Nutrition Rounds

Sickle Cell Anemia and End Stage Renal Disease

NCM II Fall 2025
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LEARNING OUTCOMES

- Explain how comorbid SCD, ESRD, and liver cirrhosis affect metabolism, nutrient status, and overall nutrition care (Frangoul et al., 2020; Brown et al., 2021).
- Interpret clinical and biochemical data to identify nutrition risks and metabolic complications in patients receiving hemodialysis (Brown et al., 2021).
- Design an evidence-based nutrition care plan (NCP) using individualized macronutrient, micronutrient, and monitoring strategies (Academy of Nutrition and Dietetics, 2023).
- Apply MI and behavior-change models to support adherence and self-management in chronic disease (Greenwood et al., 2023; Oluwole et al., 2025).
- Assess how health disparities and social determinants in Washington, DC, influence dietary adherence and outcomes in minority populations with ESRD and SCD (CDC, 2024).

PATIENT PROFILE

- Patient Initials: AG
- Age: 33 years
- Sex: Female
- Ethnicity: African American
- Living Situation: Resides with 13-year-old daughter; recently lost her mother
- Occupation: Unemployed
- Lifestyle: Smokes 3–4 cigarettes/day; denies alcohol or drug use
- Admission Date: September 10, 2025
- Chief Complaint: 10/10 pain from SCD crisis, missed hemodialysis due to port infection
- Socioeconomic Context: Low income, limited food access, grief-related psychosocial stress

PATIENT PROFILE
CLIENT HISTORY

- Past Hx: ESRD on HD T/TH/S, SCD, Chronic anemia, HTN, liver failure, heart mumur
- Past Surgical Hx: splenectomy as a child
- Family Medical/Health History: no known family history
- Allergies: Peanut, Seafood, Zosyn
- Diet Order: Renal, 2g sodium

DISEASE CONDITION OVERVIEW

- Comorbid Conditions:
  - Sickle Cell Disease (SCD)
  - End-Stage Renal Disease (ESRD) on hemodialysis
  - Hypertension urgency
  - Liver cirrhosis
  - Normocytic anemia
- Complications: Chronic anemia, hyperkalemia, hyperphosphatemia, malnutrition, and fatigue.

DISEASE CONDITION

PRIMARY DIAGNOSIS

- Sickle Cell Disease (SCD): Genetic disorder of hemoglobin causing vaso-occlusive pain crises and chronic anemia (Frangoul et al., 2020).
- End-Stage Renal Disease (ESRD): Progressive loss of renal function resulting in electrolyte imbalances, anemia, and toxin accumulation (Brown et al., 2021).
- Liver Cirrhosis: Chronic liver injury causing fibrosis and reduced metabolism of proteins and micronutrients.

DISEASE CONDITION

SICKLE CELL DISEASE

- Inherited disorder causing abnormal, sickle-shaped red blood cells (RBCs)
- Common in African ancestry; also affects Central/South American, Mediterranean, and South Asian groups (CDC, 2018)
- Caused by inheriting two hemoglobin S genes
- Leads to anemia and spleen enlargement due to short RBC lifespan (10–20 days)
- Affects ~100,000 Americans; 1–3 million carry the sickle cell trait
- Symptoms: pain crises, often abdominal, from blocked vessels
- Complications: jaundice, gallstones, liver and kidney dysfunction
- Iron issues: overload from transfusions is possible; iron deficiency can coexist

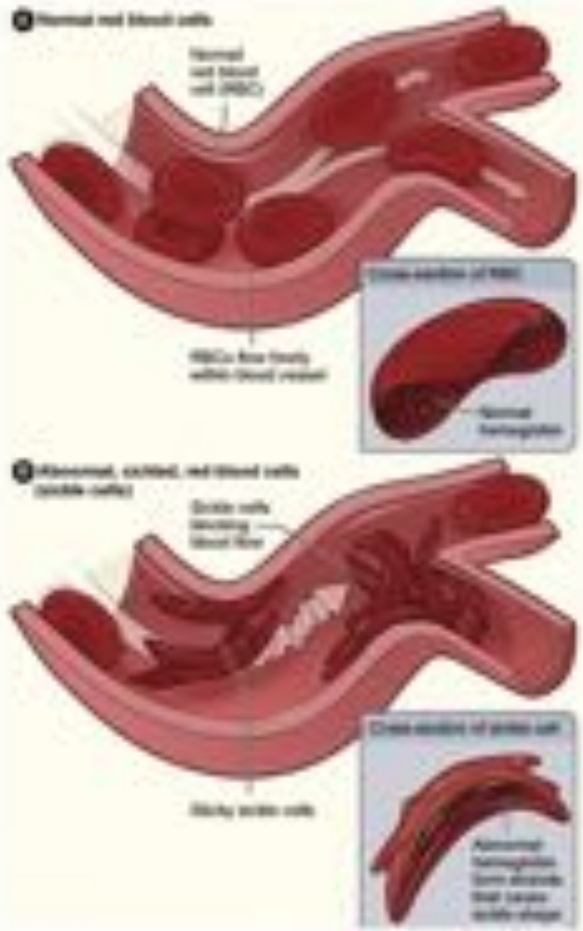

Image obtained from Raymond, J. L., & Morrow, K. (2020). Krause's Food & the Nutrition Care Process. Saunders.

DISEASE CONDITION

END-STAGE RENAL DISEASE

- End-Stage Renal Disease (ESRD)
  - Final stage of kidney failure, where kidneys can no longer:
    - Excrete waste products
    - Maintain fluid and electrolyte balance
    - Produce essential hormones
- Leads to uremia, caused by the buildup of nitrogenous wastes
  - Fatigue and weakness
  - Nausea and vomiting
  - Muscle cramps and itching
  - Metallic taste in mouth
  - Neurological impairment
- Typical lab indicators:
  - Blood Urea Nitrogen (BUN) > 100 mg/dL
  - Creatinine (Cr) 10–12 mg/dL

Image obtained from Raymond, J. L., & Morrow, K. (2020). Krause's Food & the Nutrition Care Process. Saunders.

DISEASE CONDITION

CIRRHOSIS & HEMOCHROMATOSIS

- Cause: Excessive iron absorption and storage in the liver, heart, pancreas, joints, and endocrine organs
- Indicators:
  - Transferrin saturation ≥ 45%
  - Ferritin levels are more than twice normal
- Complications:
  - Liver enlargement and dysfunction
  - Skin darkening
  - Diabetes and cardiac issues
  - Joint pain and increased risk of liver cancer
- Diagnosis: Based on clinical signs and elevated iron studies (transferrin, ferritin).
- Treatment: Regular phlebotomy or blood donation can normalize life expectancy if started early.
- Relation to Sickle Cell Disease (SCD):
- SCD patients often receive multiple blood transfusions, which can lead to secondary iron overload similar to hemochromatosis.
- Monitoring ferritin and iron levels is essential to prevent organ damage in SCD patients.

DISEASE CONDITION OVERVIEW

PREVELANCE & PATHOPHYSIOLOGY

- SCD: ~100,000 Americans, majority African American; lifelong disease causing inflammation and oxidative stress (Frangoul et al., 2020).
- ESRD: Impacts 15% of U.S. adults, with higher rates among Black populations; dialysis is a major determinant of quality of life (Brown et al., 2021).
- Cirrhosis: ~4.5 million U.S. adults; impairs protein synthesis, detoxification, and vitamin absorption.
- Overlap Impact: Increases risk for anemia, fatigue, metabolic acidosis, and nutrient depletion.

DISEASE CONDITION OVERVIEW

NUTRITION IMPLICATIONS

- Protein-Energy Malnutrition
  - Reduced intake
  - Increased catabolism.
- Electrolyte Imbalance
  - High K
  - High Phos
  - Low Ca
- Micronutrient Concerns
  - Folate
  - B12
  - Zinc
  - Vitamin D
  - Vitamin K
- GI & Appetite Changes:
  - Nausea
  - Constipation
  - Anorexia
  - Uremia.
- Quality of Life: Fatigue, decreased functional status, and reduced motivation (Brown et al., 2021; Greenwood et al., 2023)

PATIENT BACKGROUND

- Missed dialysis and ran out of medications.
- Limited appetite and poor tolerance for hospital meals.
- Reports inconsistent eating patterns (often crackers or small meals).
- Limited knowledge of renal diet guidelines and food sources of potassium/phosphorus.
- Recent bereavement and psychosocial distress impacting self-care (Oluwole et al., 2025).

NUTRITION CARE PLAN

Based on the complicated nature of balancing multiple conditions. Also being cognizant of the mentality and perception of the patient and her ability to improve her quality of life, this is the summary of the nutrition care plan created for the patient

NUTRITION CARE PLAN ASSESSMENT

ASSESSMENT

BIOMEDICAL LABS

BP H 163/91 (vital not a lab but included for context)	Indication of uncontrolled blood pressure
Sodium L 134	Indication of diuretic use, nephritis
Potassium H 5.2<5.8	Indication of renal failure, acidosis, diet high in potassium
CO2 L 21<19	Indication of metabolic acidosis
BUN H 59<46	Indication of renal disease
Creatinine Serum H 6.41<6.26	Indication of dehydration, nephritis, inflammation
Calcium L 6.7<6.9	Indication of renal failure, malabsorption, vitamin D deficiency, hyperphosphatemia
Anion Gap H 17	Indication of acidosis

ASSESSMENT
BIOMEDICAL LABS CONT.

Creatine Phosphokinase 25 L	Indication of vitamin D and magnesium deficiency
Folic Acid H 4601 H (9/10)	Indication of vitamin B12 deficiency
GFR L 8 (typical 7-9)	Indication of renal failure
Phosphorus H 8.8<7.5<7.6<7.7	Indication of liver disease, ESRD
PPT H 38.2	Indication of vitamin K deficiency, liver disease
RBC L 1.84<1.92<1.93	Indication of anemia
Hemoglobin L 5.3<5.6<5.4	Indication of anemia, prolonged deficiency of iron, renal & liver disease
Hematocrit L 16.0<16.8<16.4<12.1	Indication of anemia, prolonged deficiency of protein and iron, malnutrition, renal and liver disease

ASSESSMENT
BIOMEDICAL LABS CONT.

Eosinophil H 14.2<12.3<8.2	Indication of pernicious anemia
Absolute Eosinophil H 1.30	Indication of pernicious anemia
Absolute Basophil H 0.11	Indication of acute infection
Nucleated RBC H 0.5<0.4<0.2	Indication of hemolytic anemia
Sedimentation Rate H 50	Indication of inflammation, and anemia

ASSESSMENT
SCHEDULED MEDICATIONS

Calcium Acetate	Phosphorus binder for ESRD	Constipation, nausea, vomiting, stomach pain, and loss of appetite and can cause hypophosphatemia
Ceftaroline Fasomil	Antibiotic	Constipation, nausea, vomiting decrease in vitamin K
Clonidine	Antihypertensive	Constipation and dry mouth
Daptpmycin	Antibiotic	Diarrhea, nausea, constipation, and abdominal pain, decrease in vitamin K
Epoetin Alfa-EPBX	Anemia	N/V, stomatitis, constipation, diarrhea, loss of appetite, hypoglycemia, hyperglycemia
Folic Acid Vitamin B Complex	For deficiency	Can mask B12 deficiency so B complex was added

ASSESSMENT
SCHEDULED MEDICATIONS CONT.

Gabapentin	Muscle relaxer	Potential depletion in folic acid
Heparin	Blood thinner	Allergic reaction
Hydralazine	Antihypertensive	N/V diarrhea loss of appetite, depletion of zinc and potassium
Labetalol	Antihypertensive	Nausea depletion of zinc and potassium
Lidocaine	Anesthetic	N/V stomach cramps
Nfedipine	calcium channel blocker	Possible depletion of zinc and potassium, nausea, heartburn, diarrhea, and interaction with grapefruit

ASSESSMENT
SCHEDULED MEDICATIONS CONT.

Sevelamer Carbonate	To control hyperphosphatemia	Possible depletion of zinc and potassium, nausea, heartburn, diarrhea, and interaction with grapefruit
Sodium Zirconium Cyclosilicate	To control hyperkalemia	N/V diarrhea, constipation, dyspepsia, flatulence
Acetaminophen	Inflammation/pain management	Potential to deplete glutathione with extended use
Diphenhydramine	antihistamine	N/V, constipation, dry mouth, upset stomach, loss of appetite
Hydromorphine	Opioid	N/V, constipation, dry mouth
Ipratropium	COPD	Dry mouth, nausea, diarrhea, constipation

ASSESSMENT
HOME MEDICATIONS

Clonidine	Antihypertensive	Depletion of zinc and potassium, dry mouth, constipation, N/V
Escitalopram oxalate (Lexapro)	SSRI	Nausea, dry mouth, constipation, lack of appetite, or abdominal cramps.
Folic acid	For deficiency	Can mask B12 deficiency
Gabapentin	Muscle relaxer	Potential depletion in folic acid
Hydralazine	Antihypertensive	N/V diarrhea loss of appetite, depletion of zinc and potassium

ASSESSMENT
HOME MEDICATIONS CONT.

Labetalol	Antihypertensive	Nausea depletion of zinc and potassium
Methocarbamol	Muscle relaxant	Recommended to take with food, N/V, dyspepsia, metallic taste in mouth, diarrhea, constipation
Minoxidil	For hair loss	N/V fluid retention
Nifedipine	Antihypertensive	Nausea depletion of zinc and potassium, heartburn, constipation, dry mouth
Sennoside	Laxative	Overuse can cause deficiency in fat soluble vitamins (A, D, E, and K)

ASSESSMENT

ANTHROPOMETRIC MEASUREMENT

- Height: 60 inches
- Current Measured Weight:54.4kg= 119.931 lb
- Body Mass Index (BMI): 23.2 normal
- Usual Stated Body Weight (UBW): 119
- Weight change percentage: 0
- Ideal Body Weight (IBW): 105 lbs.
- % IBW: 113%

ASSESSMENT
ESTIMATED ENERGY REQUIRMENTS

- Renal, 2 g Na
- Calorie Estimate=1400-1900 kcal (1600 kcal)
- Protein CKD stage 5 HD range of 1.0-1.2g/kg 54-65 g/day
- Lower end of =44 g fat
- Remaining =220 g CHO
- RDA 21–25 g fiber
- kcal/mL=1000 mL fluid
- RDA + prescription=MVI, Ca citrate, trace minerals.

ASSESSMENT
NUTRITION-FOCUSED PHYSICAL EXAM

- Not advised to complete an NFPE during HD
- Upon visual examination,
  - Hair
    - thinning
  - Skin
    - lesion on her body
    - poor skin pallor
    - dry/dehydrated

ASSESSMENT
NUTRITION SUMMARY

- Dietary Intake
  - Patient was in hemodialysis (HD), incoherent, and fatigued due to Sickle Cell Disease (SCD).
  - Observed outside food (half-smoke sausage) and potato chips during HD session.
  - Limited dietary intake information obtained.
    - Breakfast: a few pieces of bacon and eggs.
    - Lunch/Dinner: sandwiches; reports finishing meals when she does eat.
  - During visit (11:00 AM): only consumed crackers and water.
  - She states she does not enjoy hospital food overall.
- Eating Patterns
  - Occasionally eats breakfast; consistently eats lunch and dinner.
  - No snacks reported.
  - Typically, someone cooks for her at home.
  - During hospitalization, consumed high-phosphorus (sausage) and high-potassium (chips) foods.

ASSESSMENT
NUTRITION SUMMARY

- Nutrition Knowledge
  - Demonstrates a knowledge deficit regarding renal diet guidelines.
  - Unable to identify foods high/low in potassium and phosphorus.
  - Inconsistent eating patterns contribute to complications with ESRD and SCD.
- Behavioral Factors
  - Uncertain of her dietary intake; has frequent hospitalizations for ESRD and SCD.
  - Condition complicated by cirrhosis of the liver.
  - Appears aware but emotionally impacted by her health status.
  - Mother recently passed, possibly her primary cook, which may explain inconsistent eating habits.

ASSESSMENT
NUTRITION PROBLEMS

- Food and Nutrition Related Knowledge Deficit NB-1.1
- Limited Adherence to Nutrition-Related Recommendations NB-1.6
- Inadequate Energy Intake NI-1.2
- Inadequate Oral Intake NI-2.1
- Unbalanced diet pattern NI-2.11
- Excessive Mineral Intake (Phosphorus) NI-5.10.2.6
- Excessive Mineral Intake (Potassium) NI-5.10.2.5
- Altered Nutrition-Related Lab Values NC-2.2
- Not Ready for Nutrition-Related Behavior Change NB-1.2

NUTRITION CARE PLAN DIAGNOSIS

DIAGNOSIS
PES STATMENTS

PES #1
Inadequate energy intake related to inconsistent eating patterns and intake secondary to ESRD and SCD as evidenced by abnormal lab values, frequent hospital visits (132), limited recall of intake, consumption of 5% of meal during assessment, and clinical signs of malnutrition through skin lesions, poor pallor, and thinning hair.

PES #2
Food and nutrition-related knowledge deficient related to a lack of understanding of renal nutritional guidelines as evidenced by the inability to identify high or low-potassium and phosphorus foods, inconsistent eating behaviors, and complications from ESRD.

PES #3
Limited Adherence to Nutrition Related Recommendations related to undesirable food choices as evidenced by abnormal lab values (phosphorus, potassium), consumption of half smoke sausage, and potato chips.

NUTRITION CARE PLAN INTERVENTION

INTERVENTION
SMARTS GOALS

SMART GOAL #1

AG will increase oral intake to meet at least 75% of estimated energy and protein needs by consuming 3 meals per day with at least 1 renal-appropriate snack within 5 days, as measured by food logs and dietitian follow-up, to improve weight stability and reduce visible signs of malnutrition.

SMART GOAL #2

AG will demonstrate improved knowledge of renal diet by accurately identifying >3 high-potassium and >3 low-potassium foods, and >3 high- vs. low-phosphorus foods during a nutrition counseling session, and saying at least 2 strategies for adhering to her renal diet within 5 days, supporting better self-management of ESRD and SCD.

INTERVENTION
DETAILED PLAN BREAKDOWN

FOOD & NUTRIENT DELIVERY

- Provide an individualized renal-friendly meal plan meeting >75% of estimated energy and protein needs
- Renal oral nutrition supplement to support intake goal.
- Recommend small, frequent meals and snacks to reduce fatigue and improve intake
- Ensure protein sources are high-quality but renal-appropriate
- Collaborate with the medical team for supplementation if intake continues to be inadequate.

NUTRITION EDUCATION

- Provide education on high vs. low potassium and phosphorus foods.
- Teach fluid restriction guidelines and sodium control.
- Explain the role of adequate protein in supporting SCD and ESRD management.
- Review food labels to identify hidden phosphorus additives and sodium.
- Create a simple food list or handout with visual aids for high vs. low potassium foods.
- Practice applying this knowledge in a mock meal-planning activity.

INTERVENTION
DETAILED PLAN BREAKDOWN

COUNSELING & BEHAVIORAL

- Use MI to explore barriers to eating consistently
- Apply the Transtheoretical Model (Preparation to Action) to support readiness to change eating habits.
- Set small, achievable goals
- Encourage self-monitoring with a simple food diary.
- Reinforce progress by linking better intake with energy improvement and fewer complications

COORDINATION OF CARE

- Collaborate with the physician, oncologist, and nephrologist to monitor dialysis adequacy, lab values, and fluid status.
- Refer to social work for support with grief, stress, and food access.
- Coordinate with nursing staff to reinforce renal diet during hospitalization.

INTERVENTION
GOALS

FOOD & NUTRIENT DELIVERY

- Improve meal frequency and portion adequacy to stabilize weight and reduce malnutrition risk.

NUTRITION EDUCATION

- Patient verbalizes understanding of potassium/phosphorus food sources and renal diet strategies.
- Patient applies knowledge when making food choices at home or hospital.

INTERVENTION
GOALS

COUNSELING & BEHAVIORAL

- Increase consistency of meals and adherence to renal diet restrictions.
- Improved adherence to meal plan and diet restrictions

COORDINATION OF CARE

- Optimize adherence and outcomes through interdisciplinary suppor

NUTRITION CARE PLAN MONITORING & EVALUATION

MONITORING & EVALUTAITON

Domain	Parameter	Indicator for Success	Time Frame
Food Intake	kcal, protein, meals/day	>75% needs met	5 days
Knowledge	Identify K/Phos foods	>3 correct in each category	5 days
Behavior	Adherence to meal plan	>80% adherence	5-7 days
Anthropometric	Weight, BMI	Stable	by discharge
Biochemical	K, Phos, Hgb, Hct	Trend toward targets	Monthly dialysis

SOCIO-ECOLOGICAL MODEL

- Individual
  - low motivation
  - grief
  - knowledge deficits
- Interpersonal
  - Loss of community and family meal support after her mother's death.
- Community
  - Limited access to renal-friendly foods and education programs.
- Institutional
  - Hospital meals are not patient-preferred
  - missed dialysis due to infection.
- Policy
  - Food insecurity linked to income and healthcare coverage limitations.

(CDC, 2024; Brown et al., 2021)

Image obtained from https://kasleykillam.medium.com/the-inspiration-behind-community-microgrants-5bdedff5e48a

SOCIO-ECOLOGICAL MODEL

- Principles
  - Safety
  - Trust
  - Collaboration
  - Empowerment
  - Cultural Sensitivity
- Recognize how medical trauma, chronic pain, and repeated hospitalizations shape food behaviors and treatment adherence (Oluwole et al., 2025).
- Integrate compassionate care strategies
  - Validate lived experiences.
  - Provide small achievable goals.
  - Offer consistent follow-up for emotional support.

HEALTH DISPARITIES IN D.C.

- Population: 45% Black residents in DC are 10% below the poverty line.
- Prevalent Issues
  - CKD
  - HTN
  - Obesity
  - SCD
- All the above conditions disproportionately impact Black communities (CDC, 2024).
- Barriers
  - Food cost
  - Transportation
  - Literacy
- Implications
  - Reduced access to renal diet counseling and culturally appropriate foods.
- Local Efforts
  - DC Healthy People 2030, Food Policy Council, WIC.
- (Brown et al., 2021; Oluwole et al., 2025)

SUMMARY

- Complex comorbidities (SCD, ESRD, cirrhosis) require coordinated care.
- Nutritional focus: consistent intake, adequate protein, electrolyte balance.
- Behavioral and trauma-informed approaches improve adherence.
- Addressing social and environmental barriers is key to equity and sustainability (Greenwood et al., 2023).

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THANK YOU

The floor is now open for questions and comments.