Point-of-Care Whole Blood Creatinine and eGFR Testing

Single-Use Creatinine Biosensor Test Strip
Virtually Painless Finger Stick Capillary Blood Sample, 1.2 µL
Fast, 30 Second Analysis
Wide Measurement Range 27-1056 µmol/L (0.3-12 mg/dL)
Calculated eGFR and Creatinine Clearance
In response to the growing need to quickly and easily assess kidney function in many point-of-care settings, Nova Biomedical introduces StatSensor Creatinine, a handheld analyzer and miniaturized, disposable biosensor for whole blood creatinine testing. StatSensor Creatinine incorporates new, patented Multi-Well™ technology adapted from Nova’s hospital glucose monitoring system. StatSensor advanced technology now enables simple, rapid, and accurate assessment of renal function by finger stick capillary blood sampling at the point of care.

Features:
- Creatinine accuracy comparable to hospital laboratory testing
- Estimated glomerular filtration rate (eGFR) by MDRD and Cockcroft-Gault equations
- Simple test procedure (single use, precalibrated disposables)
- Virtually painless, fingerstick capillary blood sampling (1.2 µL)
- Fast, 30 second results
- Wide measurement range: 27 µmol/L to 1056 µmol/L (0.3-12 mg/dL)

Creatinine with eGFR Enhances Assessment of Renal Function

The whole blood creatinine concentration has limitations when used alone to assess kidney function. While creatinine is the best single blood test for kidney function, it is influenced by age, gender, race, and body composition. For example, an elderly person could lose half of his/her kidney function before creatinine rises above the upper limit of normal.

Creatinine with eGFR is a more accurate and sensitive assessment of kidney function than creatinine alone. eGFR takes into account the creatinine concentration and other variables including: age, gender, race, and body size.

StatSensor Creatinine calculates estimated glomerular filtration rate (eGFR) by MDRD and Creatinine Clearance (CrCl) by Cockcroft-Gault equations.

### eGFR and Chronic Kidney Disease

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Glomerular filtration (GFR), per 1.73 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney Damage with normal or increased GFR</td>
<td>&gt;90</td>
</tr>
<tr>
<td>2</td>
<td>Kidney Damage with mild decrease in GFR</td>
<td>60-89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate decrease in GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>4</td>
<td>Severe decrease in GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>5</td>
<td>Kidney failure</td>
<td>&lt;15 (or dialysis)</td>
</tr>
</tbody>
</table>

### Nova StatSensor® Creatinine Measuring System

The whole blood creatinine concentration has limitations when used alone to assess kidney function. While creatinine is the best single blood test for kidney function, it is influenced by age, gender, race, and body composition. For example, an elderly person could lose half of his/her kidney function before creatinine rises above the upper limit of normal.

Creatinine with eGFR is a more accurate and sensitive assessment of kidney function than creatinine alone. eGFR takes into account the creatinine concentration and other variables including: age, gender, race, and body size.

StatSensor Creatinine calculates estimated glomerular filtration rate (eGFR) by MDRD and Creatinine Clearance (CrCl) by Cockcroft-Gault equations.
Another Technology Advance From Nova Biomedical, the World Leader In Whole Blood Testing

Nova Biomedical is the world technology leader in the development of advanced biosensors for whole blood analysis. During the past 30 years, Nova has introduced 20 biosensors, including the industry’s first biosensor to directly measure whole blood glucose in 1988, and the industry’s first biosensor to directly measure whole blood creatinine in 1996. These earlier biosensors are used routinely in thousands of hospital laboratories and critical care settings around the world in our Stat Profile® brand blood gas/critical care analyzers. Now Nova has incorporated its creatinine biosensor technology into a precalibrated, single use, disposable system that provides rapid screening of kidney function at the point of care.

Nova Whole Blood Measurement Technologies

<table>
<thead>
<tr>
<th>Core Technology</th>
<th>Measured Analyte</th>
<th>Abbreviation</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amperometric</strong> (whole blood or serum)</td>
<td>Creatinine</td>
<td>Crea</td>
<td>Immobilized three enzyme membrane + H₂O₂</td>
</tr>
<tr>
<td></td>
<td>Glucose</td>
<td>Glu</td>
<td>Immobilized glucose oxidase membrane + H₂O₂</td>
</tr>
<tr>
<td></td>
<td>Glutamate</td>
<td>Glut</td>
<td>Immobilized glutamate oxidase membrane + H₂O₂</td>
</tr>
<tr>
<td></td>
<td>Glutamine</td>
<td>Gln</td>
<td>Immobilized glutaminase and glutamate oxidase + H₂O₂</td>
</tr>
<tr>
<td></td>
<td>Lactate</td>
<td>Lac</td>
<td>Immobilized lactate oxidase + H₂O</td>
</tr>
<tr>
<td><strong>Conductivity</strong></td>
<td>Partial Pressure Oxygen</td>
<td>PO₂</td>
<td>O₂ membrane, O₂ reduction by cathode</td>
</tr>
<tr>
<td><strong>Potentiometric</strong> (whole blood or serum)</td>
<td>Hematocrit</td>
<td>Hct</td>
<td>Electrical resistance, Na⁺ corrected</td>
</tr>
<tr>
<td></td>
<td>Ammonium</td>
<td>NH₄⁺</td>
<td>pH electrode with acetic acid permeable membrane</td>
</tr>
<tr>
<td></td>
<td>Chloride</td>
<td>Cl⁻</td>
<td>Ammonium ISE ionophore in PVC</td>
</tr>
<tr>
<td></td>
<td>Hydrogen Ion Activity</td>
<td>pH</td>
<td>Hydrogen ion selective glass membrane</td>
</tr>
<tr>
<td></td>
<td>Ionized Calcium</td>
<td>Ca²⁺</td>
<td>Calcium ionophore in PVC</td>
</tr>
<tr>
<td></td>
<td>Lithium</td>
<td>Mg²⁺</td>
<td>Magnesium ionophore in PVC</td>
</tr>
<tr>
<td></td>
<td>Partial Pressure CO₂</td>
<td>PCO₂</td>
<td>pH electrode with CO₂ gas permeable membrane</td>
</tr>
<tr>
<td></td>
<td>Potassium</td>
<td>Li⁺</td>
<td>Lithium ionophore in PVC</td>
</tr>
<tr>
<td></td>
<td>Sodium</td>
<td>K⁺</td>
<td>Valinomycin ionophore in PVC</td>
</tr>
<tr>
<td></td>
<td>Total Calcium</td>
<td>Na⁺</td>
<td>Sodium ion selective glass membrane</td>
</tr>
<tr>
<td></td>
<td>Total Carbon Dioxide</td>
<td>TCO₂</td>
<td>Calcium electrode with acidified sample</td>
</tr>
<tr>
<td><strong>Photometric</strong> (lysed whole blood)</td>
<td>Urea/urea Nitrogen/BUN</td>
<td>Urea</td>
<td>Urease enzyme membrane and ammonium ISE</td>
</tr>
<tr>
<td></td>
<td>Carboxyhemoglobin</td>
<td>COHb</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Deoxyhemoglobin</td>
<td>HHb</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Methemoglobin</td>
<td>MetHb</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Oxygen Saturation</td>
<td>SO₂,⁰</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Oxyhemoglobin</td>
<td>O₂,⁰</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Sulfhemoglobin</td>
<td>shHb</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Total Hemoglobin</td>
<td>trHb</td>
<td>Multi-wavelength spectral scanning of hemolyzed RBCs</td>
</tr>
<tr>
<td></td>
<td>Hemoglobin</td>
<td>Hb</td>
<td>Multi-wavelength fiber optic reflectance, sodium correction</td>
</tr>
<tr>
<td><strong>Photometric</strong> (whole blood, nondestructive)</td>
<td>Oxygen Saturation</td>
<td>SO₂,⁰</td>
<td>Multi-wavelength fiber optic reflectance (oximetry)</td>
</tr>
</tbody>
</table>
Rapid, Easy to Use, Point-of-Care Creatinine Testing

No User Calibration
StatSensor biosensors are precalibrated and immediately ready to use.
- No analyzer or biosensor preanalytical steps, such as using a calibrating reagent or entering a calibration code in the analyzer, are necessary.
- By eliminating this calibration step, StatSensor is actually simpler to operate than most meters used by diabetics at home to self-test for glucose.

Simple Test Procedure
A bright, easy to read, color screen prompts the user through the StatSensor test procedure.
1. Place the sensor in meter
2. Stick finger to create blood drop
3. Apply strip to blood drop
4. Read creatinine results

Fast, 30 Second Creatinine Results
Assessment of kidney function can be made in real time at the point of care. Patient care treatments that require prior kidney assessment can be expedited.

Creatinine with eGFR Enhances Renal Function Assessment
StatSensor can calculate eGFR by two different equations. eGFR and creatinine results are displayed along with normal ranges. Abnormal results are prominently flagged with color highlighting, text, and symbols.

Cleared for Use by Point-of-Care Personnel
StatSensor can be used by nurses, radiology technicians, or other non-laboratory personnel.

Capillary Blood Sampling is Virtually Painless
StatSensor uses a very small, 1.2 microliter blood sample (less than one drop). Samples can be obtained virtually painlessly from a capillary finger stick using the same type lancet used by diabetics at home to self-test for glucose. No venous blood drawing or phlebotomist is needed.
StatSensor Accuracy is Comparable to Hospital Laboratory Testing

StatSensor Creatinine whole blood biosensors provide excellent correlation to central laboratory plasma reference methods. StatSensor accuracy combined with fast, 30 second analysis and calculated eGFR enable rapid screening of kidney function at the point-of-care.

StatSensor Measures and Eliminates Interference Due to Hematocrit

Measurements made on whole blood samples are subject to interference due to varying hematocrit levels of the sample. StatSensor measures and corrects for varying hematocrit levels. Accurate results are obtained throughout a broad range of hematocrit.

Interfaces with Hospital and Laboratory Information Systems

NovaConnects™ middleware system provides comprehensive connectivity, management, and control for StatSensor point-of-care testing. This system provides the critical components for successful point-of-care testing including:

- LIS/HIS Interface and Connectivity Management
- Management of Patient and QC Data
- Regulatory Compliance via Audit Logs, Reports, and Records

![StatSensor Linear Regression Analysis](image)

StatSensor Whole Blood vs Central Laboratory Plasma Reference Method (Enzymatic)

![Connection to Hospital Systems](image)

Connection to Hospital Systems

Radiology
CATH LAB
ED
NovaConnects™

Unlimited number of meters

LIS/HIS
Minimize Risk of Contrast Media Induced Nephropathy

Contrast media induced nephropathy (CMIN) is the third most common cause of acute renal failure in hospitalized patients.\(^1\) CMIN is associated with prolonged hospital stay, adverse cardiac events, and high mortality. An increasing number of imaging procedures require the use of intravenous contrast media, and the patient population subjected to these procedures is progressively older and has more pre-existing conditions. The benefits of a fast, easy POC creatinine assay are:

- StatSensor can minimize the risk of CMIN by providing comprehensive assessment of renal impairment prior to contrast media imaging.
- Comprehensive renal assessment allows renal protective strategies to be considered.
- Testing can be easily performed by radiology personnel.

Improve Productivity and Workflow

Radiology and Cath Labs are highly specialized and costly departments to operate. Procedures are carefully scheduled in order to maintain productivity of personnel and procedure rooms. Patients arriving for contrast media imaging procedures without valid creatinine results must be sent to the laboratory for creatinine testing. Obtaining creatinine/eGFR results from the lab can delay the procedure for hours or require rescheduling for another day. Productivity is lost when schedule openings occur.

- StatSensor point-of-care creatinine/eGFR testing can prevent costly procedure room openings, and loss of personnel and equipment productivity.
- A simple, inexpensive StatSensor test can prevent cancellation or rescheduling of a scan when kidney function testing is needed.

Improve Patient Satisfaction

Long delays or even cancellation and rescheduling of procedures can occur when renal status is unknown at the patient’s time of appointment. Patients may be forced to wait for hours for their creatinine/eGFR blood test or to come back another day. Patient dissatisfaction is likely if these events occur.

- StatSensor Creatinine provides rapid, 30 second assessment of renal function, virtually painlessly, from a finger stick.
- StatSensor point-of-care testing in the department can prevent patient dissatisfaction when renal function must be determined.

For Radiology and Cardiac Catheterization

Risk of Contrast Media Induced Nephrotoxicity

Contrast media induced nephropathy is the third most common cause of acute renal failure in hospitalized patients.\(^1\) The primary risk factor for contrast media induced nephrotoxicity is pre-existing renal dysfunction, especially diabetic nephropathy.\(^2\)


For Oncology
Reduce Medication Risks
Renal impairment is frequent in cancer patients, and these patients are at high risk of drug-induced renal toxicity. This has implications for drug selection and dosing. Many chemotherapy drugs are prescribed close to the maximum therapeutic dose. Renal function determines whether there is a need to use the drug more sparingly or to avoid the drug entirely. This is especially true for drugs that are cleared primarily by the kidney and for drugs with established nephrotoxicity.
• StatSensor provides a rapid, 30 second, accurate assessment of renal function including eGFR.
• StatSensor testing can be easily performed in the oncology clinic.
• Renal safety for chemotherapy patients is assured.

Improve Patient Satisfaction
Many chemotherapy outpatients need to have their kidney function assessed before receiving their chemotherapy session. Obtaining a venous blood sample and sending it to a laboratory for creatinine/eGFR testing could delay chemotherapy for several hours. A chemotherapy session that might take a couple of hours could turn into a full day.
• With StatSensor Creatinine, a capillary blood sample can be obtained and renal function can be quickly determined.
• Treatment delays and patient dissatisfaction are avoided.

For the Emergency Department
Improve Triage, Expedite Patient Care
Various patient care protocols such as chest pain and stroke protocols may require rapid assessment of renal function in order to triage the patient for radiologic procedures. Many other ED protocols require timely administration of drugs and adjustment of drug dosage based on renal function.

StatSensor Creatinine accurately assesses renal function with a simple, 30 second test that can be easily performed in the ED.

For the ICU
Acute renal failure (ARF) is a common occurrence among patients admitted to the ICU. Results of a multinational study suggest that ARF requiring renal replacement therapy occurs in 5% to 6% of ICU patients.\(^4\) Mortality for ARF in the ICU setting may be as high as 70%. Early detection and therapy is critical in reducing morbidity and mortality from ARF.
• StatSensor Creatinine with eGFR provides real time assessment of kidney function with a simple, 30-second test.
• Testing can be performed at the bedside by nursing or other point-of-care personnel.

---

**StatSensor Specifications**

**Test Measured:** Creatinine  
**Tests Reported:** Creatinine & eGFR  
**Test Time:** 30 seconds  
**Test Strip Volume:** 1.2 µL  
**Test Methodology:** Electrochemistry  
**Weight:** 360 g (0.8 lbs)  
**Size:** 153 mm x 82.5 mm x 46 mm (6.0 in x 3.25 in x 1.8 in)  

**Sample Types and Operating Modes:**  
Whole Blood: Arterial, Venous, Capillary  

**Measurement Range:**  
Creatinine: 27-1056 µmol/L (0.3-12.0 mg/dL)  

**Operating Ranges:**  
Temperature: 15˚C - 40˚C (59˚F - 104˚F)  
Altitude: Up to 4,454 meters (15,000 feet)  
Humidity: 10% to 90% relative humidity  

**Test Strip Stability:**  
Refrigerated Storage: 12 months  
Room Temperature Storage: 3 months  

**eGFR and CrCl Equations:**  
MDRD for Estimated Glomerular Filtration Rate (eGFR) and Cockcroft-Gault for Creatinine Clearance (CrCl)  

**Data Storage:**  
Patient Tests: 1,000  
QC Tests: 200  
Operators: 4,000  

**Connectivity:**  
Data Output Port: Ethernet (10 Mbit)  
Meter Data Output: RJ-45 Ethernet Port  
Protocol: TCP/IP Ethernet 10 Mbit  
Standard: POCT1-A Compliant  
Setup Program: NovaNet® Web-Based  

**Battery Information:**  
Type: 3.7V Li Polymer Rechargeable Battery  

Specifications subject to change without notice.