

Blood Testing for Informed Treatment of Severely Ill Patients

Terry L. Shirey, Ph.D. Director of Scientific Affairs Nova Biomedical (November 18, 1998)

Abstract

A significant advance in the discipline of critical care medicine is the availability of key biochemical test results at the patient's bedside within the brief period in time when they can be used to guide resuscitation and cardiovascular stabilization effectively. Frequently the menu of key tests, referred to as a critical care profile (CCP), needs to be available to the attending clinician within 5 minutes if it is to affect therapeutic strategy in real time.

Tests frequently recommended for a critical care profile include glucose, pO₂, pCO₂, pH, lactate, ionized calcium (iCa), K, Na, ionized magnesium (iMg), and either hemoglobin (Hb) or hematocrit (Hct). This test menu helps to determine whether the most urgent, time-dependent requirements for survival; i.e. getting oxygen and substrate to the most vital tissues; are being met. The electrolytes (iCa, K, and iMg) individually, or in combination, are important factors in conduction, contraction, reperfusion injury, the inflammatory response, and in hypoxic neural injury. Hypo- or hyper-glycemia also contribute to neural and cardiac damage, the latter when hypoxia is a factor in the patient's status. Lactate is the only reliable indicator suggesting that tissue hypoxia is occurring. The CCP can be very helpful for patients experiencing perfusion difficulties or that are candidates for arrhythmias. Shock, trauma, cardiac arrest, myocardial infarction, cardiopulmonary bypass surgery, transplant surgery, high-risk surgeries, sepsis, and other settings are well supported when they have access to CCP technology. Locations needing CCP support include the Emergency Department (ED), the operating room (OR) and the intensive care unit (ICU).

Recent developments make it possible to deliver a CCP with a 5 minute turnaround time (TAT) requirement. These include: (1) the ability to measure all of the analytes of the CCP on a whole blood sample, and (2) point-of-care (POC) testing. Today the results of a CCP can be available to the attending clinician within 5 minutes of his request by sampling ~200 uL of whole blood with a critical care instrument at or near a patient's bedside.