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:

- **13 billion test performed**
- **70% decisions based**
- **10–30% unnecessary**

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

13 billion test performed
70% decisions based
10–30% unnecessary
Trends in Healthcare

Laboratory Stewardship

Blood Utilization

Radiology Utilization Management

Antimicrobial Stewardship

Pharmacy Utilization Management
Agenda

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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

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Appropriate utilization of clinical laboratory services is important for patient care and requires institutional stewardship. Clinical laboratory stewardship programs are intended to improve the ordering, removal, 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 multidisciplinary committee experienced in promoting and formalizing laboratory stewardship, summarizes core elements of successful hospital-based clinical laboratory stewardship programs. The core elements will also be helpful for independent community clinical laboratories.

Pathology and laboratory medicine have transformed the practice of medicine by providing tests and services for diagnosis, treatment, monitoring, and research. Laboratories play a critical role in the health care of patients in all fields of medicine. Laboratory testing is the single highest-volume medical activity, an estimated 12 billion tests performed in the US each year.1 In addition, about 76% of non-clinician medical decisions are based on pathology and laboratory medicine results.2

The 5 most significant causes of patient harm related to laboratory services are ordering the wrong test, failing to receive a test, and misreading a test result.3 A number of studies, including a review of insurance claims,4 revealed that medical errors associated with laboratory testing are the most common of all medical errors.5 Laboratory errors are either unnecessary or inappropriate (40%, leading to a patient's harm), or falsely positive or negative (40%), and about 5% of genetic test orders are from medical errors.6 About 7% of test results are never received or review is significantly delayed.7 All medical errors, inappropriate laboratory test ordering and misinterpretation have serious effects, including delayed treatment, unnecessary and prolonged hospitalization, and additional testing costs.

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Agenda

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Interventions

Result

Downstream Impact
Interventions

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
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

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1. Test Consolidation
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   » Inappropriate test intervals
## Test Formulary

<table>
<thead>
<tr>
<th>Review</th>
<th>Eliminate</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>all sendout testing performed in 1 year</td>
<td>test listing in menu if ordered &lt;4 times in 1 year</td>
<td>remaining test on menu to see if reasonable</td>
</tr>
<tr>
<td>Test Description</td>
<td>Code</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Celiac Serology (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immunoglobulin E (IGE) (Ref, $$, 5d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levetiracetam Level (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein C/S Panel, Functional (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renin (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroid Abs (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alpha-Fetoprotein (AFP) (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2 Glycoprotein I Abs IgG IGM (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buprenorphine and Metabolites, Urine (Ref, $$, 5d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiolipin Abs (IgG, IgM, IgA) (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glutamic Acid Decarboxylase AB (Ref, $$, 4d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Islet Cell (Ref, $$, 4d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamotrigine Level (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxcarbazepine (Trileptal) (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroid Stimulating Immunoglob (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroxine Binding Globulin (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tissue Transglutaminase IGA AB (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topiramate (Topramax) Level (Ref, $$, 3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPMT Enzyme (Ref, $$, 2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Von Willebrand Multimeric Panel (Ref, $$, 4d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activated Protein C Resistance (Ref, $$, 5d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adrenocorticotropic Hormone (ACTH) (Ref, $$, 3d)</td>
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<tr>
<td>Aldosterone, Serum (Ref, $$, 5d)</td>
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<td></td>
</tr>
<tr>
<td>Aldosterone/renin ACT Ratio (Ref, $$, 6d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Interventions

Three Initial areas of Focus:

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Intervention Methods

Proactive

• Appropriate order sets
• Order management
• Preference list management
• Physician 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>17%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td>18%</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

Background

Stewardship Committee

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
    ▪ Coagulation
    ▪ Pharmacogenetic panels
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**
Expensive Biologic Agents

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

Hepatitis C Antiviral agents
• NS5A/NS3A inhibitors
Pharmacy-Related Projects

• Pharmacy & Lab Workflow Analysis
  » Create collaborative efficiencies with shared workflows
  » Time drug administration with associated lab collections
  » Budget planning teamwork

• Population Health Topics
  » Improve the health of those in the community
  » Refine medication use

• Opioid Stewardship and Antibiotic Stewardship
  » Appropriate lab and drug orders ensure success
  » Leverage order accessibility within the EHR, e.g. order sets
Coagulation

Clopidogrel (Plavix)  
CYP2C19

Warfarin (Coumadin)  
CYP2C9 and VKORC1
Pharmacogenetic Panels

Most Common PGx

Overall Patients on PGx

4,996 Patients

45% Non-PGx

55% PGx

% of Patients

% of Patients
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.
Risk report

Female, age 83 years

MOST FREQUENT SIDE EFFECTS

- Gout
- Headache
- Dizziness
- Dyspepsia
- Diarrhea

RISK RATING BY MEDICATION

- Doxepin
- Metoprolol Succinate
- Celecoxib
- Clopidogrel Bisulfate
- Rosuvastatin Calcium
- Sitagliptin Phosphate
- Febuxostat

Alternatives to Doxepin for this patient

Tricyclic and other cyclic antidepressants

<table>
<thead>
<tr>
<th>Alternative drug</th>
<th>A drug</th>
<th>A regimen</th>
<th>Detailed risk chart</th>
<th>Local reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maprotiline Hydrobromide Oral tablet</td>
<td>-68</td>
<td>-65</td>
<td></td>
<td>Generic: 1:20</td>
</tr>
<tr>
<td>Amitryptiline Hydrobromide Oral tablet</td>
<td>-35</td>
<td>-40</td>
<td></td>
<td>Generic: 9:05</td>
</tr>
<tr>
<td>Mirtazapine Oral solution</td>
<td>-30</td>
<td>-15</td>
<td></td>
<td>Generic: 1:15</td>
</tr>
<tr>
<td>Mirtazapine Oral tablet</td>
<td>-30</td>
<td>-15</td>
<td></td>
<td>Generic: 9:05</td>
</tr>
<tr>
<td>Phentermine Hydrobromide Oral tablet</td>
<td>-20</td>
<td>-25</td>
<td></td>
<td>Generic: 1:20</td>
</tr>
</tbody>
</table>
End of Year 1
Savings Total: $0.85M
Costs Total: $0.55M

End of Year 2
Savings Total: $5.08M
Costs Total: $0.90M

Savings Running Total
$10.91M

Costs Running Total
$1.04M
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Andrew Fletcher, MD, MBA, CPE
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