Optimizing Laboratory Test Utilization in Microbiology: What Works and What Doesn’t

Bobbi Pritt, MD
Laboratory Director, Clinical Microbiology
Mayo Clinic, Rochester, MN
Today’s Goals

- Discuss the role of laboratory test utilization in providing high quality patient care
- Describe the drivers behind inappropriate lab test utilization
- Review tools and strategies that are available to the laboratory for evaluating and controlling test utilization in Microbiology and beyond
Our Health Care picture today
National Health Spending, 1960 - 2010
Healthcare and Laboratory Costs

- Annual US healthcare expenditures:
  - $2,570 billion dollars

- Laboratory tests including anatomic pathology:
  - ~4% of healthcare costs
  - $55 - $60 billion
  - 20-25% increase annually
  - Molecular/Genetics is 15% of laboratory costs; anticipated to reach 25% soon
  - Largest growth: proprietary tests, genetic tests, and test bundling
Today’s Big Picture:

“Healthcare Reform”

• Our current system isn’t sustainable

• Introduction of new payment models

  › Accountable Care Organization (ACO) models

  › “Fee for service”

    ▪ Moving towards “Fee for diagnosis” or “Reward for outcome”

    ▪ Similar to a DRG model for hospital in-patients with better reimbursement for better outcomes
What can the laboratory do in this setting of decreasing reimbursement?

- Laboratory leadership needs to champion programs that allow for appropriate laboratory and pathology testing.
- If we do not act, we risk having someone else make cuts for us.
The Role of the Clinical Microbiologist

• Experts in microbiology test selection:
  o Select the most appropriate test for the clinical scenario
  o Reduce laboratory overutilization
    • Avoid unnecessary treatments that could adversely affect patient outcomes and increase downstream costs
Improving Test Utilization is about:

- Performing:
  - The Right test
  - For the Right patient
  - At the Right Time
  - Every time

  - This could mean decreasing, increasing, or changing the tests ordered (it’s not all about cutting tests)
In order to optimize lab test utilization, we need to understand why we have issues
Reason #1: The “Knowledge Gap”

- The number and complexity of lab tests has increased
- Knowledge gap between clinicians and laboratory
- Knowledge gap between science and therapies
- Laboratories do not always provide guidance for the appropriate use of assays in various diseases
Reason # 2: Non-Optimized Laboratory Systems and Processes

- Ordering process
  - Requisition forms provide no help
  - Check boxes and alphabetical lists, with no information
- In-lab review process
  - Limited processes to review test requests
  - Limited processes to sequentially add or delete tests after initial results are determined
- Clinical knowledge is often incomplete at the time the test is ordered. The clinician is compelled to order everything as it may be the only chance to get that information.
Reason #3: The ordering system makes it easy to over-order

- Test Panels and order sets may contain unnecessary tests
  - Example: extensive panels for tick-borne organisms haven’t been proven to be human pathogens
- “Standing orders” allow the same test to be performed repeatedly, regardless of the result
Reason #4: Wrongly-Aligned Incentives

• Incentives
  o Hospitals depend on laboratories for $$$
  o A “successful” laboratory is often defined as one that has a high profit margin
  o If you decrease volumes, you decrease $$$
• No incentives for clinicians to order less
• No incentives for pathologists to campaign for decreased tests – less professional fees
• This will change with implementation of ACOs
Reason #5: Societal and Patient Demands

- Patients demand more
- Patient dissatisfaction with healthcare
- Patient desire for wellness
- Google is the source of all medical knowledge
- Marketing pressures
- Litigation fears
What are some approaches that the laboratory can undertake to improve test utilization?

- Close the knowledge gap
- Use the ordering system to your advantage
- Empower the laboratory, microbiologists, resident/fellow, or genetic counselor to guide test utilization through lab-driven cascades
- Use your laboratory data to drive your utilization efforts and receive support/recognition for your efforts
APPROACH #1 – CLOSE THE KNOWLEDGE GAP
CLOSE THE KNOWLEDGE GAP

Low Impact: 1-time educational efforts

- Emails and memos
- Call for enhanced vigilance
- Educational pamphlets
- CME lectures/talks
Reality check

• 1-time educational efforts have a limited impact on changing ordering patterns
• Stool Ova and parasite test as an example
Stool Parasite Exam Test volumes 2005 – April 2012

Giardia EIA
Cryptosporidium EIA
O&P
30 min Educational Video For Laboratorians

60 min Educational Program For Lab And Clinicians

Educational Bulletin To Laboratorians

O&P

Giardia EIA

Cryptosporidium EIA
Conclusions

• Educational efforts are not enough to change ordering practices

• Why?
  o Messages don’t reach the right people
  o Habit/patterns are hard to break
  o Regular influx of new trainees and physicians
Ongoing Education has a greater impact

- Readily available test information
  - Test catalog
  - Online information
  - HIV testing as an example
Test ID: HIV
HIV-1/2 Antibody Evaluation, Serum

Useful For
Screening and confirmation of HIV-1 and/or HIV-2 infection

Clinical Information
AIDS is caused by 2 known types of HIV. HIV type 1 (HIV-1) was isolated from patients with AIDS. AIDS-related complex, and asymptomatic infected individuals at high risk for AIDS. The virus is transmitted by sexual contact, by exposure to infected blood or blood products, or from an infected mother to her fetus or infant. HIV type 2 (HIV-2) was first isolated from patients in West Africa in 1986. It appears to be endemic only in West Africa and it also has been identified in individuals who had sexual relations with individuals from that geographic region. HIV-2 is similar to HIV-1 in viral morphology, overall genomic structure, and its ability to cause AIDS.

Antibodies against HIV-1 and HIV-2 are usually not detectable until 6 to 12 weeks following exposure and are almost always detectable by 12 months. They may fall to undetectable levels in the terminal stage of AIDS.

Routine serologic screening of patients at risk for HIV-1 or HIV-2 infection usually begins with a HIV-1/2 antibody screening test which may be performed by various FDA-approved assays, including rapid HIV antibody tests, EIA, and chemiluminescent immunoassay (CIA) methods. In testing algorithms that begin with EIA or CIA methods, confirmatory antibody testing by Western blot assay should only be performed on specimens that are repeatedly reactive by EIA or CIA.
HIV Testing Algorithm (excludes HIV rapid testing)

**IF HIV antibody screen already performed over 1 of the following:**
- WB/HIV-1/2 Antibody Confirmatory Evaluation, Serum
- WB/HIV-1/2 Antibody Confirmatory Testing, Serum
- WB/HIV-1/2 Antibody Confirmatory Without Immunofluorescence Assay, Serum

**IF HIV antibody screen is reactive:**
- WB/HIV-1 Antibody Confirmatory Evaluation, Serum
- WB/HIV-2 Antibody Screen, Serum

**If suspect acute HIV infection or high-risk patient, see note 3**
- WB/HIV-1 Antibody Confirmatory Evaluation, Serum
- WB/HIV-2 Antibody Screen, Serum

**If suspect acute HIV infection or high-risk patient, see note 4**
- WB/HIV-1 Antibody Confirmatory Evaluation, Serum
- WB/HIV-2 Antibody Screen, Serum

**If HIV antibody screen is indeterminate or not interpretable:**
- HCV/O/HIV-1/2 Antibody Screen, Serum

**For non-high-risk patients, repeat serologic HIV testing WB/HIV-1/2 Antibody Evaluation, Serum in 2 to 4 weeks**

**Order Options**

<table>
<thead>
<tr>
<th>Tests Performed</th>
<th>HIVE/5333</th>
<th>Unit Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB/HIV-1/2 Antibody Evaluation, Serum</td>
<td>X</td>
<td>23979</td>
</tr>
<tr>
<td>WB/HIV-1/2 Antibody Screen, Serum</td>
<td>X</td>
<td>32466</td>
</tr>
<tr>
<td>WB/HIV-1 Antibody Confirmatory by Immunofluorescence, Serum</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>WB/HIV-2 Antibody Evaluation, Serum</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>WB/HIV-2 Antibody Screen, Serum</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>WB/HIV-2 Antibody Confirmatory by Immunofluorescence, Serum</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

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APPROACH 2 - USE THE ORDERING SYSTEM TO YOUR ADVANTAGE
Use of the Ordering System

- Provides an opportunity to influence the provider at the point of order, usually before a specimen is obtained from the patient
- This is the best place to intervene!
Ordering System – Simple interventions

- Remove tests (quickest way to decrease volumes!)
- Rename tests to be more intuitive
Renaming tests

- hCG: useful to diagnose/monitor pregnancy and useful as a tumor marker
Renaming tests, continued

- Testing for Enteroviruses, CSF
  - Test A: Enterovirus PCR
  - Test B: Coxsackievirus antibodies
  - Test C: Echovirus antibodies
  - Test D: Poliovirus antibodies

Patient scenario –
- 9 year old boy with headache and stiff neck; echovirus outbreak is occurring

- Echovirus antibodies (Use Enterovirus PCR for acute disease testing)
Ordering System – ‘moderate complexity’ interventions

• Rearrange how tests appear on ordering cards or screens

• Consider:
  o How are your tests currently listed?
  o Have you seen your ordering screens?
  o Are the tests simply listed alphabetically or in a way designed to guide use?
## Microbiology Stool Testing

### Common Procedures
- C. difficile Toxin PCR 83124

### Select Either Enteric Pathogens Culture OR PCR (not both)
- Bacterial Enteric Pathogens Culture, Stool 8098
  - ***Includes Shiga Toxin PCR
- Bacterial Enteric Pathogens PCR 60235
  - ***Rapid test for Salmonella, Shigella, Yersinia, Campylobacter, Shiga Toxin
- ***Reflexive culture performed if positive

### Fecal Leukocytes 8046

### Fecal Parasite Screen (See Guide for Algorithm)
- Giardia Ag 80231
- Cryptosporidium Ag 80335

### Rotavirus Ag 8886

### Additional procedures
- Helicobacter pylori Ag 81806
- Vibrio Culture 89658
- VRE PCR 84406
- Acid Fast Smear for Mycobacterium 8213
- M. tuberculosis Complex PCR 88807
- Mycobacterial Culture 8205
- Fungal Smear 84390
- Fungal Culture, Routine 84389
- Adenovirus PCR 89074
- Viral Culture, Non-Respiratory 87266
- Cyclospora Stain 81506
- Microsporidia Stain 81507
  - ***Microsporidia found primarily in immunocompromised patients
- Parasitic Examination (O&P) 9216
  - ***Order only if appropriate history (see Guide for Algorithm)

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**Outpatient Ordering system**

We’ve seen a 30% decrease in O&P orders over expected volumes (based on the previous year) since we’ve changed the ordering system.

**Tiered testing shows preferred order**
USE THE ORDERING SYSTEM TO YOUR ADVANTAGE – ‘high complexity’ interventions

• Require ordering clinician to fill in check boxes for patient symptoms and exposure history.
  o Based on entered answers, only certain tests will be available
Name: Thrombophilia Profile

Note: Includes Lupus Anticoag, DIC/ICF, APC-R with Factor V Leiden if indicated, Prothrombin 20210, Proteins C&S, Antithrombin, Fibrinogen.

Recommended if not performed within past 90 days:
- Detail: CBC with Differential (Blood) 9109
- Detail: Homocysteine, Total (Blood) 80379
- Detail: Phospholip Ab (Cardiolip) IgM/IgG (Blood) 82976

*Has pt received any of the following in last 7 days?
- Coumadin
- Heparin-standard
- Heparin-low molecular weight
- Argatroban/bivalirudin/lepirudin
- Aspirin, NSAIDS
- Aggrenox, Plavix
- FFP/Cryoprecipitate
- DDAVP/Factor VIII/IX or VWF concentrate
- None of the above
USE THE ORDERING SYSTEM TO YOUR ADVANTAGE - Other (more complex) options, continued

• Set up IT rules to control utilization
  o Rule type #1: only allow a certain number of tests within a certain time period
    • Example: *Clostridium difficile* toxin PCR testing – once in a 7 day period
  o Rule type #2: only allow a repeat order within a certain time frame if the previous result was abnormal
    • Example: Ionized calcium
iCAL

- ~3500 orders/month
- ~800 incidences/mo serum iCAL ordered within 24 hours of previous iCAL
  - ~300/mo both results normal
  - ~100/ mo first normal, second abnormal
  - 3 (over 3 months) were < 4 mg/dL
- Successful interventions published
iCAL order entry decision rule

Clinical Alert for: Lab Utilization

Duplicate Ionized Calcium Order

Previous Ionized Calcium (4.7 mg/dl) was within normal reference interval on replaceDate1.
Repeat measurement is NOT indicated except in the following clinical scenarios:

- Dialysis or severe renal failure (eGFR <30)
- Abnormal heart rhythm
- Following multiple/massive blood transfusions
- During or post apheresis

Replacement of calcium in critically ill patients with normal or moderately low ionized calcium levels is not associated with improved outcome. Repeat Serum Ionized Calcium measurement is not indicated more than every 24-48 hours in most hospitalized patients with normal levels.

How to Proceed:

To cancel the order select “YES” below. Then select the order from the patient’s order profile and D/C (cancel) the order.

To proceed with the order, enter the indication in the text box below, and then click on "NO".

If this alert is an error or you have questions send an email to micscds@mayo.edu

Click “YES” to cancel, click “No” and enter reason to proceed with order.

Please enter reason

Yes  No
Preliminary results

- iCAL, Mg, NT pro BNP rules implemented on select hospital wards
- Test volumes 30 day before and after rule

<table>
<thead>
<tr>
<th>Test</th>
<th>Volume pre (30 days)</th>
<th>Volume post (30 days)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>iCAL</td>
<td>1465</td>
<td>582</td>
<td>- 60%</td>
</tr>
<tr>
<td>Mg</td>
<td>4828</td>
<td>2297</td>
<td>- 52%</td>
</tr>
<tr>
<td>NT Pro BNP</td>
<td>140</td>
<td>125</td>
<td>- 11%</td>
</tr>
<tr>
<td>ELPN</td>
<td>3858</td>
<td>3810</td>
<td>- 1%</td>
</tr>
<tr>
<td>PHOS</td>
<td>2138</td>
<td>1711</td>
<td>- 20%</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>796</td>
<td>810</td>
<td>+ 2%</td>
</tr>
<tr>
<td>AST</td>
<td>936</td>
<td>932</td>
<td>- &lt;1%</td>
</tr>
</tbody>
</table>

- Number of times rule fired first 30 days: 1528 (of 55,019 qualifying orders)
- Number of pop-up overrides: 931 (61%)
USE THE ORDERING SYSTEM TO YOUR ADVANTAGE – Keep the Ordering System Up-to-Date

• Review and modify requisitions and order screens frequently
  • Computer order “hot buttons” need to reflect guidelines and not just ease of ordering

• Be quick to obsolete tests that are obsolete
  • Bleeding time, band count, red cell folate, etc.

› Have an approval process for adding tests to your menu (consider having a utilization review group)

› Simple changes can impact utilization
APPROACH #3 – Implement a Test Formulary (similar to the pharmacy drug formulary)
“STOP LIGHT” Approach

- **Red**: Testing has no documented clinical utility. Alternate testing may be available. Please contact a Lab Director to discuss patient presentation.

- **Yellow**: Testing has limited clinical utility/application. Approval to order must be coordinated through Section Head of Specialty Area.

- **Green**: Testing has proven clinical utility and its use is well-defined in clinical practice. Testing should be made available in ordering system.
Steps in this process

1. Microbiologists reviewed a list of all send out tests in the 5 years and assign them a color
2. Infectious diseases groups then reviewed the color ranking
   - Only 4 test colors were changed
3. All green tests are built into the ordering system to allow for ease of ordering
4. Yellow and red tests will require approval; only the most expensive tests will be included
   - Clinical Microbiology fellows and pathology residents will perform the review/approval
Approach #4 – Train Laboratory Staff to provide 1-on-1 education and interventions at the time of ordering
Laboratory Staff – Best for expensive, low volume tests

• Example: Genetic Counselors (GC) and genetic technologists at Mayo
  o Review test requests that “don’t make sense” and Make phone calls to clinicians
  o 30% of all requests get changed after GC intervention – add or delete test(s)
  o ~$500,000 savings per year

• Can we use technologists or residents to perform interventions?
Use of Clinical Microbiology Fellows to control use of expensive molecular multiplex platforms

• In addition to interventions at the time of ordering, we also intervene in the laboratory

• Request for multiplex Respiratory PCR panel is received in the lab
  o Lab staff confirm the medical service that ordered the test (should only be ordered by select predetermined services)
  o Physicians from other services receive a call from the Clinical Microbiology fellow
Script for ordering intervention

- Clinical Microbiology received a nasopharyngeal swab collected from your patient, <patient name>, that included an order for the Multiplex Pathogen Panel. I just wanted to provide some information before we proceed with testing. First, I wanted to make sure you were aware that this test is very expensive and also tests for a number of viral pathogens for which there is no treatment available. Can you tell me a little bit about the patient’s clinical presentation so that we can determine whether this is the right test?

- Based on the patient’s clinical presentation, there may be some molecular alternative tests that may be more appropriate and cost effective.
  
  - Influenza/RSV PCR
  - Group A Strep PCR
  - Bordetella pertussis PCR
APPROACH #5:
USE DATA TO YOUR ADVANTAGE
Using Data to your advantage

• Share data with lab and institutional leadership – and attach dollar amounts
  o This is an excellent approach for getting the support you need to start and/or continue utilization efforts
• Gather pre- and post-intervention data
  o You may find out that your intervention isn’t working! (time to try something new)
• Share ordering data with your clinicians
  o This can be very powerful for identifying ‘outliers’ – clinicians who order far more tests than the others – and getting them to change their practices
Summary

• There are many different approaches for tackling test utilization issues – some with more impact than others.

• Education is important for establishing the laboratorian as a subject matter expert and providing information for new/changed tests.

• However, education alone - especially 1-time interventions - rarely impacts long term behavior.

• Education with other enhancements (e.g. changes to test ordering system, peer report cards) have greater impact.

• The test ordering system can be a powerful tool to guide test usage.

• Using laboratory professionals to review and guide testing can be highly beneficial when used selectively.
Thank you!