Overview

Useful For
Cystatin C:

An index of glomerular filtration rate, especially in patients where serum creatinine may be misleading (eg, very obese, elderly, or malnourished patients)

Assessing renal function in patients suspected of having kidney disease

Monitoring treatment response in patients with kidney disease

Estimated Glomerular Filtration Rate (eGFR):

An index of GFR, especially in patients where serum creatinine may be misleading (eg, very obese, elderly, or malnourished patients); for such patients, use of CKD-EPI cystatin C equation is recommended to estimate GFR

Assessing renal function in patients suspected of having kidney disease

Monitoring treatment response in patients with kidney disease

Method Name
Immunoturbidimetric

NY State Available
Yes

Specimen

Specimen Type
Serum

Specimen Required

Container/Tube:

Preferred: Red top

Acceptable: Serum gel

Specimen Volume: 1 mL

Forms

If not ordering electronically, complete, print, and send a Cardiovascular Test Request Form (T724) with the specimen.

Specimen Minimum Volume
0.5 mL

Reject Due To
Test Definition: CYSTC
Cystatin C with Estimated GFR, S

<table>
<thead>
<tr>
<th>Gross hemolysis</th>
<th>Reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross lipemia</td>
<td>OK</td>
</tr>
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Specimen Stability Information

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>Serum</td>
<td>Refrigerated (preferred)</td>
<td>7 days</td>
</tr>
<tr>
<td></td>
<td>Ambient</td>
<td>7 days</td>
</tr>
<tr>
<td></td>
<td>Frozen</td>
<td>7 days</td>
</tr>
</tbody>
</table>

Clinical and Interpretive

Clinical Information

Cystatin C:

Cystatin C is a low molecular weight (13,250 kD) cysteine proteinase inhibitor that is produced by all nucleated cells and found in body fluids, including serum. Since it is formed at a constant rate and freely filtered by the kidneys, its serum concentration is inversely correlated with the glomerular filtration rate (GFR); that is, high values indicate low GFRs while lower values indicate higher GFRs, similar to creatinine.

The renal handling of cystatin C differs from creatinine. While both are freely filtered by glomeruli, once it is filtered, cystatin C, unlike creatinine, is reabsorbed and metabolized by proximal renal tubules. Thus, under normal conditions, cystatin C does not enter the final excreted urine to any significant degree.

The serum concentration of cystatin C remains unchanged with infections, inflammatory or neoplastic states, and is not affected by body mass, diet, or drugs. Thus, cystatin C may be a more reliable marker of renal function (GFR) than creatinine.

Estimated Glomerular Filtration Rate (GFR):

GFR can be estimated (eGFR) from serum cystatin C utilizing an equation which includes the age and gender of the patient. The CKD-EPI cystatin C equation was developed by Inker et al:(1) and demonstrated good correlation with measured iothalamate clearance in patients with all common causes of kidney disease, including kidney transplant recipients. Cystatin C eGFR may have advantages over creatinine eGFR in certain patient groups in whom muscle mass is abnormally high or low (for example quadriplegics, very elderly, or malnourished individuals). Blood levels of cystatin C also equilibrate more quickly than creatinine, and therefore, serum cystatin C may be more accurate than serum creatinine when kidney function is rapidly changing (for example amongst hospitalized individuals).

Reference Values

**CYSTATIN C**

Males:

0 days-22 years: no reference values established

23-29 years: 0.60-1.03 mg/L
30-39 years: 0.64-1.12 mg/L
40-49 years: 0.68-1.22 mg/L
50-59 years: 0.72-1.32 mg/L
60-69 years: 0.77-1.42 mg/L
70-79 years: 0.82-1.52 mg/L
>79 years: no reference values established

Females:
0 days-22 years: no reference values established
23-29 years: 0.57-0.90 mg/L
30-39 years: 0.59-0.98 mg/L
40-49 years: 0.62-1.07 mg/L
50-59 years: 0.64-1.17 mg/L
60-69 years: 0.66-1.26 mg/L
70-80 years: 0.68-1.36 mg/L
81-86 years: 0.70-1.45 mg/L
>86 years: no reference values established

eGFR
>60 mL/min/BSA
eGFR will not be calculated for patients under 18 years.

**Interpretation**

Cystatin C:

Cystatin C inversely correlates with the glomerular filtration rate (GFR), that is elevated levels of cystatin C indicate decreased GFR. Cystatin C may provide more accurate assessment of GFR for very obese, elderly, or malnourished patients than creatinine. Cystatin C equation does not require patient ethnic data, and can be used for those patients with this information unavailable.

Due to immaturity of renal function, cystatin C levels are higher in neonates <3 months of age.(2)

Estimated Glomerular Filtration Rate (eGFR):
Chronic kidney disease (CKD) is defined as the presence of: persistent and usually progressive reduction in GFR (GFR < 60 mL/min/1.73 m$^2$) and/or albuminuria (>30 mg of urinary albumin per gram of urinary creatinine), regardless of GFR.

According to the National Kidney Foundation Kidney Disease Outcome Quality Initiative (K/DOQI) classification, among patients with CKD, irrespective of diagnosis, the stage of disease should be assigned based on the level of kidney function:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR mL/min/BSA</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney damage with normal or increased GFR</td>
<td>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>

**Cautions**

Cystatin C:

Lipemic or frozen specimens, which become turbid after thawing, may interfere with the assay.

Estimated Glomerular Filtration Rate (eGFR):

eGFR is not a precise measure of GFR and can be influenced by nonrenal factors (eg, inflammation).

**Supportive Data**

In a study to evaluate cystatin C as a measure of renal function in comparison to serum creatinine, 500 patients had cystatin C measured by nephelometry and glomerular filtration rate (GFR) measured by nonradio-labeled iothalamate clearance.(2) In addition, serum creatinine was measured and the patients' medical records reviewed. The correlation of 1/cystatin C with GFR ($r=0.90$) was significantly superior than 1/creatinine ($r=0.82$, $p<0.05$) with GFR. The superior correlation of 1/cystatin C with GFR was observed in the various clinical subgroups of patients studied (ie, subjects with no suspected renal disease, renal transplant patients, recipients of some other transplant, patients with glomerular disease, and patients with non-glomerular renal disease). Using the lower fifth percentile age-adjusted normal values for iothalamate clearance, receiver operator characteristic curves were generated. The area under the curve for 1/cystatin C was significantly greater than for 1/creatinine. These results indicate that cystatin C may be superior to serum creatinine for the assessment of GFR in a wide spectrum of patients—both those with renal disease and those without renal disease. Others have similarly found that cystatin C correlates better than serum creatinine for assessment of GFR.(3)

**Clinical Reference**


Performance

Method Description
Serum sample from patient is mixed with Gentian cystatin C immunoparticles. Cystatin C from the sample and anti-cystatin C form the immunoparticles aggregate. The complex particles created absorb light, and by turbidimetry the absorption is related to cystatin C concentration via interpolation on an established standard calibration curve. (Package insert: Gentian Cystatin C Immunoassay on Cobas c501, Roche Diagnostics, Indianapolis, IN, June 2011)

PDF Report
No

Day(s) and Time(s) Test Performed
24 hours per day, 7 days per week

Analytic Time
1 day

Maximum Laboratory Time
2 days

Specimen Retention Time
7 days

Performing Laboratory Location
Rochester
Fees and Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact Customer Service.

Test Classification
This test has been cleared or approved by the U.S. Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
82610

LOINC® Information

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<tr>
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<th>Test Order Name</th>
<th>Order LOINC Value</th>
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<tbody>
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<td>CYSTC</td>
<td>Cystatin C with Estimated GFR, S</td>
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<table>
<thead>
<tr>
<th>Result ID</th>
<th>Test Result Name</th>
<th>Result LOINC Value</th>
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<tbody>
<tr>
<td>EGFRC</td>
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<tr>
<td>CYSC</td>
<td>Cystatin C, S</td>
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