

LAB TEST: LACTATE DEHYDROGENASE (LDH)

Test Description		
Test Name	Lactate Dehydrogenase (LDH)	
Rationale for Reducing Overuse	<p>LDH is distributed in a variety of tissues at high concentrations, often making LDH elevation a non-specific finding.¹ More specific serum markers of tissue damage have outperformed LDH leading to a loss of clinical utility.²⁻⁴ Therefore outside of specific indications, LDH testing is unnecessary, wasteful and potentially harmful.</p> <p>LDH had a history of utility in myocardial infarction, liver disease and muscle disease.⁵ In myocardial infarction troponin has become the biomarker of choice with far greater sensitivity than LDH.² In liver disease transaminases and ALP have greater sensitivity and specificity than LDH meaning there is little value in ordering LDH in this context.⁶ In muscle disease creatine kinase testing is more specific than LDH making it the superior option.⁴</p>	
Scope of the Issue		
<input type="checkbox"/> Inpatient Setting	<input checked="" type="checkbox"/> Outpatient Setting	<input checked="" type="checkbox"/> Emergency Department
Additional Details	Family Medicine	
Recommendations		
Summary of Recommendations	No Canadian Recommendations	
<ul style="list-style-type: none"> Canadian recommendations International recommendations 		
Additional Information	The clinical utility of LDH in areas where it was historically useful has been greatly diminished. ^{2,4,6} Research has shown that in many cases LDH is ordered without a relevant clinical indication and often, regardless of indication, LDH results do not impact management. ⁷ Other research has illustrated that when LDH was removed from order sets physicians denied noticing its absence, showing a lack of safety concern. ⁸	
Summary of existing metrics/indicators for appropriate use (further details below) (e.g., PT/PTT, % time test conducted, if applicable)	Studies show a reduction of 69-79% in LDH test orders. ⁸⁻¹²	
Success Stories		
Highlights	Summary of Implementation Strategy	Barriers to Change and Facilitators of Success
University Health Network, Toronto, ON, 69.1% reduction saving \$33,340.56 annually⁸	<ul style="list-style-type: none"> Two academic tertiary care EDs Removed LDH from all computerised provider order entry test panels after discussion and agreement from ED physicians 	<p>Identified Barriers:</p> <ol style="list-style-type: none"> Fast pace, hectic, high stakes environment of the ED LDH listed as a default order <p>Facilitators of Success:</p> <ol style="list-style-type: none"> Forcing function to necessitate certain action and streamline the process

Eastern Health Region, NL, 71% reduction in tests post-intervention saving \$37,136 annually^{9,10}	<ul style="list-style-type: none"> - Community setting - Provided new requisition form omitting LDH, audit and feedback was sent to family physicians, in person education to family physicians around needs for ordering LDH 	<p>Identified Barriers:</p> <ol style="list-style-type: none"> 1. Small number of high utilizing physicians <p>Facilitators of Success:</p> <ol style="list-style-type: none"> 1. Emailed family physicians individual ordering patterns 2. Visited family physicians in-person to discuss inappropriate testing
Nova Scotia Health Authority Central Zone, Halifax, NS, 77% reduction post-intervention saving \$6290 annually¹¹	<ul style="list-style-type: none"> - Laboratories servicing a population of 450,000 - Education on appropriate utilization, LDH removed from requisition form and test panels, audit and feedback sent to family physicians, hard stop lab utilization rule; LDH request cancelled if reason for request not included 	<p>Identified Barriers:</p> <ol style="list-style-type: none"> 1. Specialists push back on need to include information on requisition form <p>Facilitators of Success:</p> <ol style="list-style-type: none"> 1. Educational memo 2. Educational feedback to physicians on individual ordering patterns
Bradford Teaching Hospitals, UK, 79% reduction¹²	<ul style="list-style-type: none"> - Pathology service for a population of 500,000 - Removed LDH from requisition form that was used by community providers 	<p>Identified Barriers:</p> <ol style="list-style-type: none"> 1. Outdated request forms including unnecessary tests 2. Unclear panels that do not state what tests are included <p>Facilitators of Success:</p> <ol style="list-style-type: none"> 1. Reducing inappropriately listed tests with simplified labeling 2. Clearly labelling included tests in panels

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 LDH from requisitions
- Targeted education and feedback
- Engaging local stakeholders
- Hard-stop rules by the lab

Choosing Wisely Canada Applicable Toolkits

[Give the Test a Rest](#)

References:

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LAB TEST:

UNCOUPLING PT/INR AND aPTT TESTS

Test Description	
Test Name	Uncoupling PT/INR and aPTT tests
Rationale for Reducing Overuse	<p>PT/INR and aPTT were tests developed in the early 20th century for specific and unique indications. Despite this, they are often ordered together routinely in emergency departments.¹⁻⁴</p> <p>PT/INR and aPTT are often unknowingly ordered together because most bloodwork in the ED is based on lab order panels that are outdated and frequently couple PT/INR and aPTT tests as a bundle even though they are rarely required together. In some hospitals, laboratory software may also automatically run both tests even if only one was ordered.^{2, 4}</p> <p>PT/INR and aPTT were designed for use in the diagnosis of heritable coagulopathies and/or monitoring of anticoagulant therapy. An important limitation in their use in assessment of coagulopathy of trauma is their slow turnaround time.⁵</p> <p>Furthermore, in some hospitals, PT and aPTT tests may be used routinely as screening tests, although no rationale exists to conclude that these tests are anything but diagnostic.^{1, 3}</p>
Scope of the Issue	
<input checked="" type="checkbox"/> Inpatient Setting <input type="checkbox"/> Outpatient Setting <input checked="" type="checkbox"/> Emergency Department	
Additional Details	Internal Medicine Surgery
Recommendations	
Summary of Recommendations	<p>Choosing Wisely Canada</p> <p>Unbundle PT/INR and aPTT tests in the emergency department. PT/INR and aPTT were developed for specific and unique indications and are often unknowingly ordered together due to outdated order panels or automatic laboratory software coupling.⁴</p> <p>Which societies endorse this recommendation: NONE</p>
Additional Information	Uncoupling PT/INR and aPTT testing resulted in meaningful reduction in coagulation testing without obvious adverse effects. Studies have found decrease or no change in the level of patient transfusions, nor signs of increased downstream testing. ^{2, 6}
Summary of existing metrics/indicators for appropriate use (further details below) (e.g., PT/PTT, % time test conducted, if applicable)	Studies show 45-55% reductions in PT/INR testing. ^{2, 6}

Success Stories

Highlights	Summary of Implementation Strategy	Barriers to Change and Facilitators of Success
<p>St. Michael's Hospital: PT/INR and aPTT testing decreased 55% per week per 100 patients and resulted in \$56k USD in savings per year²</p>	<ul style="list-style-type: none"> Conducted at an academic emergency department This intervention consisted of 3 PDSA cycles PDSA1: meeting with relevant stakeholders (ED physicians, nurses and laboratory staff) and collecting baseline data (lab, patient volume and blood transfusion data) PDSA2: uncoupled PT/INR and aPTT testing by modifying back-end laboratory software PDSA3: revised ED order panels at the front-end Throughout PDSA cycles presented at ED rounds and distributed educational materials (paper and electronic pocket cards including the top 5 reasons for and not to order these tests)² 	<p>Identified Barriers:</p> <ol style="list-style-type: none"> PT/INR and aPTT were linked at the back-end via laboratory software which automatically ran both tests even if one was ordered PT/INR and aPTT tests were automatically ordered together at the front-end via physician order panels <p>Facilitators of Success:</p> <ol style="list-style-type: none"> Sustainable results due to implementing process which change laboratory test orders No negative feedback following panel revisions likely because of lack of impact on physician workload
<p>London Health Sciences Centre: combined INR and aPTT ordering decreased by 45% per 100 patients per day resulting in \$445 CAD daily and an estimated \$163k CAD saved per year⁶</p>	<ul style="list-style-type: none"> Conducted in 2 academic emergency departments Gathered baseline data when ED ordering system only had INR-aPTT coupled together on "quick ordering," selective INR and aPTT were listed in a searchable database Uncoupling PT/INR and aPTT resulted in quick selection of selective INR and aPTT testing independently Disseminating educational module provided to all physicians, nursing and house staff via email as part of an orientation package Implementing a clinical decision support system into the EMR which would remind providers of indications and costs with choice to discontinue order or sign off (Figure 1) 	<p>Identified Barriers: Not stated</p> <p>Facilitators of Success: Not stated</p>

Tips on Implementation

Feasible tips or suggestions for [initiating] implementation

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

-Most common effective strategy

- Revision to ED order panels and laboratory software
- Uncoupling PT/INR and aPTT testing
- Stakeholder engagement
- Teaching and education
- Implementing a clinical decision-making support system

Choosing Wisely Canada Applicable Toolkits

N/A

Figure 1: Decision Support Tool on EMR at LHSC

Figures

Decision Support
INR & aPTT

Reference

INR & aPTT

Literature advises **against** the routine use of ED coagulation studies (i.e., INR, aPTT) in the **absence of hemorrhage or suspected coagulopathy**.

INR/PT (\$6.20) Indications:

1. Evaluation of unexplained bleeding
2. Diagnosing disseminated intravascular coagulation
3. Prior to initiating anticoagulation
4. Monitoring warfarin therapy
5. Assessing liver synthetic function

aPTT (\$7.24) Indications:

1. Evaluation of unexplained bleeding
2. Diagnosing disseminated intravascular coagulation
3. Prior to initiating anticoagulation
4. Monitoring unfractionated heparin therapy
5. Monitoring therapy with parenteral direct thrombin inhibitors

References:

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