

Acute Care Patient Case Example

CC:	J.B. presents to the emergency department with altered mental status, “yellow skin,” and increased abdominal distension; also, she is vomiting blood.
HPI:	J.B. is a 44-year-old white woman with a known history of alcohol abuse for 20 years. She was given a diagnosis of cirrhosis 1 year ago.
Medical History:	Alcoholic cirrhosis x 1 year HTN x 1 year
Medication History:	Allergies: NKDA Current medications (nonadherent, according to family): Lactulose 30 mL orally twice daily Lisinopril 10 mg orally daily
Family History:	Father: Living; HTN, diabetes mellitus (DM) Mother: Died of “liver disease because of drinking” Brother: Living; alcoholic
Social History:	Tobacco: None Alcohol: Drinks 12 beers per day and 750 mL of vodka on weekends Diet: Doesn't eat much
ROS/Physical Examination:	HEENT: (+) Icteric sclera CV: No CP, no palpitations, tachycardic Pulm: (+) SOB; crackles heard at lung bases GI: (+) Abdominal distension; (+) black stools; (+) bloody vomit Skin: Jaundiced, (+) spider angiomas
Vital Signs:	BP: 100/70 HR: 110; RR: 18; Temp: 99.0; Ht: 5'6"; Wt: 110 lb

Pharmaceutical Care Application

Collect patient-specific information (as previously summarized).

Includes Pharmacotherapy Workup

In this interprofessional setting, the review of systems by the pharmacist is not necessary, as it was already done by the physician. The Pharmacotherapy Workup also includes asking the patient about his or her existing medical conditions to determine what conditions exist. In a setting such as a community pharmacy, this would be important, but in this setting, it is not necessary because all the medical conditions are already in the medical record.

Analyze clinical data (reported below).

Identify drug-related problems.

- Indication: Needs additional drug therapy for esophageal varices
- Indication: Needs additional drug therapy for hyperammonemic hepatic encephalopathy
- Indication: Needs additional drug therapy for ascites

Laboratory Data:

		Normal Range
Na	130 mEq/L	135–145
K	3.0 mEq/L	3.5–5.0
Cl	90 mEq/L	96–106
CO ₂	30 mmol/L	22–28
BUN	6 mg/dL	8–20
Cr	0.4 mg/dL	0.7–1.5
Glu	86 mg/dL	70–110
AST	60 U/L	4–36
ALT	30 U/L	4–36
Tbili	8.1 mg/dL	0.3–1.0
Alk Phos	150 U/L	30–120
Albumin	2.1 g/dL	3.2–4.8
PT/INR	19/1.16	
WBC	4500/mm ³	5000–10,000
Hb	7.9 g/dL	12–16
HCT	21%	37–47
Plt	82/mm ³	150,000–400,000
Ammonia	150 mcg/dL	10–80

Imaging:

Chest x-ray (CXR): Bibasilar pulmonary edema

Abdominal ultrasonography (U/S): Nodular liver and splenomegaly; marked ascites

Esophagogastroduodenoscopy: Two bleeding esophageal varices were found and sclerosed.

Identify the goals of therapy.Goals of therapy (and list if controlled or uncontrolled)

- BP less than 140/90; controlled without therapy (not taking lisinopril)
- Promote excretion of ammonia; uncontrolled
- Decrease pressure in the portal vein; uncontrolled
- Decrease fluid accumulation in the abdomen; uncontrolled
- Stop the use of alcohol; prevent delirium tremens; not yet achieved

Develop a care plan.

- Initiate new drug therapy (for bleeding esophageal varices) – once hemodynamically stable: propranolol 20 mg orally twice daily
- (Re)initiate new drug therapy (for hyperammonemic hepatic encephalopathy) – Lactulose 30 mL orally every 8 hours; adjust the dose to achieve two or three stools per day
- Initiate new drug therapy (for ascites) – After paracentesis: spironolactone 50 mg orally daily plus furosemide 20 mg orally daily
- Initiate new drug therapy for alcohol cessation (for delirium tremens prophylaxis) – Lorazepam as needed
- Unnecessary drug therapy – Discontinue lisinopril.

Develop schedule for follow-up.

Follow up in 24 hours to assess drug therapy changes and record outcomes.

- Vital signs
- Stool count
- Electrolytes
- Mental status

Evaluate patient outcomes (at follow-up, select category from a list).

- HTN: Controlled
- Esophageal varices: Partly improved
- Hyperammonemic hepatic encephalopathy: Improved
- Ascites: Partly improved

Medication Therapy Management Application

Medication Therapy Review

Medication	Indication	Efficacy	Safety	Adherence	Medication-Related Problem	Priority	Plan
Lisinopril 10 mg po daily	HTN	Good – BP 100/70 Goal < 140/90	N/A	Nonadherent	None		Discontinue
Lactulose 30 mL po bid	Hepatic encephalopathy	Uncontrolled; goal: promote excretion of ammonia	N/A	Nonadherent	Nonadherence	1	Reinitiate and increase dose to 30 mL q8h; adjust to achieve 2 or 3 stools/day.
N/A	Esophageal varices	Uncontrolled; decrease pressure in the portal vein	N/A		Needs new drug therapy	1	Initiate propranolol 20 mg bid
N/A	Ascites	Uncontrolled; decrease abdominal fluid accumulation	N/A		Needs new drug therapy	1	Initiate spironolactone 50 mg po daily plus furosemide 20 mg po daily.

Personal Medication Record (PMR) and Medication-Related Action Plan (MAP)

These elements are not applicable while the patient is in the hospital, as the medications will be given in the hospital and then may be changed at discharge. In addition, the PMR and MAP are meant for the patient to follow and use at home; in the hospital, the patient is not responsible for his or her own medications. A PMR and an MAP may be given to the patient at discharge, but they may be different from the medications that are started initially while in the hospital.

Intervention and/or referral

Recommendations:

1. Discontinue lisinopril.
2. Reinitiate lactulose and increase dose to 30 mL every 8 hours; adjust to achieve two or three stools per day.
3. Start propranolol.
4. Start spironolactone and furosemide.

Documentation and follow-up:

- Follow up in 24 hours to assess drug therapy changes and record outcomes.
 - Vital signs
 - Stool count
 - Electrolytes
 - Mental status

Depending on whether pharmacist chart documentation privileges are available at your institution, a SOAP note may or may not be left in the chart.

Patient-Centered Primary Care Collaborative (PCPCC) Application MTM in the Patient-Centered Medical Home (PCMH)

Assessment of patient's medication-related needs

Medication	Indication	Goals of Therapy
Lisinopril 10 mg po daily	HTN	BP consistently < 140/90 mm Hg
Lactulose 30 mL po bid	Hepatic encephalopathy	2 or 3 stools/day

Identify and categorize MRPs.

Medication	MRP	Appropriateness	Effectiveness	Safety	Adherence
Lisinopril 10 mg po daily	1 MRP Indication	Not indicated, as BP is controlled while not taking	N/A; patient not taking; BP 100/70	No ADRs noted	Poor
Lactulose 30 mL po bid	1 MRP Adherence	Appropriate	N/A; patient not taking – Patient has elevated ammonia level and altered mental status.	No ADRs noted	Poor
N/A	1 MRP Indication	Not receiving medication for bleeding esophageal varices	N/A	N/A	N/A
N/A	1 MRP Indication	Not receiving medication for ascites	N/A	N/A	N/A

Development of a care plan

Indication/Intervention	Goals of Therapy	Plan	Follow-up
HTN	Maintain BP < 140/90 mm Hg	Discontinue lisinopril, and initiate other therapy below.	Check daily to ensure BP is appropriate.
Hepatic encephalopathy	Promote excretion of ammonia.	Continue lactulose 30 mL; increase to q8h.	Check daily to ensure patient is having 2 or 3 stools/day. Monitor mental status and ammonia level (as needed). If the patient is meeting the goal stools/day and the ammonia level has decreased, yet is still encephalopathic, consider other pharmacotherapy.
Esophageal varices	Decrease pressure in the portal vein.	Initiate propranolol 20 mg po bid once the patient is stable.	Monitor the patient's BP and HR daily.
Ascites	Decrease fluid accumulation in the abdomen.	Begin therapy after paracentesis with spironolactone 50 mg po daily plus furosemide 20 mg po daily.	Monitor BP and fluid output daily.
Alcohol cessation	Stop the use of alcohol; prevent delirium tremens.	When patient is medically stable, discuss with her the importance of stopping alcohol. Patient may need prn lorazepam.	May need referral to Alcoholics Anonymous for support in maintaining abstinence

Follow-up

HTN: Controlled
 Bleeding esophageal varices: Partly improved
 Hyperammonemic hepatic encephalopathy: Improved
 Ascites: Partly improved

Society of Hospital Pharmacists of Australia (SHPA) Application

Medication Action Plan	
Interpretation of patient-specific data	<p>Patient is somewhat hypotensive (100/70 mm Hg) while not taking lisinopril.</p> <p>Patient is nonadherent to lactulose; has encephalopathy, with an elevated ammonia level</p> <p>Patient has esophageal varices and is not taking a nonselective β-blocker.</p> <p>Patient has ascites and is not taking an aldosterone antagonist.</p> <p>Patient is alcoholic and is not on therapy to prevent alcohol withdrawal/delirium tremens.</p>
Identification of clinical problems	<p>(1) Lisinopril unnecessary; BP low and patient not taking it (MRP: Needs additional drug therapy)</p> <p>(2) Patient has altered mental status and an elevated ammonia level; not adherent to lactulose therapy; goal 2 or 3 BMs/day. (MRP: Nonadherence)</p> <p>(3) Needs therapy for esophageal varices (MRP: Needs additional drug therapy)</p> <p>(4) Needs therapy for ascites (MRP: Needs additional drug therapy)</p> <p>(5) Needs therapy for alcohol withdrawal/delirium tremens prophylaxis (MRP: Needs additional drug therapy)</p>
Establishment of therapeutic goals	<p><u>Goals:</u></p> <p>BP goal < 140/90 mm Hg</p> <p>Promote excretion of ammonia; 2 or 3 BMs/day; uncontrolled</p> <p>Decrease pressure in the portal vein; uncontrolled</p> <p>Decrease fluid accumulation in the abdomen; uncontrolled</p> <p>Stop the use of alcohol; prevent delirium tremens; not yet achieved</p>
Evaluation of therapeutic options	<p><u>Hypertension</u></p> <p>Lisinopril appropriate but not necessary because patient is hypotensive and propranolol is being initiated</p> <p>Discussed with patient's family, who agrees</p> <p><u>Esophageal varices</u></p> <p>Nonselective β-blocker is needed.</p> <p>Options: Propranolol, carvedilol, and nadolol</p> <p>Discussed with patient's family, who agrees to try propranolol</p> <p><u>Ascites</u></p> <p>Patient not currently taking therapy for ascites. Combination of furosemide and spironolactone is recommended.</p> <p>Patient must be stable first, and paracentesis should be done initially.</p> <p>Discussed with patient's family, who agrees</p> <p><u>Alcoholism</u></p> <p>Patient needs to stop alcohol use; family agrees.</p> <p>Needs prn benzodiazepine to prevent delirium tremens</p> <p>Discussed with family, who agrees</p>
AND	
Individualization of therapy	
Monitoring of patient outcomes	<p>Follow up in 24 hours to assess drug therapy changes and record outcomes.</p> <ul style="list-style-type: none"> ■ Vital signs <ul style="list-style-type: none"> • BP stable; no hypotension ■ Stool count <ul style="list-style-type: none"> • 2 or 3 stools/day ■ Electrolytes and fluid status <ul style="list-style-type: none"> • WNL; ascites partly improved ■ Mental status <ul style="list-style-type: none"> • Improved

Accurate medication history

Lisinopril 10 mg/day orally

Lactulose 30 mL orally twice daily

Assessment of current medication management

Patient nonadherent to lisinopril and lactulose

Clinical review

- Patient is somewhat hypotensive (100/70 mm Hg), and propranolol is being initiated – Patient is not taking lisinopril.
- Patient is nonadherent to lactulose; has encephalopathy, with an elevated ammonia level
- Patient has esophageal varices and is not taking a nonselective β -blocker.
- Patient has ascites and is not taking an aldosterone antagonist.
- Patient is an alcoholic and is not on therapy to prevent alcohol withdrawal/delirium tremens.

Decision to prescribe a medicine

- Recommend discontinuing lisinopril.
- Recommend initiating lactulose 30 mL orally every 8 hours.
- Recommend initiating propranolol 20 mg orally twice daily once she is deemed clinically stable.
- Recommend initiating spironolactone 50 mg orally daily once she is deemed clinically stable after paracentesis.
- Recommend initiating furosemide 20 mg orally daily once she is deemed clinically stable after paracentesis.
- Recommend initiating lorazepam for delirium tremens prophylaxis.

Therapeutic drug monitoring

Monitor BP and HR.

Monitor K/SCr daily while hospitalized and then in 1–2 weeks after discharge.

Monitor mental status and bowel movements (goal is two or three while taking lactulose).

Monitor urine output.

Participation in multidisciplinary ward rounds and meetings

Monitor the patient, as above, to optimize pharmacotherapy.

Round with the medical team and provide recommendations.

Provision of medicines information to health professionals

None needed at this time

Provision of medicines information to patients

This is not as applicable in a hospital setting. The patient can be educated on the acute medications that are being initiated while in the hospital and what they are being used for. When patients are discharged, information about their medicines should be provided to them, but these medicines may be different from what was used acutely in the hospital.

Information for ongoing care – N/A

Adverse drug reaction management

Lactulose: Monitor for hypokalemia and signs of dehydration.

Propranolol: Monitor HR/BP for hypotension/bradycardia.

Spironolactone: Monitor for hyperkalemia and elevations in SCr.

Furosemide: Monitor for hypokalemia and elevations in SCr. Monitor for tinnitus/hearing impairment.

Lorazepam: Monitor for oversedation. Monitor for respiratory depression and hypotension.

Individualized Medication Assessment and Planning (iMAP) Application

Review and synthesize information from medical record.

- Lisinopril 10 mg/day orally for HTN
- Lactulose 30 mL orally twice daily

Conduct a comprehensive medication review with patient.

- Patient is altered, so an interview is not useful. According to family, the patient is nonadherent to the currently prescribed medications and is currently not taking any medications.

Identify MRPs.

- (1) Suboptimal drug: Lisinopril unnecessary; goal BP less than 140/90; BP low and patient not taking it
- (2) Nonadherence: Patient has altered mental status and an elevated ammonia level; nonadherent to lactulose therapy; goal two or three bowel movements daily
- (3) Drug therapy needed: Needs therapy for esophageal varices
- (4) Drug therapy needed: Needs therapy for ascites
- (5) Drug therapy needed: Needs therapy for alcohol withdrawal/delirium tremens prophylaxis

Formulate assessment/propose plan to optimize medication use.

- Recommend discontinuing lisinopril.
- Recommend reinitiating lactulose and increasing dose to every 8 hours.
- Recommend starting propranolol 20 mg orally two times/day once the patient is hemodynamically stable.
- Recommend starting spironolactone 50 mg orally daily plus furosemide 20 mg orally daily after paracentesis.
- Recommend starting lorazepam as needed.

Communicate proposed plan to primary care provider.

- Discussed all recommendations with Dr. Smith, who agreed

Implement plan once consensus reached

- Verbal orders given for all of the medication changes, per Dr. Smith

Educate patient.

- Unable to do at this time because of mental status
- Family educated on medications initiated in the hospital
- Patient educated on discharge from hospital regarding discharge medications

Document plan in medical record and provide written summary to patient.

- SOAP note

Reconcile medications at all encounters, when possible, including transitions of care.

- Medications reconciled at hospital admission; as above

Provide ongoing face-to-face and telephone follow-up.

- With physician and patient's family, unable to communicate with patient
- Follow up in 24 hours to assess drug therapy changes and record outcomes.
 - Vital signs
 - Stool count
 - Electrolytes
 - Mental status