

2018
ASHP Clinical Skills CompetitionSM
LOCAL COMPETITION CASE

Directions to Clinical Skills Competition Participants

Identify the patient's acute and chronic medical and drug therapy problems. Recommend interventions to address the drug therapy problems using the forms supplied (Pharmacist's Patient Data Base, and Pharmacist's Care Plan).

IMPORTANT NOTE: Only the Pharmacist's Care Plan will be used for evaluation purpose.

LOCAL CASE

2018 ASHP CLINICAL SKILLS COMPETITION
PHARMACIST'S PATIENT DATA BASE FORM

Demographic and Administrative Information

Name: Samuel B. Osborne	Patient ID: 000033192
Sex: Male Race: Caucasian	Room & Bed: 4 East - 403
Date of Birth: 03/03/02 (16 yo)	Physician: Chaffee
Height: 62 in (157 cm) Weight: 125 lb (56 kg)	Pharmacy: Chandler Retail and Specialty
Prescription Coverage: Insurance: Blue Cross/Blue Shield Copay: \$10 generic; \$50 brand Cost per month: \$40	Religion: Methodist
	Family's Annual Income: \$73,500

Chief Complaint: Cough, fever, increased sputum production and change in color for seven days

History of Present Illness: SBO presents to the pediatric pulmonary clinic with his mother and sister on 8/2/2018. He states that he has not felt well for the past couple of days. His mother clarifies that he has been coughing more frequently and has had increased sputum production during chest physiotherapy. She describes his sputum, which is usually clear or slightly cloudy, but now is a light yellow-green. She also states he is supposed to be doing chest physiotherapy twice daily, but sometimes he misses his evening session due to baseball practice or games. He and his mother are unsure if he was supposed to change the frequency of his treatments with albuterol, hypertonic saline, and dornase alfa in the past week. Upon further questioning, SBO's appetite has decreased and he is noted to have lost 7 kg with today's weight check compared to his previous baseline. He has also been having greasy bowel movements that leave orange rings in the toilet bowl. The physician is concerned for acute pulmonary exacerbation of SBO's cystic fibrosis necessitating inpatient admission and treatment. He orders a complete blood count (CBC), comprehensive metabolic panel (CMP) with Mg and Phos, urinalysis, lactate, CRP, liver function tests, urine/blood/sputum cultures, intravenous (IV) fluids, and respiratory therapies.

Past Medical History

1. Cystic fibrosis (F508del, P67L)
2. Asthma
3. Pancreatic insufficiency
4. Seasonal allergies
5. Constipation

Allergies/Intolerances:

Vancomycin – severe red man syndrome

Surgical History

Tonsillectomy with adenoidectomy, December 2012

Family History

Father unknown

Mother alive with history of asthma, type 2 diabetes

Half-sister alive known carrier of cystic fibrosis (F508del)

Social History

Alcohol: no reported use

Tobacco: no reported use

Illicit drugs: has used marijuana occasionally

Employment: full-time high-school student, 11th grade

Relationship status: committed relationship with girlfriend of 1 year, not sexually active

Outpatient Drug Therapy				
Drug Name/Dose/Strength	Prescribed Route/Schedule	Duration Start–Stop Dates	Prescriber	Pharmacy
Albuterol sulfate 2.5 mg/3 mL neb solution	Inh BID, may increase to QID during acute illness	9/2002 - present	Dr. Chaffee	Chandler Retail
Albuterol (Ventolin®) 108 mcg inh solution	Inh 2-4 puffs BID; 4-6 hours PRN shortness of air	4/2004 - present	Dr. Chaffee	Chandler Retail
Azithromycin 500 mg tablet	1 tab PO Mon, Wed, Fri	2/2012 - present	Dr. Chaffee	Chandler Retail
Aztreonam (Cayston®) 75 mg inh solution	Inh 75 mg TID for 28 days on/off cycles	8/2011 - present	Dr. Chaffee	Chandler Specialty
Cetirizine 10 mg tablet	1 tab PO daily	5/2014 - present	Dr. Chaffee	OTC
DEKAs™ Plus capsule	2 caps PO daily	2/2012 - present	Dr. Chaffee	Chandler Retail
Dornase alfa 1 mg/mL inh solution	Inh 1 vial daily, may increase to BID during acute illness	4/2004 - 7/2018	Dr. Chaffee	Chandler Specialty
Dronabinol 2.5 mg capsule	1 cap PO BID	12/2017 - present	Dr. Chaffee	Chandler Retail
Ferrous sulfate 325 mg tablet	1 tab PO BID	9/2016 - present	Dr. Chaffee	OTC
Fluticasone propionate 50 mcg nasal suspension	2 sprays in each nostril BID	5/2014 - present	Dr. Chaffee	Chandler Retail
Lactobacillus acidophilus chewable tablet	1 tab PO TID	8/2015 - present	Dr. Chaffee	Chandler Retail
Melatonin 3 mg tablet	1-2 tab PO QHS	4/2015 - present	Dr. Chaffee	OTC
Minocycline 100 mg capsule	1 cap PO BID for 28 days on/off cycles	8/2015 - present	Dr. Chaffee	Chandler Retail
Mometasone/formoterol 200-5 mcg inh solution	Inh 2 puffs BID	12/2017 - present	Dr. Chaffee	Chandler Retail
Montelukast 10 mg tablet	1 tab PO daily	12/2017 - present	Dr. Chaffee	OTC
Omeprazole 20 mg DR tablet	1 cap PO BID	9/2016 - present	Dr. Chaffee	Chandler Retail
Pancrealipase (Pertzye™) 24,000 units DR capsule	4-5 caps PO with meals and snacks	3/2016 - present	Dr. Chaffee	Chandler Specialty
Polyethylene glycol 3350 powder	1 capful in 8 oz of water PO 1-2 times daily PRN constipation	2/2012 - present	Dr. Chaffee	OTC
Sodium chloride 3% inh solution	Inh 1 vial BID	10/2007 - present	Dr. Chaffee	Chandler Retail
Sulfamethoxazole-trimethoprim 800-160 mg tablet	1 tab PO BID for 30 days on/off cycles	4/2015 - present	Dr. Chaffee	Chandler Retail
Tobramycin (Tobi Podhaler™) 28 mg capsule	Inh 4 caps (112 mg) Q12 hours for 28 days on/off cycles	5/2014 - present	Dr. Chaffee	Chandler Specialty
Vitamin D 50,000 units capsule	1 cap PO twice weekly	12/2017 - present	Dr. Chaffee	Chandler Retail

Medication History: SBO has adequate refills of prescriptions for Chandler Retail and Chandler Specialty medications but the prior authorization for his dornase alfa expired last month. He sometimes misses his evening inhaled treatments if he is at baseball practice or a game and does not do his evening chest physiotherapy. He also requires constant reminders by his parents to ensure he is taking all of his prescribed medications.

Vaccination Status

Completed early childhood immunization series (HepB, Rotavirus, DTaP, Hib, PCV13, IPV, MMR, Varicella)

Tdap – at age 12

Meningococcal (A/C/W/Y and B) – two doses series of each at age 12

Hepatitis A – two doses at age 12

Influenza – received last dose October 2017

Vitals

8/2/2018:

Temp: 37.1° C, BP: 110/68 mmHg, HR: 96/min, RR: 28/min, SpO₂: 94% on room air

Physical Exam

8/2/2018:

General: No acute distress. Alert and oriented.

Skin: Warm and dry without any rashes or other lesions. Capillary refill is less than 2 seconds.

HEENT: Head is normocephalic and atraumatic. PERRL. EOMI. No significant lymphadenopathy is present.

Cardiovascular: Regular rhythm without murmurs/rubs/gallops. Denies chest pain.

Pulmonary: Diffuse crackles bilaterally. No wheezes. No rhonchi.

Abdomen: Soft, non-tender, non-distended, with positive bowel sounds. Significant guarding during exam. Occasional nausea, no vomiting/diarrhea.

Genitourinary: WNL. Denies dysuria.

Extremities: No clubbing, cyanosis, or edema. No obvious deformity or bony tenderness.

Neuro: Cranial nerves II-XII are grossly intact. Normal strength and sensation in the upper/lower extremities bilaterally.

Heme: Denies abnormal bleeding/bruising.

Tests

8/2/2018:

Chest X-ray: Bilateral multifocal peribronchial airspace disease. Stable lung volume loss within the right apex. No pleural effusions. No pneumothorax or pneumomediastinum.

EKG: Normal sinus rhythm

Labs

	8/2/2018
CBC	
WBC (million/mm ³)	17.5
Hgb (g/dL)	12.5
Hct (%)	38.5
Plt (K/mm ³)	329
Other	
Lactate (mmol/L)	1.5
C-Reactive Protein (mg/dL)	17.0
FVC (L)	1.97
FEV ₁ (L)	1.03
FEV ₁ % predicted	34
FEV ₁ /FEV (%)	52

	8/2/2018
Metabolic Panel	
Na (mEq/L)	137
K (mEq/L)	3.8
Cl (mEq/L)	96
CO ₂ (mEq/L)	31
BUN (mg/dL)	10
SCr (mg/dL)	0.37
Glucose (mg/dL)	257
Calcium (mg/dL)	8.6
Phosphorus (mg/dL)	4.6
Magnesium (mEq/L)	1.7
Albumin (g/dL)	2.2
AST (IU/L)	11
ALT (IU/L)	7
Total bili (mg/dL)	0.3

	8/2/2018
Urinalysis	
Specific Gravity	1.015
Color	Light yellow
Clarity	Cloudy
Leukocyte Esterase	Negative
Nitrite	Negative
Protein	Trace
Glucose	Trace
Ketone	Negative
Blood	Trace
WBC Casts	0-2
pH	6.0
Bilirubin	Negative
Cultures	NGTD

Culture Results

Date	Specimen	Result	Susceptibilities
2/2018	Respiratory culture	Stain: Gram positive cocci Culture: <i>Staphylococcus aureus</i>	Clindamycin – Resistant Levofloxacin – Resistant Linezolid – Susceptible Minocycline – Susceptible Oxacillin – Resistant Tetracycline – Susceptible Trimethoprim/sulfamethoxazole – Susceptible Vancomycin – Susceptible Ceftaroline – Susceptible
	Respiratory culture	Stain: Gram negative bacilli Culture: <i>Pseudomonas aeruginosa (mucoïd)</i>	Biotype 1 Amikacin – Resistant Aztreonam – Susceptible Meropenem – Susceptible Cefepime – Susceptible Ceftazidime – Susceptible Tobramycin – Susceptible Levofloxacin – Intermediate Ceftolozane/tazobactam – Susceptible (test not FDA approved, for research only) Biotype 2 Amikacin – Susceptible Aztreonam – Susceptible Meropenem – Susceptible Cefepime – Intermediate Ceftazidime – Susceptible Tobramycin – Resistant Levofloxacin – Intermediate Ceftolozane/tazobactam – Susceptible (test not FDA approved, for research only)
3/2018	Respiratory culture	Stain: Gram positive cocci Culture: <i>Staphylococcus aureus</i>	Clindamycin – Resistant Levofloxacin – Resistant Linezolid – Susceptible Minocycline – Susceptible Oxacillin – Resistant Tetracycline – Susceptible Trimethoprim/sulfamethoxazole – Susceptible Vancomycin – Susceptible
	Respiratory culture	Stain: Gram negative bacilli Culture: <i>Pseudomonas aeruginosa (mucoïd)</i>	Amikacin – Resistant Aztreonam – Susceptible Meropenem – Susceptible Cefepime – Intermediate Ceftazidime – Susceptible Piperacillin/tazobactam – Resistant Tobramycin – Susceptible Levofloxacin – Resistant Ceftolozane/tazobactam – Susceptible (test not FDA approved, for research only)

6/2018	Respiratory culture	Stain: Gram positive cocci Culture: <i>Staphylococcus aureus</i>	Clindamycin – Resistant Levofloxacin – Resistant Linezolid – Susceptible Minocycline – Susceptible Oxacillin – Resistant Tetracycline – Intermediate Trimethoprim/sulfamethoxazole – Susceptible Vancomycin – Susceptible
	Respiratory culture	Stain: Gram negative bacilli Culture: <i>Pseudomonas aeruginosa (muroid)</i>	Amikacin – Resistant Aztreonam – Susceptible Meropenem – Resistant Cefepime – Resistant Ceftazidime – Susceptible Piperacillin/tazobactam – Susceptible Tobramycin – Susceptible Levofloxacin – Resistant Trimethoprim/sulfamethoxazole – Resistant
7/2018	Respiratory culture	Stain: Gram negative bacilli Culture: <i>Pseudomonas aeruginosa (muroid)</i>	Biotype 1 Amikacin – Resistant Aztreonam – Susceptible Meropenem – Resistant Cefepime – Resistant Ceftazidime – Susceptible Tobramycin – Susceptible Levofloxacin – Resistant Biotype 2 Amikacin – Intermediate Aztreonam – Susceptible Meropenem – Susceptible Cefepime – Intermediate Ceftazidime – Susceptible Tobramycin – Susceptible Levofloxacin – Susceptible
8/2018	Respiratory culture	Stain: Gram positive cocci Culture: <i>pending</i>	<i>Pending</i>
	Respiratory culture	Stain: Gram negative bacilli Culture: <i>pending</i>	<i>Pending</i>

Current Drug Therapy

Drug Name/Dose/Strength	Prescribed Route/Schedule	Administration Dates	Indication
Oxycodone 5 mg	Every 6 hours PO PRN severe pain	8/2/2018 – present	Pain control
Vitamin D 50,000 units capsule	1 cap PO twice weekly	8/2/2018 – present	Supplement
Polyethylene glycol 3350 powder	1 capful in 8 oz of water PO 1-2 times daily PRN constipation	8/2/2018 – present	Constipation
DEKAs™ Plus capsule	2 caps PO daily	8/2/2018 – present	Supplement
Ferrous sulfate 325 mg tablet	1 tab PO BID	8/2/2018 – present	Supplement
Lactobacillus acidophilus chewable tablet	1 tab PO TID	8/2/2018 – present	Maintenance of commensal flora
Melatonin 3 mg tablet	1 tab PO QHS	8/2/2018 – present	Insomnia

Dronabinol 2.5 mg capsule	1 cap PO BID	8/2/2018 – present	Appetite stimulant
Montelukast 10 mg tablet	1 tab PO daily	8/2/2018 – present	Asthma
Omeprazole 20 mg DR tablet	1 cap PO BID	8/2/2018 – present	Enzyme adjunct
Cetirizine 10 mg tablet	1 tab PO daily	8/2/2018 – present	Seasonal allergies
Acetaminophen 650 mg tablet	1-2 tab PO Q4h PRN mild/moderate pain and fever > 38.3° C	8/2/2018 – present	Pain management/ antipyretic
Pancrealipase (Pertzye™) 24,000 units DR capsule	4-5 caps PO with meals and snacks	8/2/2018 – present	Pancreatic insufficiency
Fluticasone propionate 50 mcg nasal suspension	2 sprays in each nostril BID	8/2/2018 – present	Seasonal allergies
Mometasone/formoterol 200-5 mcg inh solution	Inh 2 puffs BID	8/2/2018 – present	Asthma
Dornase alfa 1 mg/mL inh solution	Inh 1 vial BID	8/2/2018 – present	CF acute pulmonary exacerbation
Sodium chloride 3% inh solution	Inh 1 vial BID	8/2/2018 – present	CF acute pulmonary exacerbation
Albuterol sulfate 2.5 mg/3 mL neb solution	Inh 1 neb QID	8/2/2018 – present	CF acute pulmonary exacerbation
0.9% NaCl 1000 mL	80 mL/hour	8/2/2018 – present	Maintenance fluids
Chest physiotherapy with vest	QID treatments	8/2/2018 – present	CF acute pulmonary exacerbation

Patient Narrative

Culture results and sensitivities from this admission are pending, SBO has been admitted to the general pediatric unit under the care of the pediatric pulmonary team on day 1 of admission. He continues to have progressively worsening shortness of breath and increased thickened/darkened sputum production. According to his mother he has had four courses of outpatient antibiotics and three inpatient admissions in the previous 12 months. His most recent admission was approximately 3 weeks ago; she says at that time he was given vancomycin and he had a very difficult time tolerating the medication even with acetaminophen and diphenhydramine as pre-medications and requests that this medication is avoided during his current admission.

The medical team recognizes his decompensating pulmonary status and is concerned for possible infection. The Pediatric Pulmonary Attending Physician asks you, as the Pediatric Pulmonary Clinical Pharmacist Specialist, for recommendations concerning this acute episode and any additional recommendations you have for this patient's care.

Pharmacist's Care Plan

Using the patient's data, you will be able to develop an effective care plan for your patient. Clearly define the health care problems. Health care problems include treatment of all acute and chronic medical problems, resolution of all actual or potential drug-related problems, and identification of any other health care services from which your patient may benefit.

Remember to think about potential medical problems for which your patient may be at risk and disease prevention and disease screening activities that may be appropriate to recommend. Also, don't forget to consider specific patient factors that may influence your goals and recommendations for therapy (e.g., physical, psychological, spiritual, social, economic, cultural, and environmental).

To complete your care plan, specify all of your patient's health care problems that need to be addressed. Then prioritize the problems into one of three categories: (1) 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/at discharge or next follow up visit). Please note that only **one** problem should be identified as the "most urgent problem."

Then **for each problem** describe the (1) therapeutic goals, (2) recommendations for therapy, and (3) monitoring parameters and endpoints. Your monitoring parameters should include the frequency of follow-up and endpoints should be measurable by clinical, laboratory, quality of life, and/or other defined parameters (e.g., target HDL is greater than 50 mg/dL within 6 months).

Evaluated for competition

ASHP Clinical Skills Competition - Pharmacist's Care Plan

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/at discharge or next follow up visit)

**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

Evaluated for competition

ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

Evaluated for
competition

ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

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ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

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ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

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ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

Evaluated for
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ASHP Clinical Skills Competition - Pharmacist's Care Plan

Problem Identification and Prioritization with Pharmacist's Care Plan

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints

2018

ASHP Clinical Skills CompetitionSM

LOCAL CASE ANSWER KEY

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
Cystic fibrosis acute pulmonary exacerbation	1	<ul style="list-style-type: none"> Reduce morbidity and mortality by treating acute pulmonary infection Restore baseline pre-admission lung function Prevent the progressive loss of lung function 	<ul style="list-style-type: none"> Recommend initiation of intravenous antibiotic therapy <ul style="list-style-type: none"> One agent should be selected for <i>Staphylococcus aureus</i> (MRSA) coverage <ul style="list-style-type: none"> Linezolid 600 mg (~10 mg/kg/dose) IV Q8h Two agents should be selected for <i>Pseudomonas aeruginosa</i> (PsA) coverage <ul style="list-style-type: none"> Tobramycin 560-670 mg (10-12 mg/kg) IV Q24h over 30 minutes Ceftazidime 2 gram IV Q8h (150-200 mg/kg/day divided [max 6 grams] although up to 400 mg/kg/day [max 12 grams] has been used) administer over minimum of 30 minutes <ul style="list-style-type: none"> (BONUS) Extended infusion time could be recommended for maximum time over MIC Hold or continue inhaled tobramycin <ul style="list-style-type: none"> Use of inhaled antibiotics during acute pulmonary exacerbation is usually physician-specific as it is not required with the use of systemic therapy but could be continued for action at the site of infection Minimum duration of therapy 7-10 days, may require prolonged course of therapy dependent upon clinical improvement Ensure respiratory treatments are optimized <ul style="list-style-type: none"> Increased chest physiotherapy to four times daily Increased albuterol frequency to four times daily Increase dornase alfa frequency to twice daily Recommend increasing patient's inpatient and maintenance dose of hypertonic saline to 7% twice daily, could also recommend QID during inpatient admission 	<p>Efficacy</p> <ul style="list-style-type: none"> Tobramycin two level monitoring on 3rd day of therapy: 2 hours and 8-10 hours after the start of the infusion to calculate elimination rate and extrapolate Cmax (25-35 mcg/mL) and Cmin (<1 mcg/mL) with time undetectable of less than 6 hours; after dose initiation and adjustment then once per week Improvement in markers of infection at minimum 1-2 times per week/prior to discharge: decreased WBC, decreased CRP, afebrile, decreased sputum production, increased weight, increased lung function parameters Follow-up culture results for adjustment

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
			<ul style="list-style-type: none"> • Corticosteroid treatment could be recommended <ul style="list-style-type: none"> ○ Methylprednisolone 40-60 mg/day divided once or twice daily for 3-10 days or equivalent • Inappropriate treatment options: <ul style="list-style-type: none"> ▪ Azithromycin, aztreonam (Cayston), minocycline, and sulfamethoxazole/trimethoprim as these agents are utilized for maintenance treatment of immunomodulation and/or infection suppression they would not be appropriate to continue on admission while receiving intravenous antibiotic treatment ▪ Amikacin, cefepime, levofloxacin, meropenem, oxacillin, piperacillin/tazobactam, and tetracycline given recent resistance to these agents ▪ Vancomycin based on severe Redman’s syndrome and preference expressed by the patient’s mother ▪ Ibuprofen, although previously recommended for cystic fibrosis anti-inflammatory properties, due to the high doses required and necessary therapeutic drug monitoring this medication has become largely obsolete for this indication • Continuation of probiotic for promotion of commensal bacterial flora while on prolonged antibiotic therapy • Restart suppressive therapy for <i>MRSA</i> and <i>PsA</i> after inpatient treatment • Restart immunomodulatory azithromycin after inpatient treatment 	<p>of antibiotic therapy as needed</p> <ul style="list-style-type: none"> • Improved ease of breathing and improvement in cough/sputum production daily <p>Safety</p> <ul style="list-style-type: none"> • Urine output and renal function parameters (SCr, BUN) at minimum 2-3 times per week • WBC at minimum once per week • CBC and platelet count at minimum once per week with linezolid therapy, also evaluating any new medication orders for serotonergic drug-drug interactions • Evaluating daily for tolerance and bronchospasm with increased dose of hypertonic saline • With corticosteroid use: blood pressure and glucose daily with acute use
Pulmonary therapies (Asthma/Allergies)	2	<ul style="list-style-type: none"> • Restore baseline pre-admission lung function • Prevent the progressive loss of lung function 	<ul style="list-style-type: none"> • Continuation of asthma medications (montelukast and mometasone/formoterol) <ul style="list-style-type: none"> ○ Could hold inhaled corticosteroid if administering systemic therapy • Continuation of seasonal allergy medications (cetirizine and fluticasone) 	<p>Efficacy</p> <ul style="list-style-type: none"> • Improved ease of breathing and decreased congestion daily

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
				<ul style="list-style-type: none"> • Proper inhaler and nasal spray techniques demonstrated during admission <p>Safety</p> <ul style="list-style-type: none"> • With beta agonist use, tachycardia daily • With histamine blocker, over sedation daily • With nasal spray, nasal irritation daily
Medication without indication	2	<ul style="list-style-type: none"> • Prevent unnecessary medication use • Avoid opioid agents and addiction without a proper indication 	<ul style="list-style-type: none"> • Discontinue oxycodone every 6 hours PRN severe pain as patient does not currently have any pain on exam and has a history of illicit drug use • Evaluate daily need to reinstitute pain control therapy if patient experiencing pain on examination, recommend non-opioids as first line and/or adjunct options 	<p>Efficacy</p> <ul style="list-style-type: none"> • Pain scores every 6-8 hours during acute illness
Weight loss, pancreatic insufficiency, and/or nutritional status	2	<ul style="list-style-type: none"> • Regain lost weight due to acute pulmonary exacerbation • Increase fat absorption promoting good nutritional status • Maintain adequate levels of fat soluble vitamins 	<ul style="list-style-type: none"> • Initiate maintenance fluids with normal saline during acute illness to ensure adequate hydration, avoiding dextrose-containing fluids initially due to presentation with hyperglycemia • Pertzye™ recommended dose 500-2500 units/kg/meal with current dose 1720-2150 units/kg/meal therefore would increase dose to 5-6 capsules PO with meals and snacks • Continuation of DEKAs multivitamin, ferrous sulfate, and vitamin D supplements • Continuation of omeprazole for enzyme boosting effect and polyethylene glycol for constipation as needed • Continuation of dronabinol for appetite stimulation 	<p>Efficacy</p> <ul style="list-style-type: none"> • Weight gain by discharge • Nutritional intake, hydration status, oral intake daily • Decreased steatorrhea daily • Abdominal symptoms (nausea/vomiting) daily • Monitor and assess serum levels of vitamins A, 25-OH-vitamin D, and E; PT/INR (for vitamin K) once prior to discharge <p>Safety</p> <ul style="list-style-type: none"> • Headache, sedation, behavioral events daily

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
				<ul style="list-style-type: none"> Abdominal symptoms (pain, diarrhea, dyspepsia) daily
Hyperglycemia and screening for cystic fibrosis-related diabetes	2	<ul style="list-style-type: none"> Prevent hyperglycemia during inpatient admission Determine if patient has diabetes as a complication of cystic fibrosis 	<ul style="list-style-type: none"> Recommend initiating sliding scale insulin during inpatient admission <ul style="list-style-type: none"> Humalog® or Novolog® for blood glucose: 1 unit for every 25 mg/dL over 150 mg/dL Test annually for cystic fibrosis-related diabetes either currently during inpatient admission (hemoglobin A1C) or outpatient (hemoglobin A1C or oral glucose tolerance test) and annually thereafter 	Safety <ul style="list-style-type: none"> Monitor blood glucose at minimum FBG in the morning, prior to meals and at bedtime while inpatient Hemoglobin A1C or oral glucose tolerance test annually
Patient adherence and access to medication	2	<ul style="list-style-type: none"> Increase adherence to medication therapy and access to medications 	<ul style="list-style-type: none"> Counsel patient about adherence to therapy, specifically focusing on lifestyle changes that will help with evening chest physiotherapy and respiratory treatments Ensure prior authorization is completed for dornase alfa prior to discharge for continuation of home medication 	Safety <ul style="list-style-type: none"> Approval of prior authorization and patient with medication supply prior to discharge
Illicit medication drug-drug interaction	2	<ul style="list-style-type: none"> Avoid illicit drug use Avoid drug-drug interaction 	<ul style="list-style-type: none"> Counsel patient on the use of marijuana with dronabinol as a concomitant medication; duplication of use of cannabinoids with potential for increased adverse effects as well as legal consequences 	Safety <ul style="list-style-type: none"> Monitor for central nervous system effects (anxiety, amnesia, confusion, depression, drowsiness, euphoria, headache, malaise, nervousness) daily Monitor for gastrointestinal upset, abdominal pain, anorexia daily
Candidate for CFTR modulator therapy	3	<ul style="list-style-type: none"> Explore additional treatment option for CF targeting disease-causing process 	<ul style="list-style-type: none"> Based on this patient's genetic mutations of F508del and P67L as well as his age, he would be a candidate for the newly FDA approved CFTR modulator therapy of tezacaftor/ivacaftor and ivacaftor (Symdeko®) 100/150 mg (yellow tablet in the morning) and 150 mg tablet (blue tablet in the evening) taken with a fat containing meal or snack 	Efficacy <ul style="list-style-type: none"> Lung function (FEV₁, FVC, FEV₁/FVC), weight gain, decreased acute pulmonary exacerbations at

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
				minimum every 3 months Safety <ul style="list-style-type: none"> • Monitor LFTs every 3 months during the first year of therapy and annually thereafter • Monitor ophthalmologic examination prior to therapy and during treatment • Monitor for chest tightness or chest pain daily
Vaccinations	3	<ul style="list-style-type: none"> • Prevent pneumococcal and human papillomavirus infections 	<ul style="list-style-type: none"> • Provide prior to discharge or schedule follow-up for PPSV23 vaccination <ul style="list-style-type: none"> ○ Recommended by CF Foundation for children with CF ages 2-5 years for first dose of PPSV23 at least 8 weeks after last PCV13, would qualify for catch-up dose • Provide prior to discharge or schedule follow-up for HPV vaccinations <ul style="list-style-type: none"> ○ Recommended by CDC for children ages 11-12 years, would qualify for 3 dose catch-up series (0, 1-2, and 6 months) regardless of sexual activity status despite public beliefs on indication given sexual transmission of disease • Provide prior to discharge influenza vaccinations <ul style="list-style-type: none"> ○ Recommended by CDC for yearly immunization during influenza season (currently includes November) 	Efficacy <ul style="list-style-type: none"> • Minimize future pneumococcal infections and complications • Minimize future human papillomavirus infections and complications • Minimize future influenza infections and complications Safety <ul style="list-style-type: none"> • Hypersensitivity reactions and injection site pain on administration
(BONUS) Begin Transition to Adult Services	3	<ul style="list-style-type: none"> • Plan for transitioning from the pediatric to adult cystic fibrosis care team 	<ul style="list-style-type: none"> • Encourage the autonomy of the patient for being responsible for own care including knowing medications/doses/frequency. Introduce patient to adult care team for transition in care. Can recommend that the pharmacist, provider, dietitian, and additional team members participate in this process. 	<ul style="list-style-type: none"> • Monitor patient knowledge of medications/doses/frequency, symptoms of pulmonary exacerbation, ability to participate independently in clinic visits

Health Care Problem	Priority	Therapeutic Goals	Recommendations for Therapy	Monitoring Parameters and Endpoints
<p>(BONUS)</p> <p>Annual Clinical Assessment</p>	<p>3</p>	<ul style="list-style-type: none"> Complete an annual clinical assessment to establish patient well-being 	<ul style="list-style-type: none"> Review of clinical history and psychological assessment, medication adherence, physical examination, measurement of oxygen saturation, chest X-ray, laboratory tests (CBC, hemoglobin A1C, LFTs, aspergillus serology, serum IgE, vitamin levels), respiratory cultures, lung function testing (FEV₁, FVC), bone density scan (DXA) 	<p>Safety</p> <ul style="list-style-type: none"> Monitor pulmonary function, liver function, infection screening, nutritional status, medication adherence, and overall well-being at minimum once yearly