Improving Physicians’ Utilization of Laboratory Testing for Better Patient Care

Moderator:

Julie R. Taylor, PhD

Speakers:

Michael Laposata, MD, PhD
Josh Peterson, MD, MPH
Paul L. Epner, MEd, MBA
Disclosure Information

Michael Laposata, Josh Peterson, Paul Epner and Julie Taylor have nothing to disclose.
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The Dueling Doctors: A primary care clinician and a laboratory director learning the needs of the other

Diagnostic Errors in Medicine: A new contributor – misordering laboratory tests and misinterpretation of test results

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Hearing from the Audience: What needs fixed first?
Josh describes the challenges faced by the primary care physician with the use of the clinical lab

and

Mike responds with what is happening and what is developing in the clinical lab
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Diagnostic Errors in Medicine: Failures in ordering laboratory tests and interpreting test results

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Helping Clinicians Help Patients

Provide accurate, timely, low cost test results, although necessary, is not sufficient

The clinical lab’s focus should be:

To rapidly and efficiently enable the accurate diagnosis of conditions, the selection of appropriate treatments and the effective monitoring of health status*

*P Epner, “Impact of Laboratory Services on Diagnostic Errors,” CLMA’s ThinkLab, Las Vegas 2011
Help May Be Most Needed in Diagnosis

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Diagnosis/Treatment Selection</th>
<th>Monitoring</th>
<th>Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="Circle" /></td>
<td><img src="image" alt="Circle" /></td>
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The Rising Cost of Diagnosis

Diagnostic Errors Defined

• Diagnostic errors are defined as misdiagnosis, missed diagnosis, or delayed diagnosis\(^1\)

• Diagnostic errors occur in 10-15% of cases\(^2\)


Diagnostic Error Taxonomy

- **Cognitive Errors (74% in this study)**
  - Faulty knowledge
  - Faulty data gathering
  - Faulty synthesis

- **Systematic Errors (65%)**
  - Technical failures and equipment problems
  - Organizational flaws

- **No Fault Errors (7%)**
  - Masked or unusual presentation of disease
  - Patient-related error (uncooperative, deceptive)

The Role of Laboratory in Diagnosis is Unclear

• In a study of 248 hospitalized patients, 246 had definitive diagnosis within 3 months of hospitalization.

• The primary determinant of diagnosis for 215 with “exact” in-hospital diagnosis was:
  – History and Physical – 48.4%
  – Radiologic exam – 33.5%
  – Blood test or culture – 9.8%

Laboratory is a Key Source of Diagnostic Errors

N = 583 Cases

Framework for Laboratory Impact

- Inappropriate test is ordered
- Appropriate test is not ordered
- Appropriate test result is not properly utilized
  - Knowledge deficit
  - Failure of synthesis
  - Misleading result
- Appropriate test result is delayed
- Appropriate test result is wrong

Survey of Physician Practices in Laboratory Test Ordering and Result Interpretation
Demographic Characteristics of Respondents*

- Specialty:
  - IM: 500
  - FP: 1000
  - Other: 0

- Age:
  - < 45 years: 20%
  - 45-60 years: 60%
  - > 60 years: 20%

- Gender:
  - Male: 60%
  - Female: 40%

Median years in practice = 20

*N=1768, ~1250 fully complete
Methods of Analysis

- Approximately 200 questions specific to diagnosis
- Quantitative analysis
  - Frequencies, descriptives, correlations, ANOVAs
- Qualitative analysis
  - Grounded Theory and Content Analysis – NVivo
Summary of Findings

• Findings about Test Ordering
  – Dealing with Uncertainty
  – External Challenges and Response

• Findings about Result Interpretation
  – Dealing with Uncertainty
  – External Challenges and Response

• Methods for Providing Assistance
Dealing with Uncertainty in Test Ordering

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review e-references</td>
<td>Utilized most often*</td>
</tr>
<tr>
<td>Review paper references</td>
<td></td>
</tr>
<tr>
<td>Refer to a specialist</td>
<td></td>
</tr>
<tr>
<td>See how patient evolves</td>
<td>Utilized often</td>
</tr>
<tr>
<td>Review practice guideline</td>
<td></td>
</tr>
<tr>
<td>Ask a laboratory professional</td>
<td>Utilized least often</td>
</tr>
</tbody>
</table>

*based on percent reporting that the activity occurred daily or at least once per week
## Challenges in Test Ordering

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient costs</td>
<td></td>
</tr>
<tr>
<td>Lack of comparative cost info</td>
<td>Problematic most often*</td>
</tr>
<tr>
<td>Insurance mandates (lab, limits)</td>
<td></td>
</tr>
<tr>
<td>Different test in panel</td>
<td></td>
</tr>
<tr>
<td>Different test names</td>
<td>Problematic often</td>
</tr>
<tr>
<td>Test not available</td>
<td></td>
</tr>
<tr>
<td>Differing recommendations</td>
<td></td>
</tr>
<tr>
<td>Communicating with the lab</td>
<td>Problematic least often</td>
</tr>
</tbody>
</table>

*based on percent reporting it was problematic at least once per week*
## Dealing with Uncertainty in Result Interpretation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review patient history</td>
<td>Utilized most often*</td>
</tr>
<tr>
<td>Follow-up with patient</td>
<td></td>
</tr>
<tr>
<td>Review e-references</td>
<td></td>
</tr>
<tr>
<td>Order more tests</td>
<td>Utilized often</td>
</tr>
<tr>
<td>Refer to a specialist</td>
<td></td>
</tr>
<tr>
<td>Ask PCP or specialist</td>
<td></td>
</tr>
<tr>
<td>Review practice guideline or paper references</td>
<td>Utilized less often</td>
</tr>
<tr>
<td>Repeat the test</td>
<td></td>
</tr>
<tr>
<td>Ask a laboratory professional</td>
<td>Utilized least often</td>
</tr>
</tbody>
</table>

*based on percent reporting that the activity occurred daily or at least once per week
# Challenges in Result Interpretation

<table>
<thead>
<tr>
<th>Issue</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not receiving results quickly</td>
<td>Responded as problematic</td>
</tr>
<tr>
<td>Previous results unavailable</td>
<td>most often*</td>
</tr>
<tr>
<td>Suspected errors in results</td>
<td></td>
</tr>
<tr>
<td>Results inconsistent with symptoms</td>
<td>Responded as problematic</td>
</tr>
<tr>
<td>Lab to lab variation in normal values</td>
<td>often</td>
</tr>
<tr>
<td>Report format (lab to lab variation, hard to understand)</td>
<td></td>
</tr>
<tr>
<td>Not enough info in lab report</td>
<td></td>
</tr>
<tr>
<td>Difficulty communicating with labs</td>
<td>Responded as problematic</td>
</tr>
<tr>
<td>Too much info in lab report</td>
<td>least often</td>
</tr>
</tbody>
</table>

*based on percent reporting it was extremely or very problematic
<table>
<thead>
<tr>
<th>Reason</th>
<th>Communication Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status of missing results</td>
<td></td>
</tr>
<tr>
<td>Preliminary result information</td>
<td>Communicate most often*</td>
</tr>
<tr>
<td>Seeking technical assistance</td>
<td></td>
</tr>
<tr>
<td>Location of test in menu</td>
<td>Communicate less often</td>
</tr>
<tr>
<td>Assistance with choosing test</td>
<td></td>
</tr>
<tr>
<td>Assistance with follow-up testing</td>
<td></td>
</tr>
<tr>
<td>Medical opinion</td>
<td>Communicate least often</td>
</tr>
</tbody>
</table>

*based on percent reporting the activity occurred at least once per month
<table>
<thead>
<tr>
<th>METHOD</th>
<th>USEFULNESS</th>
<th>AVAILABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflex Testing</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Result Trending</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Interpretive Comments</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>CPOE with electronic suggestions</td>
<td>Moderately high</td>
<td>Low</td>
</tr>
<tr>
<td>Test characteristics</td>
<td>Moderately high</td>
<td>Low</td>
</tr>
<tr>
<td>Dedicated lab line</td>
<td>Moderately high</td>
<td>Low</td>
</tr>
<tr>
<td>Algorithms</td>
<td>Moderately high</td>
<td>Low</td>
</tr>
</tbody>
</table>
Proactive Risk Assessment During the Clinical Laboratory Testing Process to Reduce Diagnostic Error
AHRQ funded research

- Awarded to RTI in August, 2011; 18 month effort
- Developing risk assessment tools which will be tested in three sites:
  - Vanderbilt
  - Emory
  - Seattle Children’s
Goals

• Conduct comprehensive literature review to identify the most appropriate risk assessment conceptual models and procedures
• Design, utilize or modify existing proactive risk assessment procedures to identify and model the presence of risks in clinical laboratory settings including pre- and post-analytical phases
• Develop tools to assist clinical laboratories, patients, and referring physicians in successfully implementing their own proactive risk assessment efforts and test them in selected clinical laboratory sites.
Technical Expert Panel (TEP)

- Julie Taylor, CDC
- Brian Jackson, ARUP, University of Utah
- John Hickner, Cleveland Clinic
- Mario Plebani, University of Padova
- John Gosbee, University of Michigan
- Gordy Schiff, The Brigham
- Hardeep Singh, VA & Baylor
- John Fontanesi, UCSD
- Michael Laposata, Vanderbilt
- Corinne Fantz, Emory
- Mike Astion, Seattle Children’s
- Kerm Henriksen, AHRQ
Deliverables

- Literature Search
- Send-out Risk Assessment Tool
- Clinician Quiz Assessment Tool
- Joint Conference Tool
Final Literature Review

Proactive Risk Assessment during the Clinical Laboratory Testing Process to Reduce Diagnostic Error: Literature Review

Prepared for:
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Agency for Healthcare Research and Quality
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Prepared by:
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Elizabeth Yant, BS, RTI International
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Contract No. HHS/A26032001T, Task Order 1
RTI Project Number: 0212791.001

February 2012

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Referral Laboratory Risk Assessment

Prospective Assessment of Diagnostic Error Risk:
Analysis of the Referral Laboratory Testing Process Tool

July 2, 2012
Emory University Testing Site
Identification and Prioritization of Risk

Approximately what percentage of orders are entered electronically by the CLINICIAN or designee (CPOE)?

What percentage of send-out tests require manual/free text entry in the CPOE system, i.e., they are not pre-defined?

How is test selection by clinicians facilitated (check all that apply)

What percent of send-out test ordering is covered by one or more of the facilitating practices listed in the previous question?

How often does a clinician initiate a contact for help in determining appropriate tests to order specifically related to a send-out test?

How often does the ordering clinician specify at which laboratory they want the testing done on a send-out order?
ASSESSING THE RISKS OF ORDERING LAB TESTS
A SURVEY FOR PHYSICIANS

Overview
Physicians order hundreds of laboratory tests every day in the routine evaluation of new problems, and to help monitor known problems or their treatment. Most of the tests have been ordered thousands of times before, and clinicians are highly proficient in knowing the right tests to order, and how they should be interpreted.

Studies of diagnostic error, however, have found that tests that are somewhat less familiar to the physician may be ordered inappropriately, or in the wrong sequence. This is hardly surprising, given the explosion of tests now available, numbering in the tens of thousands. Many physicians are also unsure about how to get expert advice when they are ordering a test they aren’t familiar with.

The goal of this survey is to help you gauge your own level of comfort in ordering lab tests, including the less common ones, and provide resources you can use if you need them.

Contents and instructions
This toolkit has three parts:
- Part A – A general survey on test ordering
- Part B – A quiz on test ordering
- Part C – Resources on test ordering and interpretation

There are no wrong or right answers for the questions on Part A, but you can use the questions to identify areas where you may wish to improve. You can score the quiz in Part B using the attached answer key.

Take advantage of the resources listed at the end, and especially your local lab liaisons, whenever you are unsure about what test to order, how to interpret a test, or the best test strategy to investigate the problem you are evaluating.
Diagnostic Error Next Steps

• Seeking Collaborators for Improvements in Test Selection and Result Interpretation (ITSRI)
• Diagnostic Error in Medicine (DEM)
• Society to Improve Diagnosis in Medicine (SIDM)
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Hearing from the Audience: What needs fixed first?
Reflex Test Algorithms: A Potential Solution to Correct Laboratory Test Selection

CLIHC™ Algorithms Team
Project Leads
Marisa Marques, MD
Michael Laposata, MD, PhD
PTT Advisor Mobile Application – Can we provide an accurate diagnosis for a doctor even when the doctor does not know the disorder which was diagnosed?

Can we produce algorithms for test selection that cover virtually all diagnoses in coagulation?
PTT Advisor Mobile Application – Step 1

• Mobile application to assist clinicians with management of patients with:
  – Prolonged Partial Thromboplastin Time (PTT) and
  – Normal prothrombin time (PT)

• Partnership:
  – CLIHC™ Algorithm Subgroup
  – CDC Division of Laboratory Science and Standards
  – CDC Public Health Surveillance & Informatics Program Office (proposed)

• CDC Innovative Fund Award to develop app
Degrade heparin in sample and repeat PTT - if the PTT normalizes, heparin is the cause

PTT mixing study (50:50 mix of patient & normal plasma)

PTT Normalizes

Factor deficiency - measure factors VIII, IX, XI, and XII

PTT remains prolonged

Inhibitor, most often a Lupus anti-coagulant; may be a Factor VIII inhibitor if PTT mixing study first normalizes and then becomes prolonged

Perform tests for specific inhibitor suggested by results of PTT mixing study
To Begin, Describe Your Patient

Does the patient have prolonged PTT and normal PT?

Yes

No
Evaluation Review

Completed Steps

1. Does the patient have prolonged PTT and normal PT?
   - Yes

2. Is the patient older than 6 months?
   - No

3. Rule out presence of heparin and LMWH – by history, by performing a PTT after treating plasma with a heparin degrading enzyme, or by performing a thrombin time (LMWH may not prolong thrombin time). [see footnotes]
   - Continue

4. Is the child male or female?
   - Male
Help for PTT Advisor

**Toolbar:**

1. **Back:** Go back one step.
2. **Next:** Go forward one step.
3. **Go to Last:** Go to the last step you were presented, but haven’t yet responded to.
4. **Restart:** Restart a patient evaluation.
5. **Evaluation Review:** Presents a screen that lists the steps and responses so far, including the current step. You may tap a step to edit your response.
Medical Student Education in Laboratory Medicine – What are future doctors learning today about laboratory tests?

CLIHC™ Team
Project Leads

Brian Smith, MD
John Hickner, MD, MS
A survey is underway to collect data from medical schools in the US that reveal:

The amount of instruction on test selection and result interpretation

And

The courses in which such training exists
What is taught to students becoming US physicians?

The limited knowledge of clinicians about how the laboratory functions and how to interpret test results may have arisen because the pathology taught in medical school is predominantly anatomic pathology.

To pass, most medical students must know what a heart looks like under the microscope after a heart attack – and not what blood tests are needed to diagnose a heart attack.

But no one does a heart biopsy to diagnose a heart attack!
The Survey

Goal: Survey all 133 allopathic and 26 osteopathic U.S medical schools

Letter to Deputy Dean for Education, Course Director for Laboratory Medicine & Pathology, accompanied by letter of support from CDC

Analyze survey and subdivide by basic demographics
Selected Preliminary Results

- Overall, there are about 9 hours spent on laboratory medicine training + 2 more hours possibly for transfusion medicine. The number of hours teaching in anatomic pathology in medical school is 61-302 by comparison*

- There is no assessment of competency for knowledge in laboratory medicine. If you cannot correctly interpret slides in anatomic pathology, you are likely to fail the pathology course.

- The contrast between laboratory medicine and anatomic pathology training is surprising for 2012 when practicing physicians are not expected to know how to interpret slides in anatomic pathology, but they must know how to interpret the results of laboratory tests

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Hearing from the Audience: What needs fixed first?
Please respond with your voting cards when asked – the goal is learn from this audience about prioritizing a large number of immediate problems

• A : The highest level of urgency – a top priority
• B : Slightly less urgent but very important to address in the near term
• C : A concern that needs attention but other issues are more of a concern
• D : This is not a priority – if it is solved, the benefit will still be felt
Problems to Address 1-4

1. Lack of valuable clinical decision support tools about laboratory test selection for physicians.
2. The perception of the clinical laboratory as a cost center with no ability to provide cost offsets in other areas.
3. Limited use of diagnostic algorithms to direct appropriate test selection.
4. Limited ability of clinicians to identify true experts in laboratory test selection and result interpretation in a variety of content areas.
5. Complexity of laboratory test names

6. Limited teaching of laboratory medicine to medical students

7. Failure to date of collecting and organizing best practices regarding laboratory test selection and result interpretation

8. Lack of IT infrastructure that makes it easy to appropriately select the correct tests and interpret the test results
9. Inappropriate input on test selection by patients

10. Limited information exchange about test results between the clinician and the patient, often because of inadequate knowledge about the laboratory test by the clinician

11. Inability to organize laboratory data collected from different patient encounters in different sites into one clinical record

12. Patient's ability to pay for laboratory tests and the impact of this on test selection
Summary

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Thank You!

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