

# LAB TEST: CREATINE KINASE (CK)

Test Description	
<b>Test Name</b>	Creatine Kinase (CK)
<b>Rationale for Reducing Overuse</b>	<p>Troponin has become the cardiac biomarker of choice for detecting myocardial injury.<sup>1,2</sup> CK should never be used as a surrogate marker for myocardial injury when troponin is available. Despite troponin being clinically superior to CK in both specificity and sensitivity, CK is still being used in the cardiac context at a high rate in some hospitals.<sup>3,4</sup></p> <p>CK testing has also been used to monitor for rhabdomyolysis in patients taking statins.<sup>5</sup> However, the risk of rhabdomyolysis and other myopathies in general with currently available statins is extremely low.<sup>6,7</sup></p> <p>Therefore, CK testing has several contexts where inappropriate testing could be reduced.</p>
Scope of the Issue	
<input checked="" type="checkbox"/> Inpatient Setting	<input type="checkbox"/> Outpatient Setting
	<input checked="" type="checkbox"/> Emergency Department
<b>Additional Details</b>	<p><b>Family Medicine</b></p> <p><b>Internal Medicine</b></p> <ul style="list-style-type: none"> <li>- Cardiology</li> <li>- Critical Care</li> </ul>
Recommendations	
<b>Summary of Recommendations</b>	<p>No Canadian Recommendations</p> <p><b>NIH National Heart, Lung, and Blood Institute<sup>8</sup></b></p> <p>Routine laboratory monitoring of creatine kinase is of little value in the absence of clinical signs or symptoms for patients on statins</p> <p><b>European Society of Cardiology Guidelines<sup>2</sup></b></p> <p>For ACS diagnostic purposes, it is not recommended to routinely measure additional biomarkers such as CK, CK-MB, h-FABP, or copeptin, in addition to hs-cTn.</p> <p><b>Society of Hospital Medicine – Adult Hospital Medicine</b></p> <p>Don't order creatine kinase (CK) or Creatine Kinase-Myocardial Band (CK-MB) in suspected Acute Coronary Syndrome or Acute Myocardial Infarction.</p>
<b>Additional Information</b>	<p>Research has illustrated that in clinical scenarios where both troponin and CK are ordered together the likelihood that troponin is negative and CK is positive in the context of an acute myocardial infarction is extremely low.<sup>3</sup></p> <p>Research has shown that the risk of severe myopathy for patients on statins is low.<sup>6,7</sup> Even when CK is measured a very small proportion of patients will have abnormal values attributable to statins over time.<sup>5,9</sup> Only if patients present with symptoms suggesting myopathy should one consider CK testing.</p>

**Summary of existing metrics/indicators for appropriate use (further details below)**

(e.g., PT/PTT, % time test conducted, if applicable)

30-70% in featured papers below  
73% in croatia<sup>10</sup>

87% in Johns Hopkins<sup>11</sup>

88.7% In Maryland community hospital<sup>12</sup>  
Canadian initiatives achieved 30-70% reductions in tests post-intervention below, with international reductions between 73-89%.<sup>4,10-15</sup>

**Success Stories**

Highlights	Summary of Implementation Strategy	Barriers to Change and Facilitators of Success
<p><b>Sunnybrook 46.7% reduction in CK tests post-intervention saving \$28446.72 annually<sup>4</sup></b></p>	<ul style="list-style-type: none"> <li>• 1,389 bed large Canadian cardiac centre and trauma centre</li> <li>• several pillars including detailed revision of institutional testing guidelines, pre-intervention analysis, targeted information sessions with key clinical and               <ul style="list-style-type: none"> <li>○ administrative stakeholders, modifications to testing</li> <li>○ processes, ongoing evaluation and feedback and postintervention audit for sustained changes</li> </ul> </li> </ul>	<p><b>Identified Barriers:</b></p> <ol style="list-style-type: none"> <li>1. CK inclusion in standardized testing panels</li> <li>2. Multiple laboratory order processes</li> <li>3. Orders from diverse clinical settings</li> </ol> <p><b>Facilitators of Success:</b></p> <ol style="list-style-type: none"> <li>1. Removed CK from panels without restricting testing</li> <li>2. No intervention prohibiting ordering if clinicians asked for it</li> <li>3. Tailored intervention strategies to laboratory processes</li> <li>4. Diverse specialties involved in project</li> </ol>
<p><b>Eastern Health Region, NL, 31% reduction in CK tests post-intervention saving \$44,264 annually<sup>13,14</sup></b></p>	<ul style="list-style-type: none"> <li>• Community setting</li> <li>• Audit and feedback were sent to family physicians, in person education to family physicians around needs for ordering CK</li> </ul>	<p><b>Identified Barriers:</b></p> <ol style="list-style-type: none"> <li>1. Small number of high utilizing physicians</li> </ol> <p><b>Facilitators of Success:</b></p> <ol style="list-style-type: none"> <li>1. Emailed family physicians individual ordering patterns</li> <li>2. Visited family physicians in-person to discuss inappropriate testing</li> </ol>
<p><b>Queen Elizabeth II Hospital, NS, 68% reduction in CK tests post-intervention<sup>15</sup></b></p>	<ul style="list-style-type: none"> <li>• Academic tertiary care ED</li> <li>• Reviewed existing symptom-prompted nursing blood test guidelines. Order sets had tests eliminated from the 'routine' panels that were not felt to directly contribute to patient care, including CK. The new guidelines were communicated to nursing staff in a series of educational sessions, and the revised guidelines were posted at nursing stations</li> </ul>	<p><b>Identified Barriers:</b></p> <ol style="list-style-type: none"> <li>1. ED guidelines guide blood test ordering using order sets to decrease over crowding</li> </ol> <p><b>Facilitator of Success:</b></p> <ol style="list-style-type: none"> <li>1. Multidisciplinary group review of blood test guidelines</li> <li>2. Removed tests from 'set' panels that did not contribute to patient care</li> <li>3. Utilized education to guide additional testing according to specific patient presentation</li> </ol>

## Tips on Implementation

### Feasible tips or suggestions for [initiating] implementation

(Per recommendation type, e.g. uncoupling, test reduction, etc.)

- Most common effective strategy

Common effective strategies include:

- Removal of CK from order sets
- Revision of practice guidelines
- Audit and feedback
- Targeted education

### Choosing Wisely Canada Applicable Toolkits

[Give the Test a Rest](#)

### References:

1. Amsterdam, E. A. *et al.* **2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes: A report of the American college of cardiology/American heart association task force on practice guidelines.** *Circulation* vol. 130 (2014).
2. Collet, J. P. *et al.* 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur. Heart J.* **42**, 1289–1367 (2021).
3. Wiens, E. J., Arbour, J., Thompson, K. & Seifer, C. M. Routine creatine kinase testing does not provide clinical utility in the emergency department for diagnosis of acute coronary syndromes. *BMC Emerg. Med.* **19**, 1–5 (2019).
4. Raza, S. *et al.* Reducing redundant creatine kinase testing in cardiac injury. *BMJ Open Qual.* **9**. (2020).
5. Tragni, E. *et al.* Monitoring statin safety in primary care. *Pharmacoepidemiol. Drug Saf.* **16**, 652–657 (2007).
6. Alberton, M., Wu, P., Druyts, E., Briel, M. & Mills, E. J. Adverse events associated with individual statin treatments for cardiovascular disease: an indirect comparison meta-analysis. *QJM An Int. J. Med.* **105**, 145–157 (2012).
7. Kashani, A. *et al.* Risks Associated With Statin Therapy. *Circulation* **114**, 2788–2797 (2006).
8. National Heart Lung and Blood Institute. **Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III): Final Report.** <https://www.nhlbi.nih.gov/files/docs/resources/heart/atp-3-cholesterol-full-report.pdf> (2002).
9. Smith, C. C., Bernstein, L. I., Davis, R. B., Rind, D. M. & Shmerling, R. H. Screening for Statin-Related Toxicity. **163**, 688–692 (2003).
10. Lapić, I., Juroš, G. F., Rako, I. & Rogić, D. Changing the electronic request form proves to be an effective tool for optimizing laboratory test utilization in the emergency department. *Int. J. Med. Inform.* **102**, 29–34 (2017).
11. Larochelle, M. R., Knight, A. M., Pantle, H., Riedel, S. & Trost, J. C. Reducing excess cardiac biomarker testing at an academic medical center. *J. Gen. Intern. Med.* **29**, 1468–1474 (2014).
12. Zhang, L. *et al.* Financial impact of a targeted reduction in cardiac enzyme testing at a community hospital. *J. Community Hosp. Intern. Med. Perspect.* **6**, 32816 (2016).
13. Wilson, R., Parfrey, P., Barrett, B. & Mohammadi, A. Reduction in Biochemical Tests in General Practice. *Choos. Wisely Canada 2019 Natl. Meet. Abstr. B.* (2019).
14. Quality of Care Newfoundland. **A Review of Value Assessments of QCNL Projects.** [https://www.nlcahr.mun.ca/Research\\_Exchange/qocnlcwnl2018.pdf](https://www.nlcahr.mun.ca/Research_Exchange/qocnlcwnl2018.pdf) (2018).
15. Campbell, S. *et al.* Choosing Wisely in the Emergency Department to Reduce Unnecessary Tests. *Choos. Wisely Canada 2018 Natl. Meet. Abstr. B.* 18 (2018).