption is from the abdomen and thigh; arm administration is less reliable.

Pramlintide should be injected immediately before eating; doses range from 15 to 60 mcg subcutaneously for individuals with type 1 diabetes and from 60 to 120 mcg subcutaneously for individuals with type 2 diabetes. Therapy with this agent should be initiated with the lowest dose and titrated upward. Because of the risk of hypoglycemia, concurrent rapid- or short-acting mealtime insulin doses should be decreased by 50% or more. Concurrent insulin secretagogue doses also may need to be decreased in persons with type 2 diabetes. Pramlintide should always be injected by itself with a separate syringe; it cannot be mixed with insulin. The major adverse effects of pramlintide are hypoglycemia and gastrointestinal symptoms, including nausea, vomiting, and anorexia.

Glucagon-Like Polypeptide-1 (GLP-1) Receptor Agonists

In type 2 diabetes, the release of glucagon-like polypeptide is diminished postprandially, which leads to inadequate glucagon suppression and excessive hepatic glucose output. Two synthetic analogs of glucagon-like polypeptide, **exenatide** and **liraglutide,** are commercially available to help restore GLP-1 activity. These therapies have multiple actions such as potentiation of glucose-mediated insulin secretion, suppression of postprandial glucagon release through as-yet unknown mechanisms, slowed gastric emptying, and a central loss of appetite. The increased insulin secretion is speculated to be due in part to an increase in beta-cell mass. The increased beta-cell mass may result from decreased beta-cell apoptosis, increased beta-cell formation, or both.

Exenatide is approved as an injectable, adjunctive therapy in persons with type 2 diabetes treated with metformin or metformin plus sulfonylureas who still have suboptimal glycemic control. and dosage adjustment is required only when the creatinine clearance is less than 30 mL/min.

Exenatide is injected subcutaneously within 60 minutes before a meal; therapy is initiated at 5 mcg twice daily, with a maximum dosage of 10 mcg twice daily. When exenatide is added to preexisting sulfonylurea therapy, the oral hypoglycemic dosage may need to be decreased

to prevent hypoglycemia. The major adverse effects are nausea (about 44% of users) and vomiting and diarrhea. The nausea decreases with ongoing exenatide usage. Exenatide mono- and combination therapy results in HbA_{1c} reductions from 0.2% to 1.2%. Weight loss in the range of 2–3 kg is reported in some users, presumably because of the nausea and anorectic effects. A serious and, in some cases, fatal adverse effect of exenatide is necrotizing and hemorrhagic pancreatitis. Antibodies to exenatide are formed with chronic use, the clinical significance of which is unclear.

Liraglutide is a long-acting synthetic GLP-1 analog with prolonged half-life that permits once-daily dosing. Liraglutide interacts with the GLP-1 receptor and acts to increase insulin and decrease glucagon release.

Liraglutide is approved for the treatment of type 2 diabetes as an injectable therapy in patients who achieve inadequate control with diet and exercise, and are receiving concurrent treatment with metformin, sulfonylureas, or Tzds. It is not recommended as a first-line therapy or for use with insulin. Treatment is initiated at 0.6 mg and is titrated in weekly increments of 0.6 mg as needed, and as tolerated, to achieve glycemic goals. Peak levels are obtained in 8–12 hours, and the elimination half-life is about 13 hours. Liraglutide therapy results in a reduction of HbA_{1c} from 0.8% to 1.5%; weight loss ranges from nominal to 3.2 kg.. Experience with liraglutide in patients with renal or hepatic impairment is limited and it should be used with caution in these populations.

Common side effects of liraglutide are headache, nausea, and diarrhea; antibody formation, urticaria, and other immune reactions also are observed Hypoglycemia can occur with concomitant sulfonylurea use and may require a dose reduction of the oral hypoglycemic agent. Pancreatitis is another serious adverse effect; liraglutide is contraindicated in individuals with a history of pancreatitis and should be permanently discontinued if pancreatitis develops. Because rodents exposed to liraglutide developed thyroid C-cell tumors, there is an FDA mandated "black box" warning that liraglutide is contraindicated in individuals with a personal or family history of medullary cancer or multiple endocrine neoplasia type 2.

Although they require injection, the GLP-1 receptor ligands have gained popularity because of the improved glucose control and associated anorexia and weight loss in some users. Safety issues, however, may deter future use.(4)

Reference:

Kennedy MSN, Pancreatic Hormones & Antidiabetic Drugs. In: Basic & Clinical Pharmacology, Katzung BG, Masters SB, Trevor AG, eds., 12e, 2011.