



## **The Value of Osmolality Testing in Nephrology**

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### **Abstract**

A simple diagnosis of low serum sodium as hyponatremia is not sufficient to provide a treatment plan. Without testing for serum osmolality, urine osmolality, and urine sodium levels, we cannot know if the patient has true hyponatremia or “pseudo-hyponatremia”. Giving IV fluids to a patient without knowing the true diagnosis of hyponatremia through these lab results will not treat the low serum sodium and may extend the patient’s hospital stay by a day or more and compromise patient health.

### **Application Note**

I use serum osmolality to evaluate the cause of hyponatremia. Serum osmolality, urine osmolality, and urine sodium are the initial lab tests that I order when I am first asked to consult on a patient with hyponatremia. Serum osmolality helps me differentiate hypotonic hyponatremia from iso-osmolar and/or hyperosmolar hyponatremia (from hyperglycemia, mannitol, hyperlipidemia or hyperproteinemia). In the later cases of “pseudo-hyponatremia,” you will find a normal or high serum osmolality with a falsely low measured serum sodium. Furthermore, urine osmolality is used to distinguish between impaired water excretion, or Syndrome of Inappropriate Antidiuretic hormone secretion) (SIADH), and hyponatremia with normal water excretion.

Once a diagnosis of “true hyponatremia” has been established by low serum osmolality, I then use the urine sodium to differentiate between cases of hypovolemia, euvolemic, and hypervolemia. Based on the results from the urine sodium and the history and physical of the patient, I then make my treatment decision to treat the patient with isotonic (0.9%) or hypertonic (0.3%) saline. If the patient has peripheral edema or fluid overload, he should be treated with diuretics and/or fluid restriction. Whereas, if the patient has a urine osmolality  $> 150$  mosm/kg, they have SIADH and because the body is retaining water, the patient should be fluid restricted, and not given any saline fluids.

The risk of not ordering both serum osmolality and urine osmolality will lead to treating the electrolyte abnormality such as hyponatremia incorrectly, which can harm the patient. Most commonly, the patient will be getting IV fluids even in cases of “pseudohyponatremia” when there is a false reading of low sodium in hyper-proteinemia, hyperlipidemia, or after surgery using high osmotic agents. In addition, cases of SIADH can be missed if a urine osmolality is not ordered. In this condition, the body retains water instead of excreting it normally in urine, so the urine osmolality will be very high. Saline IV fluids given in a patient with SIADH will only lower the sodium level more or keep it unchanged and the patient’s condition will not improve or may get worse.

Both hyponatremia at admission and hospital-acquired hyponatremia result in increases in ICU admissions and hospital readmissions, as well as a greater utilization of healthcare resources. Ordering serum and/or urine osmolality upfront as the first tests a physician orders in hyponatremia will reduce the length of stay of a patient in the hospital. A reduced length of stay per patient with hyponatremia will reduce the cost of care as well as fewer ICU days. This is because the serum and urine osmolality give the physician the vital information on the diagnosis of the hyponatremia. If the physician knows the diagnosis on the initial day of admission, then the precise treatment begins the same day and the patient will be out of the ICU or discharged earlier when stable. Commonly, I am consulted on a hyponatremic patient in the ICU after the patient has been receiving saline IV

fluids for hyponatremia for 2 days with no change in the serum sodium level, which happens because osmolality was not ordered. Once I get consulted as a Nephrologist, I order the serum and urine osmolality and may discover that the patient has SIADH and should be off IV saline, and rather be fluid restricted. Thus, not ordering serum and urine osmolality may lead to the wrong treatment plan and thus a longer length of patient stay, higher hospital cost, and risk to patient health. In my experience, osmolality testing on the first day would reduce the number of days in the hospital by a day or more.

### **References**

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