Laboratory Stewardship: Demonstrating the Value of Clinical Laboratory Medicine

Andrew Fletcher, MD, MBA, CPE
Agenda

Background

Stewardship Committee

Interventions

Result

Downstream Impact
Background

3 most significant causes of patient harm:

- Ordering the wrong test
- Failing to retrieve a test result
- Misinterpreting a test result

13 billion tests performed

70% decisions based on test

10–30% unnecessary
Trends in Healthcare

Laboratory Stewardship

Radiology Utilization Management

Blood Utilization

Pharmacy Utilization Management

Antimicrobial Stewardship

Radiology Utilization Management

Blood Utilization

Pharmacy Utilization Management

Antimicrobial Stewardship
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Creating Successful Laboratory Stewardship

1/3 of labs have a stewardship program

1/2 of those labs have a productive and progressing committee

Success Factors

Data Analysis
Formal Governance
Evidence-Based Recommendations
IT Engagement and Support
Project Management
Measurement and Reporting
Special Report

Transforming Laboratory Utilization Review into Laboratory Stewardship: Guidelines by the PLUGS National Committee for Laboratory Stewardship

Jane A. Dickerson, 1,4 Andrew R. Fletcher, 1 Gary Procop, 1 David F. Keren, 1 Ilai R. Singh, 1 Joaquin J. Garcia, 1 Robert B. Carpenito, 2 Joe Miles, 1 Brian Jackson, 1 and Michael L. Acock 1,4

Appropriate utilization of clinical laboratory services is important for patient care and requires institutional stewardship. Clinical laboratory stewardship programs are dedicated to improving the ordering, retrieval, and interpretation of appropriate laboratory tests. In addition, these programs focus on developing, maintaining, and improving systems to provide proper financial coverage for medically necessary testing. Overall, clinical laboratory stewardship programs help clinicians improve the quality of patient care while reducing costs to patients, hospitals, and health systems.

This document, which was created by a new multi-institutional committee reinvigorated in promoting and formulating laboratory stewardship, summarizes core elements of successful hospital-based clinical laboratory stewardship programs. The core elements will also be helpful for independent commercial clinical laboratories.

Pathology and laboratory medicine have transformed the practice of medicine by providing tests and services for diagnosis, treatment, monitoring, and prevention of disease and driving advances in all fields of medicine. Laboratory testing is the single highest-volume medical activity with an estimated 13 billion tests performed in the US each year. 1 In addition, about 70% of downstream medical decisions are based on pathology and laboratory medicine results. 1,2

The 3 most significant causes of patient harm related to laboratory services are ordering the wrong test, failing to retrieve a test, and misinterpreting a test result. 3 A number of studies, as well as review of insurance claims, reveal that 10%-30% of laboratory tests performed in the US are either unnecessary or inappropriate. 4 About 30% of genetic test orders are inappropriate 5, 6, and about 5% of genetic test orders are clinically medical errors. 6 About 7% of test results are never retrieved or retrieval is significantly delayed. 7 Like all medical interventions, inappropriate laboratory test ordering and interpretation have serious effects, including delayed

http://jalm.aaccnl.org/content/2/2/259
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Three Initial Areas of Focus:

1. Test Consolidation
   How many reference labs do you use?

2. Reference Test Formulary
   Creation & implementation

3. In-House Testing
   Daily recurring labs
   Inappropriate test intervals
Test Consolidation

How many reference laboratories do you use?

1. Is there a primary vendor?

2. Why are tests sometimes not consolidated?
   - Physician request
   - Patient request
   - Insurance requirement
   - Easier process for lab staff

Free Phenytoin at Lab X $106
Free Phenytoin at Primary Lab Vendor $13
Interventions

Three Initial Areas of Focus:

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Test Formulary

**Review**
- all sendout testing performed in 1 year

**Eliminate**
- test listing in menu if ordered <4 times in 1 year

**Review**
- remaining test on menu to see if reasonable
# POE Optimization

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celiac Serology</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Immunoglobulin E (IgE)</td>
<td>REF, $$$, 5d</td>
</tr>
<tr>
<td>Levetiracetam Level</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Protein C/S Panel, Functional</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Renin</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Thyroid Abs</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Alpha-Fetoprotein (AFP)</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>B2 Glycoprotein I Abs IGG IGM</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Buprenorphine and Metabolites, Urine</td>
<td>REF, $$$, 5d</td>
</tr>
<tr>
<td>Cardiolipin Abs (IgG, IgM, IgA)</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Glutamic Acid Decarboxylase AB</td>
<td>REF, $$$, 4d</td>
</tr>
<tr>
<td>Islet Cell</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Lamotrigine Level</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Oxcarbazepine (Trileptal)</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Thyroid Stimulating Immunoglobulin</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Thyroxine Binding Globulin</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Tissue Transglutaminase IGA AB</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Topiramate (Topramax) Level</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>TPMT Enzyme</td>
<td>REF, $$$, 2d</td>
</tr>
<tr>
<td>Von Willebrand Multimeric Panel</td>
<td>REF, $$$, 4d</td>
</tr>
<tr>
<td>Activated Protein C Resistance</td>
<td>REF, $$$, 5d</td>
</tr>
<tr>
<td>Adrenocorticotropic Hormone (ACTH)</td>
<td>REF, $$$, 3d</td>
</tr>
<tr>
<td>Aldosterone, Serum</td>
<td>REF, $$$, 5d</td>
</tr>
<tr>
<td>Aldosterone/Renin Act Ratio</td>
<td>REF, $$$, 6d</td>
</tr>
</tbody>
</table>
Interventions

Three Initial Areas of Focus:

1. **Test Consolidation**
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   Daily recurring labs
   Inappropriate test intervals
Intervention Methods

Proactive

• Appropriate order sets
• Order management
• Preference list management
• Physicians education
• Physician report cards

Reactive

• Duplicate alerts
• Formulary restriction alerts
• Best Practice Alerts
• Physician education
Agenda

- Background
- Stewardship Committee
- Interventions
- **Result**
- Downstream Impact
Laboratory Stewardship

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Total Charges</th>
<th>Potential Annual Savings</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>195-bed hospital (Northeast)</td>
<td>$19,600,111</td>
<td>$4,128,087</td>
<td>21%</td>
</tr>
<tr>
<td>419-bed hospital (Upper Midwest)</td>
<td>$94,511,717</td>
<td>$12,804,082</td>
<td>14%</td>
</tr>
<tr>
<td>Children’s hospital (Upper Midwest)</td>
<td>$12,635,262</td>
<td>$1,266,516</td>
<td>10%</td>
</tr>
<tr>
<td>237-bed hospital (South)</td>
<td>$43,047,787</td>
<td>$10,698,392</td>
<td>25%</td>
</tr>
<tr>
<td>161-bed hospital (Southwest)*</td>
<td>$77,926,758</td>
<td>$9,942,054</td>
<td>13%</td>
</tr>
<tr>
<td>645-bed hospital (Southwest)*</td>
<td>$211,943,118</td>
<td>$37,916,511</td>
<td>18%</td>
</tr>
<tr>
<td>199-bed hospital (Southwest)*</td>
<td>$70,251,035</td>
<td>$15,813,898</td>
<td>23%</td>
</tr>
<tr>
<td>535-bed hospital (Southwest)*</td>
<td>$144,127,890</td>
<td>$27,008,611</td>
<td>19%</td>
</tr>
<tr>
<td>208-bed hospital (Southwest)*</td>
<td>$56,348,672</td>
<td>$10,973,516</td>
<td>19%</td>
</tr>
<tr>
<td>338-bed hospital (Southwest)*</td>
<td>$78,046,058</td>
<td>$13,476,036</td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>18%</strong></td>
</tr>
</tbody>
</table>

This sampling of 10 engagements represent an average of 18% annual savings we found from the utilization analysis reports. These are typically the highest opportunities within the hospital, but other smaller opportunities likely exist.

*All part of one system that collectively also averaged 18% in savings for over $638.6M in total charges*
Agenda

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- Interventions
- Result

Downstream Impact
13 billion

laboratory tests performed annually in the U.S.

70%
of medical decisions are influenced by laboratory data

3%
of U.S. healthcare expenditures spent on laboratory services
Downstream Impact

• **Case Management**
  - Length of stay
  - Denials of payments

• **Pharmacy**
  - Expensive biologic agents
  - Pharmacogenomics

• **Radiology**
Troponin orders and Chest Pain LOS
Identify order mechanisms that drive the repeat interval

Modify the repeat time to be 3-6 hours after

**Improve** the time-to-decision by improving the test interval by up to **3 hours**
Downstream Impact on Pharmacy
Expensive Biologic Agents

• **TNF antagonists**
  – Infliximab (Remicade)
  – Adalimumab (Humira)

• **Hepatitis C antiviral agents**
  – NS5A/NS3A inhibitors
Pharmacogenetics Coagulation

Clopidogrel (Plavix)
  - CYP2C19

Warfarin (Coumadin)
  - CYP2C9 and VKORC1
ARUP Employee Health Clinic Project

- Based on pharmacy claims data for ~5000 patients, 83% of actionable drug-gene interactions relate to the CYPs.
- Implementing the CYP panel because drug-gene interactions are of the HIGHEST levels of evidence.
- Inviting ~400 patients to obtain PGx testing with enrolment anticipated to begin in May 2019.

<table>
<thead>
<tr>
<th>Drug</th>
<th>% of Patients</th>
<th>Primary gene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocodone</td>
<td>9.15%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Omeprazole</td>
<td>8.31%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>7.55%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Bupropion</td>
<td>6.49%</td>
<td>ANKK1</td>
</tr>
<tr>
<td>Sertraline</td>
<td>6.02%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Oxycodeine</td>
<td>6.00%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Citalopram</td>
<td>5.06%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Metformin</td>
<td>4.92%</td>
<td>ATM</td>
</tr>
<tr>
<td>Fluoxetine</td>
<td>4.86%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Trazodone</td>
<td>4.14%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Atorvastatin</td>
<td>3.98%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Codeine</td>
<td>3.72%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Escitalopram</td>
<td>3.30%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>3.08%</td>
<td>COMT</td>
</tr>
<tr>
<td>Tramadol</td>
<td>2.96%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Diclofenac</td>
<td>2.74%</td>
<td>CYP2C9</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>2.16%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Alprazolam</td>
<td>2.16%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Duloxetine</td>
<td>2.14%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Simvastatin</td>
<td>1.94%</td>
<td>SLCO1B1</td>
</tr>
<tr>
<td>Meloxicam</td>
<td>1.80%</td>
<td>CYP2C9</td>
</tr>
<tr>
<td>Quetiapine</td>
<td>1.70%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Methylphenidate</td>
<td>1.60%</td>
<td>MTHFR</td>
</tr>
<tr>
<td>Buspirone</td>
<td>1.46%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Tamsulosin</td>
<td>1.30%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>1.30%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Venlafaxine</td>
<td>1.28%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Propranolol</td>
<td>1.28%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Ketoconazole</td>
<td>1.28%</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Diazepam</td>
<td>1.12%</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>1.04%</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Pantoprazole</td>
<td>0.92%</td>
<td>CYP2C19</td>
</tr>
</tbody>
</table>
CT PE Protocol

- Age LOS
  - N: 3
  - Cases: -1.0, 0.0, 1.0
  - System / ADL 6: Severity: Hospital type

- % Cases Above Avg LOS
  - Details:
  - 38.27%: 26 / 92 patients
  - 1200 / 3292 cases
  - Data System / ADL 6: Severity: Hospital type

- % Cases Above CMS GMLOG
  - Details:
  - 46.57%: 1353 / 3292 cases
  - Data System / ADL 6: Severity: Hospital type

- Average Consultants Used
  - Details:
  - 0.10: 0.12
  - 3292 cases
  - Data System / ADL 6: AFR OR: Severity

- Age Changes
  - N: 575
  - Cases: -1.0, 0.0, 1.0
  - System / ADL 6: Severity: Hospital type

- % Cases Above Avg Charge
  - Details:
  - 57.26%: 38.66%
  - 1005 / 3292 cases
  - Data System / ADL 6: Severity: Hospital type

- LOS Observed/Expected Ratio
  - 0.96: 3292 cases
  - Data National Average: Severity: Hospital type

- 5 Per Morbidity Level
  - N: 9
  - TALENT LEVEL: RESULT, AVERAGE, CASES, CHART
  - Minor: 23.57%, 26.05%, 770
  - Moderate: 25.67%, 27.80%, 880
  - Major: 35.17%, 37.70%, 1180
  - Extreme: 15.68%, 12.45%, 513

- Cases Per Severity Level
  - SEVERITY LEVEL: RESULT, AVERAGE, CASES, CHART
  - 1 - Minor: 8.33%, 19.85%, 267
  - 2 - Moderate: 30.87%, 34.83%, 1018
  - 3 - Major: 44.59%, 40.70%, 169
  - 4 - Extreme: 15.32%, 14.02%, 556

1 - 4
American College of Chest Physicians and American Thoracic Society

View all recommendations from this society

Released October 27, 2013

Don’t perform chest computed tomography (CT angiography) to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay.

Clinical practice guidelines for pulmonary embolism indicate that the cost and potential harms of CT angiography (including radiation exposure and the possibility of detecting and treating clinically insignificant pulmonary emboli with anticoagulation) outweigh the benefits for patients with a low pre-test probability of pulmonary embolism. In patients with a low clinical prediction score (e.g., Wells or Geneva score) followed by a negative D-dimer measured with a high sensitivity test (e.g., ELISA), pulmonary embolism is effectively excluded and no further imaging is indicated for pulmonary embolism evaluation.
D-Dimer and CT PE Protocol
- Average percent of patients receiving CT PE scan in months prior to Aug 2015 (n=7) = 4.58%
- Average percent of patients receiving CT PE scan in months after Aug 2015 (n=15) = 3.14% (two sample t-test, p<0.05)
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