



N4: PATHOPHYSIOLOGY

TOPIC 8: ALTERATIONS IN URINARY SYSTEM AND RENAL FUNCTION

Study Guide

Description

Magandang araw!

We are nearing the completion of Nursing 4 and please know that you are doing a great job!

You have learned in Nursing 3 about the vital function of the kidneys and the urinary system. Briefly, the urinary system contributes to homeostasis by altering blood composition, pH, volume, and pressure; maintaining blood osmolarity; excreting wastes and foreign substances; and producing hormones (Tortora and Derrickson, 2014 p. 979). Given these essential roles of the kidneys and the urinary system, it would be logical to think that any alterations in this system would also affect these functions. A failure of the kidney to filter out wastes, for example, would result to homeostatic imbalance with systemic clinical manifestations.

Pre-session Quiz

Before delving into the topic, please answer the **pre-session quiz** which has 10 items. This is non-graded, and it will help you focus yourself to the topic at hand and to serve as review of the concepts that you have previously learned in N3: Anatomy and Physiology and other subjects.

After answering the pre-session quiz, you may now proceed to the topic. If you have any questions as you through each of the following sub-topics, do not hesitate to get in touch with your faculty-in-charge. The policies on communicating with your faculty is found at the course guide.

Topic – ALTERATIONS IN URINARY TRACT AND RENAL FUNCTION

As a review of the normal physiology, recall the following functions of the kidneys from Nursing 3:

1. Regulation of blood ionic composition- the kidneys help in regulating the amount of certain electrolytes like Na, K, and Cl ions. For example, the aldosterone produced by the adrenal glands exert its effects in the kidneys by reabsorbing Na ions and secreting K ions.



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2. Regulation of blood pH- normal blood pH has very narrow limits at 7.35 to 7.45. One of the ways the body regulated blood pH is through the kidneys which can excrete variable amounts of H⁺ ions and reabsorb HCO₃⁻ ions depending on blood pH.
3. Regulation of blood volume- the kidneys regulate blood volume by reabsorbing or eliminating water into the urine. Several hormones are important for this function including the production of renin as well as the antidiuretic hormone (ADH).
4. Regulation of blood pressure- blood pressure is a function of blood volume and since the kidneys can regulate blood volume, it can also regulate blood pressure. Another way that the kidneys regulate blood pressure is through the production of renin through the renin-angiotensin-aldosterone (RAA) pathway.
5. Maintenance of blood osmolarity- blood osmolarity refers to the amount of dissolved solutes in the blood e.g., electrolytes. The kidneys, by regulating the amount of electrolytes and other solutes, can maintain the blood osmolarity.
6. Production of hormones- the kidneys produced two hormones: (1) *calcitriol* which is the active form of Vitamin D helps regulate calcium homeostasis, and (2) *erythropoietin* which stimulates the production of red blood cells.
7. Regulation of blood glucose level- the kidneys can participate in gluconeogenesis as it can use the amino acid glutamine to synthesize new glucose molecules. These new glucose molecules can then be released into the blood stream to maintain blood glucose levels.
8. Excretion of wastes and foreign substances- the kidneys form urine which are basically composed of waste products of metabolism.

You will need to go back to the normal functions as we discuss the alterations.

The specific alterations (or disease conditions) that we will be discussing in this topic are the following:

1. Urinary tract obstruction
2. Urinary tract infection
3. Pyelonephritis



4. Glomerular disorders
5. Renal dysfunction

At the end of this topic, you will be able to:

1. Discuss the pathogenesis and etiologic factors of the different alterations in urinary tract and renal function discussed in this topic.
2. Trace the pathogenesis of the different urinary tract and renal function alterations to explain the clinical manifestations of these conditions.

To help you further understand the concepts and the different alterations, watch the prerecorded lecture by **Asst. Prof. Peter James B. Abad** on **Urinary Tract Obstruction Overview and Alterations in the Urinary System and Renal Function** uploaded at the VLE. You may also download the presentation slides.

You may also read any Pathophysiology reference textbook.

To supplement your understanding, you may also check these resources:

- Thomas, R., Kanso, A., & Sedor, J. R. (2008). Chronic kidney disease and its complications. *Primary care*, 35(2), 329–vii. <https://doi.org/10.1016/j.pop.2008.01.008>
Download: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2474786/>

Post-session Quiz

After you have viewed and read all the preceding resources, you are now ready to take the **post-session quiz**. This is a graded quiz consisting of 20 items which will test the knowledge that you have acquired from the preceding subtopics.

CONGRATULATIONS for finishing Topic 8 – Alterations in Urinary System and Renal Function!
You may now proceed to the next topic.