



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

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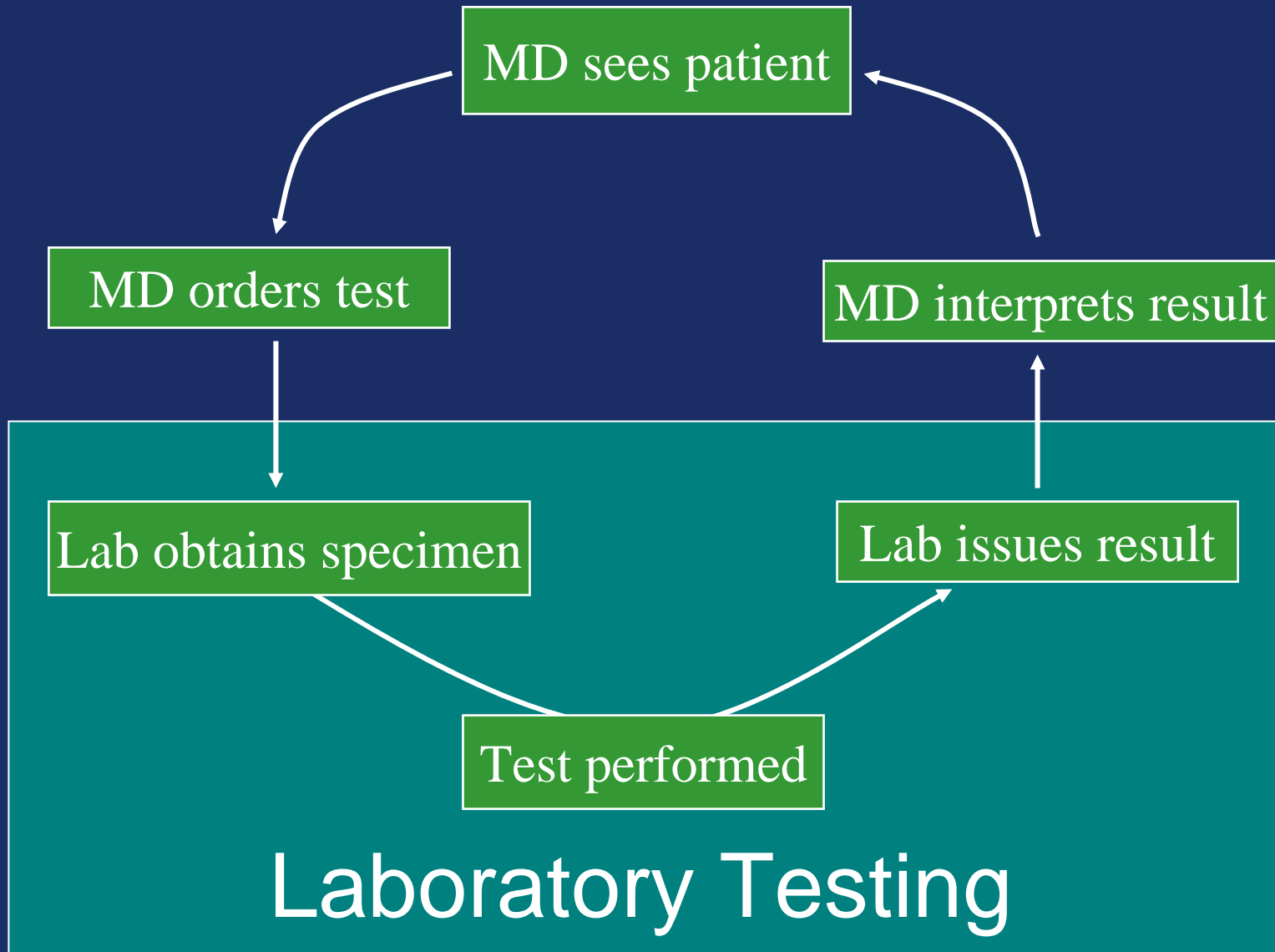




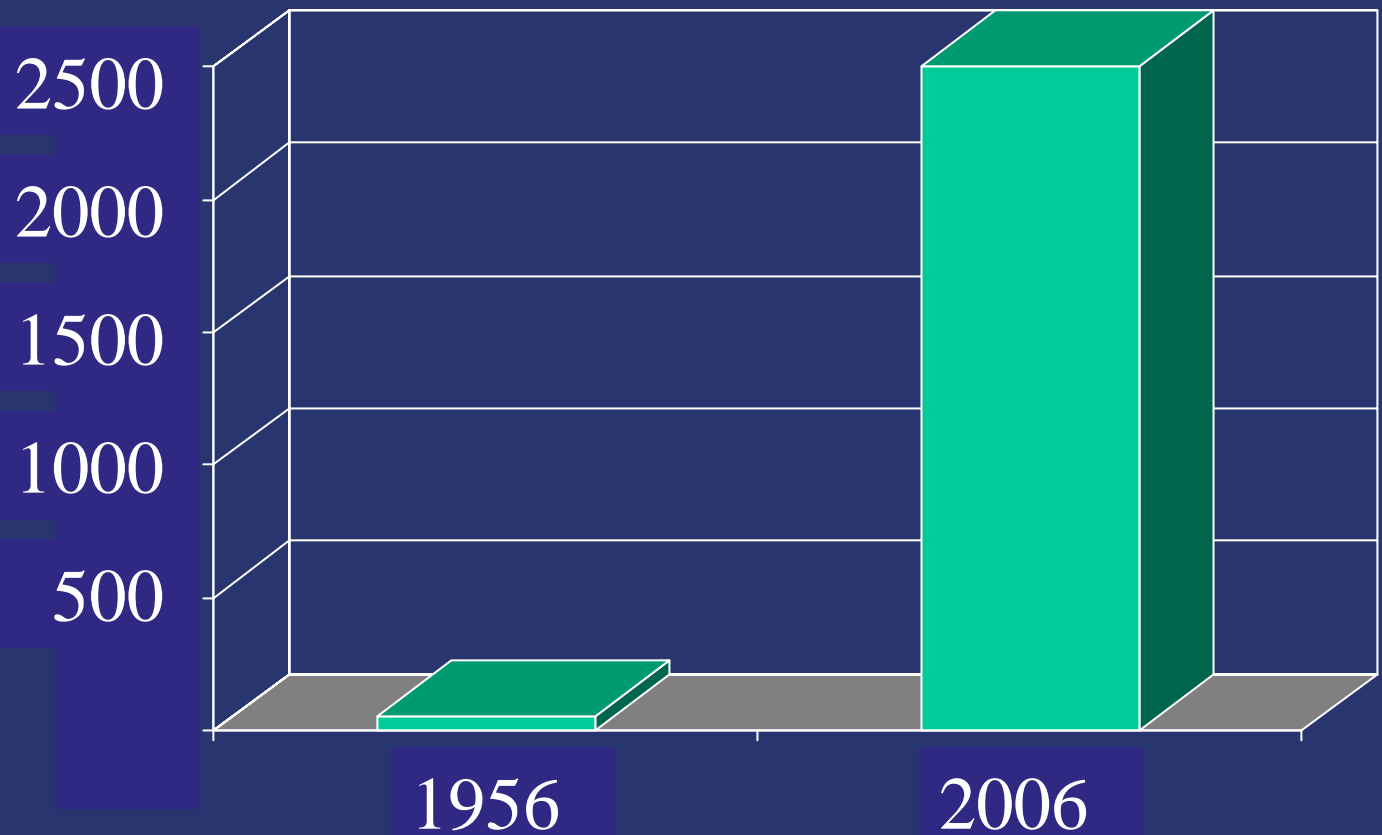
Presentation Overview

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

Laboratory Diagnosis



Lab Tests Available in Clinical Practice





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



Errors in Laboratory Testing

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

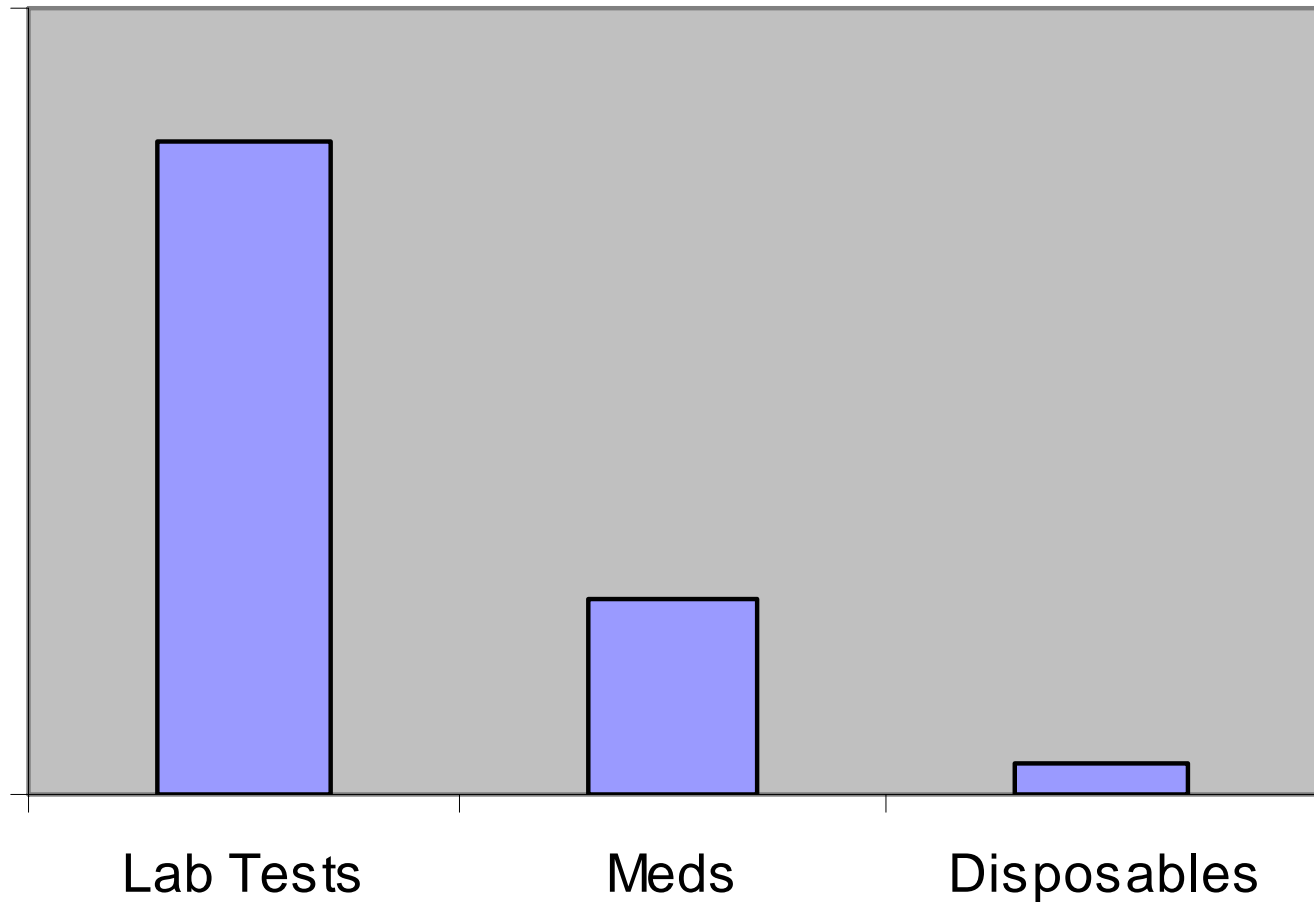


Impact of Clinical Laboratory Testing

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

Quality impact is out of proportion to direct cost impact!

Downstream Effects of Health Services per Dollar Spent



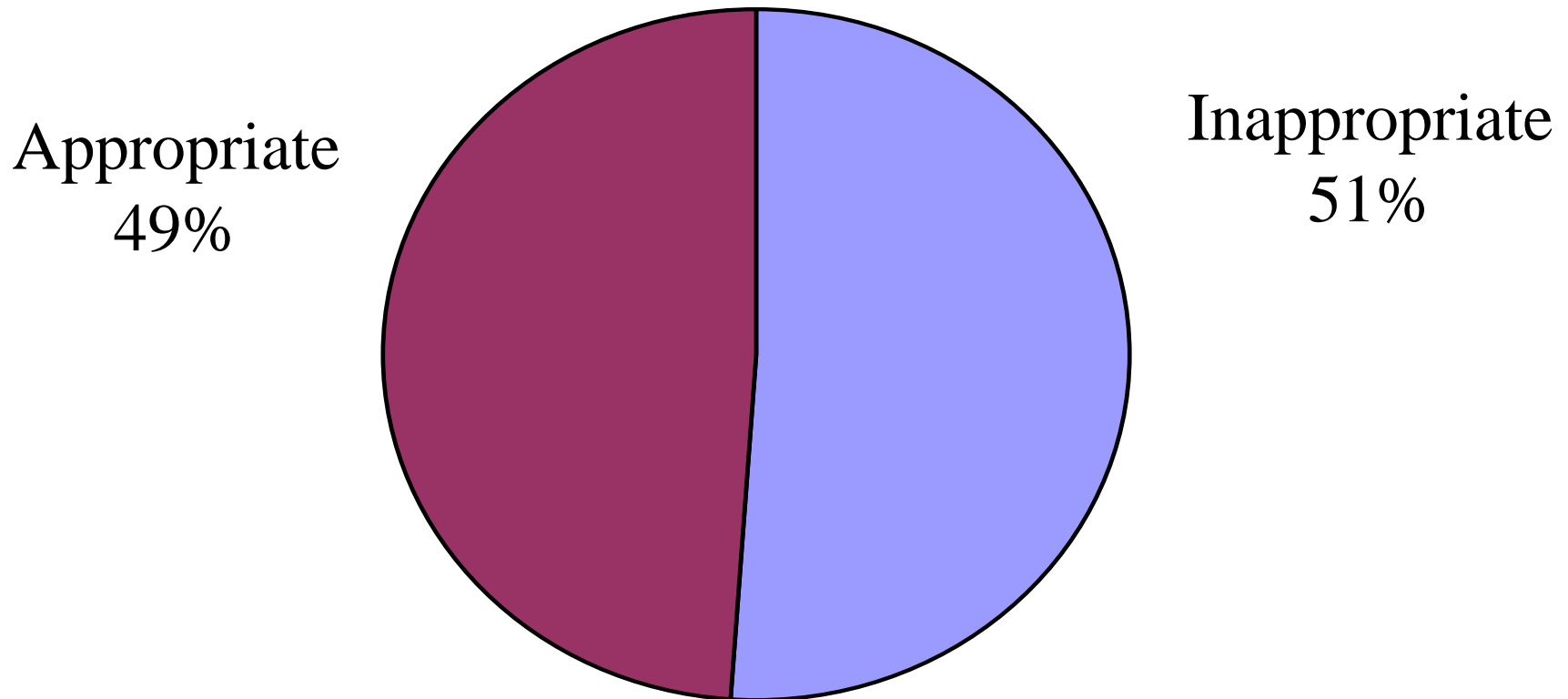


Ulysses Syndrome

- 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.

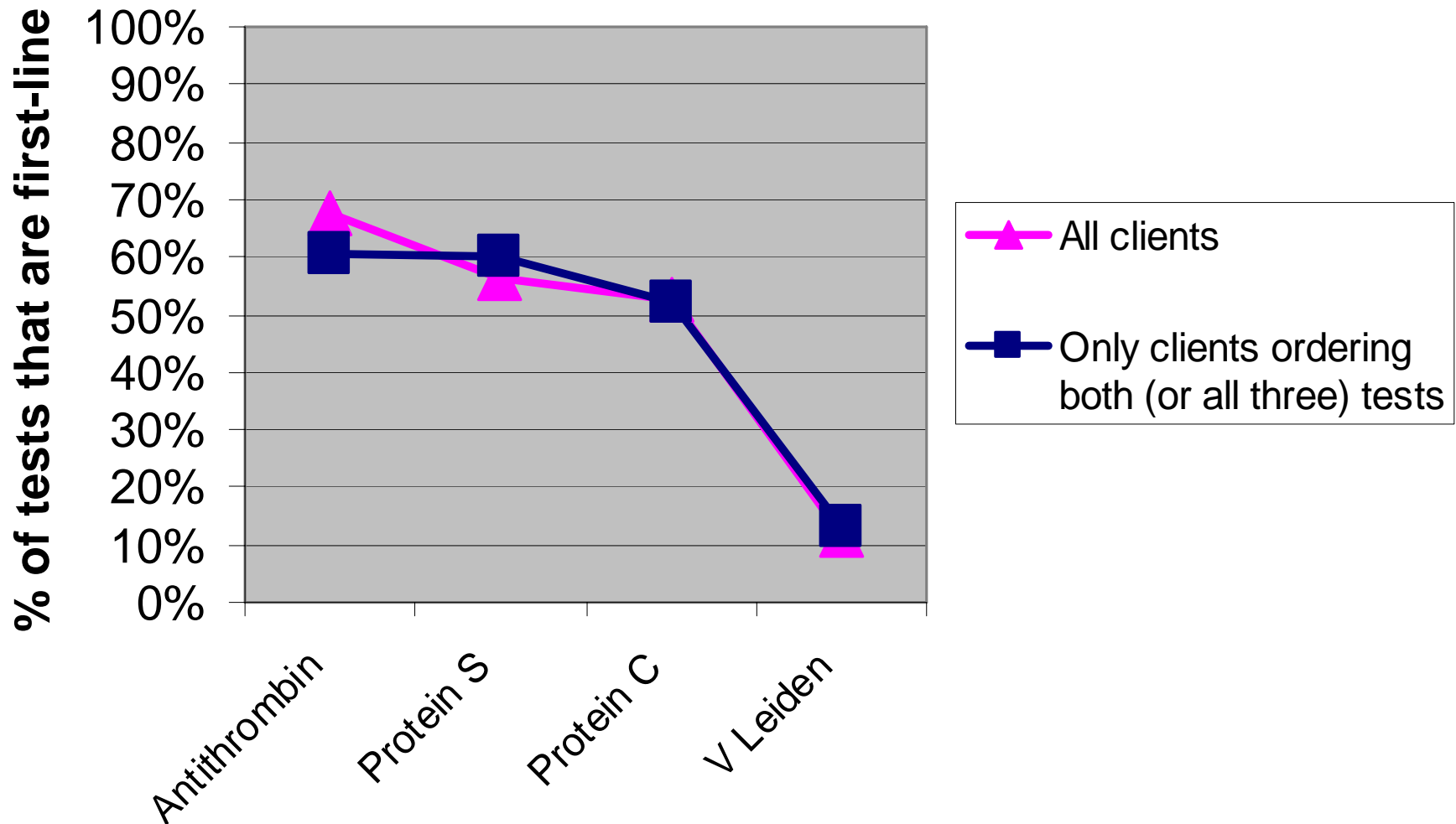
- Rang M. The Ulysses syndrome. *Can Med Assoc J.* 1972 Jan 22;106(2):122-3.

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

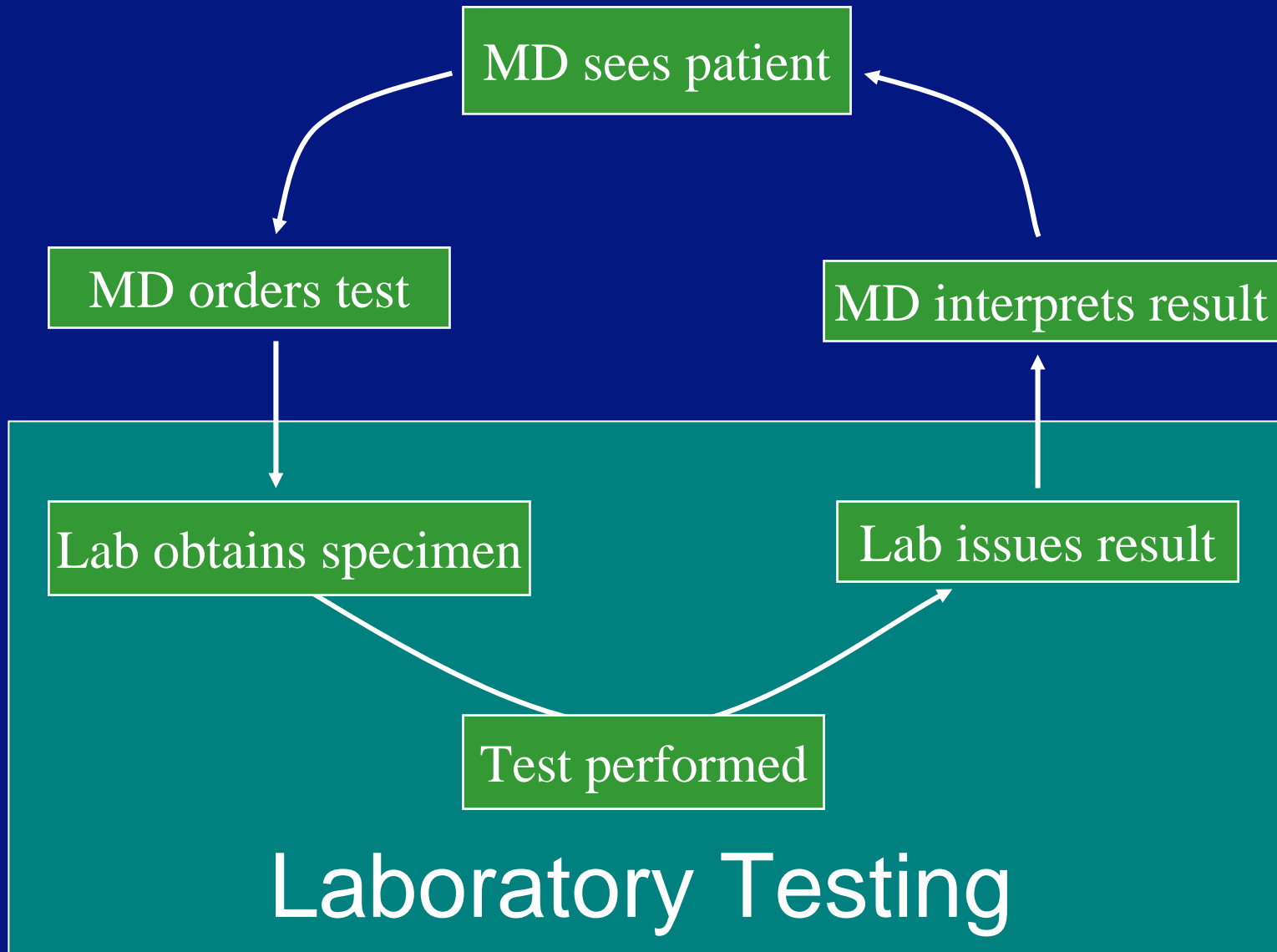
- Faster, more accurate diagnosis
- More appropriate therapy
- Shorter hospital stays
- Fewer doctor visits
- Better health
- Better satisfaction



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

Laboratory Diagnosis

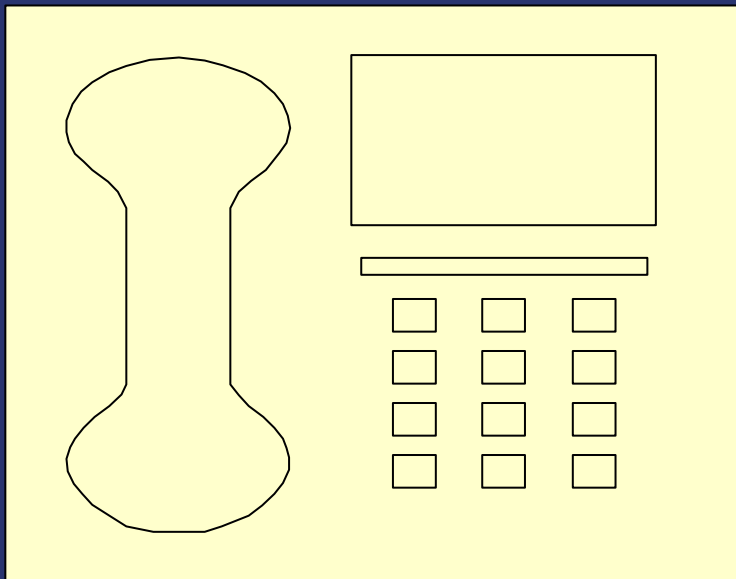




Is it Possible to Change Physician Behavior?

- 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)

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?)



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.

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.

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Disease Categories

Topics with
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Disease Categories > Autoimmune Disease

Jump to  Provide feedback on this topic

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

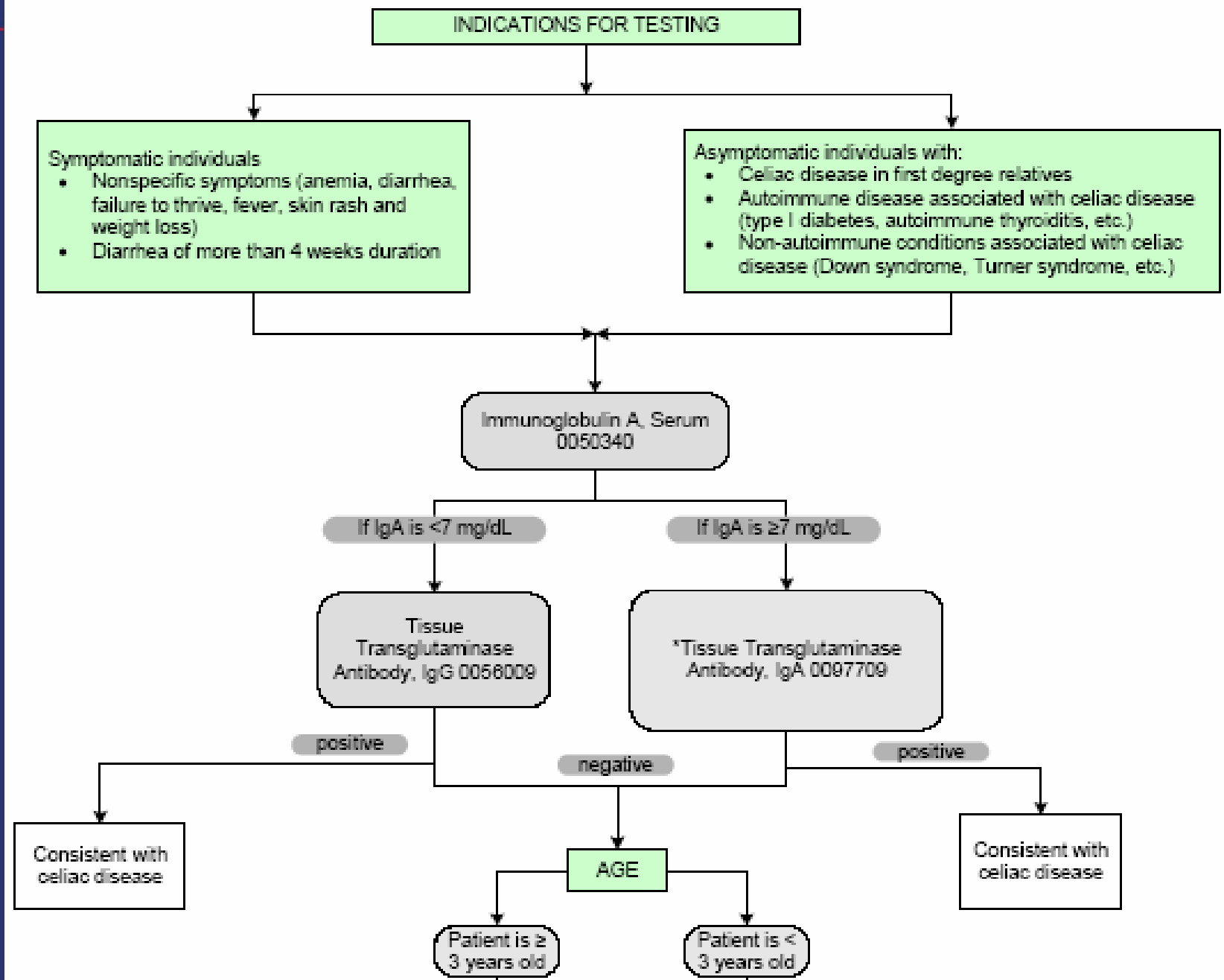
Symptoms

- 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.



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

virco[®]TYPE HIV-1

powered by *VirtualPhenotype*[™]

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 - <u>CCO</u>)	RESISTANCE ANALYSIS ³	CLINICAL NOTES <small>(see p2 for details)</small>
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NRTI / NtRTI * mutations 67N,70R,184V,211K,219E

NRTI/NtRTI *	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 - <u>3.2</u>	SUSCEPTIBLE	
	Emtriva™	Emtricitabine	55.0	4.5	RESISTANT	
	Viread™ (*)	Tenofovir DF	0.7	3.0	SUSCEPTIBLE	

GENOTYPE WITH QUANTITATIVE PHENOTYPIC ANALYSIS

ANALYSED SEQUENCE REGION	
PRO 1-99	RT 1-335

SUBTYPE ANALYSIS
Clade B

DRUGS

MATCHES IN DATABASE	PROPORTION OF MATCHED SAMPLES			Mean Fold Change in IC50	Cut-off Values	For normal susceptibility range	For maximal virologic response
		within normal susceptibility range					
		above normal susceptibility range					
		above normal susceptibility range but below clinical cut-off					
	25	50	75 (%)				

NRTI / NtRTI * mutations 67N,70R,184V,211K,219E

Drug	Active Ingredient	Code	Count	Proportion of Matched Samples	Mean Fold Change in IC50	For normal susceptibility range	For maximal virologic response
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

Drug	Active Ingredient	Code	Count	Proportion of Matched Samples	Mean Fold Change in IC50	For normal susceptibility range	For maximal virologic response
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

Drug	Active Ingredient	Code	Count	Proportion of Matched Samples	Mean Fold Change in IC50	For normal susceptibility range	For maximal virologic response
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



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



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



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



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...”



Structural Changes (“Rules”)

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



Structural Changes (“Rules”)

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



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