

Improving Physicians' Utilization of Laboratory Testing for Better Patient Care

Moderator:

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Speakers:

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Disclosure Information

Michael Laposata, Josh Peterson, Paul Epner and Julie Taylor have nothing to disclose.

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Josh Peterson and Mike Laposata

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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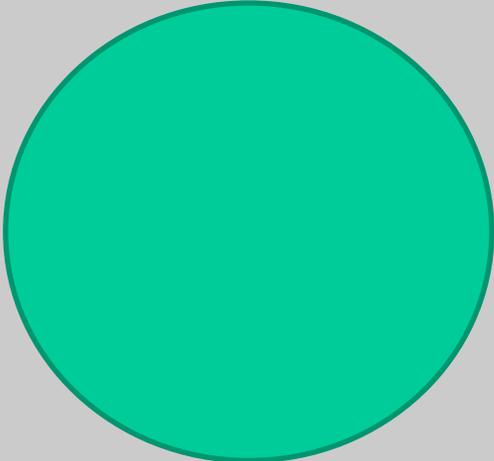
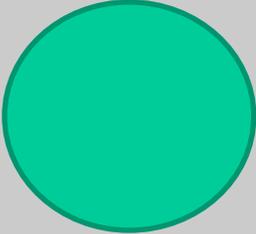
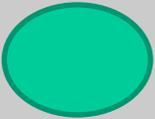
Helping Clinicians Help Patients

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*

Help May Be Most Needed in Diagnosis

	Diagnosis/Treatment Selection	Monitoring	Screening
Opportunity			

The Rising Cost of Diagnosis

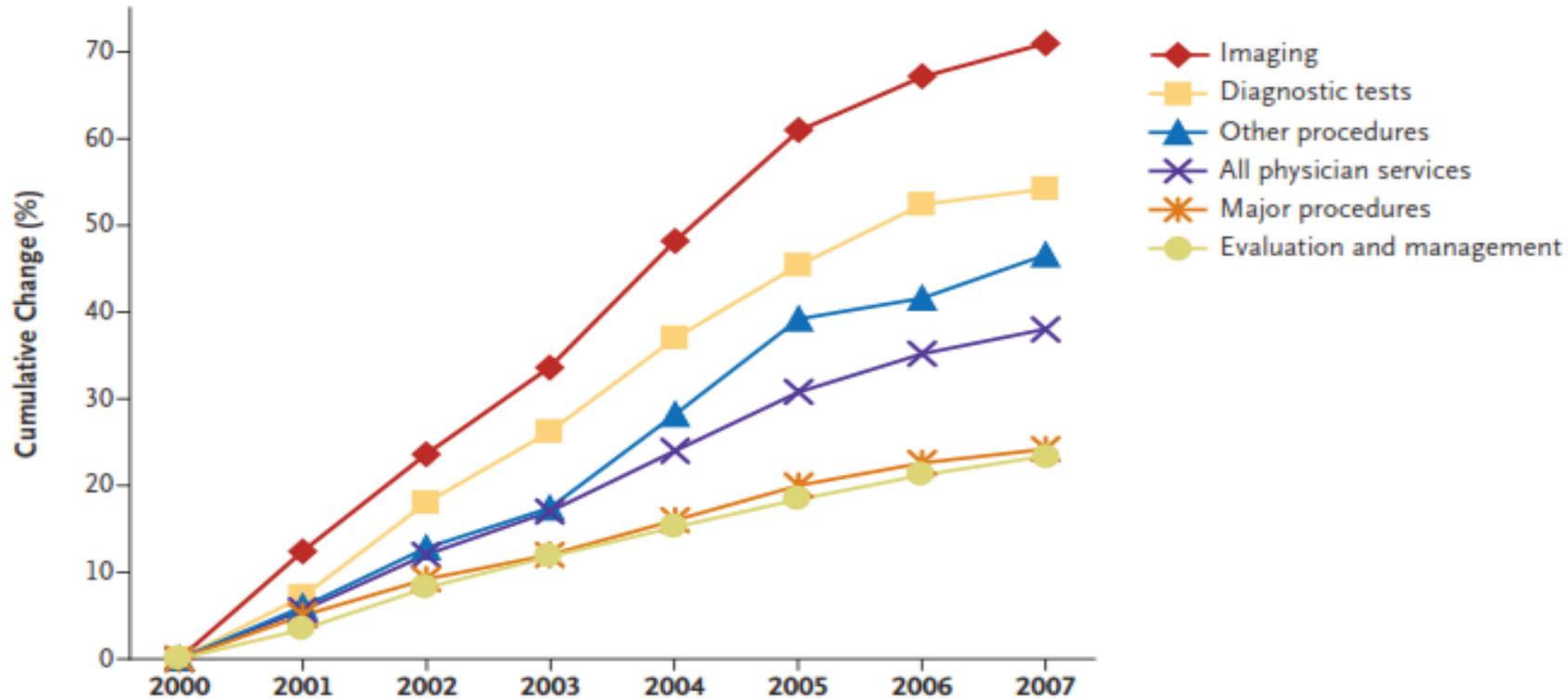


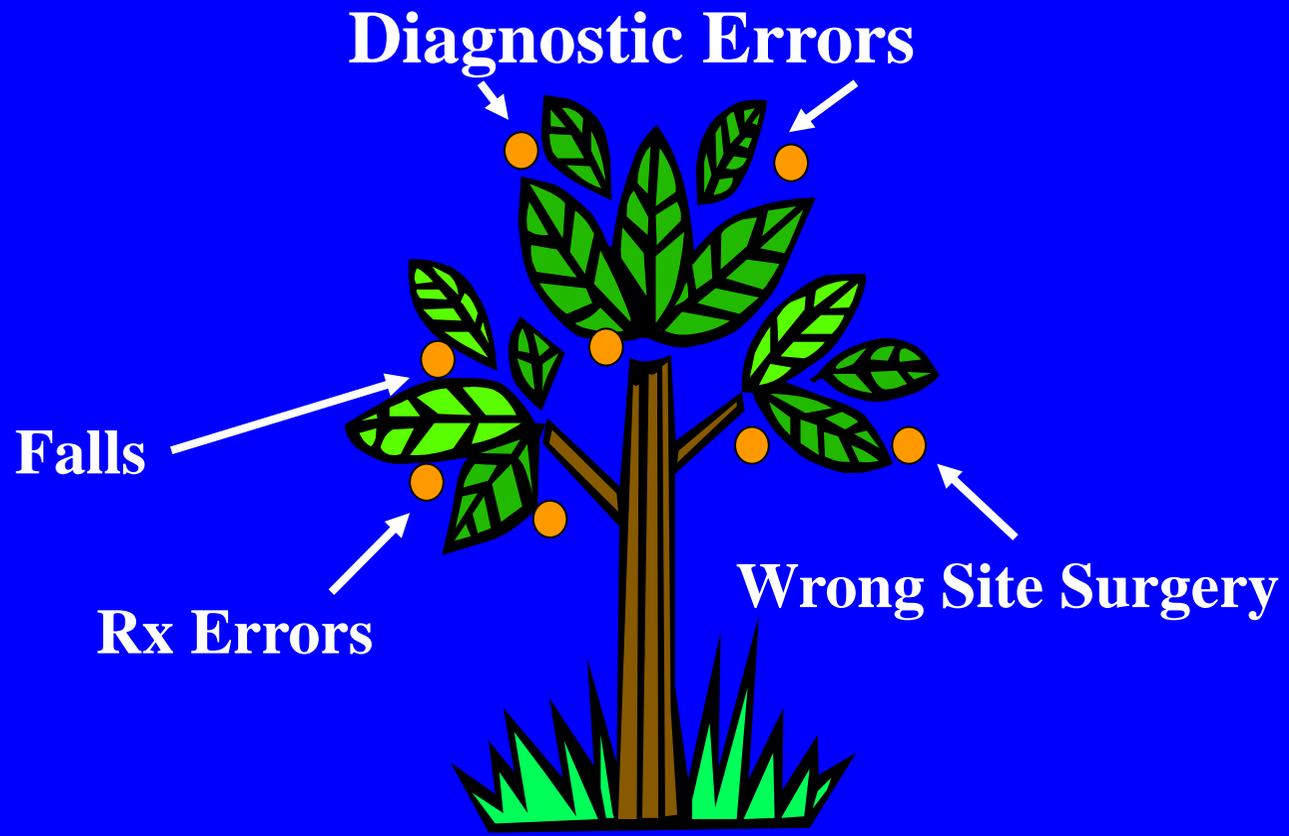
Figure 1. Rates of Use of Imaging Services, as Compared with Rates of Other Physician-Ordered Services, per Medicare Beneficiary (2000–2007).

Data are from the Medicare Payment Advisory Commission's analysis of physician claims for Medicare beneficiaries. Included are services paid under the physician fee schedule.

J. K. Iglehart, "Health insurers and medical-imaging policy--a work in progress.," *The New England journal of medicine*, vol. 360, no. 10, pp. 1030-7, Mar. 2009.

Diagnostic Errors Defined

- Diagnostic errors are defined as misdiagnosis, missed diagnosis, or delayed diagnosis¹
- Diagnostic errors occur in 10-15% of cases²



¹Graber, M. L. et al, "Diagnostic error in internal medicine," *Archives of internal medicine*, vol. 165, July, 2005.

²Berner, E. S., & Graber, M. L, "Overconfidence as a cause of diagnostic error in medicine," *American Journal of Medicine*, vol. 121, 2008, S2-S23.

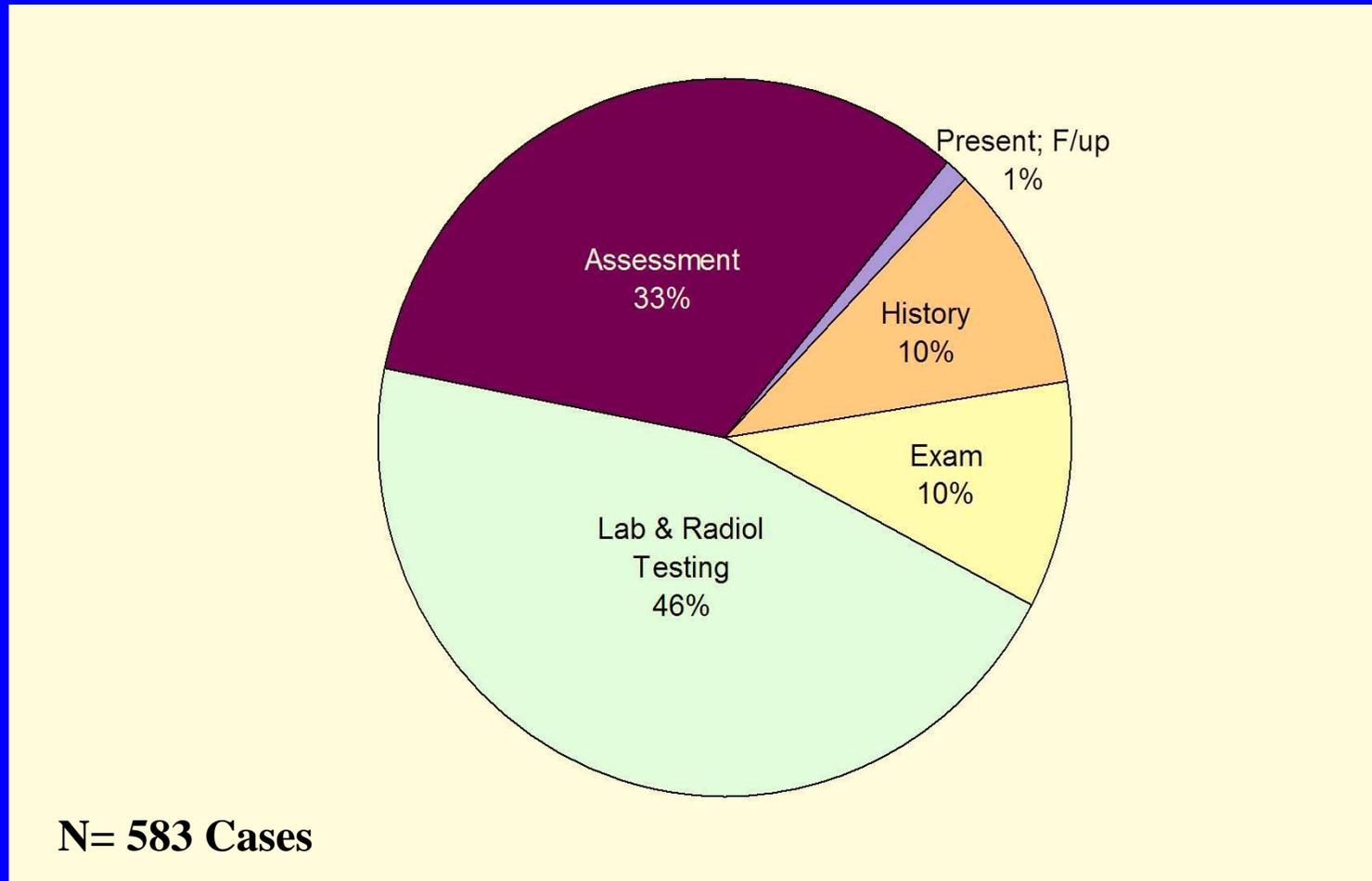
Diagnostic Error Taxonomy

- 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



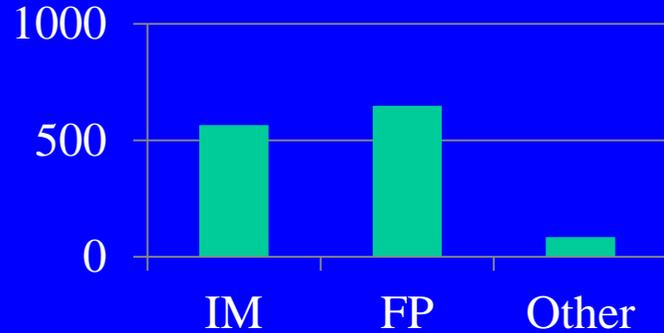
Framework for Laboratory Impact

- 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

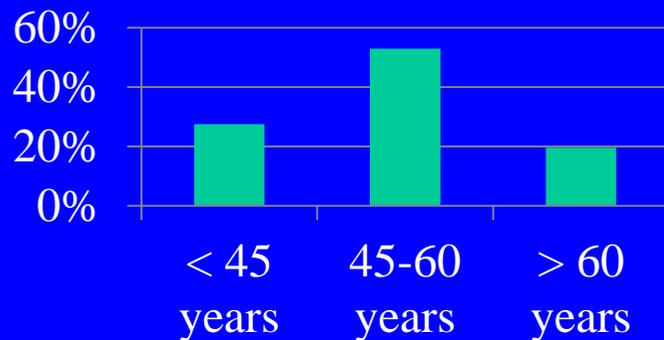
Demographic Characteristics of Respondents*

Specialty

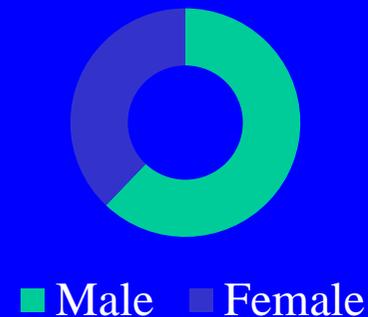


Median years in practice = 20

Age



Gender



*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

Q7 - Interpretation Uncertainty: Frequency	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	0.0%	#VALUE!						
qn01a	100.0%	35.6%	0.5%	3.6%	3.2%	0.9%	2.3%	
qn01b	35.6%	100.0%	2.0%	13.8%	8.8%	1.9%	9.4%	
qn01c_w	0.5%	2.0%	100.0%	90.0%	8.1%	1.5%	2.9%	
qn01c_m	3.6%	13.8%	90.0%	100.0%	57.2%	6.0%	32.6%	
qn01c_y	3.2%	8.8%	8.1%	57.2%	100.0%	2.9%	22.7%	
qn01d_w	0.9%	1.9%	1.5%	6.0%	2.9%	100.0%	76.0%	
qn01d_m	2.3%	9.4%	2.9%	32.6%	22.7%	76.0%	100.0%	
qn01d_y	1.8%	9.9%	1.9%	25.7%	33.3%	42.6%	67.4%	
qn02a	0.4%	-0.2%	-1.0%	-1.9%	-3.6%	-4.7%	-5.6%	
qn02b	0.0%	-5.1%	-1.8%	-5.2%	-4.9%	-4.1%	-6.1%	

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

Review e-references	Utilized most often*
Review paper references	
Refer to a specialist	
See how patient evolves	Utilized often
Review practice guideline	
Ask a laboratory professional	Utilized least often

*based on percent reporting that the activity occurred daily or at least once per week

Challenges in Test Ordering

Patient costs	
Lack of comparative cost info	Problematic most often*
Insurance mandates (lab, limits)	
Different test in panel	
Different test names	Problematic often
Test not available	
Differing recommendations	
Communicating with the lab	Problematic least often

*based on percent reporting it was problematic at least once per week

Dealing with Uncertainty in Result Interpretation

Review patient history Follow-up with patient	Utilized most often*
Review e-references	
Order more tests	Utilized often
Refer to a specialist	
Ask PCP or specialist Review practice guideline or paper references Repeat the test	Utilized less often
Ask a laboratory professional	Utilized least often

*based on percent reporting that the activity occurred daily or at least once per week

Challenges in Result Interpretation

Not receiving results quickly	Responded as problematic most often*
Previous results unavailable	
Suspected errors in results	
Results inconsistent with symptoms	Responded as problematic
Lab to lab variation in normal values	often
Report format (lab to lab variation, hard to understand)	
Not enough info in lab report	
Difficulty communicating with labs	Responded as problematic
Too much info in lab report	least often

*based on percent reporting it was extremely or very problematic

Reasons Physicians Communicate with Laboratory Professionals

Status of missing results	
Preliminary result information	Communicate most often*
Seeking technical assistance	
Location of test in menu	Communicate less often
Assistance with choosing test	
Assistance with follow-up testing	
Medical opinion	Communicate least often

*based on percent reporting the activity occurred at least once per month

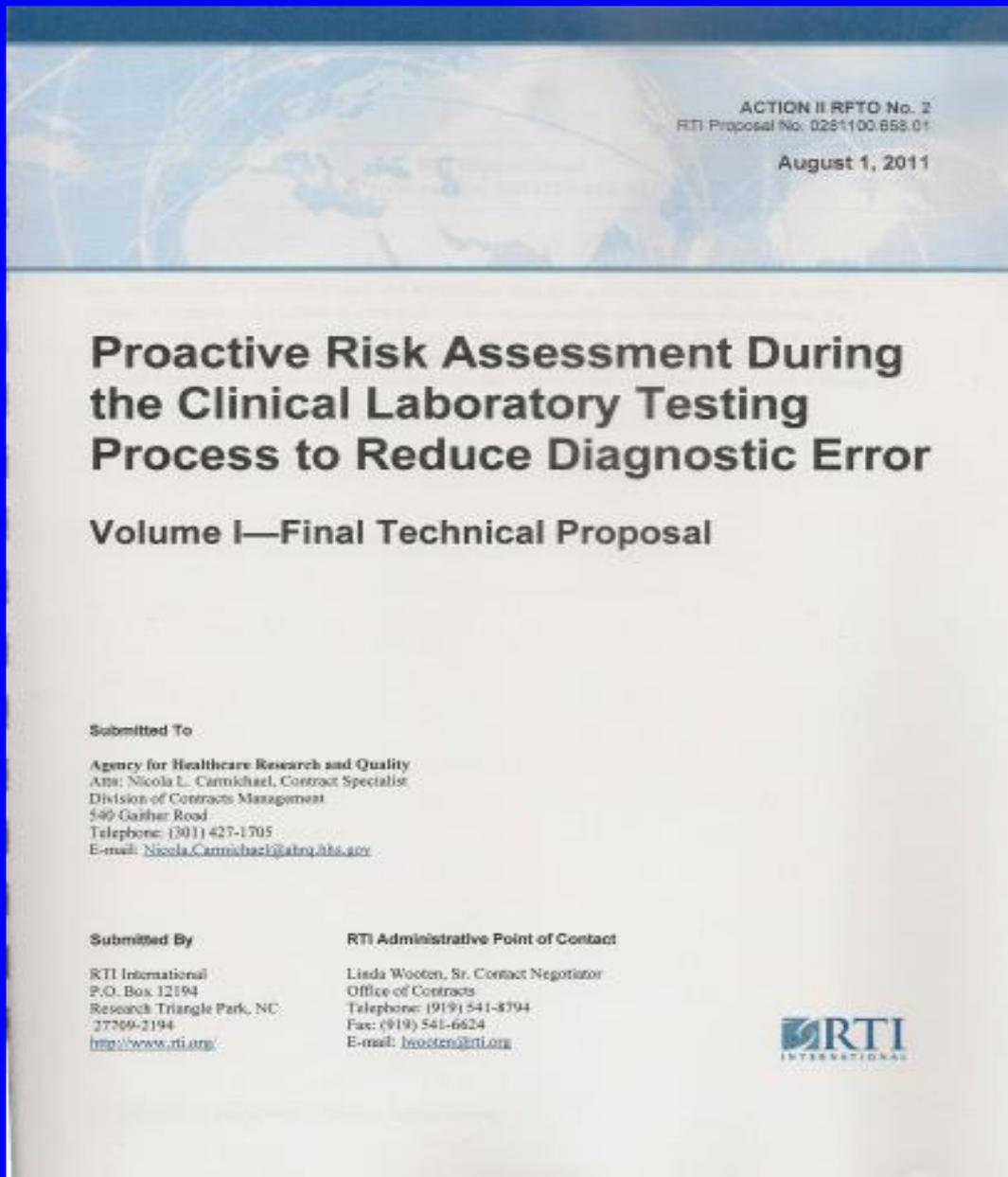
Methods that Assist Physicians

<u>METHOD</u>	<u>USEFULNESS</u>	<u>AVAILABILITY</u>
Reflex Testing	High	High
Result Trending	High	High
Interpretive Comments	High	High
CPOE with electronic suggestions	Moderately high	Low
Test characteristics	Moderately high	Low
Dedicated lab line	Moderately high	Low
Algorithms	Moderately high	Low

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

Literature Review

Final Literature Review

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

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None of the investigators has any affiliations or financial involvement that conflicts with the material presented in this report.

Referral Laboratory Risk Assessment



turning knowledge into practice

***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?

Clinician Testing Knowledge Risk Assessment

ASSESSING THE RISKS OF ORDERING LAB TESTS

A SURVEY FOR PHYSICIANS

Overview

Physicians order hundreds 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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Reflex Test Algorithms: A Potential Solution to Correct Laboratory Test Selection

CLIHCTM 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:
 - **CLIHCTM Algorithm Subgroup**
 - **CDC Division of Laboratory Science and Standards**
 - **CDC Public Health Surveillance & Informatics Program Office (proposed)**
- **CDC Innovative Fund Award to develop app**

The iPhone app takes what is below and turns it into -----

**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**



PTT Advisor

Footnotes



To Begin,
Describe Your Patient

Does the patient have prolonged
PTT and normal PT?

Yes

No

Step 1



Evaluation Review

Done

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

Done



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?**

**CLHC™ Team
Project Leads**

**Brian Smith, MD
John Hickner, MD, MS**

Limited Teaching of Laboratory Medicine in US Medical Schools

**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

*Taylor, CR, et al; Pathology education: quo vadis?; *Human Pathology* (2008) 39: 1555

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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**



Problems to Address 5-8

- 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



Problems to Address 9-12

- 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**

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Thank You!

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