

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

- Ordering the wrong test
- 70% decisions based**
- Failing to retrieve a test result

10–30% unnecessary
• Misinterpreting a test result



Trends in Healthcare

Radiology Utilization
Management

Blood Utilization

Laboratory
Stewardship

Antimicrobial
Stewardship

Pharmacy Utilization
Management



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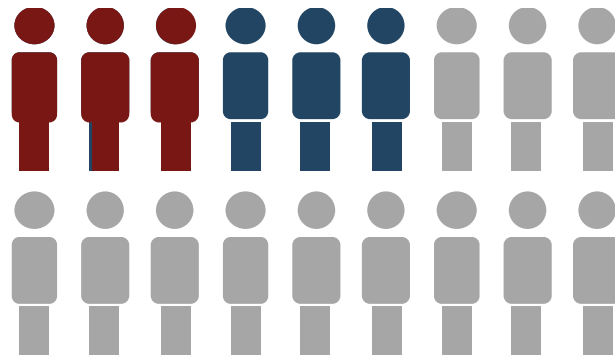
Creating Successful Laboratory Stewardship

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

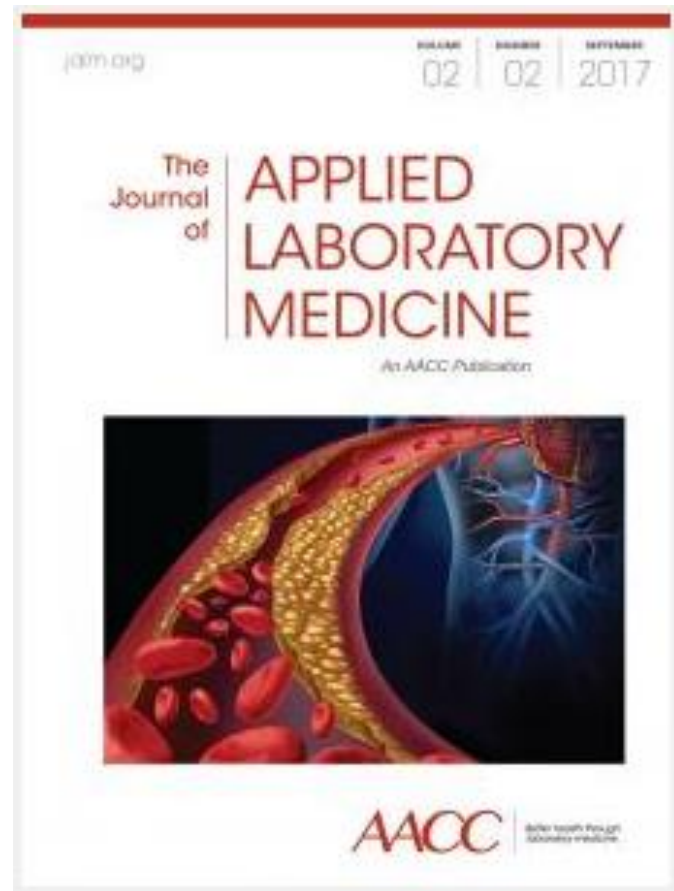
Evidence-Based Recommendations

IT Engagement and Support

Project Management

Measurement and Reporting

NCLS Publication



SPECIAL REPORT

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

Jane A. Dickerson,^{1,2*} Andrew H. Fletcher,³ Gary Procop,⁴ David F. Keren,⁵ Ila R. Singh,⁶ Joaquin J. Garcia,⁷ Robert B. Carpenter,⁸ Joe Miles,³ Brian Jackson,³ and Michael L. Astion^{1,2}

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 multiinstitutional committee interested 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 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 (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), and about 5% of genetic test orders are frank 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

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*Nonstandard abbreviations: UM, utilization management; PLUGS, Pediatric Laboratory Utilization Guidance Services; CPOE, computerized provider order entry.

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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

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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

- ☐ CELIAC SEROLOGY (REF,\$\$,3d)
- ☐ IMMUNOGLOBULIN E (IGE) (REF,\$\$,5d)
- ☐ LEVETIRACETAM LEVEL (REF,\$\$,2d)
- ☐ PROTEIN C/S PANEL, FUNCTIONAL (REF,\$\$,3d)
- ☐ RENIN (REF,\$\$,2d)
- ☐ THYROID Abs (REF,\$\$,2d)
- ☐ ALPHA-FETOPROTEIN (AFP) (REF,\$\$,3d)
- ☐ B2 GLYCOPROTEIN I ABS IGG IGM (REF,\$\$,3d)
- ☐ BUPRENORPHINE and METABOLITES, URINE (REF,\$\$,5d)
- ☐ CARDIOLIPIN Abs (IgG, IgM, IgA) (REF,\$\$,2d)
- ☐ GLUTAMIC ACID DECARBOXYLASE AB (REF,\$\$,4d)
- ☐ ISLET CELL (REF,\$\$,4d)
- ☐ LAMOTRIGINE LEVEL (REF,\$\$,2d)
- ☐ OXCARBAZEPINE (TRILEPTAL) (REF,\$\$,3d)
- ☐ THYROID STIMULATING IMMUNOGLOB (REF,\$\$,3d)
- ☐ THYROXINE BINDING GLOBULIN (REF,\$\$,3d)
- ☐ TISSUE TRANSGLUTAMINASE IGA AB (REF,\$\$,3d)
- ☐ TOPIRAMATE (TOPRAMAX) LEVEL (REF,\$\$,3d)
- ☐ TPMT ENZYME (REF,\$\$,2d)
- ☐ VON WILLEBRAND MULTIMERIC PANEL (REF,\$\$,4d)
- ☐ ACTIVATED PROTEIN C RESISTANCE (REF,\$\$,5d)
- ☐ ADRENOCORTICOTROPHIC HORMONE (ACTH) (REF,\$\$,3d)
- ☐ ALDOSTERONE, SERUM (REF,\$\$,5d)
- ☐ ALDOSTERONE/RENIN ACT RATIO (REF,\$\$,6d)

Interventions

Three Initial areas of Focus:

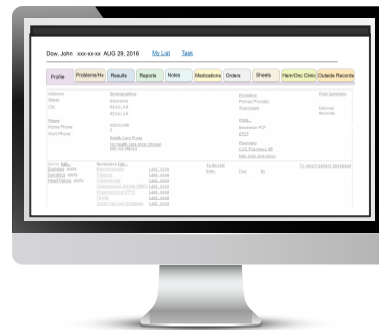
1. Test Consolidation
 - » How many reference labs do you use?
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 - » Inappropriate test intervals



Intervention Methods

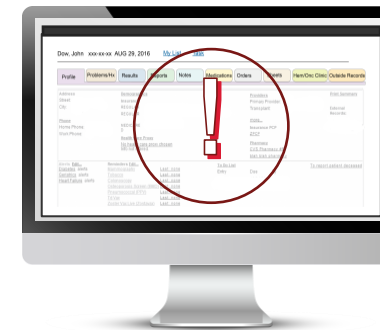
Proactive

- Appropriate order sets
- Order management
- Preference list management
- Physician education
- Physician report cards



Reactive

- Duplicate alerts
- Formulary restriction alerts
- Best Practice Alerts
- Physician education





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LABORATORY STEWARDSHIP

| Hospital | Total Charges | Potential Annual Savings | % |
|-------------------------------------|---------------|--------------------------|-----|
| 195-bed hospital (Northeast) | \$19,600,111 | \$4,128,087 | 21% |
| 419-bed hospital (Upper Midwest) | \$94,511,717 | \$12,804,082 | 14% |
| Children's hospital (Upper Midwest) | \$12,635,262 | \$1,266,516 | 10% |
| 237-bed hospital (South) | \$43,047,787 | \$10,698,392 | 25% |
| 161-bed hospital (Southwest)* | \$77,926,758 | \$9,942,054 | 13% |
| 645-bed hospital (Southwest)* | \$211,943,118 | \$37,916,511 | 18% |
| 199-bed hospital (Southwest)* | \$70,251,035 | \$15,813,898 | 23% |
| 535-bed hospital (Southwest)* | \$144,127,890 | \$27,008,611 | 19% |
| 208-bed hospital (Southwest)* | \$56,348,672 | \$10,973,516 | 19% |
| 338-bed hospital (Southwest)* | \$78,046,058 | \$13,476,036 | 17% |
| Average | | | 18% |

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



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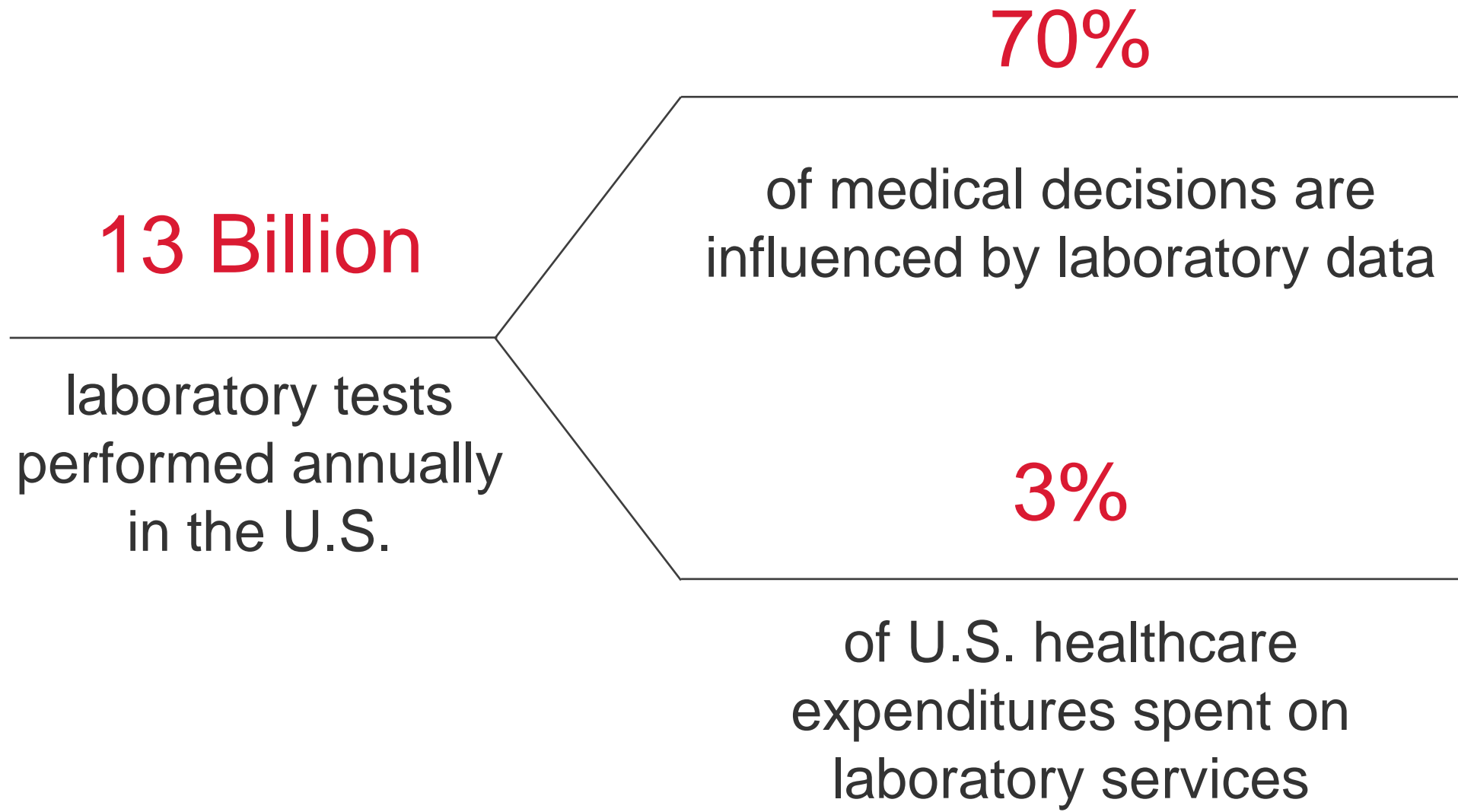
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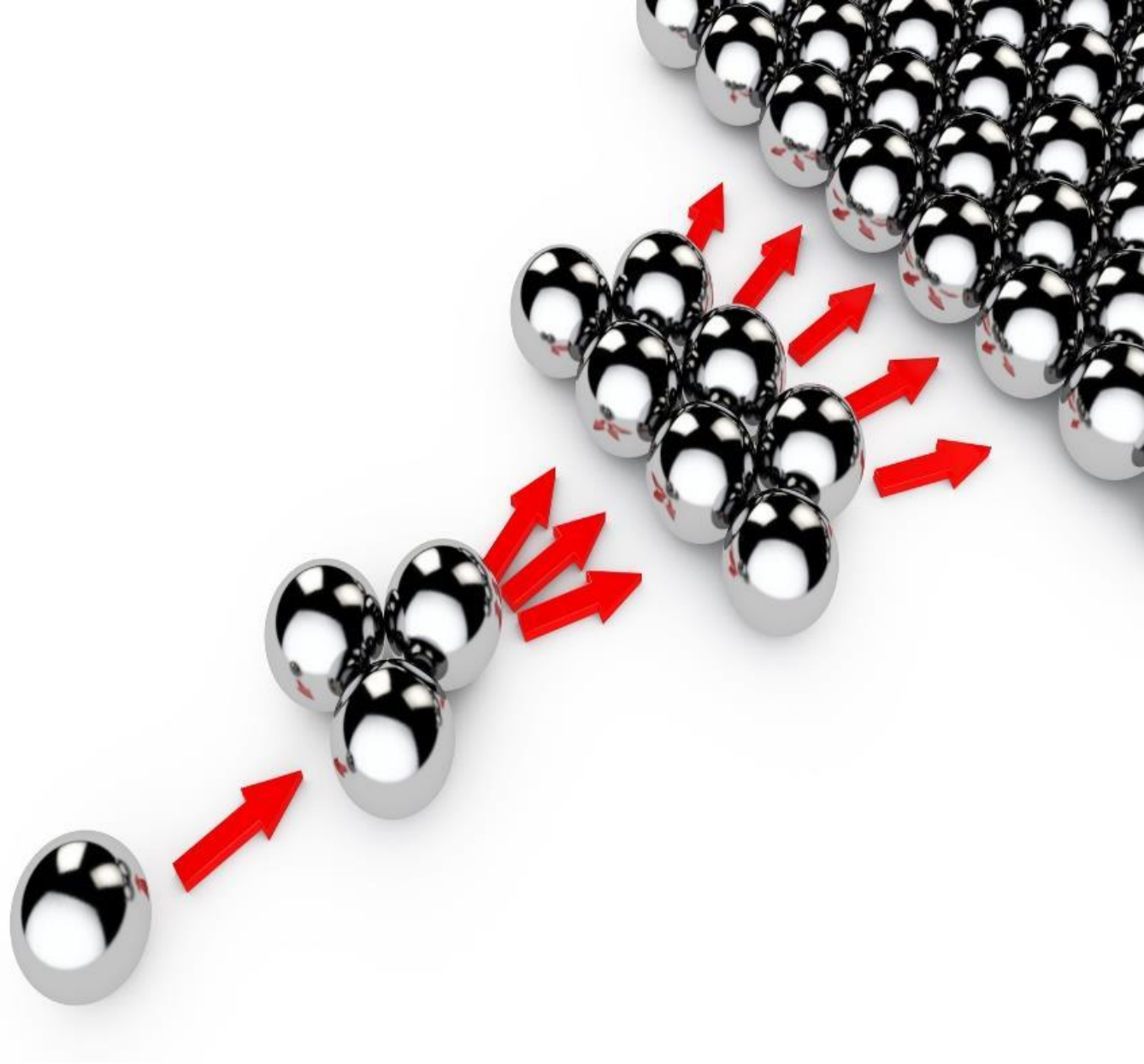
Result

Downstream Impact



Downstream Impact

- Case Management
 - » Length of stay
 - » Denials of payments
- Pharmacy
 - » Expensive Biologic Agents
 - » Pharmacogenomics
 - Coagulation
 - Pharmacogenetic panels



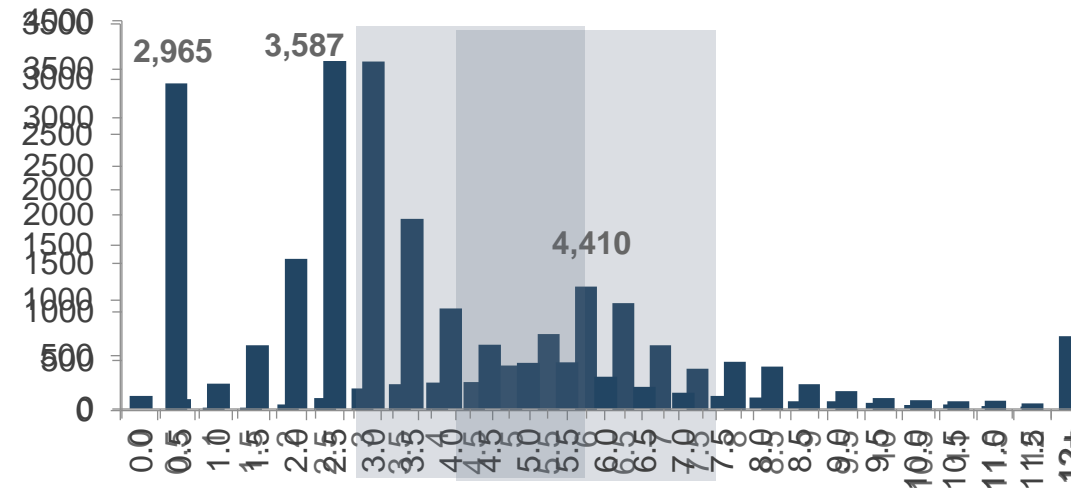
Troponin Orders and Chest Pain LOS

The screenshot shows a software window titled "Order picklists -- Webpage Dialog". At the top, there are radio buttons for "Selected Visit", "Other Visit", and "No Visit", along with a checkbox for "Do Not Discontinue Orders After End of Visit". Below this is a tabbed interface with "Common", "Patient Based", "Order Sets", "Search", and "Personal Favorites". The "Common" tab is active, showing a search bar with "troponin" and buttons for "All", "Meds", and "Labs". A "Favorites" list on the left includes items like "00 - Updates for Physicians", "01 - Medications", "02 - IV Fluids", "03 - Blood Bank orders", "04 - Laboratory Orders", "05 - Radiology Orders", "06 - Vascular Orders", "07 - Respiratory Orders", "08 - Cardiology Tests", "09 - Diet Orders", "10 - Consult Orders", "11 - Protocol Orders", "12 - Discharge/Transfer", "14 - GetWell Network Education", "Cardiology Order Sets", "Internal Medicine Order Sets", "Pediatrics Order Sets", and "Physical Medicine/Rehab Order Sets". A "Specialty" dropdown is at the bottom left. The main area displays a list of troponin order sets with checkboxes for selection. The list includes:

- ☐ TROPONIN - I
- ☐ Notify MD: Elevated Troponin Levels
- ☐ Cardiac Enzymes
 - ☐ Troponin STAT and then every 6 hr x 2
 - ☒ TROPONIN - I Stat
 - ☒ TROPONIN - I Timed Q6Hrs Daily for 12 Hours
 - ☒ Troponin STAT and then every 4 hr x 2
 - ☒ TROPONIN - I Stat
 - ☒ TROPONIN - I Timed Q4Hrs Daily for 8 Hours
 - ☐ Troponin STAT and then every 3 hr x 2
 - ☒ TROPONIN - I Stat
 - ☒ TROPONIN - I Timed Q3Hrs Daily for 6 Hours
 - ☐ Troponin STAT and every 3 hrs x 4; Notify MD if positive
 - ☒ TROPONIN - I Stat
 - ☒ TROPONIN - I Timed Q3Hrs Daily for 12 Hours
 - ☒ Notify MD: If troponin results are positive
- [Evidence to use troponin as firstline cardiac biomarker](#)
- ☐ Troponin STAT and every 3 hrs x 4; Notify MD if positive
 - ☒ TROPONIN - I Stat
 - ☒ TROPONIN - I Timed Q3Hrs Daily for 12 Hours
 - ☒ Notify MD: If troponin results are positive
- ☐ TROPONIN STAT and REPEAT every 4 HRS X 2
 - ☒ Perform: ISTAT troponin stat, if unavailable order Serum Troponin I stat
 - ☒ TROPONIN - I Timed Q4Hrs Daily for 8 Hours
- ☐ Troponin STAT and then every 3 hr x 2
 - ☒ TROPONIN - I Stat

Buttons at the bottom right include "Add", "Add & Close", and "Close".

Troponin I



1

Identify order mechanisms that drive the repeat interval

2

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)

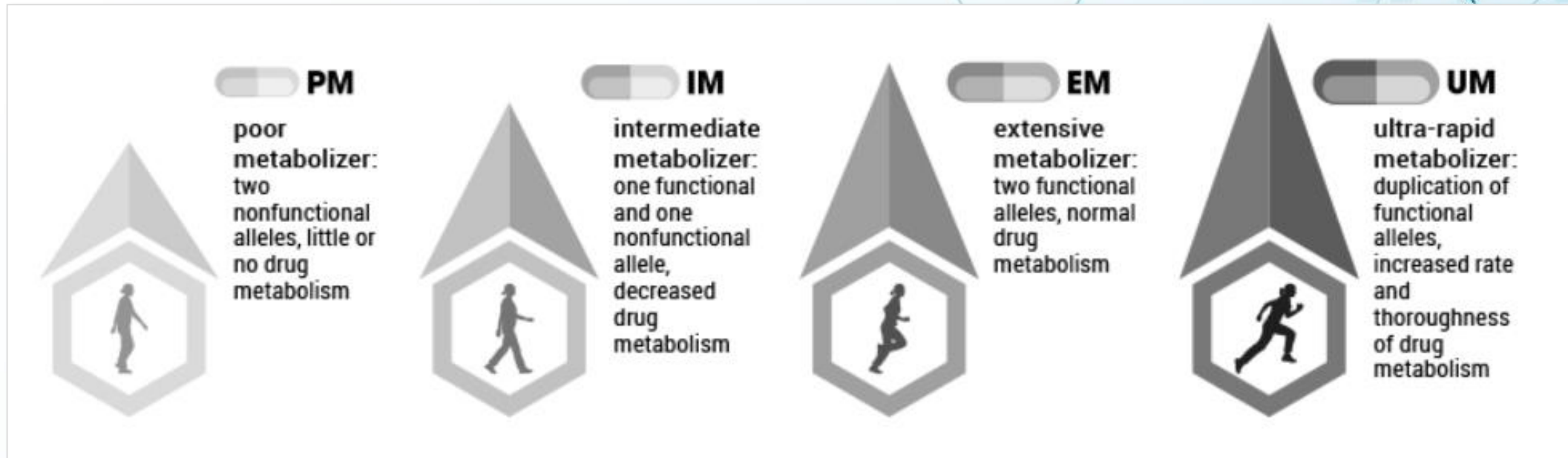
Hepatitis C Antiviral agents

- NS5A/NS3A inhibitors

Coagulation

Clopidogrel (Plavix)
CYP2C19

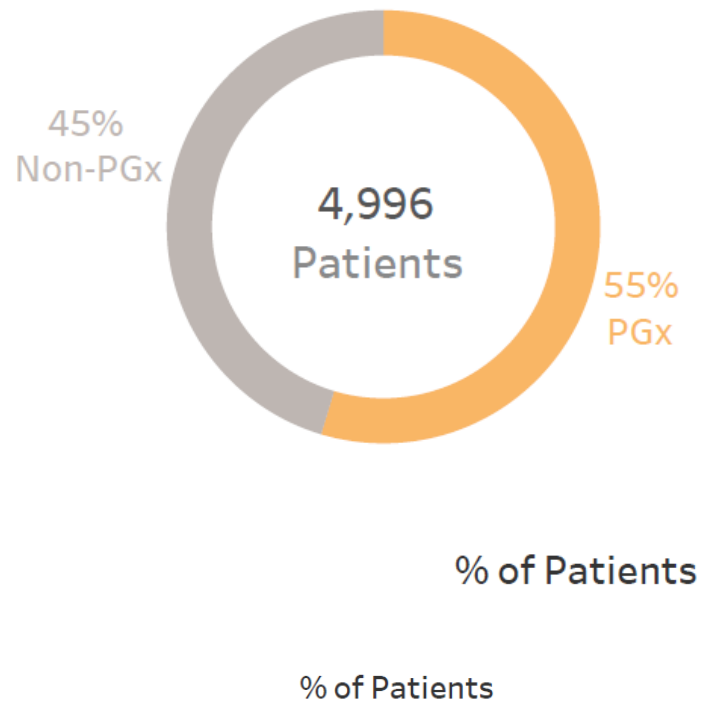
Warfarin (Coumadin)
CYP2C9 and VKORC1



Pharmacogenetic Panels

Most Common PGx

Overall Patients on PGx



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.

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

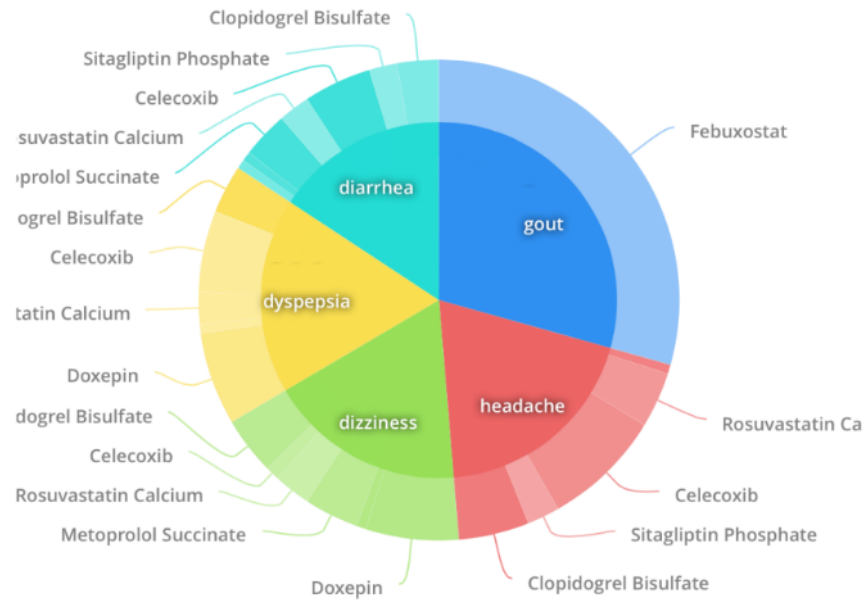
Risk report

Open Save Export PDF

Female, age 83 years

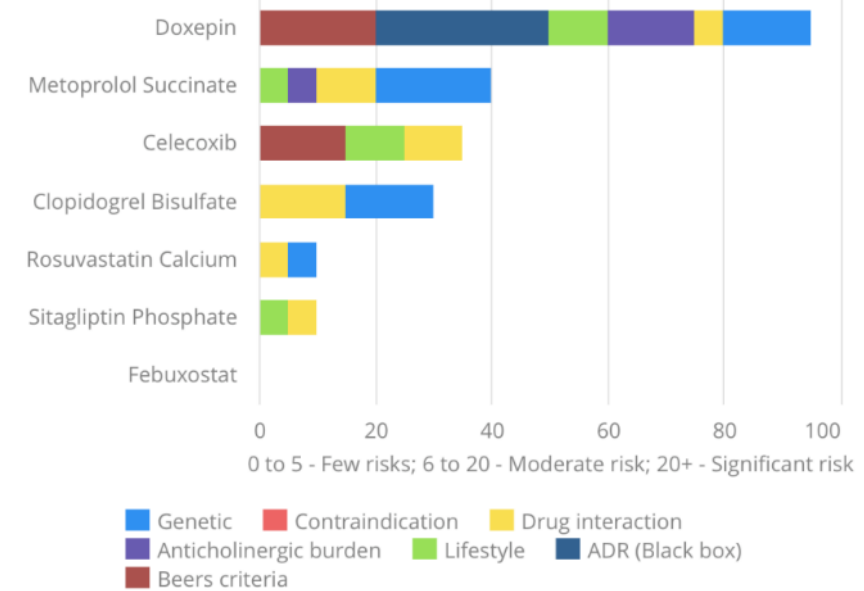
MOST FREQUENT SIDE EFFECTS

[View all side effects](#)



RISK RATING BY MEDICATION

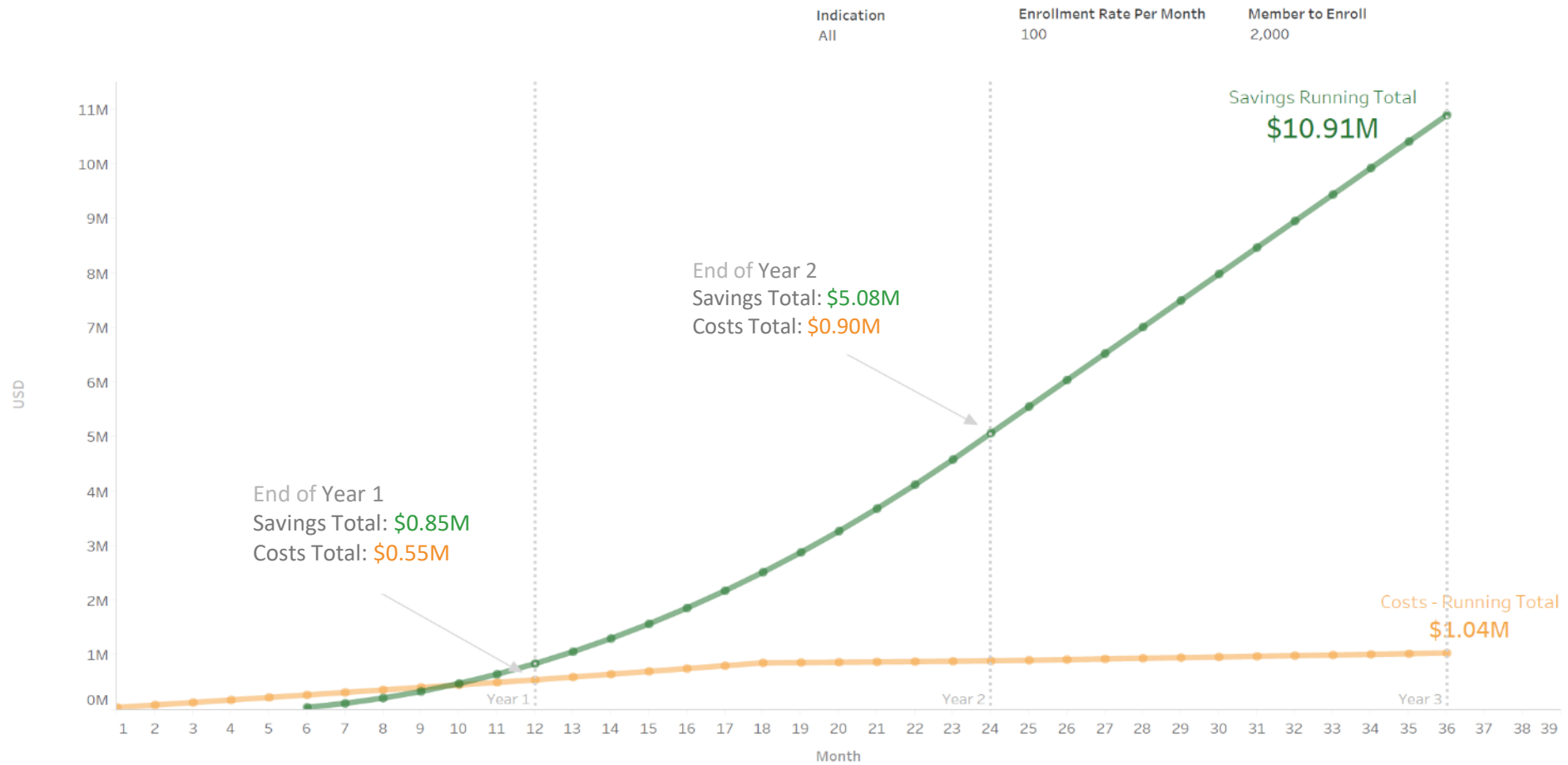
[View all side effects](#)



Alternatives to Doxepin for this patient

Tricyclic and other cyclic Antidepressants

| Alternative drug | Δ drug | Δ regimen | Detail | Risk chart | Est. cost/dose |
|--|--------|-----------|--------|------------|----------------------------------|
| <input type="checkbox"/> Maprotiline Hydrochloride Oral tablet | -60 | -65 | ⊕ | | Generic: \$1.20 |
| <input type="checkbox"/> Amitriptyline Hydrochloride Oral tablet | -35 | -40 | ⊕ | | Generic: \$0.65 |
| <input type="checkbox"/> Mirtazapine Oral disintegrating tablet | -30 | -35 | ⊕ | | Brand: \$4.18 Generic: \$0.93 |
| <input type="checkbox"/> Mirtazapine Oral tablet | -30 | -35 | ⊕ | | Brand: \$5.06 Generic: \$0.46 |
| <input type="checkbox"/> Protriptyline Hydrochloride Oral tablet | -20 | -25 | ⊕ | | Brand: \$4.09 Generic: \$1.63 |





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