

LOCAL CASE

2017 ASHP CLINICAL SKILLS COMPETITION
PHARMACIST'S PATIENT DATA BASE FORM

Demographic and Administrative Information

Name: Susan K. Reynolds	Patient ID: 0000345672
Sex: Female Race: Caucasian	Room & Bed: MICU-4302
Date of Birth: 03/16/1950 (67 yo)	Physician: Benson
Height: 64 in (163 cm) Weight: 240 lb (109 kg)	Pharmacy: Walgreens
Prescription Coverage: Insurance: Blue Cross/Blue Shield Copay: \$10 generic; \$50 brand Cost per month: \$40	Religion: None
	Family's Annual Income: \$70,000

Chief Complaint: Confusion, chills, lower back pain, and unable to get out of bed for two days

History of Present Illness: SR presents to the emergency department with her husband on 8/4/2017. Her husband states that she is confused and hasn't been able to get out of bed for two days. He states SR reported chills and lower back pain earlier in the week, but that she has a history of chronic low back pain from a work-related injury. He is unsure if she checked her temperature at home. The physician is concerned for sepsis and that SR is unable to adequately protect her airway. He orders a complete blood count (CBC), comprehensive metabolic panel (CMP), urinalysis, urine culture, blood cultures, intravenous (IV) fluids, and empiric antibiotics. Her mental status continues to be poor with limited response to the medical team. The decision is made to perform rapid sequence intubation. Her blood pressure has improved, but still remains low after adequate fluid resuscitation so a norepinephrine infusion is initiated. SR is transferred to the medical intensive care unit (MICU) once stabilized in the emergency department. She is diagnosed with septic shock secondary to pyelonephritis and acute kidney injury (AKI).

Past Medical History

1. Hypertension
2. Hyperlipidemia
3. Chronic lower back pain
4. Morbid obesity
5. Tobacco abuse

Allergies/Intolerances:

Levofloxacin – hives

Outpatient Drug Therapy

Drug Name/Dose/Strength/Route	Prescribed Schedule	Duration Start–Stop Dates	Prescriber	Pharmacy
Lisinopril 20 mg PO	Daily	1/12/1995 – Present	Dr. Carter	Walgreens
Simvastatin 40 mg PO	Nightly	4/16/2000 – Present	Dr. Carter	Walgreens
Gabapentin 600 mg PO	TID	3/18/2010 – Present	Dr. Carter	Walgreens
Acetaminophen 650 mg PO	QID PRN pain	3/18/2010 – Present	Dr. Carter	OTC
Oxycodone 5 mg PO	QID PRN pain	4/20/2010 – Present	Dr. Carter	Walgreens
Polyethylene glycol 17 g PO	Daily	4/20/2010 – Present	Dr. Carter	OTC

Medication History

SR has prescriptions from her primary care physician (Dr. Carter), and there are no adherence issues to report. Per her husband's report and based on her prescription refill history, she takes acetaminophen and oxycodone approximately 1-2 times per day.

Surgical History

None

Family History

Father died of myocardial infarction at age 65

Mother still alive with history of hypothyroidism, type 2 diabetes, hypertension, and hyperlipidemia

Social History

Alcohol intake: Occasional drinker (1-2 drinks per month)

Tobacco: 47 pack year history, smokes 1 pack per day, 1st cigarette 2 hours after waking

Illicit drugs: None

Employment: Works as a secretary at an elementary school

Married for 40 years

Vaccination history

Influenza – received last dose November 2016

Tdap – received last dose 4 years ago

Varicella – history of varicella infection as a child

HZV – received last dose 7 years ago

PPSV23 – received last dose 2 years ago

Vitals

8/4/2017:

Temp: 39.1° C, BP: 75/40 mmHg (MAP 52 mmHg) → 85/50 mmHg (MAP 62 mmHg) after fluid resuscitation, HR: 120/min, RR: 12/min, SpO₂: 88% on room air

8/8/2017:

Temp: 37.2° C, BP: 121/76 mmHg (MAP 91 mmHg), HR: 99/min, RR: 12/min, SpO₂: 98% on room air

Physical Exam

8/4/2017:

General: Obese woman in moderate distress

HEENT: Conjunctiva clear; mucosal membranes appear pale and dry; no palpable lymphadenopathy

Pulmonary: Acyanotic; faint expiratory wheeze bilaterally; no rhonchi/ crackles

Cardiovascular: Negative JVD; tachycardic without murmurs/rubs/gallops

Abdomen: Left flank tenderness to palpation with guarding; normal bowel sounds

Genitourinary: WNL

Extremities: No pitting edema

Neuro: Confused, lethargic, oriented to person; cranial nerves 2-12 grossly intact; strength 4/5 x 4

Tests

8/4/2017:

Chest X-ray: Endotracheal tube tip is appropriately positioned above the carina. Cardiomedial silhouette within normal limits. No overt pulmonary edema or focal consolidations.

EKG: Sinus rhythm

8/8/2017:

Upper and lower extremity ultrasounds: negative for thrombosis

Labs

	8/8/2017	8/4/2017	2/10/2017
CBC			
WBC (million/mm ³)	11.3	18.1	
Hgb (g/dL)	10.1	10.2	
Hct (%)	31.3	31.2	
Plt (K/mm ³)	88	240	
Metabolic Panel			
Na (mEq/L)	138	139	
K (mEq/L)	4.0	4.9	
Cl (mEq/L)	105	104	
CO ₂ (mEq/L)	25	20	
BUN (mg/dL)	40	80	12
SCr (mg/dL)	2.6	3.4	0.83
Glucose (mg/dL)	116	95	
Calcium (mg/dL)	8.6	8.5	
Phosphorus (mg/dL)	3.7	5.3	
Magnesium (mEq/L)	1.9	2.1	
Albumin (g/dL)	3.3	3.4	
AST (IU/L)	18	14	
ALT (IU/L)	24	22	
Total bili (mg/dL)	1.0	1.0	
Urinalysis			
Specific Gravity		1.023	
Color		Dark yellow	
Clarity		Hazy	
Leukocyte Esterase		Positive	
Nitrite		Positive	
Protein		Trace	
Glucose		Negative	
Ketone		Negative	
Blood		Small	
WBC		> 182	
WBC Casts		Present	
RBC		12	
Squam Epithel		< 1	
Bacteria		Many	
Mucus		Rare	
Other			
Lactate (mmol/L)	1.1	3.5	
aPTT (seconds)	26	26	
PT (seconds)	11.4	11.1	
INR	1.04	1.01	
HIT PF4 Antibody Assay	2.215		
HIT PF4 Antibody Interpretation	Positive		
Serotonin Release Assay	Positive		
Cholesterol, Total			180
Triglycerides			110
HDL-C			56
LDL-C			98
Non-HDL-C			124

Culture Results

Date	Specimen	Result	Susceptibilities
8/4/2017	Blood culture # 1	Stain: Gram negative bacilli Culture: <i>Escherichia coli</i>	Amikacin – Susceptible Ampicillin – Resistant Cefazolin – Resistant Ceftriaxone – Susceptible Cefepime – Susceptible Gentamicin – Susceptible Levofloxacin – Susceptible Piperacillin + Tazobactam – Susceptible Tobramycin – Susceptible
	Blood culture # 2	Stain: Gram negative bacilli Culture: <i>Escherichia coli</i>	See above isolate
	Urine culture	> 100,000 CFU/mL <i>Escherichia coli</i>	Ampicillin – Resistant Cefazolin – Resistant Ceftriaxone – Susceptible Cefepime – Susceptible Ciprofloxacin – Susceptible Levofloxacin – Susceptible Nitrofurantoin – Susceptible Piperacillin + Tazobactam – Susceptible Tobramycin – Susceptible TMP-SMX – Susceptible
8/6/2017	Blood culture # 1	No growth at 48hrs	
	Blood culture # 2	No growth at 48hrs	

Current Drug Therapy

Name/Dose/Strength/Route	Schedule	Administration Dates	Indication
Piperacillin/tazobactam 2.25 g IV	Every 6 hours	8/4/2017 – Present	Pyelonephritis
Heparin 7500 units subcutaneous	Every 8 hours	8/4/2017 – Present	VTE prophylaxis
Chlorhexidine 5 mL PO	Every 12 hours	8/4/2017 – Present	Ventilator-associated pneumonia prophylaxis
Famotidine 20 mg PO	Every 24 hours	8/4/2017 – Present	Stress ulcer prophylaxis
Simvastatin 40 mg PO	Nightly	8/4/2017 – Present	Hyperlipidemia
Gabapentin 600 mg PO	Every 8 hours	8/4/2017 – Present	Chronic low back pain
Norepinephrine 8 mg/250 mL NS infusion	0-30 mcg/min Start at 2 mcg/min and increase by 2 mcg/min every 10 minutes to maintain MAP > 65 mmHg (Current rate 0 mcg/min – off for 48 hrs)	8/4/2017 – Present	Hypotension/septic shock
Normal saline 3 L IV	Once	8/4/2017	Hypotension/septic shock
Heparin flush 500 units/mL IV	Daily PRN for central line care	8/5/2017 – Present	Central line care
Hydromorphone 0.5 mg IV	Every 4 hours PRN severe pain	8/4/2017 – 8/8/2017	Sedation/Pain control
Oxycodone 5 mg PO	Every 6 hours PRN severe pain (Receiving 1-2 dose per day)	8/8/2017 – Present	Pain control
Acetaminophen 650 mg PO	Every 6 hours PRN mild/moderate pain and fever > 38.3° C (Receiving 3 doses per day for mild/moderate pain)	8/4/2017 – Present	Antipyretic/pain control
Polyethylene glycol 17 g PO	Every 24 hours	8/4/2017 – Present	Constipation

Patient Narrative

Culture results and sensitivities finalize, SR's septic shock has resolved, and she is extubated on day 4 of admission. She remains a little drowsy, but passed a swallow evaluation and is tolerating a renal restricted diet well. On day 5 of admission, her AKI is resolving. The medical team recognizes a developing thrombocytopenia and is concerned for possible heparin-induced thrombocytopenia (HIT). The medical team calculates a 4Ts score of 5 and orders both the HIT PF4 antibody test and serotonin release assay, which both later come back positive.

The medical team then asks you, as the MICU clinical pharmacist, for further management recommendations and any additional recommendations you have for this patient's care.

Problem Identification and Prioritization with Pharmacist's Care Plan

- A. List all health care problems that need to be addressed in this patient using the table below.
- B. Prioritize the problems by indicating the appropriate number in the "Priority" column below:
- 1 = Most urgent problem (Note: There can only be one most urgent problem)
 - 2 = Other problems that must be addressed immediately or during this clinical encounter; **OR**
 - 3 = Problems that can be addressed later (e.g. a week or more later)

**Please note, there should be only a "1", "2", or "3" listed in the priority column, and the number "1" should only be used once.*

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
Heparin-Induced Thrombocytopenia (HIT)	1	- Reduce morbidity and mortality by discontinuing all heparin products and starting alternative anticoagulant - Prevent formation of thrombosis - Prevent re-exposure to heparin-containing products in the future	- Discontinue heparin 7500 units subcutaneously every 8 hours and heparin flushes - Initiate argatroban for the acute management of HIT - Argatroban 2 mcg/kg/min IV continuous using actual body weight (218 mcg/min IV continuous), titrated to aPTT of 1.5-3.0 times baseline aPTT (39-78 seconds) - Alternative dosing regimen for multiple organ system failure (MODS), liver failure, heart failure, severe anasarca, or post cardiac surgery: argatroban 0.5-1.2 mcg/kg/min IV continuous (54.5-130.8 mcg/min IV continuous) – not required for this patient given only significant organ failure is AKI - Inappropriate treatment options: - Fondaparinux – contraindicated when CrCl < 30 mL/min - Bivalirudin – only FDA-approved for use in HIT patients undergoing PCI. Some supporting evidence from case series for use in HIT patients with both renal and hepatic dysfunction - NOACs – not FDA-approved for the treatment of HIT - Avoid providing platelet transfusions unless required for invasive procedure due to possible increased risk for thrombosis with administration - Initiate warfarin therapy once platelets are $\geq 150 \times 10^9/L$ and transition off argatroban infusion - Start warfarin 5 mg PO daily - Continue warfarin and argatroban together for at least 5 days and until combined argatroban and warfarin INR > 4 (BONUS) Because argatroban increases the INR, the	Efficacy - aPTT every 4-6 hours and titrate infusion to maintain aPTT 1.5-3.0 times baseline (39-78 seconds) - Daily CBC to monitor platelets - Daily INR once warfarin therapy is initiated Safety - Daily CBC to monitor Hgb and for signs of bleeding - Signs of hypersensitivity and other adverse effects

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
			following process must be used to assess the true INR while on argatroban and warfarin therapy together: ▪ If argatroban infusion rate is ≤ 2 mcg/kg/min: 1. When combined INR > 4, stop argatroban infusion 2. Repeat INR 4-6 hours after stopping argatroban infusion 3. If repeat INR < 2, restart argatroban infusion and increase warfarin dose appropriately 4. If repeat INR between 2-3, discontinue argatroban and continue warfarin only 5. If INR > 3, discontinue argatroban infusion and reduce warfarin dose appropriately ▪ If argatroban infusion rate is > 2 mcg/kg/min: 1. Reduce argatroban infusion rate to 2 mcg/kg/min 2. Check combined INR 4-6 hours after infusion rate reduction 3. Follow steps 1-5 listed above • Continue warfarin therapy for 4 weeks after diagnosis of HIT without thrombosis • Add a heparin allergy to the patient's medical record with reaction listed as "heparin-induced thrombocytopenia" • Provide patient education prior to discharge to minimize risk for heparin exposure in the future	
Treatment of pyelonephritis and bacteremia	2	• Eradicate bacteremia and pyelonephritis • Practice good antimicrobial stewardship and de-escalate antibiotics	• De-escalate antibiotic therapy by changing piperacillin/tazobactam IV to one of the following appropriate regimens: ○ Ceftriaxone 1-2 g IV every 24 hours for 7 days from 1st negative blood culture (8/12/2017) ○ Cefdinir 300 mg PO daily for 10-14 days from 1st negative blood culture (8/15/2017-8/19/2017) • Inappropriate treatment options: ○ All fluoroquinolones given history of hives to levofloxacin ○ Nitrofurantoin given poor penetration into renal parenchyma and bacteremia ○ TMP-SMX given patient's AKI ○ Ampicillin/amoxicillin and cefazolin/cephalexin given resistance to these agents ○ All aminoglycosides given patient's AKI and more	Efficacy • Daily CBC to monitor WBC • Resolution of signs of infection – fevers, tachycardia, hypotension, chills, and flank pain • Ensure blood cultures remain negative Safety • Signs of hypersensitivity (e.g. itching, rash, shortness of breath, hives) and other adverse effects (e.g. diarrhea,

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
			narrow agents available o Cefepime given more narrow agents available	nausea/vomiting, increased serum transaminases) • Signs of <i>Clostridium difficile</i> infection
Acute kidney injury	2	• Prevent adverse effects of medications • Manage metabolic derangements	• The patients estimated CrCl using the Cockcroft-Gault equation with 40% adjustment for obesity is 25 mL/min. Renally adjust the following medications for CrCl < 30 mL/min: o Change gabapentin 600 mg PO TID to 600 mg PO once daily (maximum daily dose = 200-700 mg once daily for CrCl 15-29 mL/min) • Continue to hold home lisinopril in the setting of AKI	Safety • Monitor SCr, K, Mg, and phosphate daily • Gabapentin: CNS depression • Monitor BP while off lisinopril
Drug therapy without indication	2	• Avoid unnecessary medication therapy	• Discontinue chlorhexidine oral swabs now that patient is no longer mechanically ventilated • Discontinue famotidine now that patient no longer has an indication for stress ulcer prophylaxis • Discontinue norepinephrine infusion now that patient has been off the infusion for 48 hours	
Hypertension	2	• Maintain normal blood pressure	• Continue to hold home lisinopril given AKI and normal blood pressure	Efficacy • Monitor blood pressure and MAP Safety • Lisinopril: hyperkalemia, increased SCr, hypotension
Tobacco cessation	2	• Prevent symptoms of nicotine withdrawal • Encourage tobacco cessation	• Given patient smokes 1 pack per day and her 1 st cigarette is within 2 hours of waking, provide one of the following tobacco cessation products while hospitalized: o Nicotine 2 mg gum, chew 1 piece every 1-2 hours PRN cravings (maximum 24 pieces/ day) o Nicotine 2 mg lozenge, 1 lozenge every 1-2 hours PRN cravings (maximum 20 lozenges/day) o Nicotine patch 21 mcg/day (patient smokes > 10 cigarettes/day) o Nicotine 10 mg inhaler cartridge, 1 cartridge every 1-2 hours PRN cravings (maximum 16 cartridges/day) • Provide tobacco cessation counseling prior to discharge	Efficacy • Signs and symptoms of nicotine withdrawal Safety • Nicotine: tachycardia, increased BP, insomnia, application site reactions from patch

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
Chronic low back pain	3	Maintain adequate pain control	Continue oxycodone and acetaminophen at the current doses, adjust gabapentin dosing (as above), and re-evaluate chronic pain management with PCP for appropriateness and optimization of therapy	Efficacy - Monitor pain daily using numerical rating scale (NRS) Safety - Monitor for respiratory depression, sedation, and constipation with opioid use - Monitor APAP use and do not exceed > 4 g/day
Vaccinations	3	Prevent pneumococcal infections	- Provide PCV13 vaccination prior to discharge - Vaccination criteria met: age > 65 and > 1 year since PPSV23 vaccination	Efficacy - Minimize future pneumococcal infections Safety - Hypersensitivity reactions and injection site pain
Morbid obesity	3	Encourage healthy lifestyle modifications related to exercise and eating	Provide counseling regarding diet and exercise interventions prior to discharge. Can recommend that the pharmacist, provider, or dietician provides this education.	Monitor weight, exercise, and diet
Hyperlipidemia	3	Maintain optimal lipid panel to reduce risk for heart disease and stroke	Continue simvastatin and follow up with PCP for future management of hyperlipidemia	Safety: - Monitor liver function - Monitor for potential drug and food interactions