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Director of Clinical Laboratories
Massachusetts General Hospital
Professor, Harvard Medical School
Everyone accepts the fact that the ordering physician cannot interpret a biopsy specimen nor read an MRI, but there is an incorrect assumption, often by pathologists who are in charge of clinical laboratories, that the ordering physician knows precisely what to do with a prolonged PTT or a speckled ANA positive at 1:1280 – BUT THEY DON’T

And these tests are ordered far more frequently than any test in AP !!
ANATOMIC PATHOLOGY

1972 & Today

# Microscopic Morphologic Diagnoses

Known

Recognizable by Clinicians

Anatomic Pathologist Provides Expertise Without Specific Request from Clinician
Lab Tests and # Diagnoses Dependent on Lab Tests

1972

Diagnoses Known & Tests Available

Clinician Expertise in Test Selection and Interpretation

No Difference
Diagnoses Known & Tests Available

Clinician Expertise in Test Selection and Interpretation

Lab Tests and # Diagnoses Dependent on Lab Tests

BUT - No Expert Advice Provided Unless Specifically Requested
Most pathologists do know that this is a problem, but specifically someone else’s problem because-

-I never learned CP well enough in residency and cannot learn it now
-Unlike AP, I am not sure I’ll be paid for doing it
-No one really expects me to do it- I just need to answer an occasional question about a test
-I could get into trouble if I start a turf war over consultation services-better to be referral service to other consult services
Coagulation test interpretations at MGH –
How much case experience is necessary
to correctly interpret >95% of cases?

Pathology residents on the MGH coagulation service
sign out >98% of cases correctly after
2 months – this is > 1200 cases

Visiting pathologists and residents from
internal medicine at MGH coagulation rounds
report confidence at the 90+% level after 1-2 weeks –
this is > 150 cases per week
<table>
<thead>
<tr>
<th>Code</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>86320-26</td>
<td>Immunoelectrophoresis, serum</td>
</tr>
<tr>
<td>86325-26</td>
<td>Immunoelectrophoresis, other fluids</td>
</tr>
<tr>
<td>86327-26</td>
<td>Immunoelectrophoresis, 2-dimensional</td>
</tr>
<tr>
<td>86334-26</td>
<td>Immunofixation electrophoresis</td>
</tr>
<tr>
<td>87162-26</td>
<td>Dark field examination, any source</td>
</tr>
<tr>
<td>87207-26</td>
<td>Smear, primary source, for inclusion bodies/parasites</td>
</tr>
<tr>
<td>88371-26</td>
<td>Protein analysis by western blot, interpretation</td>
</tr>
<tr>
<td>88372-26</td>
<td>Protein analysis by western blot, with probe, interpretation</td>
</tr>
<tr>
<td>89060-26</td>
<td>Crystal identification by light microscopy</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>83020-26</td>
<td>Hemoglobin; electrophoresis</td>
</tr>
<tr>
<td>83912-26</td>
<td>Nucleic acid probe, each, with exam and report</td>
</tr>
<tr>
<td>84165-26</td>
<td>Protein, electrophoretic fraction and quantitation</td>
</tr>
<tr>
<td>84181-26</td>
<td>Western blot interpretation</td>
</tr>
<tr>
<td>84182-26</td>
<td>Western blot interpretation, immunological probe for band identification, each</td>
</tr>
<tr>
<td>85390-26</td>
<td>Fibrinolysis or coagulopathy screen, interpretation and report</td>
</tr>
<tr>
<td>85576-26</td>
<td>Platelet aggregation (in vitro), each agent</td>
</tr>
<tr>
<td>86255-26</td>
<td>Fluorescent antibody; screen, each antibody</td>
</tr>
<tr>
<td>86256-26</td>
<td>Fluorescent antibody; titer, each antibody</td>
</tr>
</tbody>
</table>
PHYSICIANS' RATING OF MOST IMPORTANT SERVICE ASPECT FOR CLINICAL LABORATORIES – EXPECTATIONS ARE LOW
Random sample of adults living in 12 metropolitan areas in the United States and asked about selected health care experiences. Written consent received to copy medical records for the most recent two year period and this information used to evaluate performance on 439 indicators of quality of care for 30 acute and chronic conditions as well as preventive care. We then constructed aggregate scores.
ADHERENCE TO QUALITY INDICATORS, OVERALL AND ACCORDING TO TYPE OF CARE AND FUNCTION

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of Indicators</th>
<th>Percentage of Recommended Care Received (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall care</td>
<td>439</td>
<td>54.9 (54.3 – 55.5)</td>
</tr>
<tr>
<td>Type of Care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive</td>
<td>38</td>
<td>54.9 (54.2 – 55.6)</td>
</tr>
<tr>
<td>Acute</td>
<td>153</td>
<td>53.5 (52.0 – 55.0)</td>
</tr>
<tr>
<td>Chronic</td>
<td>248</td>
<td>56.1 (55.0 – 57.3)</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screening</td>
<td>41</td>
<td>52.2 (51.3 – 53.2)</td>
</tr>
<tr>
<td><strong>Diagnosis</strong></td>
<td><strong>178</strong></td>
<td><strong>55.7 (54.5 – 56.8)</strong></td>
</tr>
<tr>
<td>Treatment</td>
<td>173</td>
<td>55.7 (54.5 – 56.8)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>47</td>
<td>58.5 (56.6 – 60.4)</td>
</tr>
</tbody>
</table>

*N Engl J Med 2003; 348:2635-45*
ADHERENCE TO QUALITY INDICATORS, ACCORDING TO MODE

<table>
<thead>
<tr>
<th>Mode</th>
<th>No. of Indicators</th>
<th>Percentage of Recommended Care Received (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
<td>95</td>
<td>68.6 (67.0 – 70.3)</td>
</tr>
<tr>
<td>Immunization</td>
<td>8</td>
<td>65.7 (64.3 – 67.0)</td>
</tr>
<tr>
<td>Physical Examination</td>
<td>67</td>
<td>62.9 (61.8 – 64.0)</td>
</tr>
<tr>
<td>Laboratory Testing or Radiography</td>
<td>131</td>
<td>61.7 (60.4 – 63.0)</td>
</tr>
<tr>
<td>Surgery</td>
<td>21</td>
<td>56.9 (51.3 – 62.5)</td>
</tr>
<tr>
<td>History</td>
<td>64</td>
<td>43.4 (42.4 – 44.3)</td>
</tr>
<tr>
<td>Counseling or Education</td>
<td>23</td>
<td>18.3 (16.7 – 20.0)</td>
</tr>
</tbody>
</table>

*N Engl J Med 2003; 348:2635-45*
## ADHERENCE TO QUALITY INDICATORS, ACCORDING TO CONDITION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage of Recommended Care Received (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Cancer</td>
<td>75.7 (69.9 – 81.4)</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>68.0 (64.2 – 71.8)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>64.7 (62.6 – 66.7)</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>63.9 (55.4 – 72.5)</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>59.1 (49.7 – 68.4)</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease</td>
<td>58.0 (51.7 – 64.4)</td>
</tr>
<tr>
<td>Depression</td>
<td>57.7 (55.2 – 60.2)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage of Recommended Care Received (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>53.5 (50.0 – 57.0)</td>
</tr>
<tr>
<td>Benign Prostatic Hyperplasia</td>
<td>53.0 (43.6 – 62.5)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>48.6 (44.1 – 53.2)</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>45.4 (42.7 – 48.3)</td>
</tr>
<tr>
<td>Headache</td>
<td>45.2 (43.1 – 47.2)</td>
</tr>
<tr>
<td>Urinary Tracy Infection</td>
<td>40.7 (37.3 – 44.1)</td>
</tr>
<tr>
<td>Community-acquired Pneumonia</td>
<td>39.0 (32.1 – 45.8)</td>
</tr>
<tr>
<td>Sexually Transmitted Diseases or Vaginitis</td>
<td>36.7 (33.8 – 39.6)</td>
</tr>
<tr>
<td>Dyspepsia and Peptic Ulcer Disease</td>
<td>32.7 (26.4 – 39.1)</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>24.7 (18.4 – 30.9)</td>
</tr>
<tr>
<td>Hip Fracture</td>
<td>22.8 (6.2 – 39.5)</td>
</tr>
<tr>
<td>Alcohol Dependence</td>
<td>10.5 (6.8 – 14.6)</td>
</tr>
</tbody>
</table>
THE LIST OF LABORATORY MEDICINE INTERPRETIVE ROUNDS AT THE MGH – MINIMAL TURF ISSUES HAVE OCCURRED

Currently active-
- Coagulation
- Autoimmune disease
- Hemoglobinopathy/Anemia
- Transfusion reactions & Complex transfusion cases
- Serum protein analysis

HIV
- Hepatitis
- To be reactivated-
  - Toxicology

Needed but not created-
- Endocrinology

Needed and being created-
- Cardiovascular risk
Not all lab test results need an interpretation –

Which tests or panels of tests provide clinically valuable information?
How much diagnostic complexity should be present so that an interpretation provides information not known to the ordering physician?
Who suffers without a laboratory medicine consult service that addresses correct test selection and result interpretation?
Not the pathologists.

The patient, of course, whose care is subject to the variable knowledge of non-experts in laboratory medicine.
And the primary care doctor who wants to deliver optimum care in a healthcare system that discourages input from pathologists in test selection and result interpretation.
THE VICIOUS CYCLE: AMERICAN SOCIETY

CONDITIONS NOT CONDUCIVE TO LEARNING

DANGEROUS NEIGHBORHOODS

LACK OF EDUCATION

INCREASE IN CRIME

ABSENCE OF SKILLS

NO GAINFUL EMPLOYMENT
Clinicians perceive need for advice on selection and interpretation of laboratory tests, but no expertise in pathology department available.

Less than optional quality of care and increased cost to manage patient.

Not infrequently, clinicians order tests inappropriately and make incorrect interpretations of laboratory data.

No competency among residents to meet need for 24 hr/7 day consult service.

No support for pathologists to teach appropriate laboratory test selection and interpretation to residents.

No consults received by pathologists on laboratory test use and interpretation.
A big problem is that those pathologists interested in optimizing care and minimizing errors in the clinical laboratory are addressing the issues within the walls of the laboratory. This approach misses the major source of error -- the improper selection of tests and incorrect interpretation of test results --

High frequency errors which occur outside the laboratory.
Has the right test been ordered?

Error between result receipt and action?

Ordering → Collection → Identification → Transportation → Preparation

Interpretation

Reporting

Analysis

The nine steps in the performance of any laboratory test. The brain-to-brain turnaround time loop.

Lundberg, 1981
Are serious errors really being missed – ones that might be prevented if the complex lab results are not automatically interpreted by a knowledgeable pathologist - without requiring a call from the ordering physician?
Bleeding disorders missed in children whose fathers were accused of child abuse – 2 cases
Misinterpretation of results by an obstetrician that led to termination of a pregnancy with a normal fetus
Failure to identify a factor deficiency prior to neurosurgery that led to major neurologic deficiencies
Misidentification of a lupus anticoagulant as a factor VIII inhibitor and treatment with factor VIII concentrate
Inadequate anticoagulation with heparin because of the presence of a lupus inhibitor that elevated the PTT value prior to anticoagulation
AND MANY, MANY MORE....
INCORRECT LABORATORY TESTS ORDERED OR MISINTERPRETATION OF TEST RESULTS

- Increased cost of care from lab tests & technologist labor
- Delay in time to diagnosis with increased length of stay for inpatients
- Physician time lost in assessment of incorrect tests
- Clinical consequences and emotional distress from unnecessary procedure or misdiagnosis

- Increased cost of care from lab tests & technologist labor
- Delay in time to diagnosis with increased length of stay for inpatients
- Physician time lost in assessment of incorrect tests
- Clinical consequences and emotional distress from unnecessary procedure or misdiagnosis
Changes in the Scope of Care Provided by Primary Care Physicians

Physicians’ Assessments of the Appropriateness of Primary Care Physicians’ Scope of Care

<table>
<thead>
<tr>
<th>Scope of Care</th>
<th>Primary Care Physicians (N=7015)</th>
<th>Specialists (N=5092)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than it should be</td>
<td>$24 \pm 0.8$</td>
<td>$38 \pm 0.8$</td>
</tr>
</tbody>
</table>

I have a case of a 25 year old woman who is interested in oral contraceptive use. I will only recommend them if I know that she does not have a risk factor for thrombosis –

Can you tell me which tests I should order to assess hypercoagulability in this case?
Platelet Specific PLA-1 Antigen (526)
Platelet Factor 4 (504)
Protein C
  Activity (035) □ Antigen (036)
  Antigen/F VII Ratio (067)
Protein C Inhibitor (PAI-3)* (717)
Protein S
  Activity (088)
  Antigen Total (038) □ AntigenFree (087)
  Antigen/F VII Ratio (059)
Protein C and S
  Activity (149) □ Antigen (142)
  Antigen/F VII Ratio (032)
  Activity and Antigen (204)
Proconvertin Prothrombin Assay (084)
Prothrombin Consumption (PF3) (503)
Prothrombin Fragment 1+2 (718)
Prothrombin Time (080)
Prothrombin Time Mixing Study (116)
Reptilase Time (610)
Stypven Time (611)
Thrombin Time (807)
Thrombin Time Mixing Study (813)
Thrombin-ATIII Complex (714)
Thrombus Precusor Protein* (209)
Tissue Factor Pathway Inhibitor Ag* (147)
Tissue Plasminogen Act Antigen (125)
Tissue Thromboplastin Inhibition (804)
von Willebrand Factor
  Activity (114) □ Antigen (113)
  Multimers (117)
F VIII Human (Bethesda) (701)
F VIII Porcine Screen (703)
F IX (Bethesda) (704)
Fibrin Monomer (202)
Fibrinogen
  Activity (200)  Antigen (199)
Fibrin(ogen) Degradation Products (201)
Fibrinopeptide A (086)
Fletcher Factor
  Prekallikrein Assay (121)
  Prekallikrein Screen (120)
Heparin Adsorption of Plasma (135)
Heparin Anti-Xa Assay
  Unfractionated (600)
  LMWH (602)
  Heparin Cofactor II* (133)
Heparin-Induced Antibody
  Antibody* (522)  Antibody Titer* (528)
  Heparin Solution Quantitation (139)
  Hexagonal Phospholipid Neut. (144)
  High Mol Wt Kininogen Assay (123)
  Homocysteine (Serum) (727)
  Homocysteine (Urine) (729)
  Kaolin Clotting Time (056)
  Lipoprotein(a)* (715)
  Plasminogen Activator Inhibitor-1 (126)
  Plasminogen Activator Inhibitor-2* (140)
  PIVKA-II* (726)
Plasminogen
  Activity (400)  Antigen (408)
  Platelet Neutralization Procedure (805)
Platelet Antibody
  Direct (523)
  Screen (520)  Platelet Specific (524)
- Activated Protein C Resistance (716)
- alpha-2-Antiplasmin Assay (039)
- Anti-cardiolipin Antibody
  - IgG, IgM (034)
  - IgA (164)
- Antiphosphatidyserine (153)
- Antithrombin
  - Activity Plasma (030)
  - Antigen Plasma (033)
  - Activity Serum (031)
- APTT (040)
- APTT Mixing Study (806)
- beta-Thromboglobulin (085)
- C4b Binding Protein* (160)
- Cryofibrinogen (203)
- D-Dimer
  - Quantitative (405)
  - Semiquantitative (404)
- Dilute Russell's Viper Venom Test (057)
- Euglobulin Lysis Time (401)
- Factor Activities
  - F II (100)
  - F V (101)
  - F VII (102)
  - F VIII (103)
  - F IX (104)
  - F X (105)
  - F XI (106)
  - F VIIIa* (activated Factor VIII) (111)
  - F XIX (107)
  - F XII (108)
- Factor Antigens
  - F VII* (112)
  - F X* (206)
- Factor V Mutation (Leiden) (719)
- Factor VIII Concentrate Quantitation (058)
- Factor Inactivators
  - Inhibitor/Inactivator Screen (700)
  - F V (Bethesda) (706)
  - F VIII Porcine (Bethesda) (702)
One check mark in the correct box and all the correct tests are performed on the same blood sample.
Are there potential solutions to the problem of incorrect ordering of tests and misinterpretation of test results from the clinical laboratory?

If yes, have they been proven to work in a clinical setting?
STRATEGY #1

Use reflex testing as much as possible to increase appropriateness of test selection
Prolonged PTT Evaluation

Degrade heparin in sample and repeat PTT -
if the PTT normalizes, heparin is the cause

PTT mixing study (1:1 mix of
patient:normal plasma)

PTT Normalizes

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

PTT remains prolonged

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

Perform tests for specific inhibitors
suggested by results of PTT mixing study
To minimize the number of lab tests-

**Example:** Patient with a prolonged PTT of 65 seconds

**Assumption:** Physician orders all tests relevant to the most likely diagnostic possibilities
IN THE ABSENCE OF REFLEX TESTING

VISIT 1: PTT = 65 seconds

VISIT 2: New sample collected for PTT mixing study

Result: Corrects into normal range

VISIT 3: New sample collected for Factor VIII, IX, XI, XII assays

RESULT: Factor XI low at 3% of normal; factors VIII, IX, and XII normal

DIAGNOSIS: Factor XI Deficiency

# Visits: 3       # Tests Performed: 6
To minimize the number of patient visits-

Example: Patient with a prolonged PTT of 65 seconds

Assumption: Physician orders all tests relevant to the most likely diagnostic possibilities
TESTS TO MAKE DIAGNOSIS:
PTT mixing study, assays for factors VIII, IX, XI, XII, lupus anticoagulant screening assay and confirmatory assay, Bethesda Unit assay for factor VIII inhibitor

DIAGNOSTIC POSSIBILITY 1:
Factor deficiency

DIAGNOSTIC POSSIBILITY 2:
Lupus anticoagulant
DIAGNOSTIC POSSIBILITY 3:
A potentially lethal bleeding disorder-
factor VIII inhibitor

Bethesda unit assay for quantitation of a
factor VIII inhibitor is highly complex!

# Visits: 1

# Tests Performed: 9, with most tests
not necessary to establish diagnosis
<table>
<thead>
<tr>
<th>Test ordered on Requisition</th>
<th>Initial Test Performed</th>
<th>Criteria for Reflex</th>
<th>Test Ordered by Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lupus anticoagulant</td>
<td>Screen</td>
<td>Positive Screen</td>
<td>Lupus anticoagulant confirmation; anticardiolipin antibody added if red top received even if lupus anticoagulant is negative</td>
</tr>
<tr>
<td>Protein C</td>
<td>Protein C functional</td>
<td>&lt;70% activity</td>
<td>Antigenic Protein C</td>
</tr>
<tr>
<td>Antithrombin III</td>
<td>Functional antithrombin III</td>
<td>&lt;70% activity</td>
<td>Antigenic antithrombin III</td>
</tr>
<tr>
<td>Protein S</td>
<td>Functional Protein S</td>
<td>&lt;70% activity</td>
<td>Free Protein S antigen, fibrinogen and functional FVIII activity</td>
</tr>
<tr>
<td>Activated protein C resistance or Factor V Leiden</td>
<td>Activated protein C resistance</td>
<td>≤2.1</td>
<td>Factor V Leiden by DNA assay</td>
</tr>
<tr>
<td>Prolonged PT Evaluation (mixing studies)</td>
<td>PT, removal of heparin if PTT also prolonged, mixing study</td>
<td>Mixing study normal, prolonged, or &quot;fades&quot;</td>
<td>Factor assays, lupus anticoagulant, and/or factor inhibitor tests if indicated</td>
</tr>
<tr>
<td>Prolonged PTT Evaluation (mixing studies)</td>
<td>PTT, removal of heparin, mixing study</td>
<td>Mixing study normal, prolonged, or &quot;fades&quot;</td>
<td>Factor assays if mix is normal; lupus anticoagulant if mix is prolonged, factor VIII if mix &quot;fades&quot;; all three tests if mix results inconclusive; factor inhibitor tests if indicated</td>
</tr>
<tr>
<td>Multiple individual hypercoagulation tests</td>
<td>As ordered</td>
<td>Patient not on coumadin or other reason for not performing tests</td>
<td>If missing a test from the usual screen (activated protein C resistance, protein C, protein S, antithrombin), it will be included</td>
</tr>
<tr>
<td>Reptilase time</td>
<td>Reptilase time</td>
<td>&gt; 24 seconds</td>
<td>Fibrinogen Degradation Products (or D Dimer), Fibrinogen</td>
</tr>
</tbody>
</table>
The MGH clinical laboratory currently uses about 100 reflex test algorithms in all areas of laboratory medicine –

Most are locally generated and once approved by the MGH medical policy committee are rapidly implemented. Every proposed algorithm has been approved by the committee and new ones are presented each year.
MGH experience with detectable errors in test selection by clinicians

Test selection errors by commercial laboratory clients for hypercoagulable states

The clients were not given the opportunity for reflex testing and forced to select individual tests from a large test menu
Interpretations Reduce Test Ordering Errors

First 3 months

After 2 years of interpretations

Percentage of Total Requisitions

Number of Errors Per Requisition

STRATEGY #2

Provide patient-specific narrative interpretations of the test results, as done in Anatomic Pathology and Radiology, for complex evaluations in many areas of Laboratory Medicine, obtaining clinical information when necessary to enhance the speed and accuracy of the interpretation.
LABORATORY MEDICINE INTERPRETATIONS: LEVELS OF DIAGNOSTIC INFORMATION

- **Results Only**
- **Canned Comment with Results**
- **Patient-Specific Interpretation with Results** - Often Requires Clinical Data
Many pathologists and many clinical laboratories claim that they do interpretations 
BUT IN ALL CASES I HAVE SEEN
- The interpretation is a canned comment if provided systematically OR
- The interpretations are only done if the pathologist is called with a question – and this is at best a very small percentage of the questions in the head of the ordering physician regarding test selection and result interpretation OR
- The interpretations are not done regularly as would be expected with frozen sections in AP
“In this study, our objective was to determine the frequency, characteristics, and pursuit of residents’ medical information needs in clinic by interviewing them immediately after each patient encounter.”
ASSOCIATIONS BETWEEN A RESIDENT’S PERCEPTIONS OF A CLINICAL QUESTION AND THE LIKELIHOOD THAT THE ANSWER WAS PURSUED

<table>
<thead>
<tr>
<th>Perception</th>
<th>Number of Questions Pursued/Number of Questions (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am uneasy about this problem</td>
<td>29/96 (30)</td>
</tr>
<tr>
<td>I must obtain the answer urgently</td>
<td>22/65 (34)</td>
</tr>
<tr>
<td>The answer would change management</td>
<td>58/192 (30)</td>
</tr>
<tr>
<td>Without the answer, my patient could be harmed</td>
<td>33/93 (36)</td>
</tr>
</tbody>
</table>
ASSOCIATIONS BETWEEN A RESIDENT’S PERCEPTIONS OF A CLINICAL QUESTION AND THE LIKELIHOOD THAT THE ANSWER WAS PURSUED

<table>
<thead>
<tr>
<th>Perception</th>
<th>Number of Questions Pursued/ Number of Questions (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The answer will help me manage other patients</td>
<td>76/262 (29)</td>
</tr>
<tr>
<td>The answer will benefit my general knowledge</td>
<td>79/270 (29)</td>
</tr>
<tr>
<td>This problem involves malpractice risk</td>
<td>32/76 (42)</td>
</tr>
<tr>
<td>My patient expects to know the answer</td>
<td>52/136 (38)</td>
</tr>
<tr>
<td>The answer definitely exists</td>
<td>57/196 (29)</td>
</tr>
</tbody>
</table>
“There are an estimated 20,000 medical journals offering updates on various medical specialties.

Partly because of the overload of information, most physicians rely on what was current during their own education for what they do.”

Guessing at the correct answer is far more common than seeking a consultation from an expert –

And guesses are made for the most serious of clinical decisions and the patient is usually unaware that the physician is guessing.
The income from performance of interpretations of results from the clinical laboratory –

including the microscopic interpretations that fall within the clinical laboratories like peripheral blood smears and gram stains

– is not great enough to drive the majority of pathologists into this activity.
1996 Survey of MGH physician experience with narrative interpretations of complex laboratory evaluations in coagulation

Ordering physicians sent a narrative interpretation of one their own cases

Clinicians asked to respond to several questions about the interpretation

46 of 100 surveys returned
THIS INTERPRETATION SHORTENED THE TIME TO A DIAGNOSIS?

THIS INTERPRETATION PROBABLY REDUCED THE NUMBER OF LABORATORY TESTS REQUIRED TO MAKE A DIAGNOSIS?

- 71.7% YES
- 26.1% NO
- 2.2% NO ANSWER

THIS INTERPRETATION HELPED AVOID A MISDIAGNOSIS?

- **YES** 71.7%
- **NO** 21.7%
- **NO ANSWER** 6.5%

DO YOU FIND THESE INTERPRETATIONS USEFUL OR INFORMATIVE?

2.2%

97.8%

2000 Survey of MGH physician experience with narrative interpretations of complex laboratory evaluations in coagulation

Ordering physicians electronically sent a narrative interpretation of one of their own cases.

Clinicians asked to respond electronically to several questions about the interpretation.

100 of 100 surveys returned.

Interpretation Impact - Physician Outcomes

<table>
<thead>
<tr>
<th>Percentage of Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Saved Physician Time

Impacted Differential Diagnosis

Reduced Time to Diagnosis

Interpretation Impact
Medical Utilization

- Reduced Lab Testing
- Reduced Medical Procedures
- Reduced Admissions
- Reduced Medications
- Reduced Blood Product Usage
- Reduced Specialist Consultation
- Increased Specialist Consultation

So with this kind of evidence of improved clinical outcome and wide support from clinicians ordering tests in an actual clinical setting, is the provision of systematically provided, patient specific, expert driven interpretations increasing the test volume and thereby increasing the number of promptly and accurately diagnosed cases?
TOTAL SPECIAL COAGULATION TESTS AT MGH

<table>
<thead>
<tr>
<th>Year</th>
<th>Test Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>35,793</td>
</tr>
<tr>
<td>2002</td>
<td>46,079</td>
</tr>
<tr>
<td>2003</td>
<td>56,198</td>
</tr>
<tr>
<td>2004</td>
<td>59,794</td>
</tr>
</tbody>
</table>
PATIENT-SPECIFIC INTERPRETATIONS OF COMPLEX COAGULATION EVALUATIONS AT MGH

Test Volume by Year:
- 2001: 4,938
- 2002: 7,227
- 2003: 7,861
- 2004: 8,065
The ramp up for this service is slow – in our institution we did 9 cases the first week the interpretation service was implemented and the entire first year showed similar activity –

Some might perceive low case volume initially as a reason to not initiate or discontinue the service if it is implemented-
A service never implemented never becomes valued
Pathologists hear mostly about overuse of tests, which are primarily the routine tests ordered daily, without consideration of their true value –

This is different from a series of focused tests that shorten the time to diagnosis and improve the accuracy of diagnosis – thereby saving money and improving clinical outcome.
REQUEST FOR IMPLEMENTATION OF PROGRAM TO REDUCE LABORATORY ERRORS

From General Clinicians

1. Make the service available and easy to use
2. Request for subspecialist cooperation
3. Quality and efficiency are driving forces
BARRIERS TO IMPLEMENTATION OF PROGRAM TO REDUCE LABORATORY ERRORS

From Pathologists

1. Lack of expertise by pathologists
2. Fear of subspecialist response
3. No expectation of payment
4. Complacency with canned comments
5. Lack of interest by academic pathologists
<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Mean Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Pathology services for which a separate bill is issued</td>
<td>2.9</td>
</tr>
<tr>
<td>Clinical pathology services for which no separate bill is issued</td>
<td>7.7</td>
</tr>
<tr>
<td>Total hours per week in clinical pathology services</td>
<td>10.6</td>
</tr>
<tr>
<td>Total hours worked per week</td>
<td>49.4</td>
</tr>
</tbody>
</table>

2004 CAP Practice Characteristics Survey Report
### CHANGE IN AMOUNT OF CLINICAL PATHOLOGY-RELATED SERVICES COMPARED TO TWO YEARS AGO, BY REPORTING YEAR

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compared to Two Years Ago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More</td>
<td>24</td>
<td>28</td>
<td>21</td>
<td>25</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Same</td>
<td>55</td>
<td>48</td>
<td>54</td>
<td>49</td>
<td>53</td>
<td>56</td>
</tr>
<tr>
<td>Less</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>16</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Did not perform clinical path two</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>years ago and still don’t</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Answer</td>
<td>*</td>
<td>1</td>
<td>1</td>
<td>*</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*Less than 1%

2004 CAP Practice Characteristics Survey Report
The current CAP practice data indicate that the vast majority of pathologists do little clinical pathology and many of those that do don’t bill professionally for it – possibly because the activity is lab management and not clinical consultation.

Most pathologists think they are doing more CP every year, but really aren’t by their own data on practice time distribution AP vs. CP.

People tend to overestimate the time spent on activities that they do not like.
WHAT CAN BE DONE NOW –
WITH A NATIONAL SHORTAGE OF EXPERT
PATHOLOGISTS IN LABORATORY MEDICINE?

Create a national group of experts in the areas of Laboratory Medicine to provide the narrative interpretations (A “Supreme Court”) and link the experts to the physicians requesting advice and their pathologists through a web-based Internet service.
A National Lab Medicine Consultative Service?

- **Clinician**
  - Requests interpretation
  - Views completed interpretation

- **Resident or Pathologist**
  - Assembles case
  - Presents case to pathologist

- **Pathologist**
  - Manages case flow
  - Creates interpretation
Software is commercially available to expedite the generation of narrative reports BY

- Linking the interpreting pathologist to other experts
- Assisting the interpreter in arriving at the correct clinical conclusions.
LABORATORY MEDICINE ACTIVITIES: THE ROAD TO INDISPENSIBILITY

- Teaching Program in Lab Medicine
- Answer Questions on Laboratory Related Issues
- Provide Interpretive Service for Complex Test Batteries Independent of Requests from Clinicians

Necessary to pass board examinations
Necessary to gain visibility in patient care
Necessary to gain indispensability in patient care
Where do the path and lab societies stand?

- **CAP** has taken no leadership role in advancing this activity for pathologists.
- **AACC** is not actively interested, presumably because PhD laboratory scientists cannot be paid for interpretations.
- **ASCP** is not closely connected with issues of daily pathologist practice.
- Some **state societies of pathology** are interested but appear more focused on the revenue from interpretations than the lack of CP knowledge of pathologists.
Is this problem a topic of active discussion by any of the agencies that are concerned with the quality of clinical care – particularly the Institute for Quality in Laboratory Medicine?
Medical error from incorrect laboratory test selection and result interpretation is rapidly becoming a more serious problem as the test menu becomes larger and more complex—particularly with the growth of molecular diagnostics.
Will the Services Desired by Clinicians Ever be Provided?

Patient specific, proven value added narrative interpretations by expert clinical pathologists at the Massachusetts General Hospital

Institute for Quality in Laboratory Medicine?

Growth of programs outside MGH by MGH trained pathologists

Medical error reduction becomes associated with financial benefits