

Clinical Value of Unique Prime Plus® Critical Care Tests

STAT PROFILE
Prime+



Prime Plus
Comprehensive Model

Prime Plus is the only blood gas/critical care analyzer to offer ionized magnesium, BUN (Urea), creatinine, estimated plasma volume and mean corpuscular hemoglobin concentration as part of its test menu. These tests offer important insights for cardiac, respiratory, renal, and volume status, enabling clinicians to better manage critically ill patients.

Ionized Magnesium

All Cause Mortality: Both hypomagnesemia and hypermagnesemia are associated with all-cause mortality.¹

Respiratory Function: Hypomagnesemia is a highly prevalent, but under diagnosed, electrolyte abnormality in critically ill patients. It is associated with a 26-44% increase in risk for needing ventilatory support,^{2,3,5} and a 53-96% increase in the duration of ventilatory support.^{4,5} Mg replacement therapy guided by real-time, serial iMg measurement improves patient outcome in these patients:

- 21% reduction in the need for ventilatory support⁴
- Up to 2.5 fewer days on ventilator^{3,5}

Hypermagnesemia, while less common than hypomagnesemia, can also lead to diaphragmatic weakness requiring ventilatory support.⁶

ICU: Approximately 30% of ICU patients do not have agreement between iMg and tMg. This can lead to unnecessary Mg replacement and testing, or under-replacement.⁷

Cardiac Surgery: 75% of patients undergoing cardiopulmonary bypass (CPB) have postoperative hypomagnesemia which can cause reduced cardiac contractility, cardiac arrhythmias, and cardiac arrest. Peri-operative correction of hypomagnesemia, titrated by real-time serial measurement of iMg, reduces risk of arrhythmia after CPB:⁸

- 77% reduction in ventricular tachycardia
- 35% reduction in atrial fibrillation
- 115% increase in maintaining continuous sinus rhythm after surgery.

Kidney Function: For patients undergoing continuous venovenous hemofiltration (CVVH) with citrate, ionized magnesium and not total magnesium (tMg), represents the physiologically active fraction of magnesium in serum. As many as 40% of CVVH patients have tMg results that do not correlate with iMg status.⁹ This is thought to be because citrate is used in CVVH to bind Ca to anti-coagulate the blood. If citrate binds Ca, it binds Mg also, and the Mg/citrate complex would be measured in the tMg value. Thus, in this patient group, iMg is the only accurate way to assess a patient's effective Mg status.

BUN (Urea), Creatinine and eGFR

Kidney Function: Over 50% of intensive care unit (ICU) patients will develop acute kidney injury (AKI).¹⁰ AKI portends increased ICU stay, increased cost, and compromised outcome. Prime Plus is the only blood gas analyzer to provide optional whole blood creatinine and BUN (Urea) tests plus eGFR for rapid assessment of kidney function. The BUN/Creatinine ratio also provides an assessment of illness severity, prolonged ICU stay, and prognosis.

Estimated Plasma Volume (ePV)

Respiratory Function: In patients requiring ventilatory support, measuring ePV and Δ ePV may be useful additional data points to guide fluid management and guide extubation.

Heart Failure: ePV and Δ ePV have been shown to have prognostic ability in patients with congestive heart failure (CHF).¹¹ Another area of interest is the use of ePV to guide diuresis in patients admitted for CHF. Often the endpoint for volume reduction in heart failure patients is not apparent, and over-diuresis is common. ePV therapy and Δ ePV are useful parameters to help diurese in this challenging patient population.¹²

Kidney Function: Often patients on hemodialysis become hypotensive during treatment from having too much fluid removed, and this is associated with an increase in mortality.¹³ ePV and Δ ePV can help to guide fluid balance in these patients. In addition to hemodialysis, ePV may be beneficial in following patients with CKD, AKI, to help optimize their management. CKD and AKI patients are often congested and trending ePV allows better assessment and treatment.

Sepsis: Septic patients are often total-body fluid overloaded due to capillary leakage and movement of fluid from the intravascular space to the extravascular space. As a result, patients with sepsis require significant fluid resuscitation. Accurately assessing intravascular volume is notoriously difficult, and using ePV gives the clinician important data to help with that critical parameter.^{11,12,14,15} ePV and Δ ePV help to determine whether the patient is intra-vascularly depleted, or if they have been given enough fluid to restore intravascular volume. It is useful in deciding whether to give more fluid or to start pressers.

Mean Corpuscular Hemoglobin Concentration (MCHC)

Anemias: MCHC, along with measured hemoglobin and hematocrit, provides insight to identify and manage certain anemias and their etiologies. Low MCHC is found in microcytic hypochromic anemias due to internal bleeding, iron deficiency, chronic low grade blood loss, and thalassemia. High MCHC is associated with autoimmune hemolytic anemia, macrocytic anemia, severe burns, vitamin B12 deficiency, chemotherapies, and hereditary spherocytosis.

References

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