Improving Ordering and Interpretation of Laboratory Tests:
A Reference Lab Perspective

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Presentation Overview

- Problems with current lab diagnosis model
- Solutions
  - Pull (online resources)
  - Push (customized reporting)
  - Analytics (customized feedback)
  - Structural changes (changing the rules)

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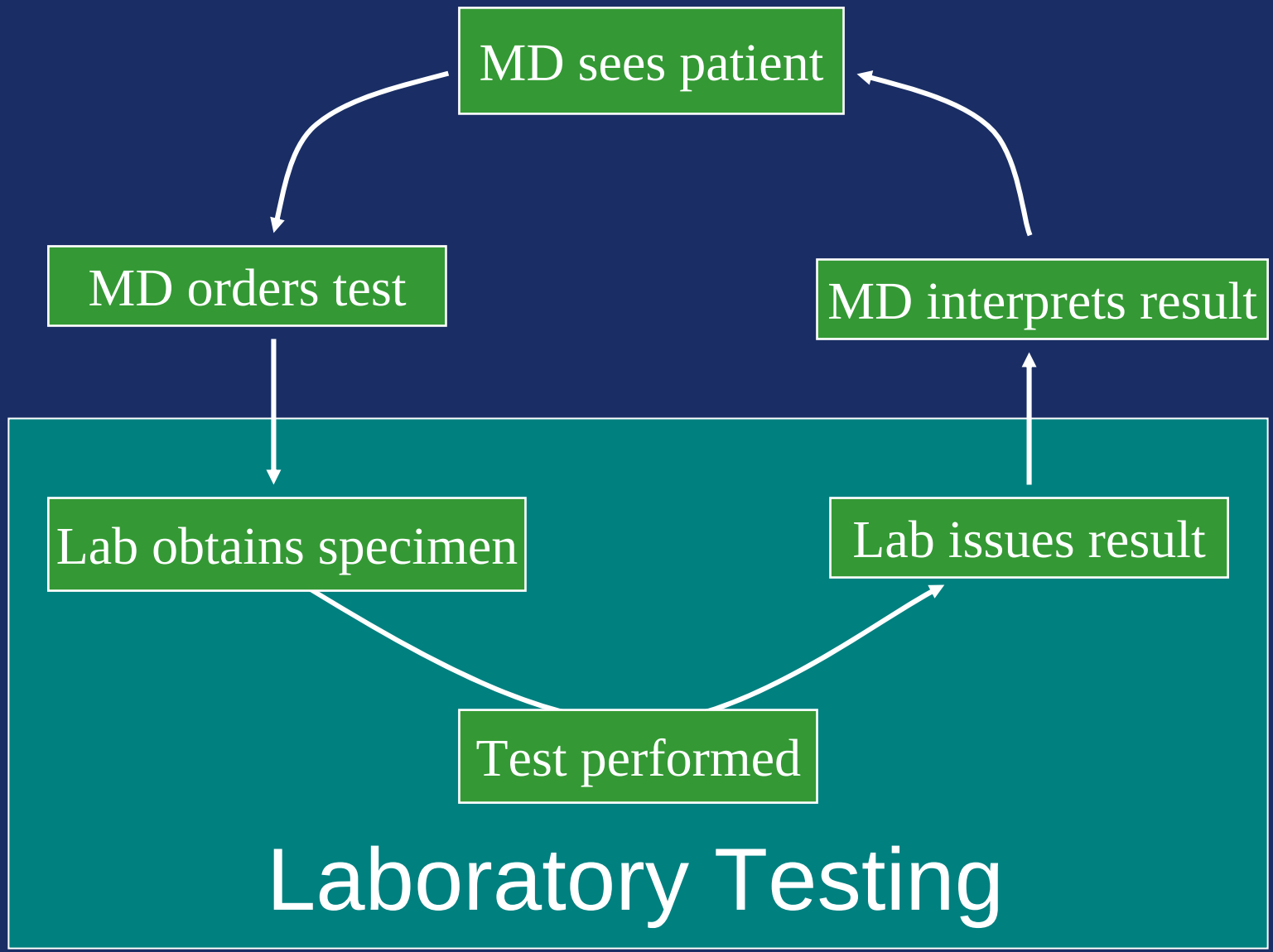
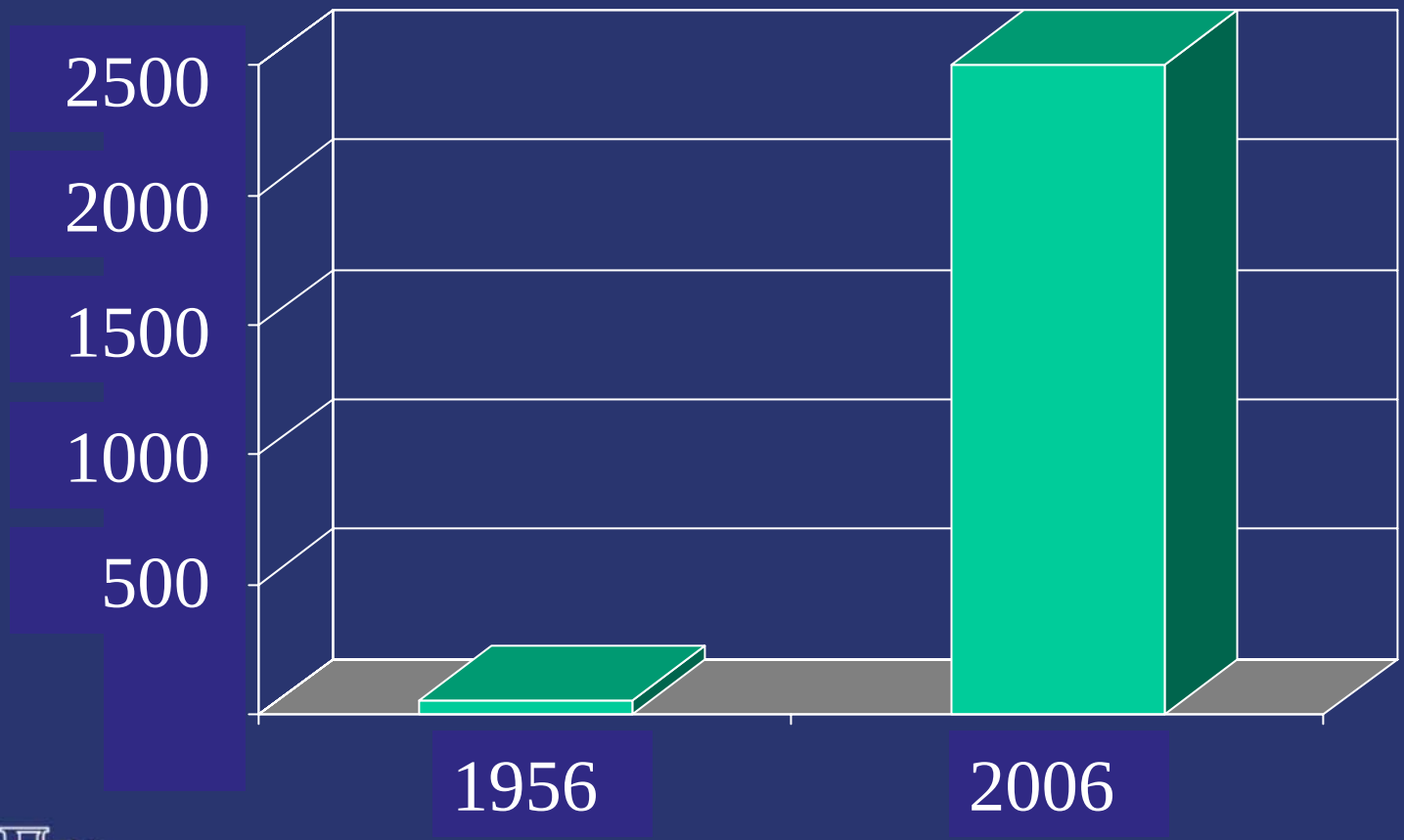
Laboratory Diagnosis



Lab Tests Available in Clinical Practice



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Variation in Utilization

- Study at 17 Academic Medical Centers
- Lab costs in highest quintile were 82% higher than in lowest quintile
- Lab costs varied more than any other cost category
- No measurable difference in outcomes

  - Fisher et al. Health Affairs 2004

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Errors in Laboratory Testing

- Between 5% and 50% of all inpatient lab test orders are inappropriate.
    - Van Walraven and Naylor, JAMA 1998

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Impact of Clinical Laboratory Testing

- ~2% of health care budget
- Drives >50% of major healthcare decisions

Quality impact is out of proportion to direct cost impact!

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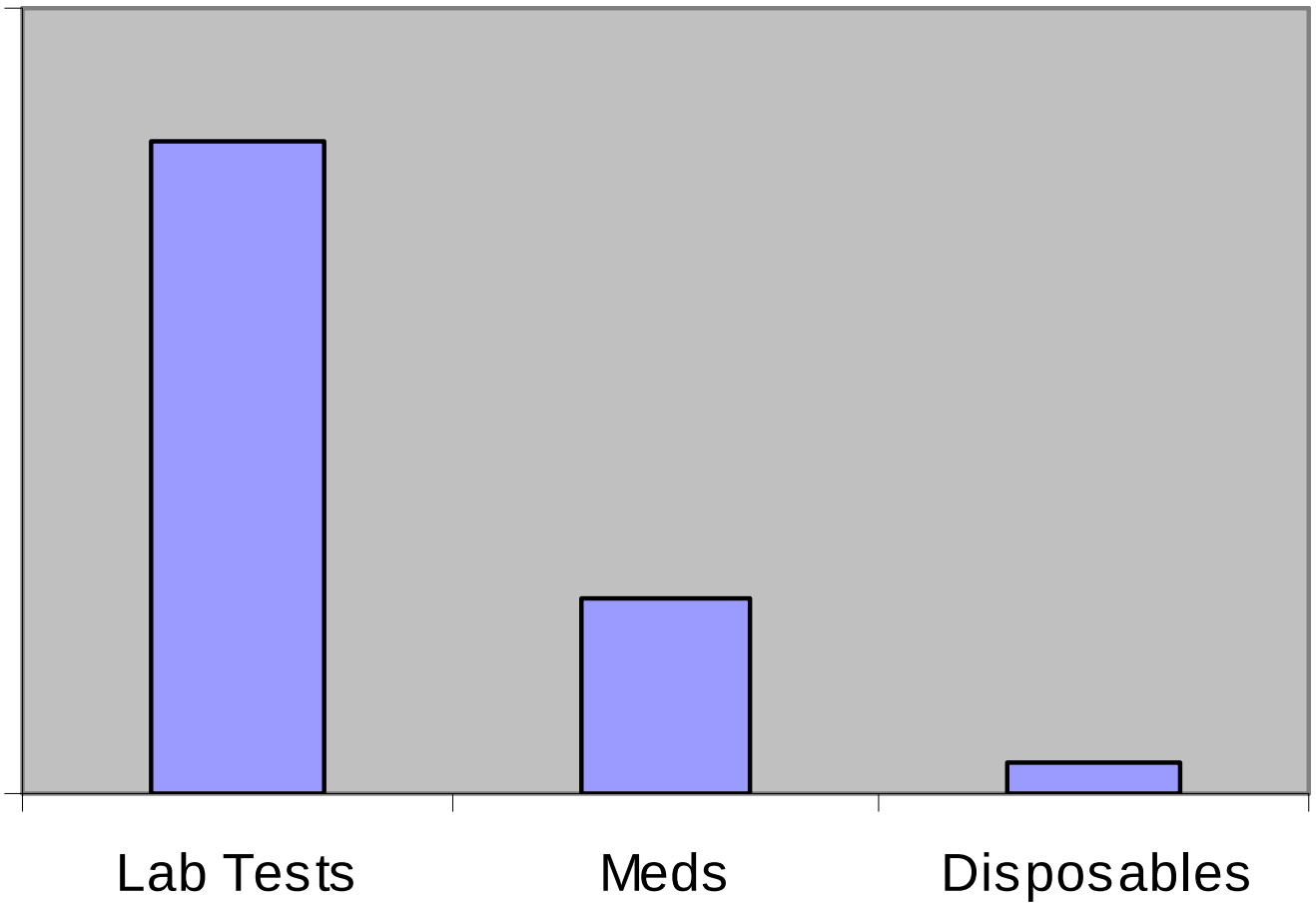
Downstream Effects of Health Services per Dollar Spent



Ulysses Syndrome

- Phenomenon whereby one unnecessary test leads to a long sequence of unnecessary followup testing and/or therapy.
- Typically occurs when a test result is slightly outside the reference interval or represents a normal variant.

- Rang M. The Ulysses syndrome. *Can Med Assoc J*. 1972 Jan 22;106(2):122-3.

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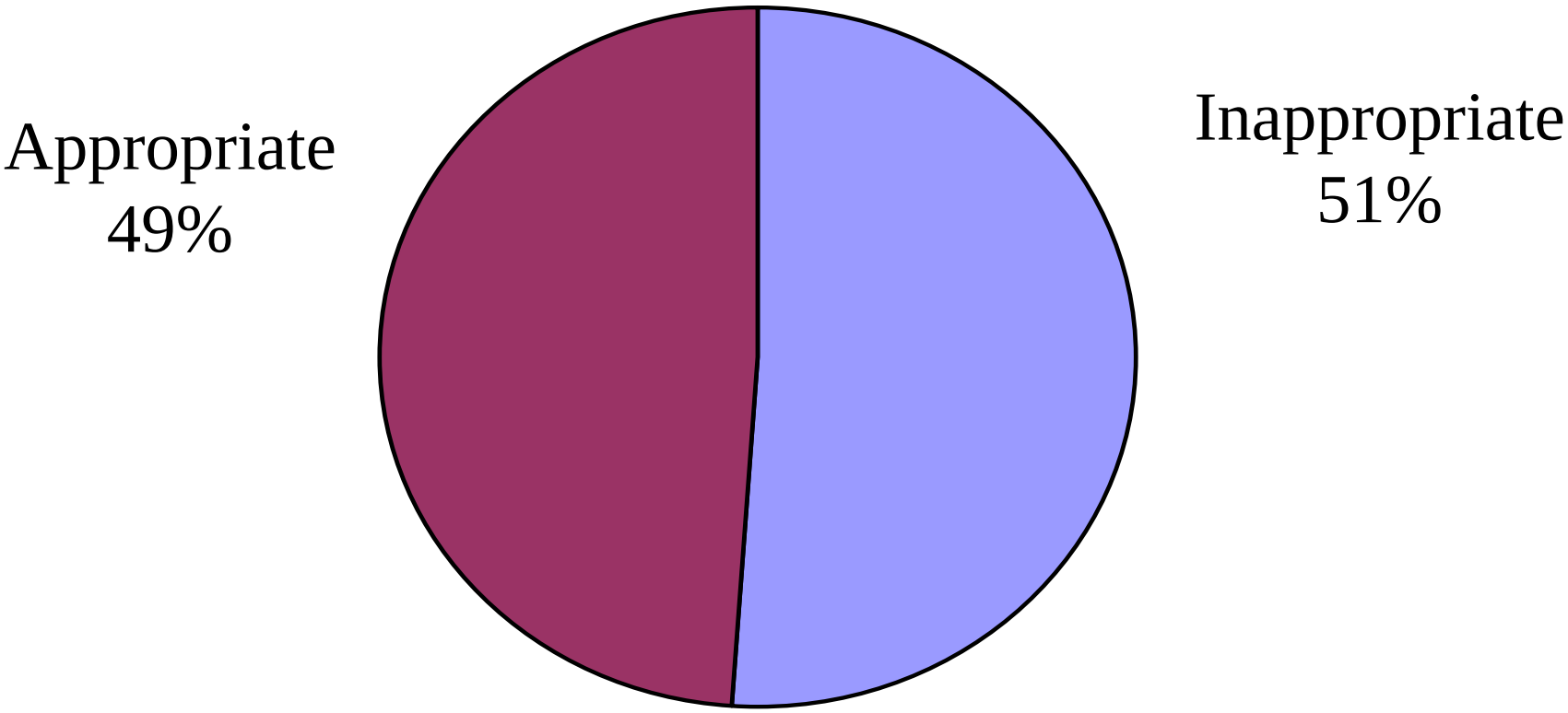
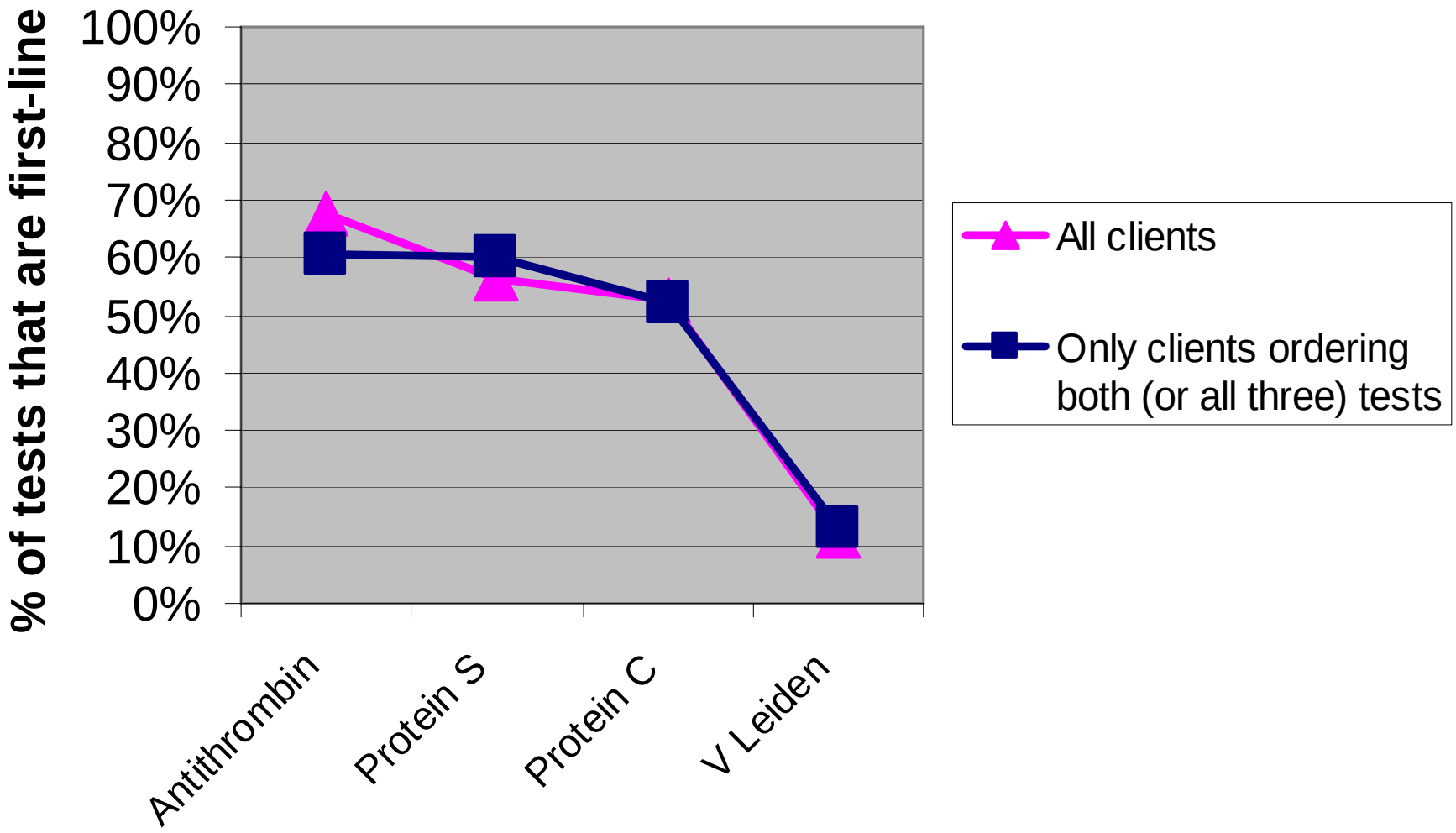
Overall appropriateness of Free PSA orders based on age, tPSA



Jackson BR, Roberts WR. J Gen Int Med 2005 Sep;20(9):859-61

Thrombophilia Testing: Orders for First vs. Second Line Tests



Improved Test Ordering: Impact on Patients

- Faster, more accurate diagnosis
- More appropriate therapy
- Shorter hospital stays
- Fewer doctor visits
- Better health
- Better satisfaction

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Improved Test Ordering: Impact on Hospitals

- More accurate diagnosis = higher quality of care
- Fewer inappropriate/unnecessary tests
  - shorter lengths of stay
  - fewer outpatient visits
  - fewer unnecessary procedures
- Currently, HMO's have more to gain than fee-for-service
- Medicare pay-for-performance will create new incentives for quality

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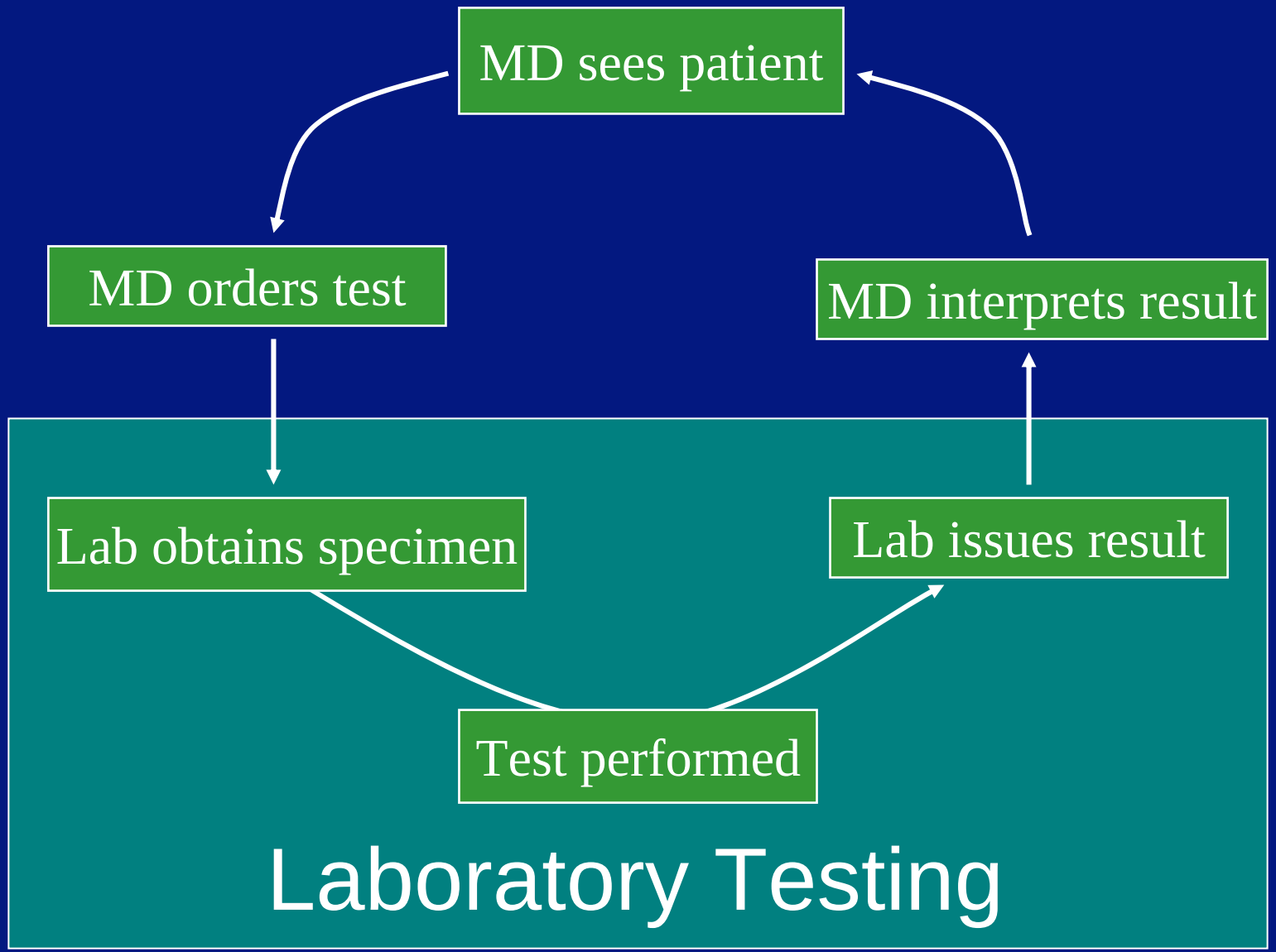
Laboratory Diagnosis



Is it Possible to Change Physician Behavior?

- Of course -- drug companies have proven this clearly
  1. Give doctors fast, easy access to information they need (Pull)
  2. Optimize pathology reports (Push)
  3. Actively monitor utilization and provide feedback (Analytics)
  4. Structural changes (Rules)

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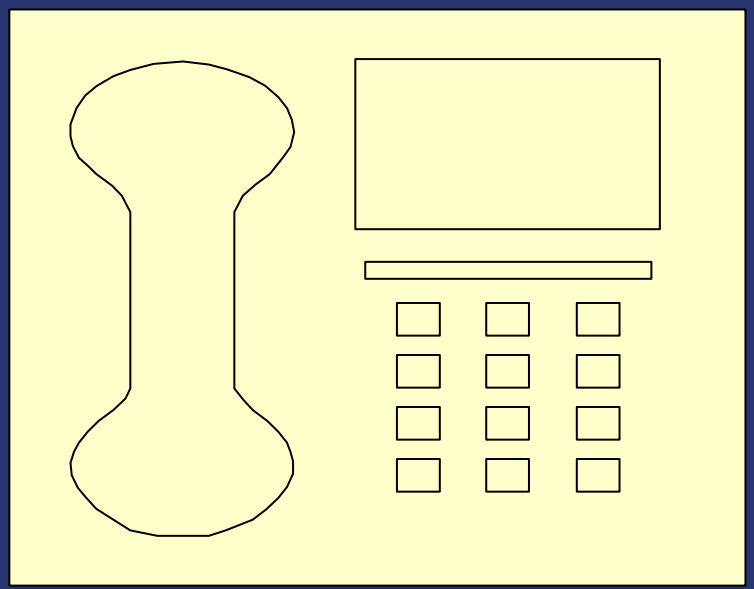
Pull: Easy access to trusted information



- Pathologist on call service
  - Necessary but not sufficient
  - Fast turnaround time
  - Accurate, clinically useful responses
- Use as learning opportunity (how are we not meeting physicians' information needs?)

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Pull: Easy access to trusted information

- Online test directories
  - Optimize for physicians, not just office staff
  - Link to ordering and interpretive guidance
    - Disease context
    - Related tests
    - Clinical guidelines
    - Etc.

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ARUP Consult | *The Physician's Guide to Laboratory Test Selection and Interpretation*

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BROWSE BY

Disease Categories

Topics with Algorithms

Recent Updates

Topic Name:

A B C D E F G H I
J K L M N O P Q R
S T U V W X Y Z #

ARUP Consult®

The Physician's Guide to Laboratory Test Selection and Interpretation

physicians helping physicians

simplify test ordering and interpretation

ARUP Consult™, Version 1.2, is a dynamic tool that provides instant, point-of-care access to ordering and interpreting hundreds of laboratory tests:

- Over 1,000 lab tests categorized for diagnostic decision making
- Disease-specific topics include background information, test ordering suggestions, and concise diagnostic advice
- Co-authored and maintained by ARUP's expert panel of medical faculty and consultants
- Recommendations congruent with national guidelines
- Diagnostic algorithms available
- Automatic updates for PDA and Web platforms

Provide feedback on ARUP Consult

For questions, write to arupconsult@aruplab.com.

Celiac Disease

Celiac Disease or Gluten Sensitive Enteropathy Algorithm

CLINICAL BACKGROUND

Gluten sensitive enteropathy (GSE) is non-allergic hypersensitivity to gluten or storage proteins found in wheat and other cereals.

- Hypersensitivity causes intestinal villous atrophy (flattening) and malabsorption
- Celiac disease and dermatitis herpetiformis are recognized forms
- Patient may be asymptomatic

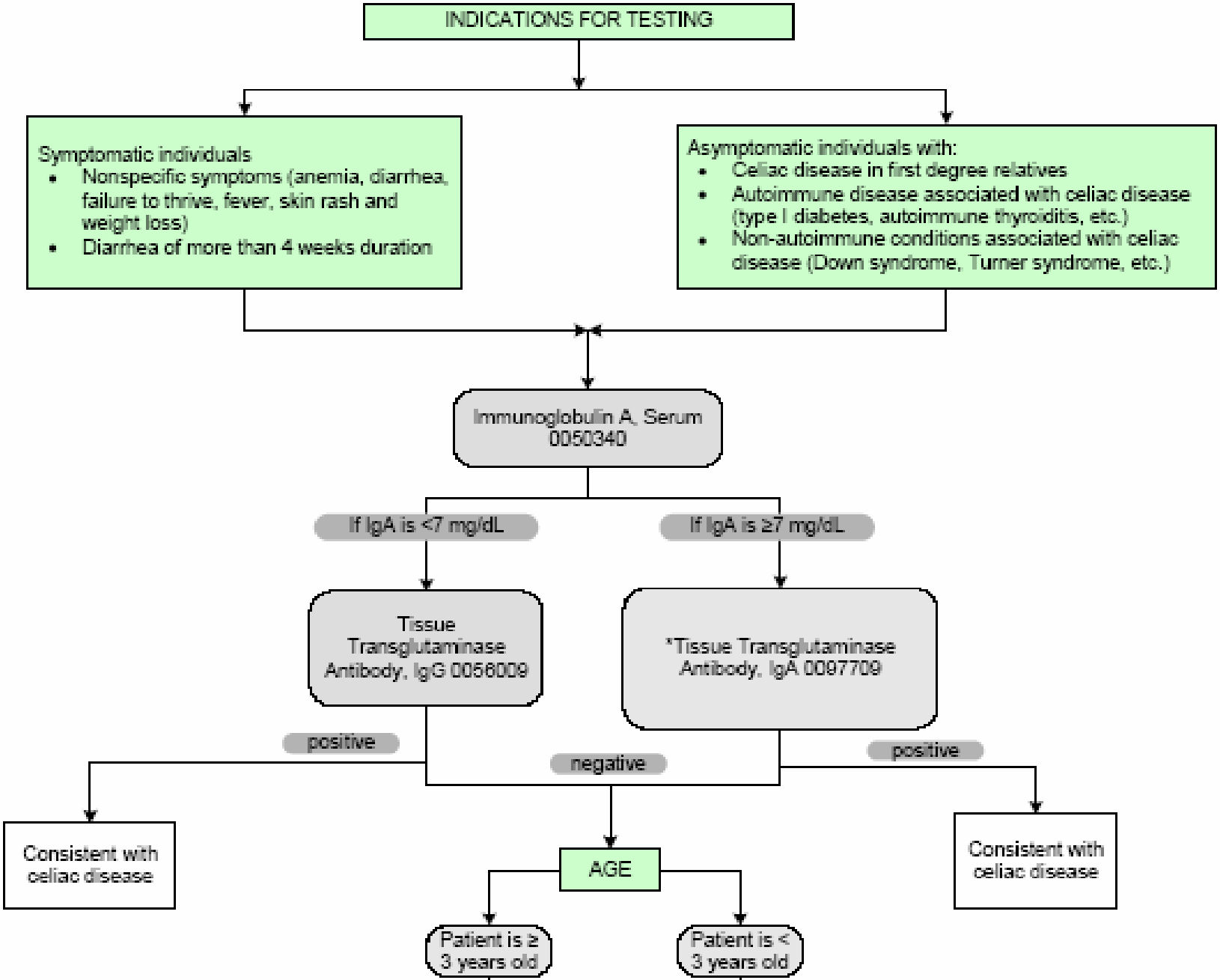
Symptoms

- Diarrhea
- Gastrointestinal problems
- Anemia
- Fatigue
- Psychiatric problems
- Other diverse side effects
  - Dermatitis herpetiformis
  - Increased risk of lymphoma

INDICATIONS FOR ORDERING

Test Name and Number	Recommended Use	Limitations	Follow Up
Celiac Disease Reflexive Panel 0051065	Order when gluten sensitivity suspected in patient with chronic diarrhea Preferred panel for celiac disease diagnosis (Panel includes IgA, tissue transglutaminase antibodies, and gliadin peptide antibodies)	Test results alone are not diagnostic. Use in conjunction with other clinical findings and biopsy to make diagnosis of celiac disease/gluten sensitive enteropathy Many children under 3 do not make tissue transglutaminase or endomysial antibodies well which results in false-negative test results; test for anti-IgG and IgA gliadin	
Immunoglobulin A, Serum 0050340	First step in celiac diagnostic algorithm; IgA results determine whether to use IgA or IgG versions of subsequent tests	Test results alone are not diagnostic Use in conjunction with other clinical findings and biopsy to make	

Celiac Disease/Gluten Sensitive Enteropathy Testing



Push: Optimized reporting

- Report formats
  - HL7 (and most EMR systems, for that matter) designed with discrete single values in mind
    - Sodium, glucose, etc.
  - HL7 and EMR's terrible at integrating complex data involving multiple tests
    - HIV genotypes, etc.

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Push: Optimized reporting

- Formatted integrated reports that doctors find easy to read
  - Can’t distribute over most HL7 interfaces; requires paper, proprietary network and/or web distribution
- Billed pathologist consultations
  - Useful model for complex coag testing
  - Jury still out on broader applicability

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virco®TYPE HIV-1

powered by *Virtual*Phenotype™

The Complete Resistance Analysis

Patient/Sample Details				Physician Details
Patient name	HIV, VT10	Sample ID	0504600200	Client ID:
Patient ID	0504600200	Collection Date		Physician:
MRN		Received by Virco on	Feb 23, 2005	
Date of birth		Visit		
Gender		Study name		
Virco ID	ASP00000028	Report date	Feb 23, 2005	

SUMMARY REPORT

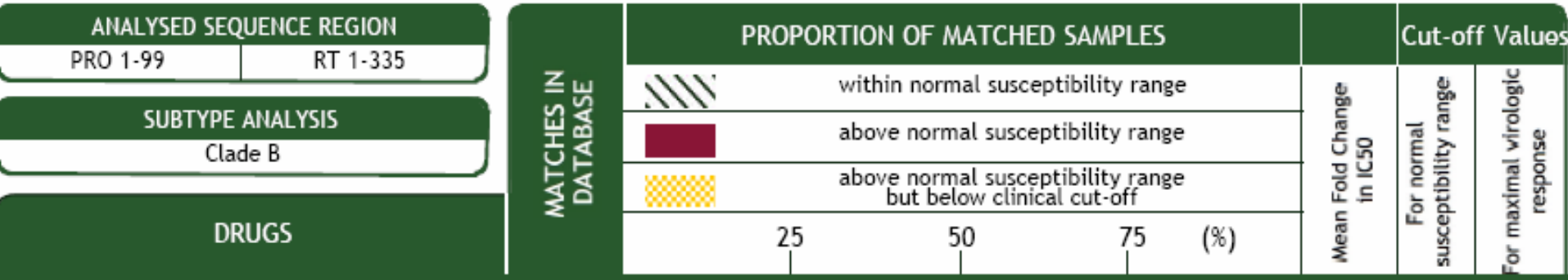
	DRUGS		FOLD CHANGE[1]	CUT-OFF[2] (BCO - CCO)	RESISTANCE ANALYSIS[3]	CLINICAL NOTES (see p2 for details)
NRTI/NtRTI *	**NRTI / NtRTI * mutations 67N,70R,184V,211K,219E**					
	Retrovir®	Zidovudine	2.6	4.0	SUSCEPTIBLE	
	Epivir®	Lamivudine	45.7	4.5	RESISTANT	
	Videx®	Didanosine	1.2	2.0	SUSCEPTIBLE	
	Hivid®	Zalcitabine	1.4	2.0	SUSCEPTIBLE	
	Zerit®	Stavudine	0.9	1.75	SUSCEPTIBLE	
	Ziagen®	Abacavir	1.8	3.0 - 3.2	SUSCEPTIBLE	
	Emtriva™	Emtricitabine	55.0	4.5	RESISTANT	
	Viread™ (*)	Tenofovir DF	0.7	3.0	SUSCEPTIBLE	

PATIENT ID 0504600200 VIRCO ID ASP00000028

GENOTYPE WITH QUANTITATIVE PHENOTYPIC ANALYSIS

ANALYSED SEQUENCE REGION	
PRO 1-99	RT 1-335

SUBTYPE ANALYSIS: Clade B



				Mean Fold Change in IC50	For normal susceptibility range	For maximal virologic response
NRTI / NtRTI * mutations 67N,70R,184V,211K,219E						
Retrovir®	Zidovudine	AZT	887	2.6	4.0	
Epivir®	Lamivudine	3TC	968	45.7	4.5	
Videx®	Didanosine	ddI	728	1.2	2.0	
Hivid®	Zalcitabine	ddC	150	1.4	2.0	
Zerit®	Stavudine	d4T	751	0.9	1.75	
Ziagen®	Abacavir	ABC	676	1.8	3.0	3.2
Emtriva™	Emtricitabine	FTC	123	55.0	4.5	
Viread™ (*)	Tenofovir DF	TDF	2,883	0.7	3.0	
NNRTI mutations:	**None**					
Viramune®	Nevirapine	NVP	10,556	1.3	8.0	
Rescriptor®	Delavirdine	DLV	10,342	1.6	10.0	
Sustiva® / Stocrin®	Efavirenz	EFV	12,850	1.1	6.0	
PI mutations:	**10I,20T,46I,63P,71I,74S,77I,90M,93L**					
Crixivan®	Indinavir	IDV	348	8.9	3.0	
Norvir®	Ritonavir	RTV	288	12.3	3.5	
Viracept®	Nelfinavir	NFV	344	23.6	4.0	
Invirase® / Fortovase®	Saquinavir	SQV	899	3.8	2.5	

Analytics: Identify suboptimal ordering and provide feedback

- Given literally thousands of laboratory tests available today, where do we focus our educational efforts?
  - Every hospital has different needs
  - Chart review would identify the problems, but is impractical on a large scale
- Use data mining approach to tease out patterns of inappropriate ordering

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ATOP™ (Analyzing Test Ordering Patterns)

- Service offered by ARUP since 1998
- Review test mix for opportunities to:
  - Improve patient care
  - Save money
- “Medical” analysis, not just financial analysis
  - Compare test ordering practices to best available evidence, including national guidelines

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Sample of ATOP™ Analytic Methods

- Relative order volumes
  - E.g. HCV PCR vs. HCV RIBA
- Age distribution
  - E.g. urine VMA
- Result distribution
  - E.g. CA-125

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ATOP™ Case Study #1

- Large academic medical center with active clinical pathology department
- Ordered $50,000/year worth of whole blood drug screens
  - 95% of ARUP's volume of this panel
- Local pathologists discovered this was due to misunderstanding by transplant services
- Switched to in-house urine drug screens

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ATOP™ Case Study #2

- Large academic medical center with active clinical pathology department
- Ordered $20,000/year worth of HCV RIBA confirmations
- Lab manager discovered that this was due to a canned comment applied to HCV screens
  - “If RIBA confirmation is needed, contact the laboratory at…”

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Structural Changes (“Rules”)

- Requisition forms
  - Paper
  - Online (e.g. CPOE)
- Panels
  - Reject requests for medically questionable panels
  - Create reflex panels where appropriate

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Structural Changes (“Rules”)

- Diagnostic Utilization Committees
  - Analogous to P&T Committees
  - Set policy related to permissible test orders
- Examples
  - Group Health Cooperative
  - Vanderbilt

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Summary

- Overuse, underuse and misuse of diagnostic tests are all common
- Laboratories have numerous tools available for improving utilization
- Reference Laboratories can be a valuable partner to local laboratories in improving utilization

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