

# Nephrology Rotation Clerkship Objectives

The following objectives are based on the the Licensing Medical Council of Canada objectives.

## 1. Acid/Base Abnormalities Hydrogen

### Key Objectives

Given a patient with an acid-base abnormality, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan, particularly when dealing with a high anion gap metabolic acidosis.

### Objectives

Given a patient with an acid-base abnormality, the student will

1. through efficient, focused, data gathering, diagnose cause of acidemia/alkalemia expeditiously
2. list and interpret critical clinical and laboratory findings which were key in the processes of exclusion, differentiation, and diagnosis:
  1. appropriate investigations for acidemia/alkalemia in order to identify the primary abnormality and the adequacy of the associated secondary compensation;
3. construct an effective initial plan of management for acidemia/alkalemia
  1. describe general supportive measures;
  2. describe management for specific acid-base disorders;
  3. determine if the patient needs to be referred for consultation.

## 2. Hypertension

### Key Objectives

Given a patient with hypertension, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. Particular attention should be paid to other cardiac risk factors, existing target organ damage and the identification of patients with hypertensive urgencies and emergencies.

### Enabling Objectives

Given a patient with hypertension, the student will

1. list and interpret key clinical findings, including
  1. accurate measurements taken to appropriately assess blood pressure, correctly diagnose hypertension, and determine its severity;
  2. results of an appropriate history and physical examination aimed at eliciting risk factors, evidence of acute and chronic target organ damage and secondary causes;
2. list and interpret critical investigations, including
  1. baseline investigations (e.g., creatinine, electrolytes, urinalysis);
  2. tests for risk factors (e.g., fasting lipids and glucose);
  3. tests for secondary causes, where indicated (e.g., urinary catecholamines, thyroid-stimulating hormone);
  4. tests for end organ damage (microalbuminuria, electrocardiography);
3. construct an effective initial management plan, including
  1. recommending non-pharmacological management strategies (e.g., sodium reduction, weight loss, stress reduction);
  2. selecting appropriate anti-hypertensive medication taking into consideration concomitant conditions (e.g., diabetes mellitus, asthma);
  3. selecting appropriate anti-hypertensive medication, dose, and dosage schedule taking into consideration individual characteristics (e.g., elderly), compliance, and potential for adverse reactions;
  4. selecting appropriate parenteral agents for hypertensive emergencies and ensure appropriate titration and monitoring;
  5. implementing strategies for the prevention of complications;
  6. discussing psychosocial aspects of taking lifelong medications (e.g., cost, adherence).

### **3. Blood in Urine/Hematuria**

#### **Key Objectives**

Interpret a urinalysis, paying attention to differentiating glomerular from non-glomerular causes and construct an initial management plan. The student will be able to provide a basic differential diagnosis of glomerular and non-glomerular causes of hematuria.

#### **Enabling Objectives**

Given a patient with hematuria, the student will

1. list and interpret clinical findings, including results of a detailed history and of an appropriate physical examination;
2. list and interpret investigations, including a urinalysis as well as further laboratory and imaging studies, as appropriate;

3. construct an appropriate initial management plan, including appropriate follow up and referral for specialized procedures, as required (e.g., renal biopsy, cystoscopy).

#### **4. Generalized Edema**

##### **Key Objectives**

Given a patient with generalized edema, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. In particular, it is important to differentiate systemic edema from local edema, and categorize the general mechanism of edema, since management may be affected.

##### **Enabling Objectives**

Given a patient with generalized edema, the student will

1. list and interpret critical clinical findings, including
  1. an appropriate history and physical examination;
2. list and interpret critical investigations (e.g., creatinine, urinalysis, chest X-ray)
3. construct an effective initial management plan, including
  1. non-pharmacological measures (e.g., dietary salt restriction);
  2. pharmacological measures;
  3. determination as to whether the patient requires specialized care and/or consultation (e.g., patient with advanced renal, cardiac, or hepatic disease).

#### **5. Localized Edema**

##### **Key Objectives**

Given a patient with localized edema, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. In particular, diagnosis of proximal deep venous thrombosis must be considered.

##### **Enabling Objectives**

Given a patient with localized edema, the student will

1. list and interpret critical clinical findings, including
  1. elicit history of risk factors for DVT;

2. examine extremity for signs associated with specific causes (e.g., palpable clot, tenderness);
3. in the case of suspected DVT, classify the patient into a pretest probability category (e.g., Wells criteria);
2. list and interpret critical investigations (e.g., d-Dimer, duplex ultrasonography)
3. construct an effective initial management plan, including
  1. outline the management of DVT including under circumstances where same-day diagnostic testing may be unavailable;
  2. list indications and complications, and explain management and monitoring of anti-coagulant therapy;
  3. counsel the patient about anticoagulant therapy (prevention of postphlebotic syndrome);
  4. investigation of causes of DVT, if indicated (e.g., thrombophilic states, underlying cancer);
  5. outline the management of cellulitis;
  6. determine if the patient requires specialized care.

## **6. Hyperkalemia**

### **Key Objectives**

Given a patient with hyperkalemia, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan, including indications for specialized care. In particular, the student will recognize the urgency of hyperkalemia associated with electrocardiogram (ECG) abnormalities.

### **Enabling Objectives**

Given a patient with hyperkalemia, the student will

1. list and interpret critical clinical findings, including
  1. perform a history and physical examination to determine the underlying cause (e.g., potassium sparing medications, signs of kidney injury);
2. list and interpret critical investigations, including
  1. those that can help in distinguishing between life-threatening hyperkalemia and pseudohyperkalemia;
  2. an ECG to determine the severity of the case;
  3. tests to distinguish between causes of hyperkalemia (e.g., serum creatinine, urine electrolytes);
3. construct an effective initial management plan, including
  1. initiate emergency measures (e.g., intravenous calcium, glucose/insulin, potassium binders, dialysis) in the case of hyperkalemia with ECG changes;

2. refer the patient for specialized care (e.g., nephrology), if necessary.

## **7. Hypokalemia**

### **Key Objectives**

Given a patient with hypokalemia, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. In particular, the student will recognize the urgency of hypokalemia associated with severe muscle weakness and/or ECG abnormalities.

### **Enabling Objectives**

Given a patient with hypokalemia, the student will

1. list and interpret critical clinical findings, including
  1. performing a history and a physical examination to determine the cause and complications (e.g., medications, blood pressure);
2. list and interpret critical investigations, including
  1. an ECG to identify life-threatening conduction abnormalities;
  2. tests to distinguish between causes of hypokalemia (e.g., serum and urine electrolytes);
3. construct an effective initial management plan, including
  1. ensuring appropriate potassium replacement with monitoring in a severe case;
  2. reducing renal excretion of potassium and/or GI losses;
  3. referring the patient for specialized care, if necessary.

## **8. Proteinuria**

### **Key Objectives**

Given a patient with proteinuria, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. In particular, the student should recognize the importance of proteinuria as a predictor of chronic kidney disease.

### **Enabling Objectives**

Given a patient with proteinuria, the student will

1. list and interpret critical clinical findings, including

1. perform a history and physical exam to elicit symptoms and signs of underlying diseases associated with kidney disease (e.g., diabetes mellitus, connective tissue diseases);
2. list and interpret critical investigations, including
  1. quantitative measures of proteinuria (e.g., albumin/creatinine ratio, 24 hour protein collection) to guide further diagnostic work-up;
  2. tests to determine the underlying cause of the proteinuria (e.g., blood glucose, serum protein electrophoresis);
3. construct an effective initial management plan, including
  1. initiate measures to delay progression of chronic kidney disease associated with proteinuria (e.g., angiotensin-converting enzyme inhibition, treatment of hypertension and diabetes);
  2. refer the patient for specialized diagnostic tests and care (e.g., kidney biopsy), if necessary.

## **9. Acute Kidney Injury**

### **Key Objectives**

Given a patient with acute kidney injury, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan. In particular, the student must recognize situations in which urgent intervention is required.

### **Enabling Objectives**

Given a patient with acute kidney injury, the student will

1. list and interpret critical clinical findings, including
  1. results of history and physical examination aimed at determining the most likely cause of the acute kidney injury (e.g., medications, volume status);
2. list and interpret critical investigations, including
  1. laboratory tests to determine the underlying cause and severity (e.g., urinalysis, serum/urine electrolytes, serum creatinine and potassium);
  2. renal ultrasonography, if indicated;
3. construct an effective initial management plan, including
  1. assessing the need for urgent intervention (e.g., dialysis, fluid resuscitation, or urinary catheterization);
  2. managing the patient's fluid and dietary intake;
  3. determining whether the patient requires specialized care (indications for dialysis).

## **10. Chronic Kidney Injury**

### **Key Objectives**

Given a patient with chronic kidney injury, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan.

### **Enabling Objectives**

Given a patient with chronic kidney injury, the student will

1. list and interpret critical clinical findings, including
  1. those derived from an appropriate history and physical examination aimed at determining causal conditions and manifestations of chronic kidney injury;
2. list and interpret the appropriate laboratory, including
  1. diagnostic imaging investigations needed to make the diagnosis and determining potential complications;
3. construct an effective initial management plan, including
  1. instituting immediate measures to correct metabolic abnormalities (e.g., fluids, electrolytes, treatment of acidosis);
  2. instituting immediate measures to prevent further loss of kidney function (e.g., blood pressure control, steroids for autoimmune disorders);
  3. determining whether the patient requires urgent or specialized care (e.g., dialysis);
  4. determining whether the patient requires more specialized management (e.g., intensive long-term integrated care, dialysis and/or transplantation);
  5. counseling re lifestyle changes in anticipation of long-term consequences and prevention of further complications

## **11. Hypernatremia**

### **Key Objectives**

Given a patient with hypernatremia, the student will diagnose the cause, severity and complications, and initiate an appropriate management plan. In particular, the student will recognize that most cases occur in the frail elderly population due to conditions associated with water depletion.

### **Enabling Objectives**

Given a patient with hypernatremia, the student will

1. list and interpret critical clinical findings, including
  1. history aimed at identifying the common triggers and the clinical consequences of hypernatremia;
  2. physical examination with careful assessment of volume status and the neurological effects of hypernatremia;
2. list and interpret critical investigations, including
  1. estimation of water deficit;
  2. specific laboratory and other investigations for underlying medical conditions (e.g., blood glucose, brain imaging);
3. construct an effective initial management plan, including
  1. establishing a short-term and long-term plan for correcting the sodium concentration, with recognition of the neurological consequences of overly rapid correction;
  2. correcting causes of hypernatremia.

## **12. Hyponatremia**

### **Key Objectives**

Given a patient with hyponatremia, the student will diagnose the cause, severity, and complications, and will initiate an appropriate management plan, recognizing that severe hyponatremia can be life-threatening.

### **Enabling Objectives**

Given a patient with hyponatremia, the student will

1. list and interpret critical clinical findings, including
  1. appropriate history and physical examination, with particular attention to assessment of volume status;
2. list and interpret key investigations directed towards establishing the underlying etiology, including plasma and urine osmolality and urine electrolytes;
3. construct an effective initial management plan, including
  1. a therapeutic approach based on the underlying etiology;
  2. understanding the risk factors for, and how to avoid osmotic demyelination syndrome/central pontine myelinolysis;
  3. correcting serum sodium at an appropriate rate and understanding the risks and indications for more rapid correction of sodium concentration.

## **13. Polyuria and/or Polydipsia**



## Enabling objectives

Given a patient with polyuria and/or polydipsia, the student will

1. list and interpret critical clinical findings, including
  1. diagnose polyuria/polydipsia, causal factors, and severity, differentiating urinary frequency from polyuria;
  2. inquire about any personal or family history of diabetes;
  3. identify neurological features that may suggest intracranial pathology as a cause of central diabetes insipidus;
2. list and interpret critical investigations, including
  1. tests which distinguish between water and osmotic diuresis;
  2. screening for diabetes;
  3. use of a voiding diary, when appropriate;
3. construct an effective initial management plan, including
  1. management of the underlying cause;
  2. determination as to whether the patient requires specialized care.