

# Your Role in the Clinical Team

**ASCP**

**Session 8403**

**October 31, 2012**

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**Division of Laboratory Science and Standards**

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

## **No Disclosures**

***In the past 12 months, I have not had a significant financial interest or other relationship with the manufacturer(s) of the product(s) or provider(s) of the service(s) that will be discussed in my presentation.***

***This presentation will (not) include discussion of pharmaceuticals or devices that have not been approved by the FDA or unapproved or "off-label" uses of pharmaceuticals or devices.***

# Clinical Laboratory Integration into Healthcare Collaborative (CLIHC)<sup>TM</sup>

- **CLIHC<sup>TM</sup>'s**
  - Origins
  - Goals
  - Team Members
- **Impact of Diagnostic Errors**
- **Key Projects**

# Audience Participation

Look for the ---



# CLIHCTM's Origins

- **Precursor to CLIHCTM: 7 Institutes held at CDC between 1984 and 2007**
  - CDC and experts in the laboratory field (national and international)
  - Discussed the role of clinical laboratories in providing quality testing services for improved patient outcomes
  - Found gaps in the effective use of laboratory services
- **CLIHCTM = *Clinical Laboratory Integration into Healthcare Collaborative***
  - Founded in 2008
  - Organized as response to 2007 Institutes' findings

# **CLIHCTM's Goal**

**Optimize the utilization of  
laboratory services for better  
patient care**

# Clinical Laboratory News

THE AUTHORITATIVE  
SOURCE FOR THE  
CLINICAL LABORATORIAN

**September 2012: Volume 38, Number 9**

## **The Path to Better Test Utilization**

*Why Labs Should Step-up Physician Education, Consultation*

By Genna Rollins



<http://www.aacc.org/publications/cln/2012/September/Pages/TestUtilization.aspx#>

# CLIHCTM Workgroup Members

- **Co-Lead: John Hickner, MD, MSc**  
Cleveland Clinic
- **Co-Lead: Michael Laposata, MD, PhD**  
Vanderbilt University Hospital
- **Paul Epner, MEd, MBA**  
Paul Epner, LLC
- **Marisa B. Marques, MD**  
University of Alabama at Birmingham
- **Jim L. Meisel, MD, FACP**  
Boston Medical Center
- **Elissa Passiment, EdM**  
American Society for Clinical  
Laboratory Science
- **Brian Smith, MD**  
Yale School of Medicine

## CLIHCTM Workgroup – Atlanta – April 2012



(Left to Right): Dr. John Hickner, Ms. Elissa Passiment, Dr. Jim Meisel, Mr. Paul Epner, Dr. Michael Laposata, and Dr. Marisa Marques (not pictured – Dr. Brian Smith)

# CLIHCTM Workgroup Support

## CDC:

- Julie Taylor, PhD, MS (*CLIHCTM Lead*)
- Nancy Cornish, MD
- MariBeth Gagnon, MS CT (ASCP) HTL
- Anne Pollock, MT (ASCP) SLS
- Pam Thompson, MS MT (ASCP)

# Impact of Diagnostic Errors





**How many laboratory-related diagnostic errors occur per year in the US?**

- A. 100 - 1000**
- B. 1001 - 10,000**
- C. 10,001 - 100,000**
- D. Not known**

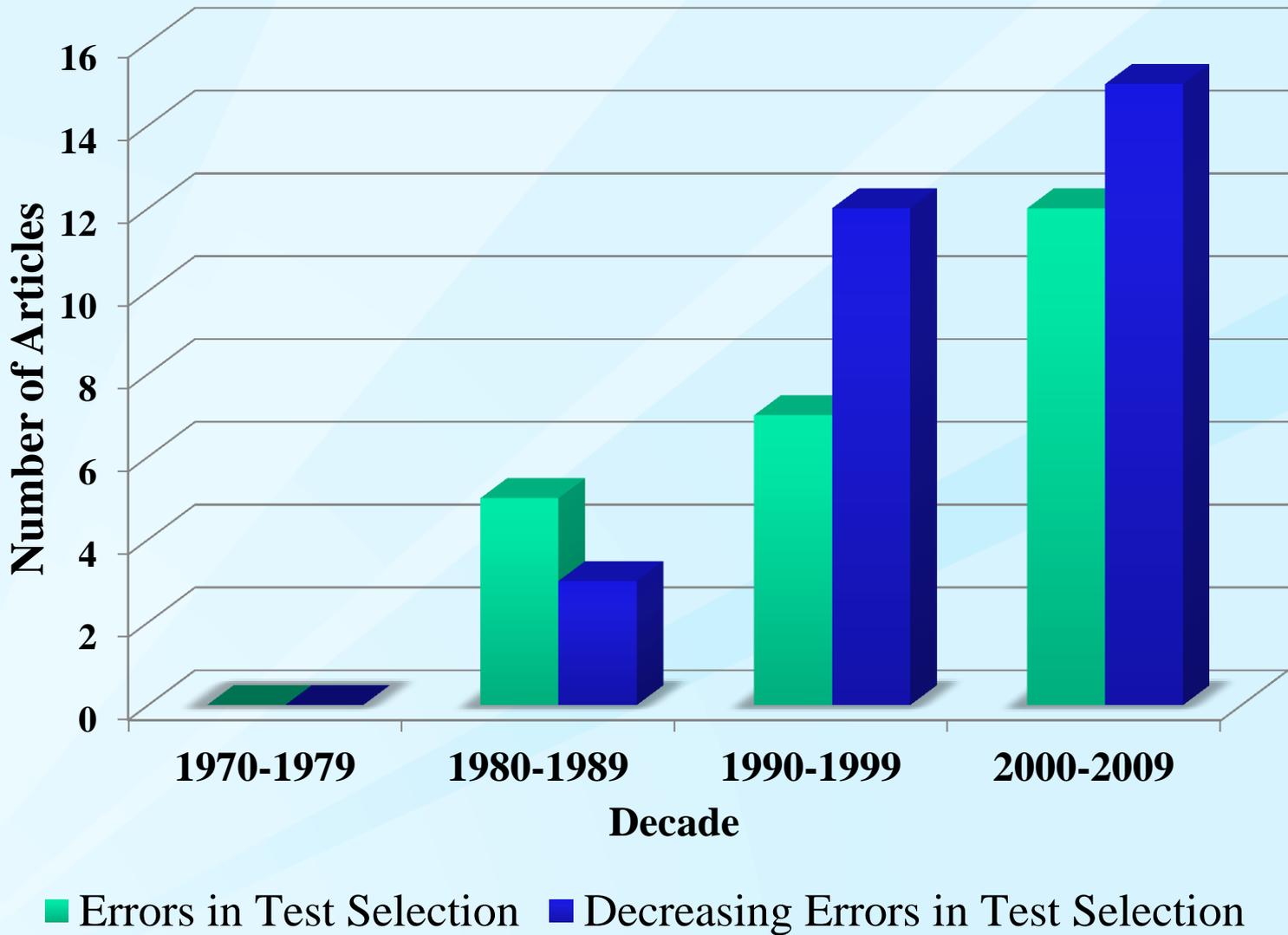
# **A 40-year review of the literature**

## **Revealed**

**An increasing number of reports showed that errors in test selection and result interpretation jeopardize patient safety**

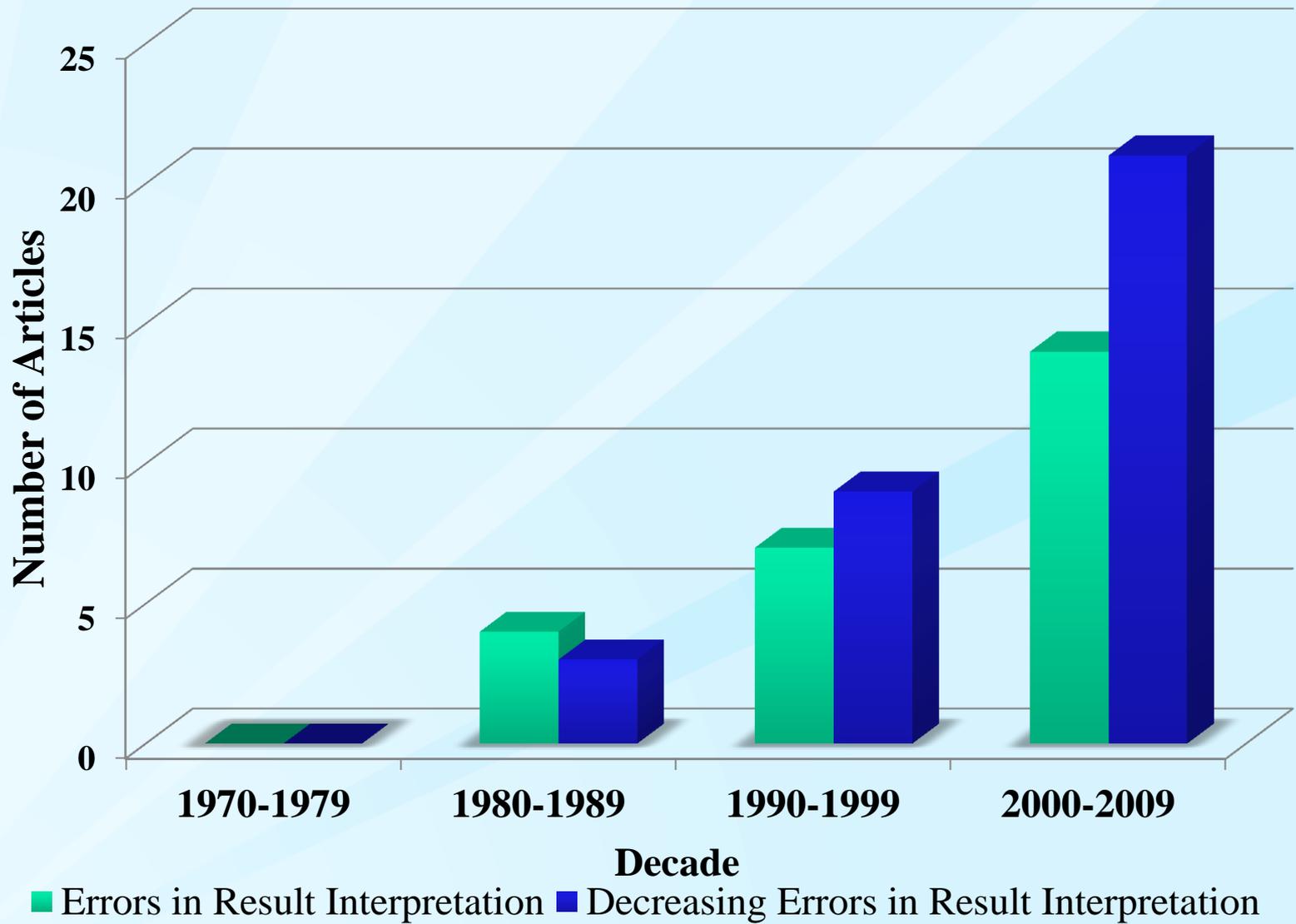
Allison Wasserman, MD and Michael Laposata, MD, PhD,  
Vanderbilt University Medical Center, unpublished data

## Articles on Test Selection Errors



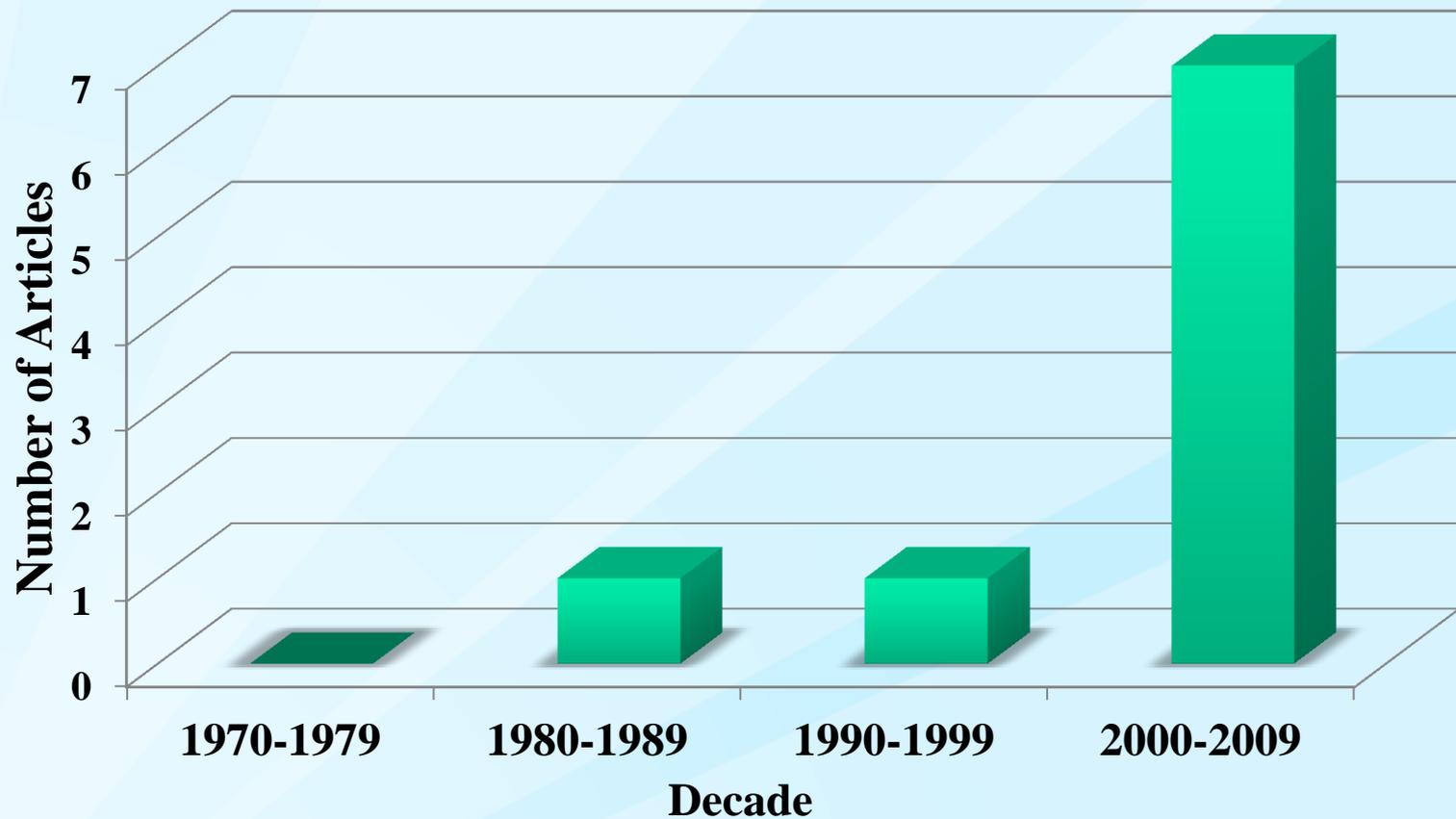
Allison Wasserman, MD and Michael Laposata, MD, PhD, VUMC, unpublished data

## Articles on Result Interpretation Errors



Allison Wasserman, MD and Michael Laposata, MD, PhD, VUMC, unpublished data

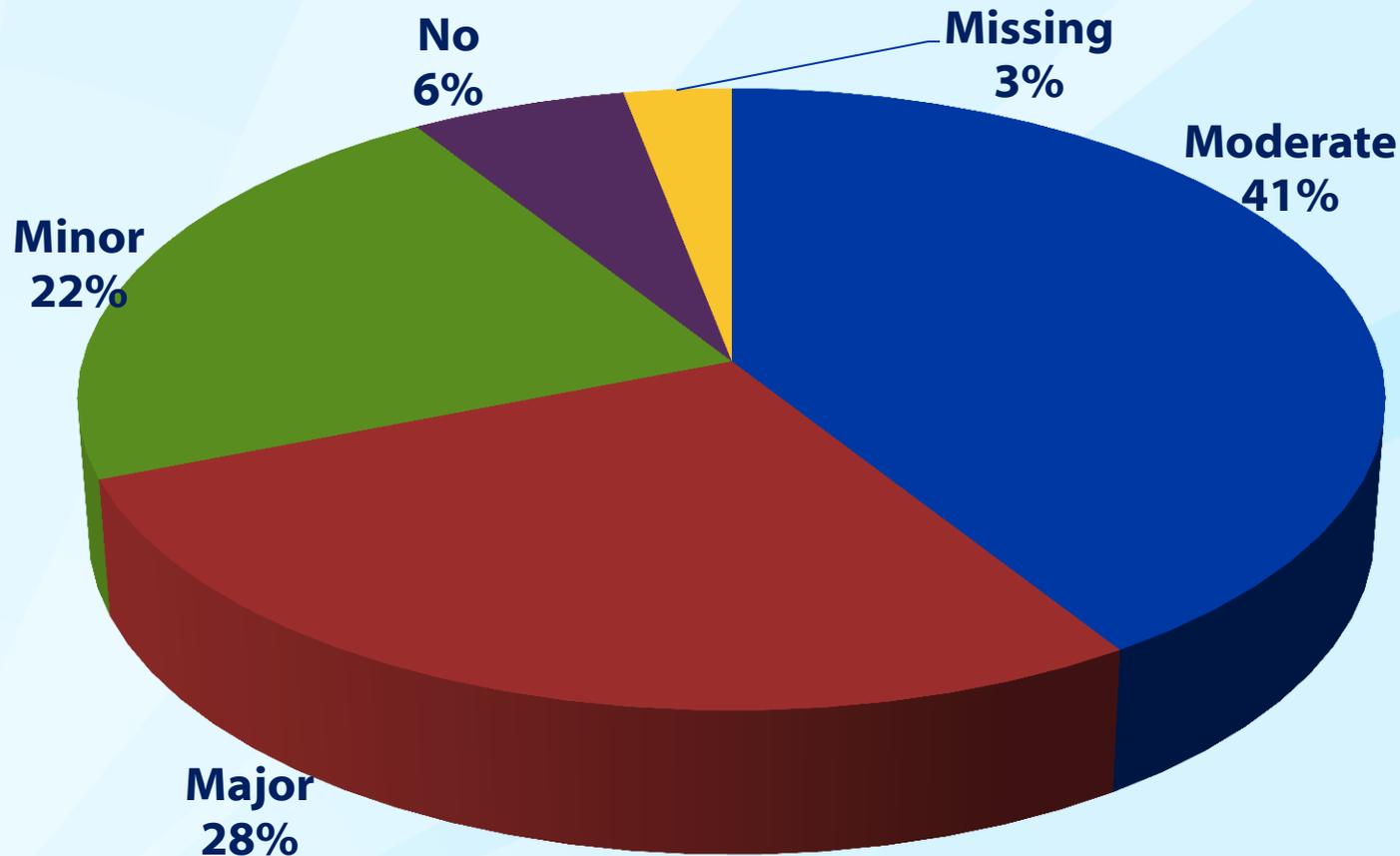
## Articles on Adverse Outcomes



■ Adverse Outcomes from Incorrect Test Selection or Results Interpretation

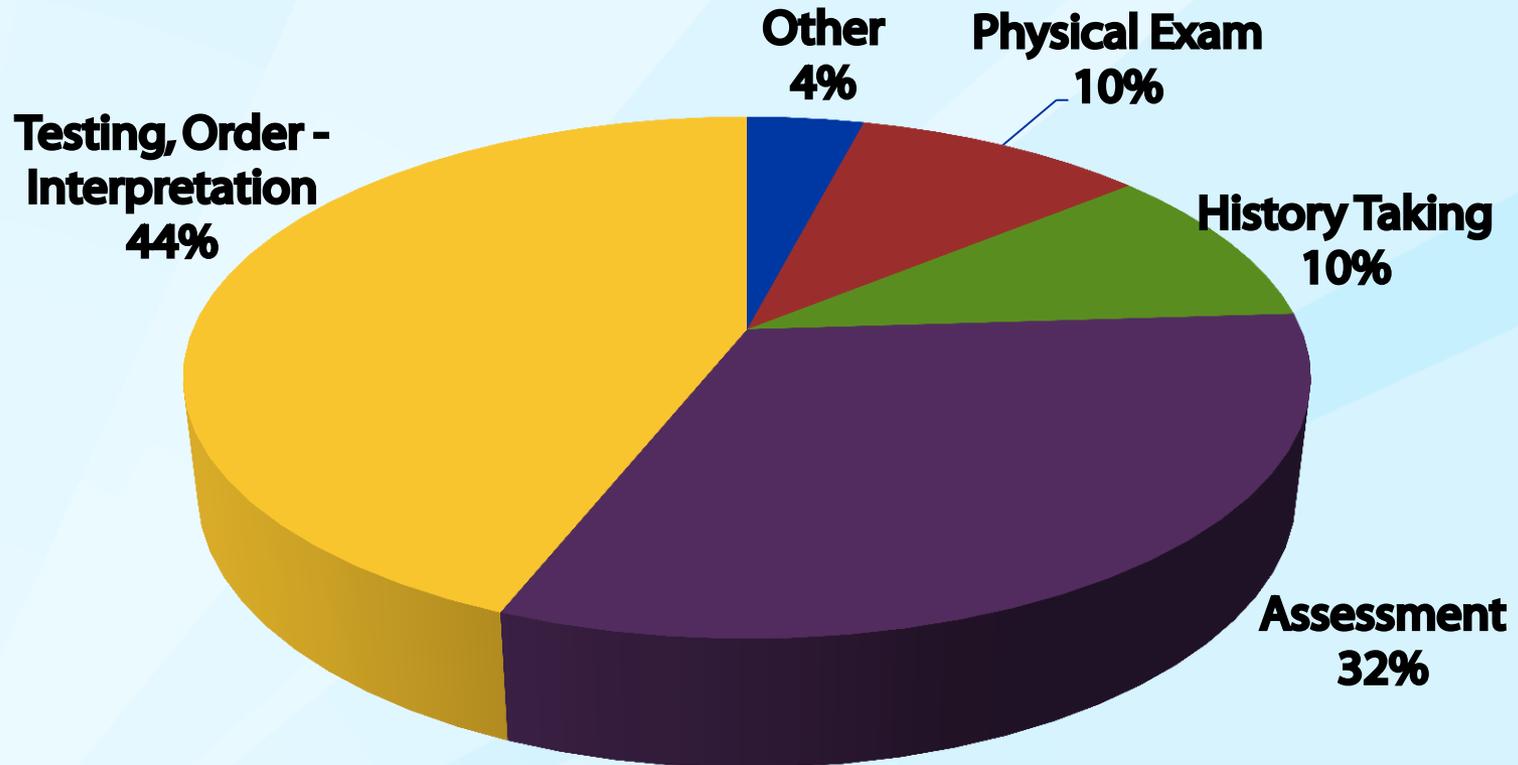
Allison Wasserman, MD and Michael Laposata, MD, PhD, VUMC, unpublished data

# Severity of 583 Physician-Reported Diagnostic Errors



Schiff, G. D. et al. (2009). Diagnostic error in medicine: analysis of 583 physician-reported errors. *Archives of internal medicine*, 169(20): 1881-1887

# Frequency of 583 Physician-Reported Diagnostic Errors



Schiff, G. D. et al. (2009). Diagnostic error in medicine: analysis of 583 physician-reported errors. *Archives of internal medicine*, 169(20): 1881-1887

# Interventions that Reduce Errors in Test Ordering and Result Interpretation

- Guideline/ clinical pathways
  - Nationally and locally developed
  - With or without electronic decision support
- Structured requisitions
- Reflex testing
- Consultations
- Interpretive comments

Published studies summarized by Paul Epner,  
Diagnostic Errors in Medicine, October 25, 2010



## **Which choice best describes the use of laboratory diagnostic algorithms in your institution or organization?**

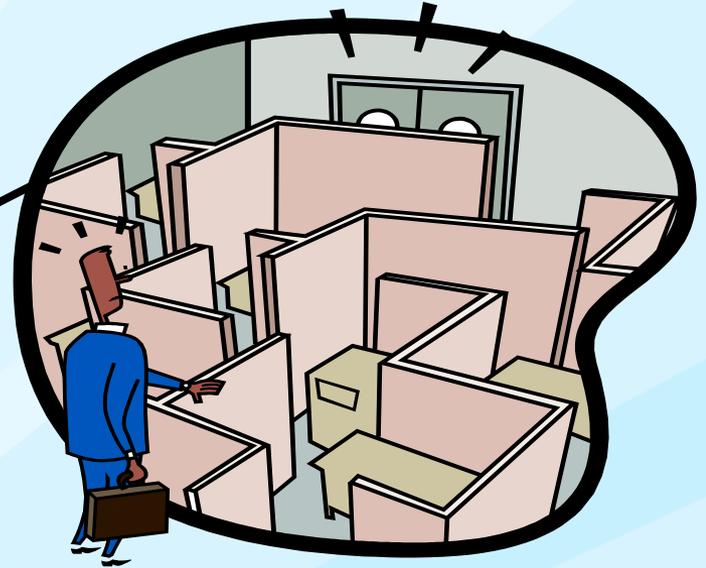
- A. We use standard reflex testing such as performing antibiotic sensitivity tests following identification of pathogenic organisms in microbiology.**
- B. We exceed the standard reflex testing by using a few institutionally derived algorithms.**
- C. Our institution extensively uses reflex testing with dozens of reflex test algorithms.**

# CLIHCTM

- Key Projects
  - Clinician Test Selection & Result Interpretation
    - Nomenclature
    - Survey of Clinicians' Challenges
    - Diagnostic Algorithms
  - Medical Student Education
    - Survey of US Medical Schools
    - Clinical Pathology Residency Education

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## Clinical Laboratory Testing - 1970

30-50  
lab tests



Michael Laposata, AACC 2010

## Clinical Laboratory Testing - Today

30-50  
lab tests

RIAs  
for hormones

Intro of  
molecular testing

>5000  
lab tests

1970

1980

1990

2000

2010

Intro of  
automated  
instruments

Immunoassay  
automation

Major expansion  
of molecular  
testing

Michael Laposata, AACC 2010

# Nomenclature

Project Leads – Elissa Passiment, EdM and Jim Meisel, MD, FACP

## Goal:

- Demonstrate the complexity of test selection
  - Multiplicity - Hepatitis B surface antibody
    - HBs Antibody, Hepatitis Bs Ab, Anti-HBs
  - Complexity - rheumatoid factor- not specific for rheumatoid arthritis

## Methods:

- Develop flow chart and tables demonstrating:
  - Complexity – Vitamin D
  - Breadth – Commonly ordered tests
  - Depth – Coagulation



## **How many different test names are there for Vitamin D?**

- A. 1 to 5**
- B. 5 to 10**
- C. 10 – 15**
- D. More than 15**

# Nomenclature Options for Vitamin D

**Vitamin D2**

**Vitamin D3**

**25-OH vitamin D2**

**25-OH vitamin D3**

**25-OH vitamin D**

**25 hydroxy vitamin D2**

**25 hydroxy vitamin D3**

**25 hydroxy vitamin D**

**1,25 (OH)<sub>2</sub> vitamin D2**

**1,25 (OH)<sub>2</sub> vitamin D3**

**1,25 (OH)<sub>2</sub> vitamin D**

**1,25 dihydroxy vitamin D2**

**1,25 dihydroxy vitamin D3**

**1,25 dihydroxy vitamin D**

**Vitamin D 25 Hydroxy D2**

**Vitamin D 25 Hydroxy D3**

**Vitamin D 1,25 Dihydroxy**

**Cholecalciferol**

**Ergosterol**

## Nomenclature Options for Commonly Ordered Tests

Key Name	Synonyms/Confounders	Abbreviation(s)
Alkaline Phosphatase	Alkaline Phos blood Alkaline phosphomonoesterase Alkaline phosphohydrolase Alkaline phenyl phosphatase	ALP, Alk Phos, AP, AKP
Beta HCG	BHCG (serum qualitative) Beta-Chorionic Gonadotropin Blood vs urine Beta HCG	BHCG, HCGB, Beta-HCG
Complete blood count with differential	Hematology profile; blood count; hemogram CBC with diff CBC with differential CBC with differential and platelets CBC w/diff & PLT CBC diff plts	CBC CBC d/p

## Nomenclature Options for Coagulation Tests

Anticardiolipin antibody	Anti-cardiolipin antibody	ACA
	Antiphospholipid antibody	ACL
	Anti-phospholid antibody	APA
		APL
Factor XII activity assay	Factor XII assay	
	Factor XII functional assay	FXII
	Hageman Factor assay	
Lupus anticoagulant assay	Lupus anticoagulant	LA
	Lupus antibody	LAC
	Anti-phospholipid antibody	LI
	Lupus inhibitor	APL
	Dilute Russell viper venom time	DRVVT
	Tissue thromboplastin inhibitor	dRVVT
	Dilute prothrombin time	TTI
	Kaolin clotting time	KCT
	Non-specific inhibitor	DPT

# Nomenclature

Project Leads – Elissa Passiment, EdM and Jim Meisel, MD, FACP

## Status:

- *Decoding Laboratory Test Names: A Major Challenge to Appropriate Patient Care*
- Journal of General Internal Medicine, accepted 10/8/12

## Next Steps:

- Investigate IT strategies and systems to assist the clinician in selecting the correct test - search support technology

# CLIHCTM

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# There is substantial regional variability in test ordering practices that cannot be explained by case mix

Song, Y. et al. (2010). Regional Variations in Diagnostic Practices.

*New England Journal of Medicine*

[www.nejm.org](http://www.nejm.org) May 12, 2010

10.1056/nejmsa0910881 [nejm.org](http://nejm.org)



# Survey of Clinicians' Challenges

Project Leads – John Hickner, MD, MSc & Paul Epner, MEd, MBA

## Goal:

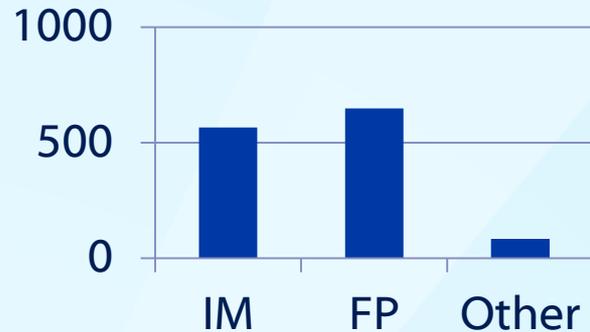
- Raise awareness about the challenges clinicians face for test ordering and result interpretation

## Methods:

- Phase 1 - Conduct focus groups targeting family physicians and internal medicine physicians
- Phase 2 - Using information from Phase 1, design a national survey of family physicians and internal medicine physicians

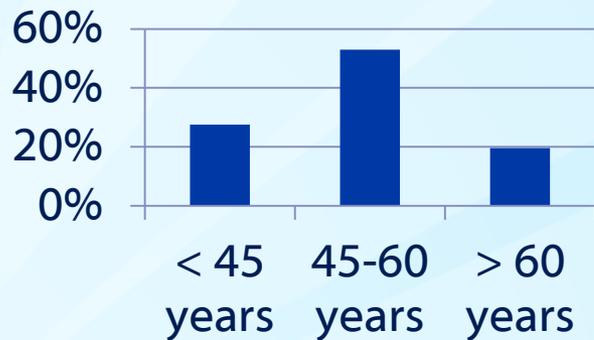
# Demographic Characteristics of Respondents\*

## Specialty

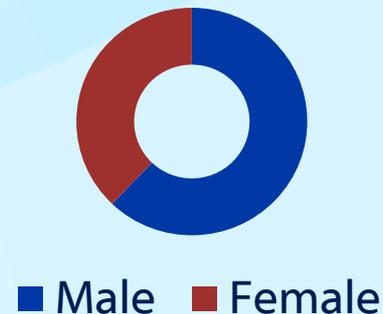


**Median years in practice = 20**

## Age



## Gender



\*N=1768, ~1250 fully complete

# Summary of Findings

- **Test Ordering**
  - Dealing with Uncertainty
  - Challenges in Test Ordering
- **Result Interpretation**
  - Dealing with Uncertainty
  - Challenges in Result Interpretation
- **Methods for Providing Assistance**
  - Communicate with Laboratory Professionals
  - Methods that Assist Physicians

# Dealing with Uncertainty in Test Ordering

Review e-references	
Review paper references	
Refer to specialist	
See how patient progresses	
Review practice guideline	
Ask a laboratory professional	

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



## **Which method is used least often by physicians?**

- A. Review e-references**
- B. Refer to a specialist**
- C. Review practice guidelines**
- D. Ask a laboratory professional**

# Dealing with Uncertainty in Test Ordering

Review e-references	Utilized most often*
Review paper references	
Refer to specialist	
See how patient progresses	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

**\*Problematic at least once per week**

**\*\*"Ask a laboratory professional" utilized least often**

# 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
Previous results unavailable	most often*
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**

**\*\*"Ask a laboratory professional" utilized least often**

# Summary of Findings

- **Test Ordering**
  - Dealing with Uncertainty
  - Challenges in Test Ordering
- **Result Interpretation**
  - Dealing with Uncertainty
  - Challenges in Result Interpretation
- **Methods for Providing Assistance**
  - Communicate with Laboratory Professionals
  - Methods that Assist Physicians



## **What is the most frequent reason physicians communicate with laboratory professionals?**

- A. Preliminary result information
- B. Seeking technical assistance regarding sample collection
- C. Assistance with follow-up testing
- D. Status of missing results

# Reasons Physicians Communicate with Laboratory Professionals

Status of missing results	
Preliminary result information	Communicate most often*
Seeking technical assistance regarding sample collection	
Location of test in menu	Communicate less often
Assistance with appropriate test ordering	
Assistance with follow-up testing	
Medical opinion of results	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	Lowest
Test characteristics	Moderately high	Low
Dedicated lab line	Moderately high	Low
Algorithms	Moderately high	Low

\* Based on percent reporting it was very to extremely useful

\*\*Based on percent reporting it was available

**?** **How often does your laboratory assist clinicians with ordering or interpreting results of laboratory tests?**

- A. Rarely**
- B. About once per week**
- C. Several times per week**
- D. Daily**

**? Does your laboratory, or institution, provide these methods?**

**Computerized Physician Order Entry (CPOE) with electronic suggestions**

**A. Yes**

**B. No**

**? Does your laboratory, or institution, provide these methods?**

**Dedicated laboratory phone line for questions**

**A. Yes**

**B. No**

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# Diagnostic Algorithms

Project Leads – Michael Laposata, MD, PhD and  
Marisa B. Marques, MD

## Goals:

1. Develop diagnostic algorithms for selected scenarios for appropriate laboratory testing to guide diagnosis and patient care
2. Develop information technology tools to guide appropriate laboratory test selection

# Goal 1: Develop Algorithms

## Method:

Three clinical pathologists with expertise in coagulation created algorithms for evaluating patients:

- Prolonged Partial Thromboplastin Time (PTT)
- Normal Prothrombin Time (PT)

Three other clinical pathologists with expertise in coagulation reviewed the algorithms

## Article:

*The isolated prolonged PTT*; Oxana Tcherniantchouk, Michael Laposata, and Marisa B. Marques; American Journal of Hematology, 2012

<http://onlinelibrary.wiley.com/doi/10.1002/ajh.23285/full>

# Goal 2: Develop IT Tools

## Method:

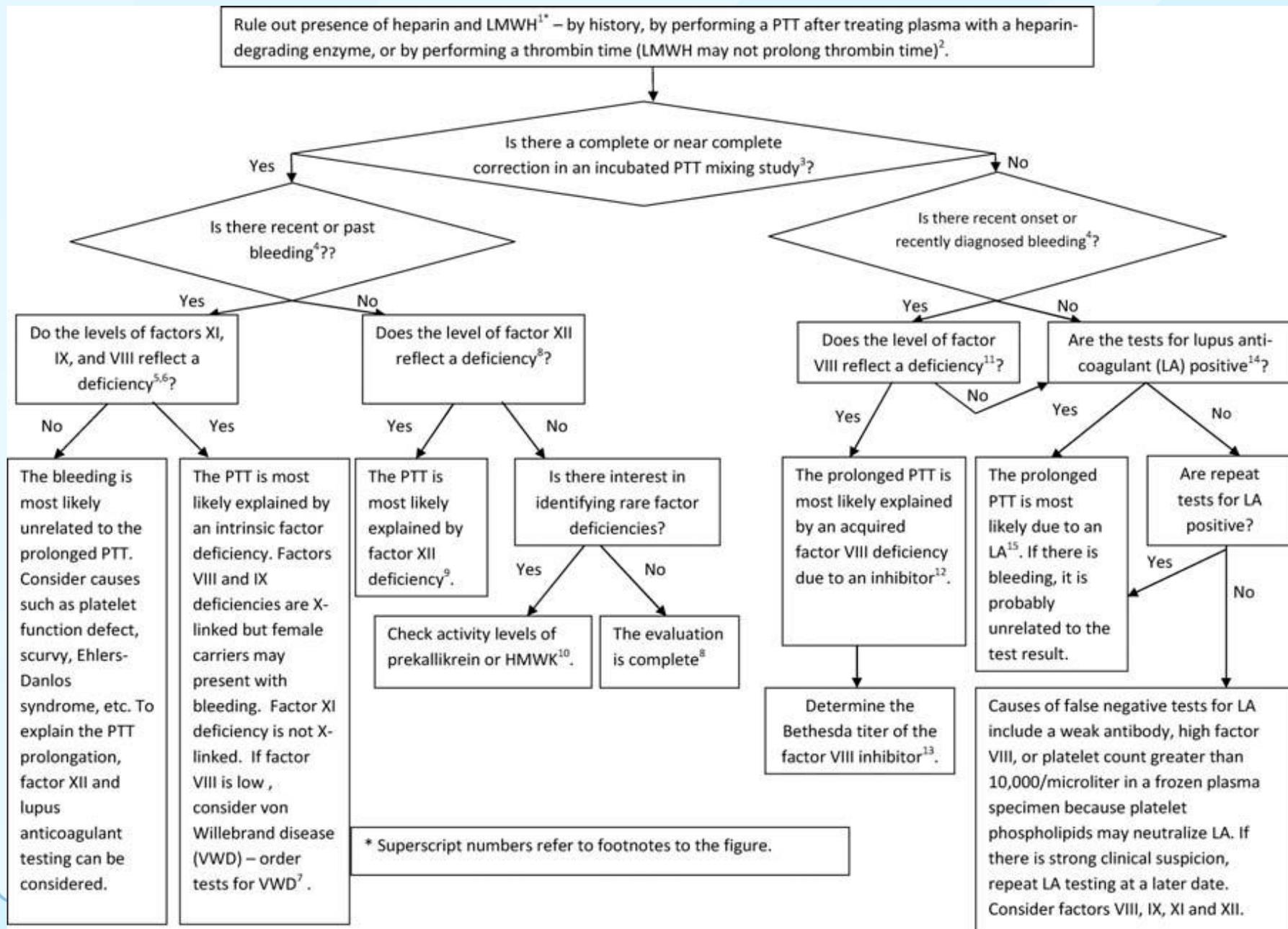
### CDC Innovations Award Partnership:

- CLIHC™ Algorithm Subgroup
- CDC Division of Laboratory Science and Standards
- CDC Public Health Surveillance & Informatics Program Office (Proposed)

## IT Tool:

- *PTT Advisor* app with algorithms for the isolated PTT

# The mobile app takes what is below and turns it into ----



  **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**

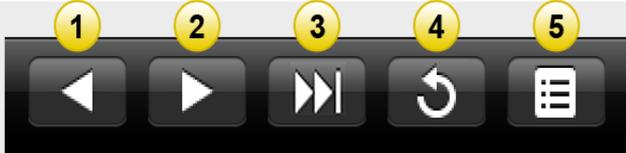
AT&T 3G 8:58 AM 97%

## 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.



**Do you think your clinician clients would use mobile applications to assist them with test utilization?**

**A. Yes**

**B. No**

- Key Projects
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    - Survey of Clinicians' Challenges
    - Diagnostic Algorithms
  - **Medical Student Education**
    - Survey of US Medical Schools
    - Clinical Pathology Residency Education



**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!**

Michael Laposata, AACC, 2012

# Survey of U.S. Medical Schools

Project Leads –Brian Smith, MD and John Hickner, MD, MSc

## Goals:

- Raise awareness about the gaps in US medical school curricula for laboratory medicine training
- Determine the amount of instruction about test selection and result interpretation

## Methods:

- Survey all 133 allopathic and 26 osteopathic U.S medical schools
- Letters to Deputy Dean for Education and Course Director for Laboratory Medicine & Pathology, accompanied by letter of support from CDC

CLIHCTM Medical School Survey Team, 2012  
Survey conducted by Yale School of Medicine

# Selected Preliminary Results

- Laboratory medicine training – 9 hours
- Transfusion medicine - + 2 more hours
- Anatomic pathology – 61 to 302 hours\*
- No assessment of competency for knowledge in laboratory medicine
  - But, fail pathology course if cannot interpret slides for anatomic pathology

\*Taylor, CR, et al; Pathology education: quo vadis?;  
*Human Pathology* (2008) 39: 1555 - 1561

# Next Steps

## Depending on results, consider:

- Establishing a national resource for instruction
  - Refine the Academy of Clinical Laboratory Physicians and Scientists curriculum in conjunction with primary care and specialty physician-educators
- Establishing a national assessment that schools can use (e.g., an on-line examination)
- Extending the survey to other health professionals
  - Physician Assistants
  - Advanced Practice Registered Nurses



**Do you participate in medical student education?**

**A. Yes**

**B. No**



**Would you be willing to participate in medical student education if a forum was available to do so?**

- A. Yes**
- B. No**

# Clinical Pathology Residency Education

Project Leads – Robert Hoffman, MD, PhD &  
Michael Laposata, MD, PhD

## Goal:

- Establish the nature and amount of clinical consultation education provided to clinical pathology residents
- Raise awareness about the gaps in, and solutions to improve clinical pathology residency education

## Method:

- Conduct observational study of academic institutions assessing clinical pathology resident training activities

# Clinical Pathology Residency Education

Project Leads – Robert Hoffman, MD, PhD &  
Michael Laposata, MD, PhD

## Results:

- 14 Accredited programs contacted – invited to visit 3
- “You would be surprised to see how little consultation there is”
- Some training programs have focal areas of consult activity
- Many programs not prepared to develop meaningful consultative roles for residents in laboratory medicine
- Obstacle: Limited # of doctoral level laboratory directors to teach residents

## Article:

*In CP training, are we teaching consultation?;*

Robert D. Hoffman; *CAP TODAY, August 2011, Feature Story*

# Your Role in the Clinical Team



“Knowing is not enough; we must apply.  
Willing is not enough; we must do”

Goethe



For More Information Please Contact:  
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Division of Laboratory Science and Standards

Office of Surveillance, Epidemiology, and Laboratory Services  
Laboratory Science, Policy, and Practice Program Office

