Arizona Society of Pathologists

Using

in laboratory medicine

to improve operations and outcomes

April 2, 2016

Ron B. Schifman, MD

Southern Arizona VA Healthcare System

Big Data

A buzz word that describes massive amounts of structured and unstructured data, or data that expands or changes rapidly.

Technology (tools and processes) that organization uses to handle and analyze large amounts of data.

Big Data

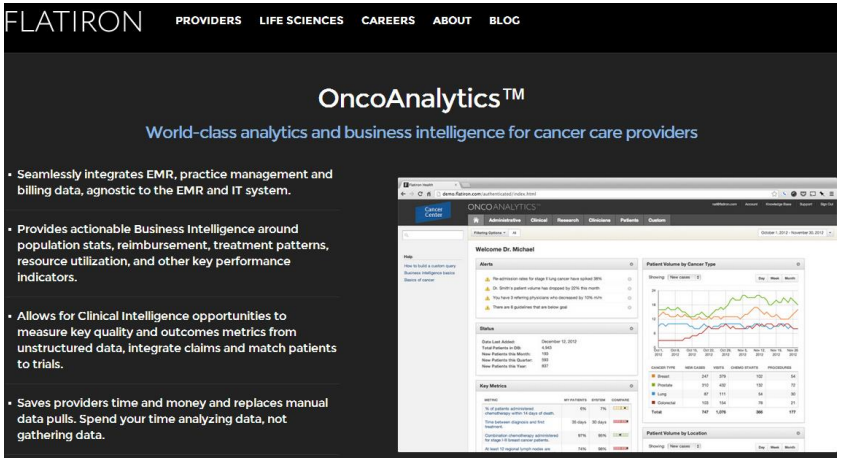
advertisers - monitoring social media to learn about customer behavior, preferences, or responses to campaigns

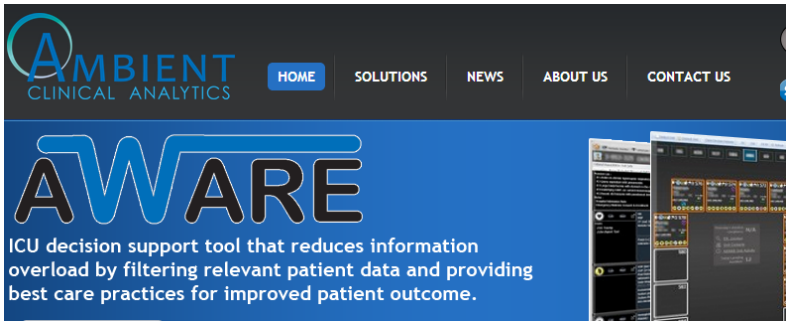
financial services - predict risk

hospitals – predict readmission

Big Data

Healthcare Analytics Startups





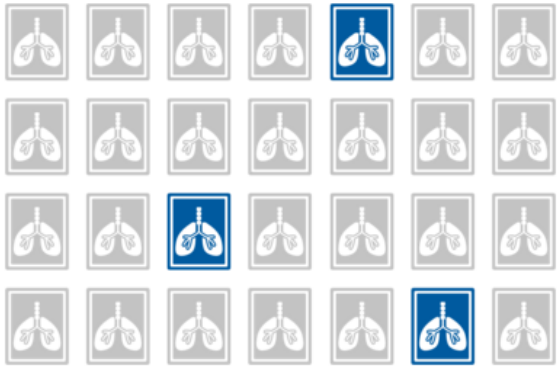
A New Approach:
Predictive analytics powered by
an evidence-based medical graph.

Striving to combine the brilliance of a physician with the analytic power of big data, we've tied hundreds of healthcare data sets together and spent over 20,000 physician hours to build a medical graph: raw big data processed into usable curated big knowledge.

enlitic

Real-time Insights

Provide every doctor at your healthcare center with fast, accurate reports to help them diagnose individual patients with high accuracy and personalized treatment recommendations. We provide these insights across a broad spectrum of disease states and conditions.

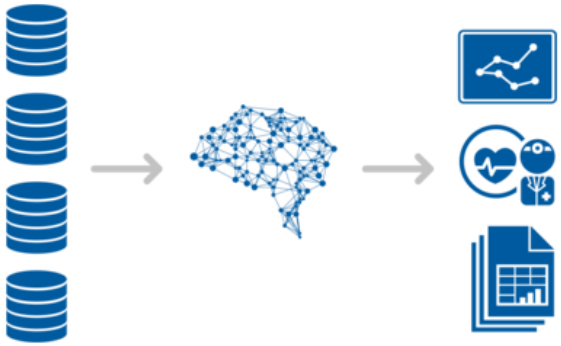


Our key objective is to deliver care at:

- 2x Speed
- 2x Accuracy
- 1/2 Cost

Retrospective Insights

'Real Peer Review': show radiologists the areas where they can improve the most, based on validated predictive models, not just human judgement

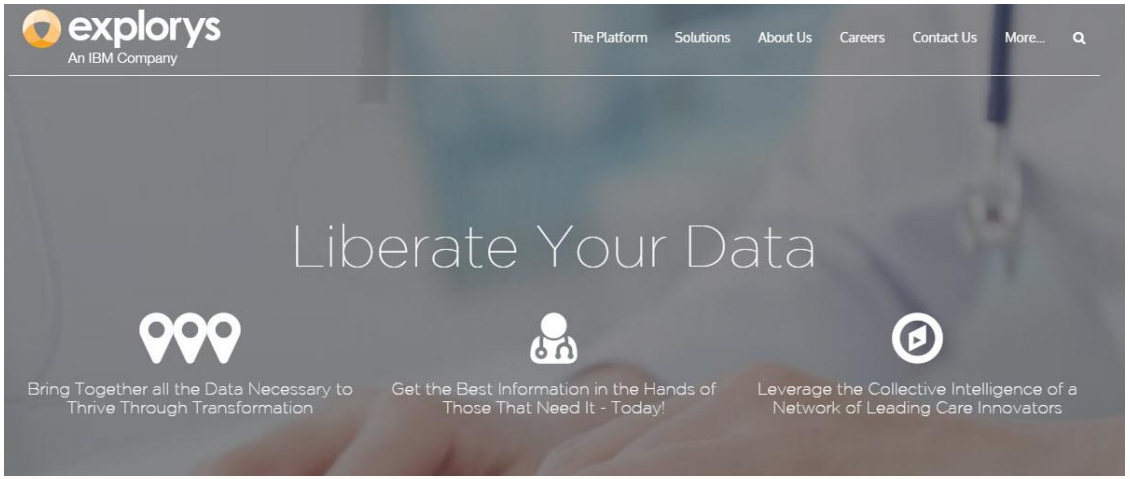


This provides you with a business intelligence dashboard, that can feature:

- Historical and current misdiagnoses
- Missed afflictions
- Accuracy Rates by:
  - Radiologist
  - Affliction
  - Time of Day, Day of Week, Holidays
  - Service Provider

Big Data

Healthcare Analytics



Big Data

Healthcare Analytics

PHYTEL
An IBM Company

Our Platform Client Success Resources

IBM Acquires Phytel

PRESS RELEASE

BY MARKET
- Accountable Care Organizations
- Physician Practices
- Hospitals
- Health Systems
- Integrated Delivery Networks
- Community Health Centers
- Consultants

BY NEED
- Reduce Total Cost of Care
- Prepare for Value Based Care
- Increase Patient Engagement
- Measure Quality and Outcomes
- Scale Care Management
- Improve Patient Satisfaction
- Reduce Avoidable Readmissions
- Qualify for PCMH
- Manage Medicare Risk
- Maximize Your IT Investment

BY PR
- Phytel A
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Effectively *scale* to provider-led population

Clinical Analytics + MORE

Patient Outreach + MORE

Care Coordination + MORE

Patient + MORE

Backed by Proven, Peer-Reviewed Analytics

Each of our annual independent studies noted below are founded on trusted, validated methodologies. Criteria for qualifying hospitals and key performance measures are listed below. For more detailed information, please review the methodology highlights posted for each of the three stu

Public data sources include:
- Medicare Provider Analysis and Review (MEDPAR)
- Medicare Hospital Cost Report Information System (HCRIS)
- Centers for Medicare & Medicaid Services (CMS) Hospital Compare

100 Top Hospitals

Qualifying Hospitals
Short-term, acute-care, nonfederal U.S. hospitals treating a broad spectrum of patients.

Key Performance Measures
- Risk-adjusted mortality index (in-hospital)
- Risk-adjusted complications index
- Risk-adjusted patient safety index
- Core measures score
- 30-day mortality rate
- 30-day readmission rate
- Severity-adjusted average length of stay
- Case mix- and wage-adjusted inpatient expense per adjusted discharge
- Operating profit margin
- HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) score indicating patient ratings of overall hospital performan

50 Top Cardiovascular Hospitals

Qualifying Hospitals
Short-term, acute-care, nonfederal U.S. hospitals with an open heart program. Specialty heart hospitals are included.

Key Performance Measures
- Risk-adjusted mortality index (in-hospital)
- Risk-adjusted complications index
- Core measures
- Percentage of CABG (coronary artery bypass graft) patients with internal mammary artery use
- 30-day mortality rate
- 30-day readmissions rate
- Severity-adjusted average length of stay
- Wage- and severity-adjusted average cost per case

15 Top Health Systems

Qualifying Health Systems
A health system must have at least two short-term, acute-care, nonfederal U.S. hospitals that report a parent or related organization in their cost re

Big Data

Healthcare Analytics

Epic, Watson at work on interoperability

IBM Watson Health also collaborates with 14 cancer centers

By **Bernie Monegain** | May 06, 2015 | 10:54 AM

IBM **Watson** Health is collaborating with **Epic** and **Mayo Clinic** to apply cognitive computing capabilities of Watson to **EHRs**, and also with 1 cancer institutions to reduce from weeks to minutes the ability to translate DNA insights.

Epic has more than 350 customers – some of the largest and most-recognized healthcare systems in the world, **IBM** pointed out in announcing the collaboration – "and they exchanged more than 80 million medical

Big Data

Performance and Value Metrics

Performance Measurement

Patients, employers, and payers alike expect the highest quality of care and value from their providers. The achievement of key performance metrics has become a prerequisite for contract models.

Explorys provides a comprehensive Platform and Suite of Applications for measuring ambulatory, inpatient, and specialty care quality, utilization, and outcomes across hundreds of metrics including pre-built libraries for patient centered medical homes, accountable care organizations, disease management, HEDIS, health and wellness, and specialties services.

Risk Adjustment
Explorys metric risk adjustment helps level the playing field for the reporting of patient outcomes and adjusting for the differences in severity of illness among patients. We support popular risk adjustment for inpatient and ambulatory models, such as 3M's APR-DRG and EAPG.

Benchmarking
Explorys *intra*-organization benchmarking provides direct comparisons of key performance indicators, helping to monitor, assess, and improve performance within an organization. Explorys also provides *inter*-organization benchmarks across those who participate in the Explorys Network. The combined de-identified data across these members enables organizations to learn together with their peers that are facing similar challenges. Our customers choose us, in part, because of our unique ability to harmonize and curate data at scale, so that the metrics and directives they enable are consistent and accurate.

Up-to-date network-wide reporting and measures relative to performance targets, program return-on-investment, and pinpointed opportunities for continued improvement such as...

Leadership

- Care coordinators
- Providers
- Program Specific Measure Libraries & Scorecards

Value-Based Care

- Medicare Advantage
- Employee Health plan
- Physician-based HEDIS
- Inpatient quality and efficiency
- Utilization
- Pre-built Reports & Data Marts

Support for GPRO reporting

- Provider scorecards and performance plans
- HCC and proper coding opportunities
- Contract performance

Big Data

Population Health

Population Analytics

Explorys solutions enable insight into populations and contracts relative to past and predicted outcomes and costs. Our value-based-care Program Framework provides insight into population disease burdens, utilization patterns, and per-member-per-month (PMPM) costs using a rich combination of claims and clinical data from across the continuum of care. This enables providers and health plans alike to assess risk and pinpoint opportunities to mitigate it.

Pre-built Programs
Explorys provides modifiable templates for major value-based-care programs making it easy to launch quickly...

- Medicare Shared Savings Program ACO
- Commercial ACOs
- Medicare Advantage
- Patient Centered Medical Homes (PCMH)
- Employee Health Plans

A Wide Range of Risk Models
Because Explorys provides a true platform, model makes the most sense for their initia myriad of options, including 3rd-party comm generation risk models.

- Population profiles including sex, ag stratification, and share-of-chart.
- Historical utilization including cost c utilizers, and E&M distribution acros
- Risk and projected utilization such a and condition.

The Explorys Risk Model
Explorys clients have an option to impleme analytic and population health managemen in-class performance (both the R2 and MAP analytics applied to a richer data set.

The Explorys Risk Model facilitates several key features when embedded within the Explorys Enterprise Performance Management (EPM) Suite, including the following:

- Risk adjustment and benchmarking of clinical outcomes and utilization to accurately compare performance across a variety of commercial and Medicare

Population Management

When done well, population management improves quality, efficiency, and outcomes. It drives suboptimal utilization and unnecessary costs out of the process. For healthcare systems competing in the value-based care arena, population management is a cornerstone of an effective program.

The Explorys EPM Suite provides targeted information and directives for care coordinators, providers, and patients to drive performance, including:

Registries and Work Lists

- To mitigate time-sensitive risks of unnecessary utilization and poor outcomes
- To proactively manage diseases
- To meet performance goals and objectives of programs

Workflow

- Integrated into the daily process of care coordinators and providers
- Automated assignment, alerts, notes, and reminders
- Communicate via integrated 3rd party portal, telephone, and correspondence.

Big Data Laboratory Medicine

Big Data

Clinical Laboratory News

THE AUTHORITATIVE SOURCE FOR THE CLINICAL LABORATORIAN

March 2014 Clinical Laboratory News: Volume 40, Number 3

The Rise of Big Data

Trends and Opportunities for the Lab

By Nancy B. Williams

Even as many doctors struggle to give up their pen and paper charts, some innovators are already shifting healthcare information technology into warp speed. Researchers, health systems, and other stakeholders are analyzing huge amounts of aggregated information—big data—to elucidate patterns that remained hidden under old data models. Blending biostatistics, bioinformatics, computer programming, and operational research, big data is expected to transform the process of clinical decision-making. And of course, much of this data will come from laboratory medicine. The promise of big data is taking these

Big Data Laboratory Medicine

Cerner

Cerner, Tableau Collaborate to Provide Advanced Data Exploration Capabilities to Health Care Organizations

Interactive Data Analysis Provides Health Care Organizations With Insight Into Patient Care, Operational Effectiveness

April 08, 2015 09:00 ET | **Source:** Cerner Corporation

KANSAS CITY, Mo., April 8, 2015 (GLOBE NEWSWIRE) -- Cerner Corp. has collaborated with Tableau Software to enhance the data discovery experience of health care organizations through interactive data exploration.

The integration of Tableau's visual analytics with Cerner's *HealtheAnalytics℠* and *HealtheEDW℠* enterprise data warehouse and analytic offerings enables health care organizations to manipulate data and make new discoveries. Through this data mining and analysis, health care organizations can derive meaningful insight to identify trends, improve clinical decision support and help enable continuous improvement.

"With preventable health conditions rising, finding new ways to improve health and care through data analysis is key," said Adam Christmann, general manager, reporting and analytics, Cerner. "By providing our clients with the ability to easily know, predict and evaluate population data, they have the ability to make strategic decisions that can impact outcomes based on large volumes of data."

Tableau provides a highly intuitive interface, which allows health care organizations to discover trends and insights in data that might have gone undetected in static reports based on traditional business intelligence approaches. Tableau is rated as an industry leader by KLAS for 'Ease of Use.'[1] Tableau has been ranked highest along the 'Ability to Execute' axis by Gartner in the Magic Quadrant for Business Intelligence and Analytics Platforms, Gartner, Inc., February, 23, 2015.[2]

"Tableau's mission is to help people see and understand their data. Our collaboration with Cerner is an exciting step forward in doing this," said Scott Jones, senior vice president of Americas sales, Tableau Software. "Combining Cerner's leading health care information technology expertise with Tableau's advanced data discovery capabilities will support organizations in making data-driven decisions through face-up, meaningful information."

PROFILE

Cerner Corporation

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Kansas City, Missouri, UNITED STATES

http://www.cerner.com

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Marlene Bentley

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TAGS

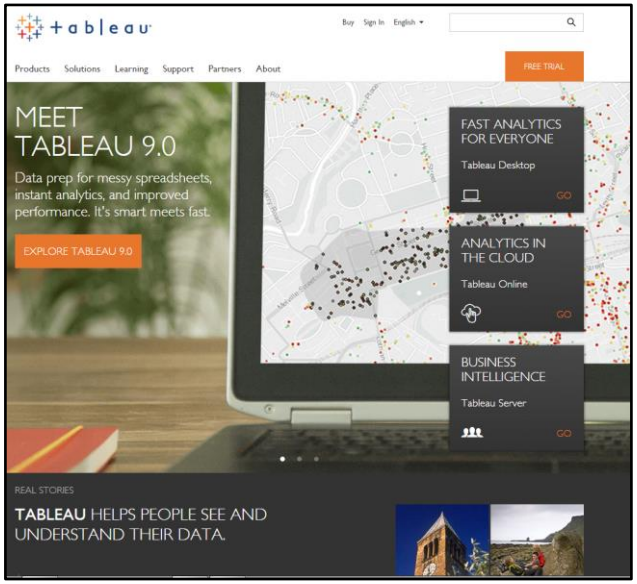
health software

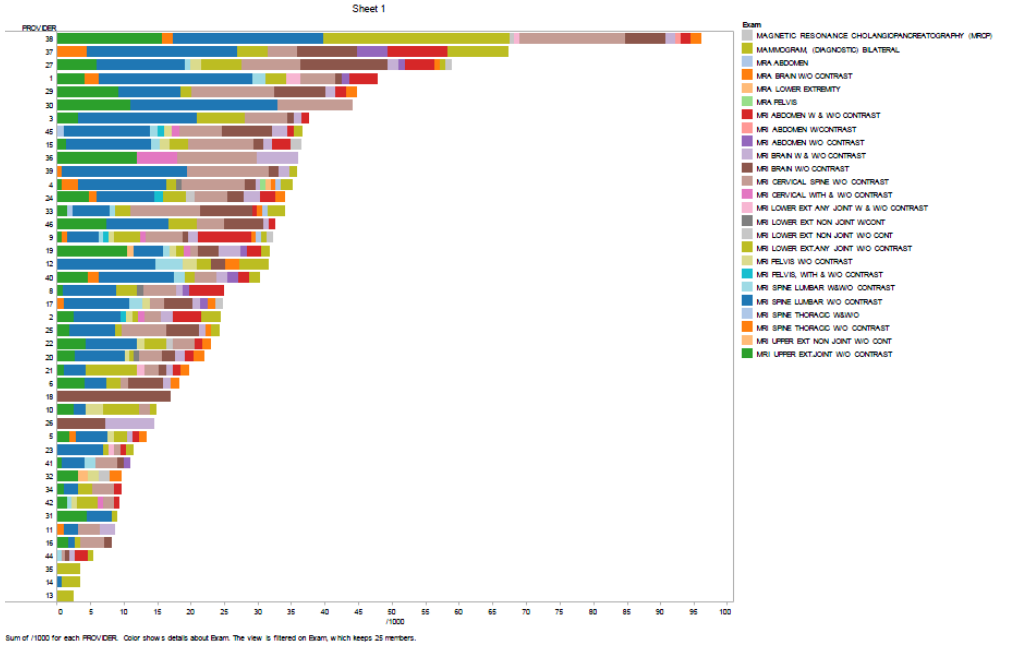
Pat Hanrahan
CANON Professor of Computer Science and Electrical Engineering at Stanford University.

tableau

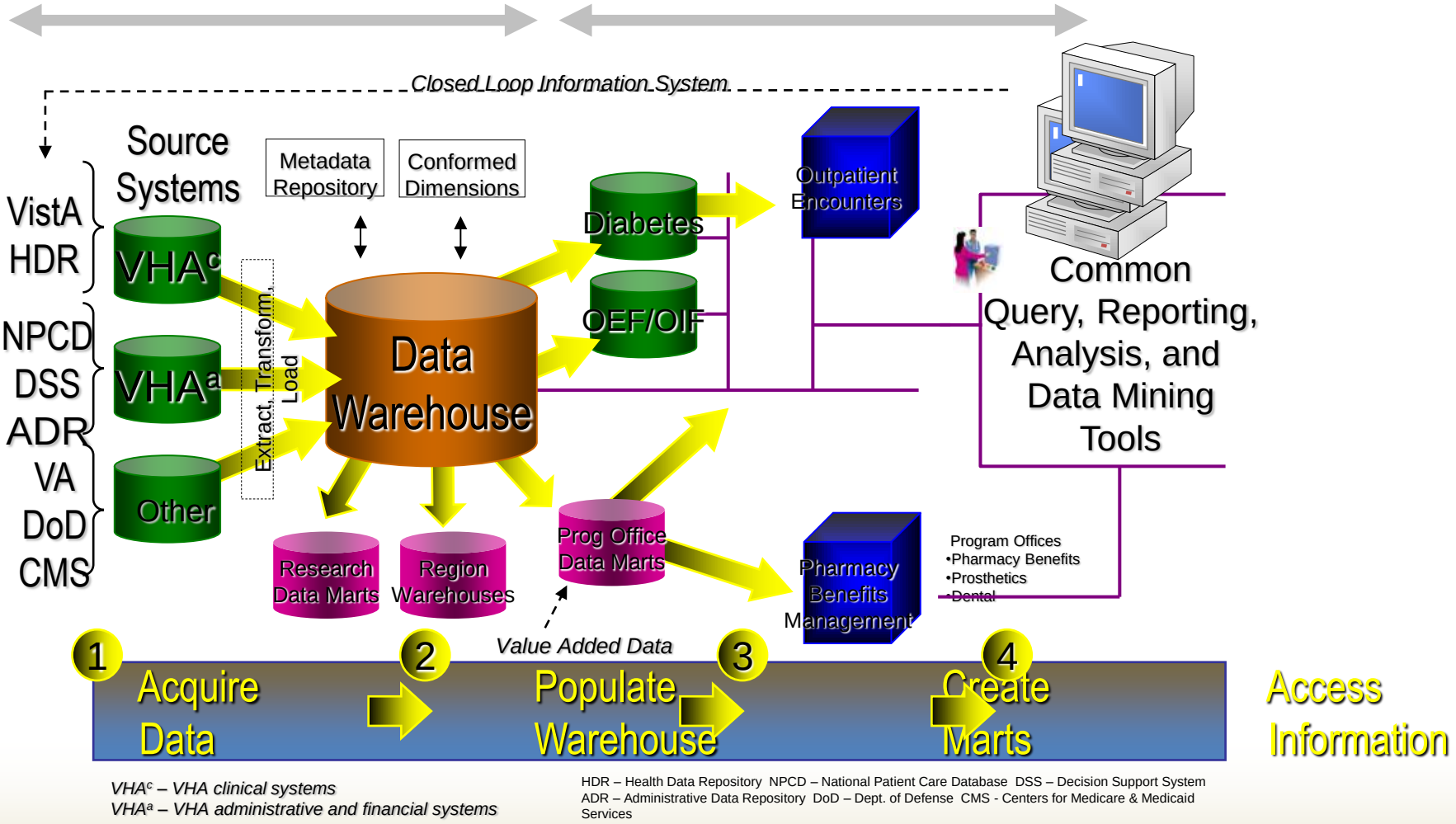
Tableau

Healthcare Analytics





VHA Corporate Data Warehouse



VHA^{c} – VHA clinical systems
VHA^{a} – VHA administrative and financial systems

HDR – Health Data Repository NPCD – National Patient Care Database DSS – Decision Support System
ADR – Administrative Data Repository DoD – Dept. of Defense CMS - Centers for Medicare & Medicaid Services

Big Data

Test performance

Hemolysis (preanalytical)

Germline and phenotype testing (analytical)

Evidence-based laboratory practices

Myoglobinuria

Protein C

Poplulation health

High and low risk (birth cohort) HCV screening

Utilization

Germline mutation and phenotype testing

Benchmarking
Test performance (preanalytical)

Hemolysis

Clinical Laboratory Quality Practices When Hemolysis Occurs

Peter J. Howanitz, MD; Christopher M. Lehman, MD; Bruce A. Jones, MD; Frederick A. Meier, MD; Gary L. Horowitz, MD

• *Context.*—Hemolyzed specimens delay clinical laboratory results, proliferate unnecessary testing, complicate physician decisions, injure patients indirectly, and increase health care costs.

Objective.—To determine quality improvement practices when hemolysis occurs.

Design.—We used the College of American Pathologists (CAP) Survey Program to distribute a Q-Probes–type questionnaire about hemolysis practices to CAP Chemistry Survey participants.

Results.—Of 3495 participants sent the questionnaire, 846 (24%) responded. Although 85%, 69%, and 55% of participants had written hemolysis policies for potassium, lactate dehydrogenase, and glucose, respectively, only a few (46%, 40%, and 40%) had standardized hemolysis reports between their primary and secondary chemistry analyzers for these 3 analytes. Most participants (70%) had not attempted to validate the manufacturers' hemolysis data for these 3 analytes; however, essentially all who

taken corrective action to reduce hemolysis during the pa
year and used, on average, 2.4 different actions, wit
collection and distribution of hemolysis data to admin
trative leadership (57%), troubleshooting outliers (55%),
retraining phlebotomist (53%), and establishment
quality improvement teams among the laboratory and
problem locat
When asked t
70% noted
improvement
drogenase, a
pants used t
lipemia and
Conclusio
increases th
reporting, a
ment.
(*Arch Pa*

Practices for Identifying and Rejecting Hemolyzed Specimens Are Highly Variable in Clinical Laboratories

Peter J. Howanitz, MD; Christopher M. Lehman, MD; Bruce A. Jones, MD; Frederick A. Meier, MD; Gary L. Horowitz, MD

• *Context.*—Hemolysis is an important clinical laboratory quality attribute that influences result reliability.

Objective.—To determine hemolysis identification and rejection practices occurring in clinical laboratories.

Design.—We used the College of American
Survey program to distribute
naire about hemol

ries, no hemolyzed specimens were rejected; and in 88% of laboratories, some specimens were rejected depending on hemolysis levels. Participants used 69 different terms to describe hemolysis scales, with 21 terms used in more than 10 laboratories. *Slight* and *moderate* were the terms used most commonly. Of 16 different cutoffs used to reject hemolyzed specimens, *moderate* was the most common, occurring in 30% of laboratories. For whole blood electrolyte measurements performed in 86 laboratories, 57% did not evaluate the presence of hemolysis, but for those that did, the most common practice in 21 laboratories (24%) was centrifuging and visually determining the presence of hemolysis in all specimens.

Conclusions.—Hemolysis practices vary widely. Standard assessment and consistent reporting are the first steps in reducing interlaboratory variability among results.

(*Arch Pathol Lab Med.* 2015;139:1014–1019; doi: 10.5858/arpa.2014-0161-CP)

CLINICAL RESEARCH STUDY

THE AMERICAN JOURNAL *of* MEDICINE®

Reducing Blood Sample Hemolysis at a Tertiary Hospital Emergency Department

Marcus Eng Hock Ong, MBBS, MPH,[a] Yiong Huak Chan, PhD,[b] Chin Siah Lim, MBBS[a]

[a]*Department of Emergency Medicine, Singapore General Hospital, Singapore;* [b]*Yong Loo Lin School of Medicine, National University of Singapore, Singapore.*

ABSTRACT

PURPOSE: To determine the causes for sample hemolysis and measure the effect of an intervention to reduce sample hemolysis in the Emergency Department of a large hospital.

METHODS: We conducted a phased, prospective, interventional study. In phase 1, factors associated with urea and electrolyte sample lysis were studied. Based on these results and a literature review, an educational program consisting of a 15-minute presentation was implemented. In phase 2, questionnaires were distributed to the doctors and medical students conducting blood sampling, and outcome data were collected after the samples were processed.

RESULTS: In phase 1 (n = 227), the use of a vacutainer was associated with the highest rates of hemolysis. Lysis rate was 35.8% with use of the vacutainer, compared with 11% without (adjusted odds ratio 6.0, 95% confidence interval, 2.3-15.2). In phase 2 (n = 204), the following significant changes were found: increased use of a syringe rather than vacutainer (before 64.3%; after 98.5%, $P < .01$), increased use of venipuncture for blood sampling (26%-36.8%, $P = .02$), reduced arterial sampling (3.1%-0%, $P = .02$), increased sample volume (4.5-5.2 mL, $P < .01$) and reduced interval from sampling to analysis (60.8-48.4 minutes, $P < .01$). We were able to attain a reduction in sample hemolysis from 19.8% (before) to 4.9% (after) ($P < .001$). This would translate to a cost savings of SGD$834.40 (USD$556.30) per day at the emergency department and SGD$304,556 (USD$203,037) per year.

CONCLUSIONS: Introduction of an educational program at a hospital Emergency Department was able to significantly reduce rates of sample hemolysis.

 • *The American Journal of Medicine (2009) 122, 1054.e1-1054.e6*

KEYWORDS: Chemistry testing; Emergency department; Sample hemolysis; Venipuncture; Vena[illegible]culation

Benchmarking
Test performance (preanalytical)

Hemolysis

LocationName	LabChemTestNa	LabCh	COMMENTS
ABQ VA EMERGENCY DEPT/WK-X	POTASSIUM	3.8	~ ~STAT SPECIMEN SLIGHTLY HEMOLYZED. Interpr
ABQ VA EMERGENCY DEPT/WK-X	POTASSIUM	4.2	~ SPECIMEN IS SLIGHTLY HEMOLYZED.
ABQ VA EMERGENCY DEPT/WK-X	POTASSIUM	3	~ ~STAT SPECIMEN SLIGHTLY HEMOLYZED. Interpr
ABQ VA EMERGENCY DEPT/WK-X	POTASSIUM	5.1	~ SPECIMEN IS MODERATELY HEMOLYZED.
ABQ VA EMERGENCY DEPT/WK-X	POTASSIUM	canc	~ CHEM Specimen hemolyzed. Called RN SARAH M

16 facilities (November 2014)

- 220,596 serum potassium results of which 22,442 (10.2%) from ED.
- **Median hemolysis rate: 3.5% ED – 0.7% Other**

Facility	Emergency Department								Non-Emergency Department								ED/Non-ED Hemolyzed
	N	Hemolyzed				C/R	Total (%)		N	Hemolyzed				C/R	Total (%)		
		Reported		Canceled						Reported		Canceled (%)					
1	2,403	67	2.8%	47	2.0%	0.7	114	4.7%	15,305	53	0.3%	72	0.5%	1.4	125	0.8%	5.8
2	2,162	11	0.5%	0	0.0%	0.0	11	0.5%	17,396	20	0.1%	1	0.0%	0.1	21	0.1%	4.2
3	2,096	3	0.1%	106	5.1%	35.3	109	5.2%	16,370	5	0.0%	212	1.3%	42.4	217	1.3%	3.9
4	2,015	55	2.7%	39	1.9%	0.7	94	4.7%	15,527	80	0.5%	38	0.2%	0.5	118	0.8%	6.1
5	1,809	3	0.2%	1	0.1%	0.3	4	0.2%	11,935	1	0.0%	2	0.0%	2.0	3	0.0%	8.8
6	1,723	84	4.9%	4	0.2%	0.0	88	5.1%	20,780	84	0.4%	8	0.0%	0.1	92	0.4%	11.5
7	1,638	9	0.5%	74	4.5%	8.2	83	5.1%	14,240	102	0.7%	262	1.8%	2.6	364	2.6%	2.0
8	1,453	4	0.3%	11	0.8%	2.8	15	1.0%	12,194	32	0.3%	32	0.3%	1.0	64	0.5%	2.0
9	1,440	9	0.6%	48	3.3%	5.3	57	4.0%	5,949	11	0.2%	120	2.0%	10.9	131	2.2%	1.8
10	1,212	190	15.7%	1	0.1%	0.0	191	15.8%	11,408	760	6.7%	0	0.0%	0.0	760	6.7%	2.4
11	1,158	8	0.7%	0	0.0%	0.0	8	0.7%	14,558	22	0.2%	4	0.0%	0.2	26	0.2%	3.9
12	1,109	44	4.0%	1	0.1%	0.0	45	4.1%	11,859	196	1.7%	6	0.1%	0.0	202	1.7%	2.4
13	646	13	2.0%	0	0.0%	0.0	13	2.0%	6,607	26	0.4%	0	0.0%	0.0	26	0.4%	5.1
14	563	12	2.1%	0	0.0%	0.0	12	2.1%	4,200	14	0.3%	0	0.0%	0.0	14	0.3%	6.4
15	511	14	2.7%	1	0.2%	0.1	15	2.9%	16,201	123	0.8%	6	0.0%	0.0	129	0.8%	3.7
16	504	4	0.8%	7	1.4%	1.8	11	2.2%	3,625	2	0.1%	8	0.2%	4.0	10	0.3%	7.9
Total	22,442	530	2.4%	340	1.5%	0.6	870	3.9%	198,154	1,531	0.8%	771	0.4%	0.5	2,302	1.2%	3.3

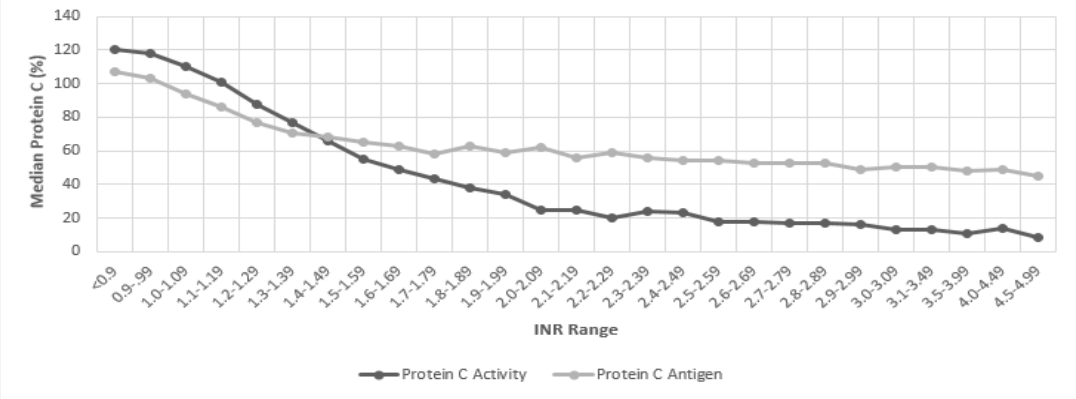
Effect of vitamin K deficiency (INR) on protein C activity and antigen values

Protein C and INR
102 VA laboratories and 25,461 cases

Protein C testing with elevated INR results

The incidence of abnormal protein C results with normal (<1.1) INR levels was 2.9% and accounted for 48.9% of all protein C tests.

Protein C was frequently tested when INR results were elevated; 17.2% and 10.9% of cases with INRs of ≥1.5 and ≥2.0 were tested for protein C respectively.



INR Range	Functional Protein C Method			Antigen Protein C Method		
	N	PC ≤54%	% low	N	PC ≤54%	% low
<0.9	289	7	2.4%	108	1	0.9%
0.9-.99	3049	69	2.3%	887	12	1.4%
1.0-1.09	6231	201	3.2%	1878	78	4.2%
1.1-1.19	3390	187	5.5%	1087	88	8.1%
1.2-1.29	1465	195	13.3%	535	87	16.3%
1.3-1.39	710	170	23.9%	306	79	25.8%
1.4-1.49	442	170	38.5%	185	55	29.7%
1.5-1.59	340	168	49.4%	159	48	30.2%
1.6-1.69	280	160	57.1%	133	41	30.8%
1.7-1.79	205	135	65.9%	116	43	37.1%
1.8-1.89	221	155	70.1%	100	33	33.0%
1.9-1.99	196	147	75.0%	110	46	41.8%
2.0-2.09	177	145	81.9%	98	28	28.6%
2.1-2.19	189	158	83.6%	119	57	47.9%
2.2-2.29	132	116	87.9%	90	35	38.9%
2.3-2.39	169	144	85.2%	95	43	45.3%
2.4-2.49	148	126	85.1%	82	41	50.0%
2.5-2.59	128	117	91.4%	90	45	50.0%
2.6-2.69	123	107	87.0%	77	42	54.5%
2.7-2.79	137	118	86.1%	67	35	52.2%
2.8-2.89	94	86	91.5%	51	29	56.9%
2.9-2.99	79	65	82.3%	42	26	61.9%
3.0-3.09	77	72	93.5%	46	28	60.9%
3.1-3.49	204	188	92.2%	117	73	62.4%
3.5-3.99	142	129	90.8%	73	46	63.0%
4.0-4.49	82	72	87.8%	46	32	69.6%
4.5-4.99	44	40	90.9%	21	15	71.4%

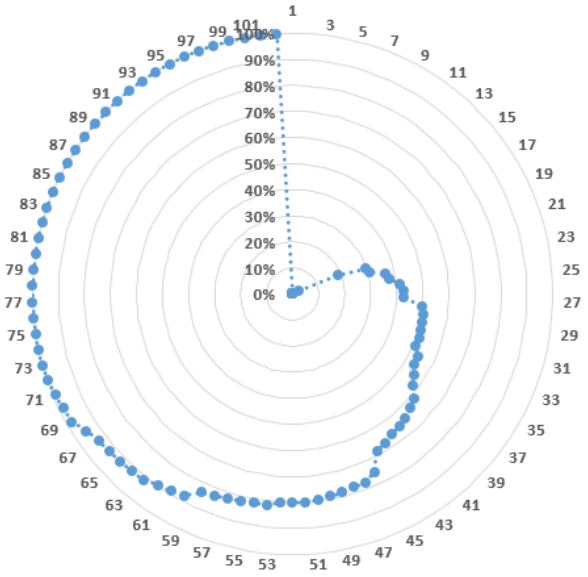
Protein C Method Selection

Protein C – Functional vs Antigenic Testing

73.6% of protein C results are performed by functional methods. However, the relative percent varied by facility; 18 laboratories reported only antigenic protein C results while 30 reported only functional protein C results

Distribution of % of all protein C tests performed using funcitonal method among 102 laboratories over 14 years					
	Percentile				
	10th	25th	50th	75th	90th
% functional protein C	0%	42.9%	80.0%	100%	100%

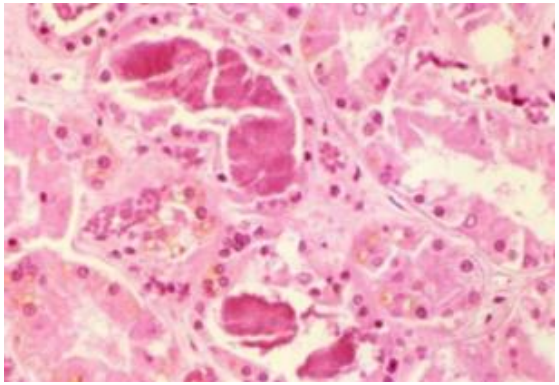
Distribution among 102 VA laboratories of all protein C tests as % measured by functional assay



Evidence Based Best Practices
Myoglobinuria

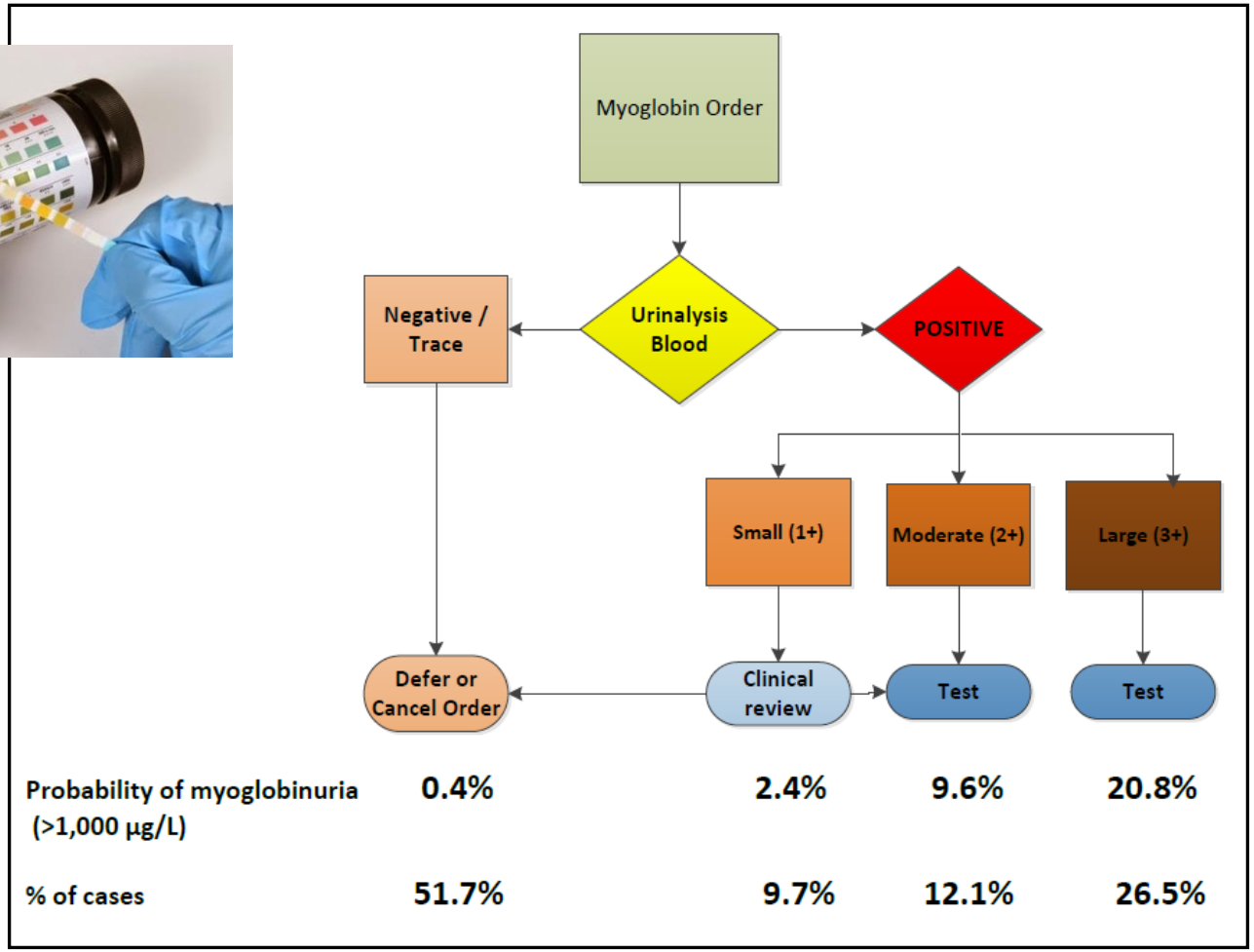
Performance of urine dipstick blood test for detecting myoglobinuria

81 facilities
7,579 cases



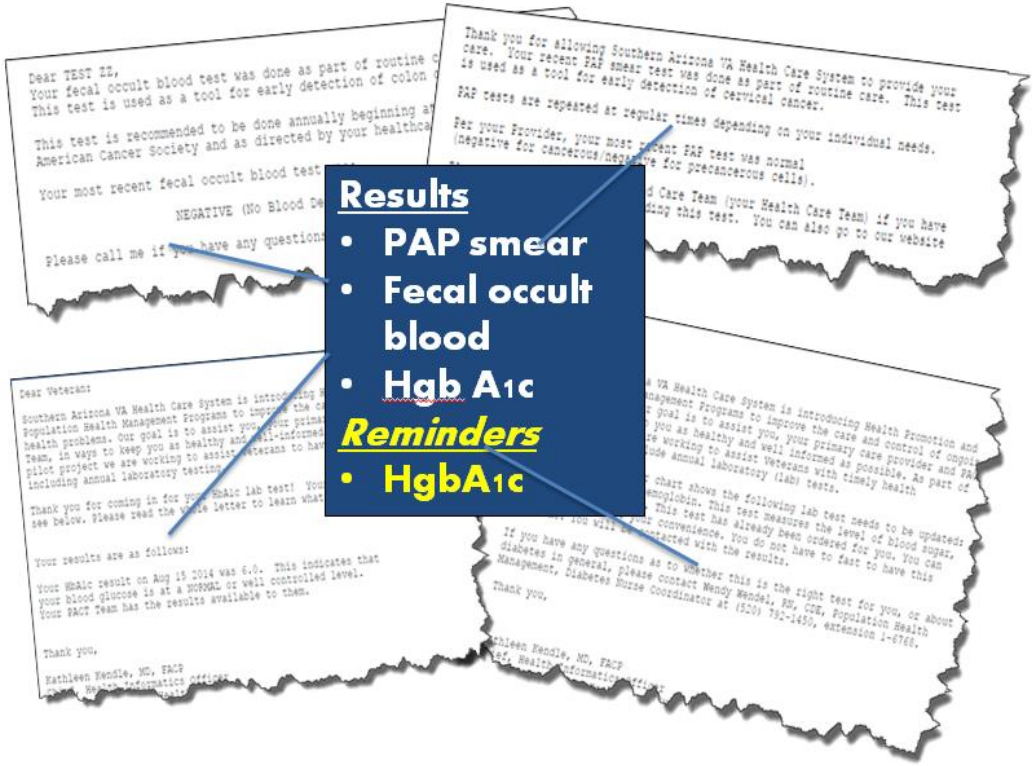
Urine Myoglobin µg/L	Negative and trace dipstick blood			Positive dipstick blood				Total No. (%)
	Negative No. (%)	Trace No. (%)	ALL NEGATIVE	Small (1+) No. (%)	Mod (2+) No. (%)	Large (3+) No. (%)	ALL POSITIVE	
	3,421 (45.1%)	494 (6.5%)	3,915 (51.7%)	738 (9.7%)	920 (12.1%)	2,006 (26.5%)	3,664 (48.3%)	7,579
<50	3,310 (96.8%)	431 (87.3%)	3,741 (95.6%)	632 (85.6%)	662 (71.9%)	1,039 (51.8%)	2,333 (63.7%)	6,069 (80.1%)
50-99	42 (1.2%)	18 (3.6%)	60 (1.5%)	26 (3.5%)	44 (4.8%)	131 (6.5%	201 (5.5%)	261 (3.4%)
100-249	30 (0.9%)	27 (5.5%)	57 (1.5%)	30 (4.1%)	52 (5.7%)	180 (9.0%)	262 (7.2%)	319 (4.2%)
250-999	27 (0.8%)	13 (2.6%)	40 (1.0%)	32 (4.3%)	74 (8.0%)	239 (11.9%)	345 (9.4%)	385 (5.1%)
1,000-5,000	7 (0.2%)	4 (0.8%)	11 (0.3%)	14 (1.9%)	69 (7.5%)	148 (7.4%)	231 (6.3%)	242 (3.2%)
5,001-10,000	1 (<.0.1%)	1 (0.2%)	2 (<0.1%)	2 (0.3%)	8 (0.9%)	73 (3.6%)	83 (2.3%)	85 (1.1%)
>10,000	4 (0.1%)	0 (0.0%)	4 (0.1%)	2 (0.3%)	11 (1.2%)	196 (9.8%)	209 (5.7%)	213 (2.8%)

Evidence Based Best Practices

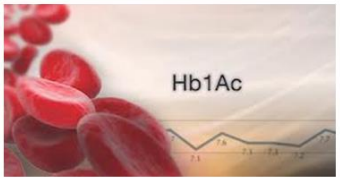


Population Health

Patient Letters
Reminders & Results



Patient Results Letters



Dear Veteran:

Southern Arizona VA Health Care System is introducing Health Promotion and Population Health Management Programs to improve the care and control of ongoing health problems. Our goal is to assist you, your primary care provider and PACT Team, in ways to keep you as healthy and well-informed as possible. As part of a pilot project we are working to assist Veterans to have timely health screenings including annual laboratory testing.

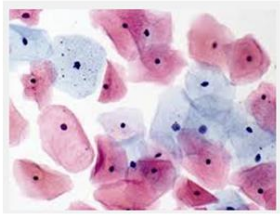
Thank you for coming in for your HbA1c lab test! Your results are now available, see below. Please read the whole letter to learn what to do with this result.

Your results are as follows:

Your HbA1c result on Aug 15 2014 was 9.0. Goals for your HbA1c level should be discussed with your health care provider who has been notified about your results. Please call Ocotillo Clinic at Southern Arizona VA Health Care System at (520) 629-4881, Monday though Friday between 8:00am and 4:00pm to schedule a time to discuss your recent HbA1c result.

Thank you,

PAP smear



Thank you for allowing Southern Arizona VA Health Care System to provide your care. Your recent PAP smear test was done as part of routine care. This test is used as a tool for early detection of cervical cancer.

PAP tests are repeated at regular times depending on your individual needs.

Per your Provider, your most recent PAP test was normal (negative for cancerous/negative for precancerous cells).

Please call your Patient Aligned Care Team (your Health Care Team) if you have any questions or concerns regarding this test. You can also go to our website at www.va.gov.

FOBT

Dear TEST ZZ,
Your fecal occult blood test was done as part of routine care.
This test is used as a tool for early detection of colon cancer.

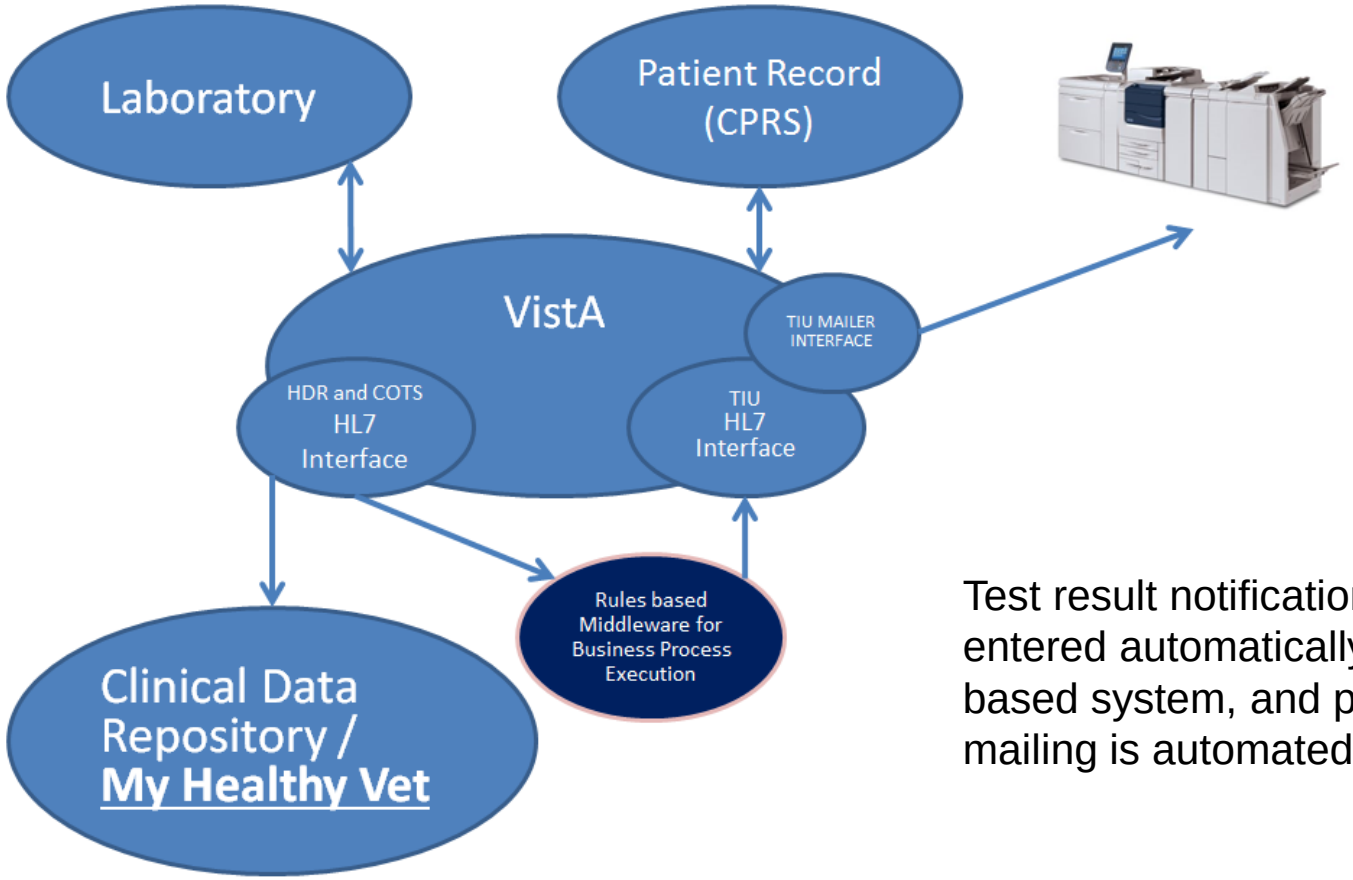
This test is recommended to be done annually beginning at age 50 by the American Cancer Society and as directed by your healthcare provider.

Your most recent fecal occult blood test was:

NEGATIVE (No Blood Detected) Performed on: 10 Dec 2013

Please call me if you have any questions or concerns regarding this test.

Automated Patient Letters



Test result notification TIU notes are entered automatically via a rules based system, and printing and mailing is automated.

Viral Hepatitis C

VHA HIV, Hepatitis & Public Health Pathogens Program

U.S. Department of Veterans Affairs

Health | Benefits | Burials & Memorials | About VA | Resour

VA » Health Care » Viral Hepatitis » Providers Home » Hepatitis C » Hepatitis C: Birth Cohort Testing

Viral Hepatitis

- Viral Hepatitis
  - Viral Hepatitis Home
  - For Veterans and the Public
  - For Health Care Providers
    - Provider Home
    - Hepatitis B
    - Hepatitis C
    - Liver Complications
    - Related Clinical Issues
    - Policies and Reports
    - Clinician Tools
    - Provider Education
    - Patient Education
    - Browse by Topic

for Health Care Providers

Birth Cohort Testing

HEPATITIS C

CONTENTS

Introduction

References and Resources

Risk Factors for Hepatitis C

Introduction

According to CDC, in the United States a disproportiona
people born between 1945 and 1965 have hepatitis C. M
are unaware they are infected, and thus do not receive c
this reason, all Veterans born between 1945 and 1965 s
for hepatitis C. Veterans with current or historical risk fa
offered a test for hepatitis C. Risk factors are listed belo

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Recommendations and Reports / Vol. 61 / No. 4 August 17, 2012

Recommendations for the Identification of Chronic Hepatitis C Virus Infection Among Persons Born During 1945–1965

Patient Result Letters Initiative
Hepatitis C birth-cohort screening

Department of Veterans Affairs

~ Aug 28, 2015~

To: TEST ZZ

I want to inform you about recent healthcare guidelines which recommend that individuals in your age group be screened for hepatitis C infection.

~Since there is no record of you ever being evaluated for hepatitis C, I'd ~
~advise that you be tested. While it is unlikely that you have this infection, ~
it is still worthwhile to check. This only requires a blood test.

The reason for doing this is because individuals who have hepatitis C infection
~usually do not feel sick or have any symptoms at first, but may eventually get ~
severe liver disease or even cancer if not treated.

~If you wish to be tested for hepatitis C infection, simply bring this letter to ~
the phlebotomy(blood collection) sectio
tell the phlebotomist that you receive
screening blood test for hepatitis C.

~Once testing is completed, you will r
about test results or advice for furth

If you are unsure or have any question
~infection at this time, please contac
~information to assist with making a d
next visit.

~Sincerely,~

Department of Veterans Affairs

~ Aug 28, 2015~

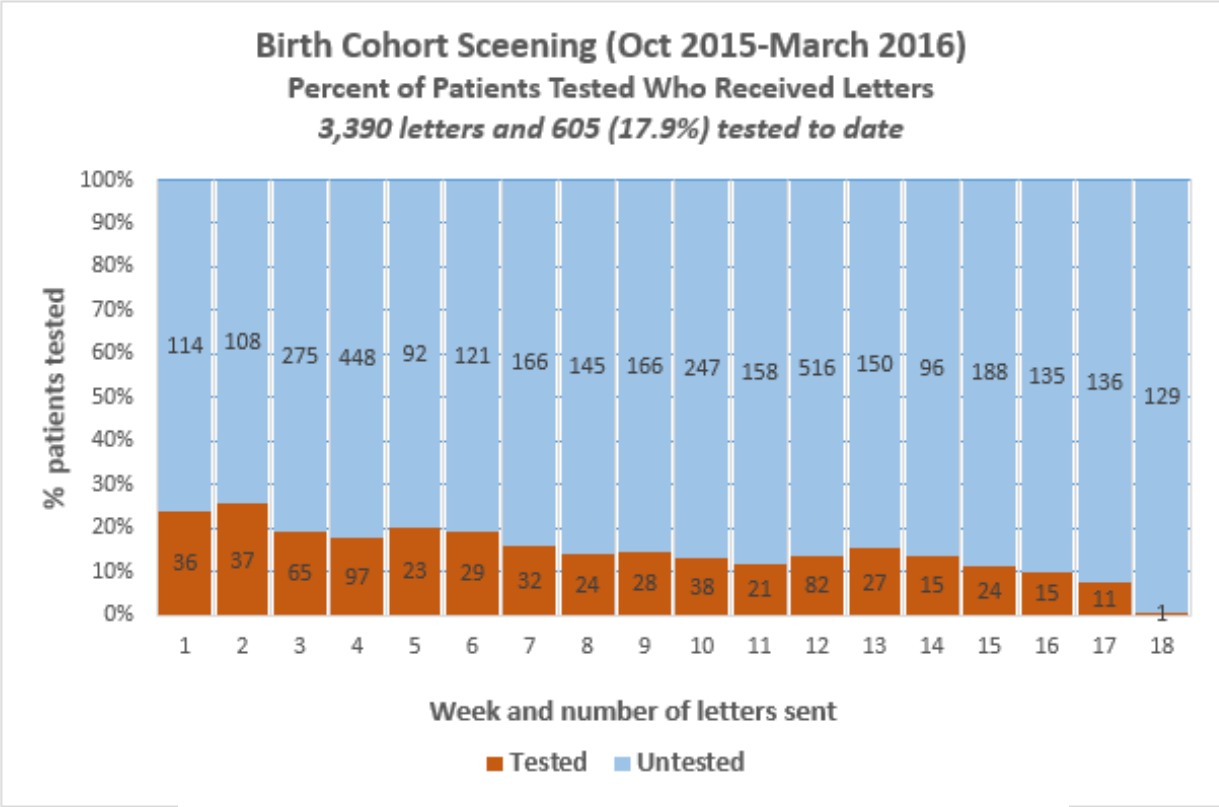
To: TEST ZZ

I am pleased to inform you that your recent test for hepatitis C was completed and results were NEGATIVE

This means that you DO NOT have any evidence of hepatitis C infection and no further evaluation is needed.

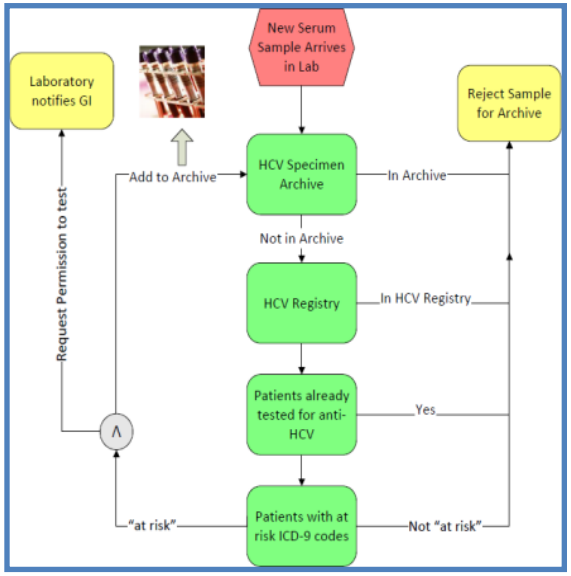
~Thank you,~

Hepatitis C Birth Cohort Screening



Cases	Tested (%)	Anti-HCV POS (%)	HCV RNA POS (%)
3,390	605 (17.8%)	12 (2.0%)	5 (0.8%)

Viral Hepatitis C
High Risk Screening



Use of automated algorithm and HCV registry to screen for occult HCV infection among high risk population

…at risk for HCV infection (ICD-9 code)
….no history of anti-HCV testing
….not in HCV registry
….blood specimen in lab

High Risk Patients Tested			
Cases	Tested (%)	Anti-HCV POS (%)	HCV RNA POS (%)
166	128 (77.1%)	16 (12.5%)	8 (6.3%)*

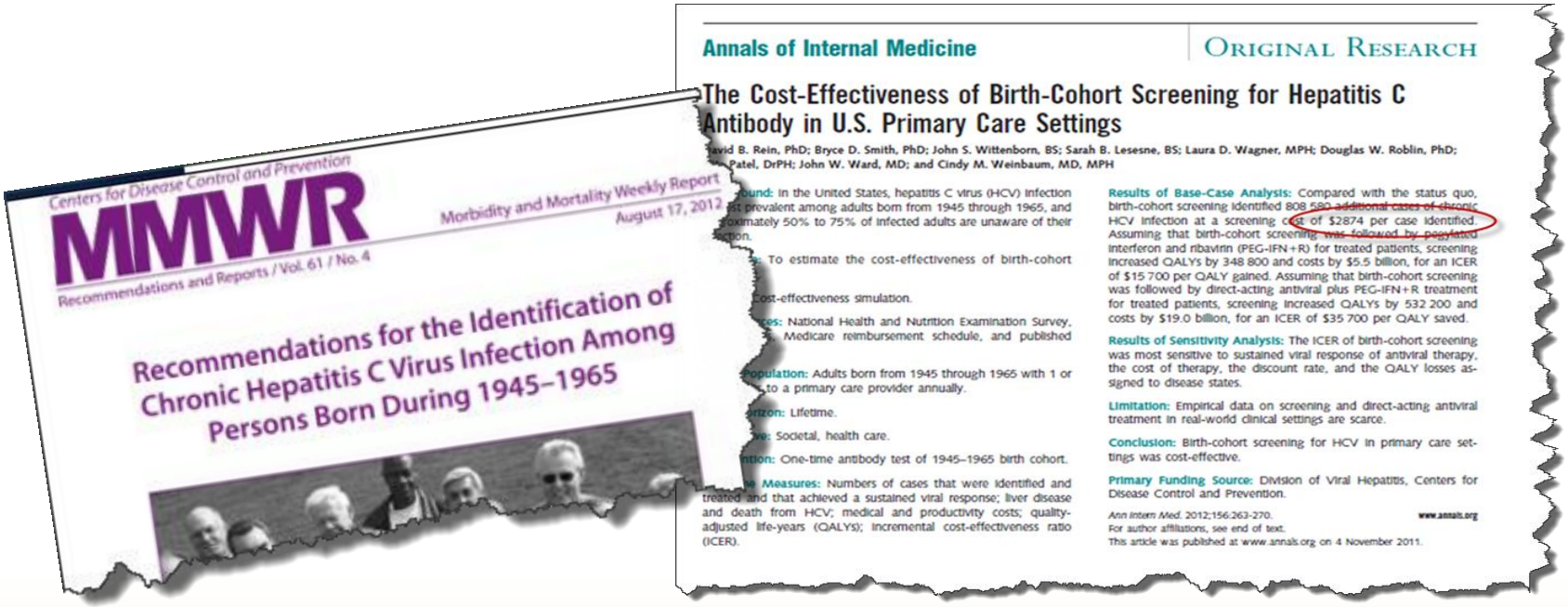
*One not tested for HCV RNA.

*All HCV RNA pos born between 1945-1965

High Risk Patient Not Tested (N=38)	
Reasons for not testing	N (%)
Unable to contact	20 (52.6%)
Deferred for clinical, technical or administrative reasons	9 (23.7%)
Refused testing	6 (15.8%)
Specimen not available	3 (7.9%)

Viral Hepatitis C
High risk vs low risk screening

Screening Method	Cases	Tested (%)	Anti-HCV POS (%)	HCV RNA POS (%)
Birth cohort	3,390	605 (17.8%)	12 (2.0%)	5 (0.8%)
High Risk	166	128 (77.1%)	16 (12.5%)	8 (6.3%)*



Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
August 17, 2012
Recommendations and Reports / Vol. 61 / No. 4

Recommendations for the Identification of Chronic Hepatitis C Virus Infection Among Persons Born During 1945–1965

Annals of Internal Medicine | ORIGINAL RESEARCH

The Cost-Effectiveness of Birth-Cohort Screening for Hepatitis C Antibody in U.S. Primary Care Settings

avid B. Rein, PhD; Bryce D. Smith, PhD; John S. Wittenborn, BS; Sarah B. Lesesne, BS; Laura D. Wagner, MPH; Douglas W. Roblin, PhD; Patel, DrPH; John W. Ward, MD; and Cindy M. Weinbaum, MD, MPH

Results of Base-Case Analysis: Compared with the status quo, birth-cohort screening identified 808 580 additional cases of chronic HCV infection at a screening cost of $2874 per case identified. Assuming that birth-cohort screening was followed by peginterferon and ribavirin (PEG-IFN+R) for treated patients, screening increased QALYs by 348 800 and costs by $5.5 billion, for an ICER of $15 700 per QALY gained. Assuming that birth-cohort screening was followed by direct-acting antiviral plus PEG-IFN+R treatment for treated patients, screening increased QALYs by 532 200 and costs by $19.0 billion, for an ICER of $35 700 per QALY saved.

Results of Sensitivity Analysis: The ICER of birth-cohort screening was most sensitive to sustained viral response of antiviral therapy, the cost of therapy, the discount rate, and the QALY losses assigned to disease states.

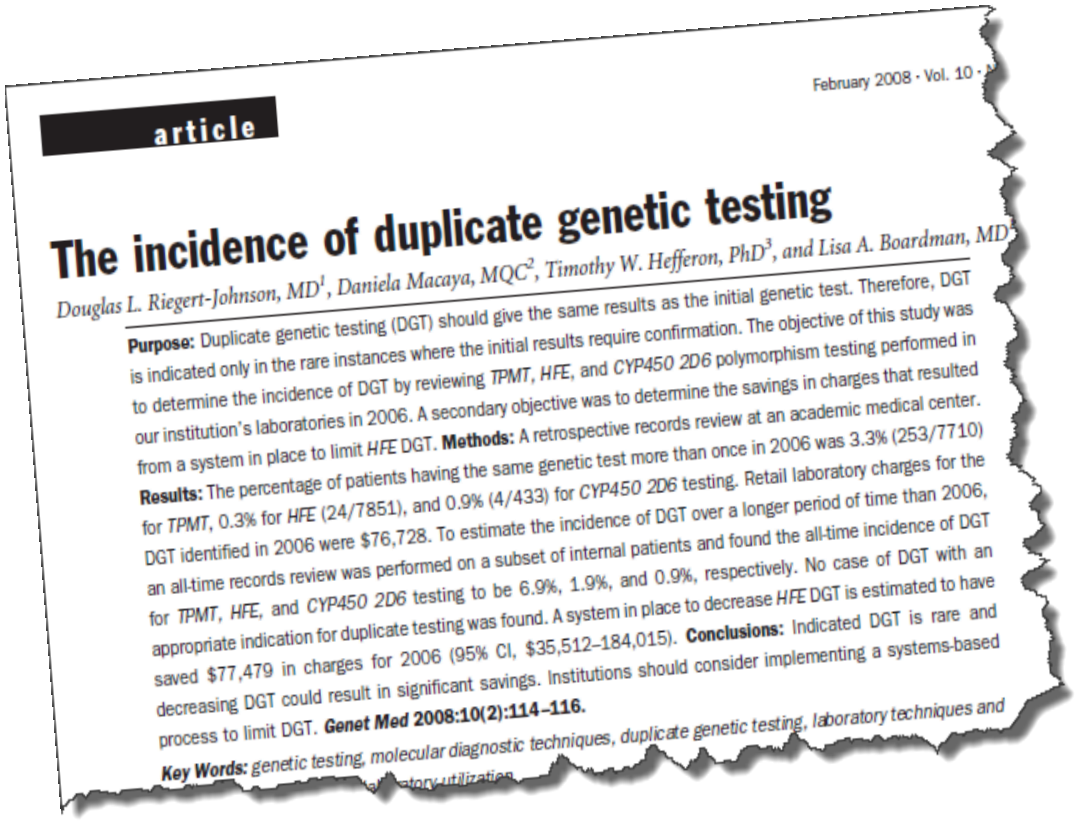
Limitation: Empirical data on screening and direct-acting antiviral treatment in real-world clinical settings are scarce.

Conclusion: Birth-cohort screening for HCV in primary care settings was cost-effective.

Primary Funding Source: Division of Viral Hepatitis, Centers for Disease Control and Prevention.

Ann Intern Med. 2012;156:263-270. www.annals.org
For author affiliations, see end of text.
This article was published at www.annals.org on 4 November 2011.

Duplicate Germline Genetic & Phenotype Testing



February 2008 · Vol. 10 ·

article

The incidence of duplicate genetic testing

Douglas L. Riegert-Johnson, MD[1], Daniela Macaya, MQC[2], Timothy W. Hefferon, PhD[3], and Lisa A. Boardman, MD[1]

Purpose: Duplicate genetic testing (DGT) should give the same results as the initial genetic test. Therefore, DGT is indicated only in the rare instances where the initial results require confirmation. The objective of this study was to determine the incidence of DGT by reviewing *TPMT*, *HFE*, and *CYP450 2D6* polymorphism testing performed in our institution's laboratories in 2006. A secondary objective was to determine the savings in charges that resulted from a system in place to limit *HFE* DGT. **Methods:** A retrospective records review at an academic medical center. **Results:** The percentage of patients having the same genetic test more than once in 2006 was 3.3% (253/7710) for *TPMT*, 0.3% for *HFE* (24/7851), and 0.9% (4/433) for *CYP450 2D6* testing. Retail laboratory charges for the DGT identified in 2006 were $76,728. To estimate the incidence of DGT over a longer period of time than 2006, an all-time records review was performed on a subset of internal patients and found the all-time incidence of DGT for *TPMT*, *HFE*, and *CYP450 2D6* testing to be 6.9%, 1.9%, and 0.9%, respectively. No case of DGT with an appropriate indication for duplicate testing was found. A system in place to decrease *HFE* DGT is estimated to have saved $77,479 in charges for 2006 (95% CI, $35,512–184,015). **Conclusions:** Indicated DGT is rare and decreasing DGT could result in significant savings. Institutions should consider implementing a systems-based process to limit DGT. ***Genet Med* 2008:10(2):114–116.**

Key Words: *genetic testing, molecular diagnostic techniques, duplicate genetic testing, laboratory techniques and*

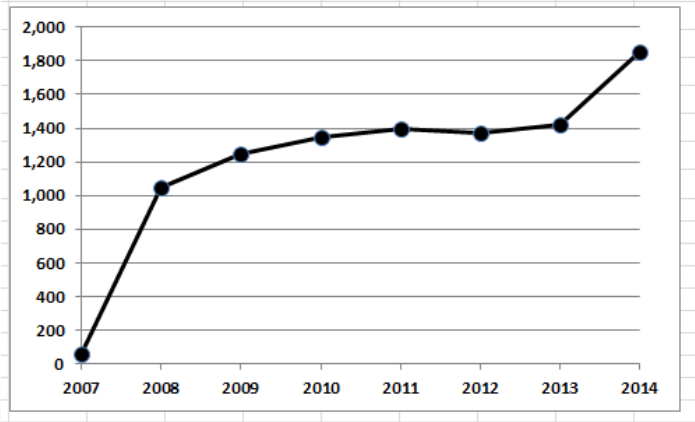
- **Reliability of Test Results**
- **Test Utilization**

HLA-B *5701 Phenotype (Abacavir Hypersensitivity)

HLA B5701
HLA-B*5701 W/RFL HLA-B HIGH
(HLA B*5701
.HLA-B*5701 GENOTY ABACAVIR SENS
ABACAVIR HYPERSENSITIVITY
ABACAVIR HYPERSENSITIVITY (006926)
B*5701-HLA
B5701
HLA B 5701
HLA B*5701
HLA B*5701 LC
HLA B*5701 TYPING
HLA B5701
HLA B5701 (D/C 8/1/13)
HLA B5701 (LABCORP)
HLA B5701 (LC006926)QQQ
HLA B5701 (OUTPUT)
HLA B5701 (V2)
HLA B5701 ANTIGEN
HLA B5701(PRE 8/1/2013)
HLA B5701*
HLA B5701/SEND OUT
HLA-B 5701
HLA-B 5701 (2002429)
HLA-B 5701 TYPING
HLA-B 5701 TYPING RT
HLA-B 5701 TYPING(STL)
HLA-B*5701
HLA-B*5701
HLA-B*5701 -
HLA-B*5701 (Dcd 3-30-12)
HLA-B*5701 (dc'd 5/6/14)
HLA-B*5701 (PCR)
HLA-B*5701 Buccal Swab
HLA-B*5701 REPORT,blood
HLA-B*5701 Test
HLA-B*5701 TYPING
HLA-B*5701 TYPING (Q)
HLA-B*5701 TYPING (QU)
HLA-B*5701 TYPING 19774
HLA-B*5701 TYPING SPL
HLA-B*5701 TYPING(Q)
HLA-B*5701 TYPING,blood
HLA-B*5701(DC'D 10/24/14)
HLA-B*5701.
HLA-B5701
HLA-B5701 (19774)
HLA-B5701 (REF LAB)
HLA-B5701 TEST
HLA-B5701 TEST (LC)
HLA-B5701 TYPING
HLA-B5701(Mayo91833)
HLA-B5701(o)
HLA-B5701, ABACAVIR HYPERSENSITIVITY
ID***HLA-B5701
zzHLA B*5701 TYPING
ZZ-HLA-B*5701
ZZHLA-B5701 TYPING
ZZZHLA-B*5701

YEAR	NEG	POS	UNK	Total	%POS*	%UNK
2006	1			1	0.0%	0.0%
2007	58	4		62	6.5%	0.0%
2008	1,004	46	1	1,051	4.4%	0.1%
2009	1,184	46	17	1,247	3.7%	1.4%
2010	1,185	47	116	1,348	3.8%	8.6%
2011	1,297	71	30	1,398	5.2%	2.1%
2012	1,301	64	8	1,373	4.7%	0.6%
2013	1,356	58	9	1,423	4.1%	0.6%
2014	1,738	90	29	1,852	4.9%	1.6%
2015**	361	9	3	370	2.4%	0.8%

*UNK excluded
**Jan-Feb 2015



Test results per patient	No.
NEG	8,094
NEGNEG	593
NEGNEGNEG	51
NEGNEGNEGNEG	5
NEGNEGNEGNEGNEG	1
UNKNEGNEG	1
NEGUNKUNK	1
Subtotal	8,746
POS	387
POSPOS	22
POSPOSPOSPOS	1
Subtotal	410
UNK	180
UNKUNK	23

Factor V Leiden testing
120 facilities

PATIENT TEST RESUTS				
DIAGNOSIS		%		
WILD	40,457	87.4%		
HETE	5,601	12.1%		
HOMO	197	0.43%		
DISCREPANCY	18	0.04%		
TOTAL			46,273	98.3%
OTHER				
MUTATION	103			
NOT REPORTED	674			
TOTAL	777		777	1.7%
GRAND TOTAL			47,050	

MUTA – Mutation, not otherwise specified
NOTR – Not reported in test results or comments (e.g. comment reads "see scanned report," etc.)

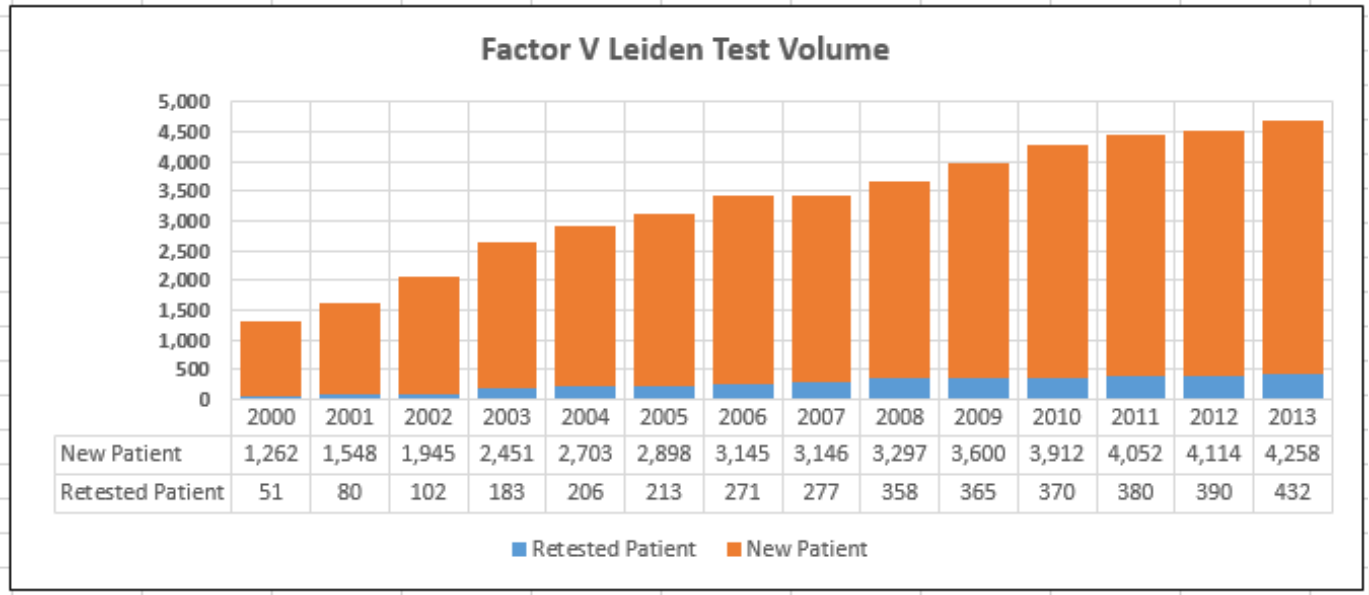
Patients with repeated tests	3,762
Patient with discrepant results	24
Percent discepancies	**0.64%**
Interpretive discrepancies*	**0.48%**
* ≥ 2 of 3 concordance	

Test Result(s)	N
WILD	37,251
HETE	5,108
WILD.WILD	2,815
NOTR	657
HETE.HETE	414
WILD.WILD.WILD	276
HOMO	175
MUTA	97
NOTR.WILD	39
HETE.HETE.HETE	31
WILD.WILD.WILD.WILD	30
WILD.NOTR	27
HOMO.HOMO	20
NOTR.NOTR	15
MUTA.HETE	14
HETE.NOTR	13
WILD.HETE	8
HETE.WILD	7
NOTR.HETE	6
NOTR.WILD.WILD	5
HETE.MUTA	4
WILD.NOTR.WILD	4
MUTA.MUTA	3
HOMO.HETE	2
MUTA.NOTR	2

Test Result(s)	N
NOTR.NOTR.NOTR	2
WILD,WILD	2
WILD.WILD.NOTR	2
HETE.HETE.HETE.HETE	1
HETE.HETE.HETE.HETE.HETE.HETE	1
HETE.HETE.NOTR	1
HETE.HETE.WILD.HETE	1
HETE.HETE.WILD.HETE.HETE	1
HETE.MUTA.HETE.HETE	1
HETE.NOTR.HETE	1
HETE.WILD.HETE	1
HOMO.HOMO.HOMO	1
MUTA.HOMO.HOMO	1
MUTA.WILD	1
NOTR.HETE.HETE.HETE	1
NOTR.MUTA	1
NOTR.NOTR.WILD	1
NOTR.WILD.NOTR	1
NOTR.WILD.WILD.WILD	1
WILD.HETE.HETE	1
WILD.HETE.MUTA.HETE	1
WILD.HETE.WILD	1
WILD.NOTR.NOTR.NOTR	1
WILD.WILD.WILD.WILD.WILD	1

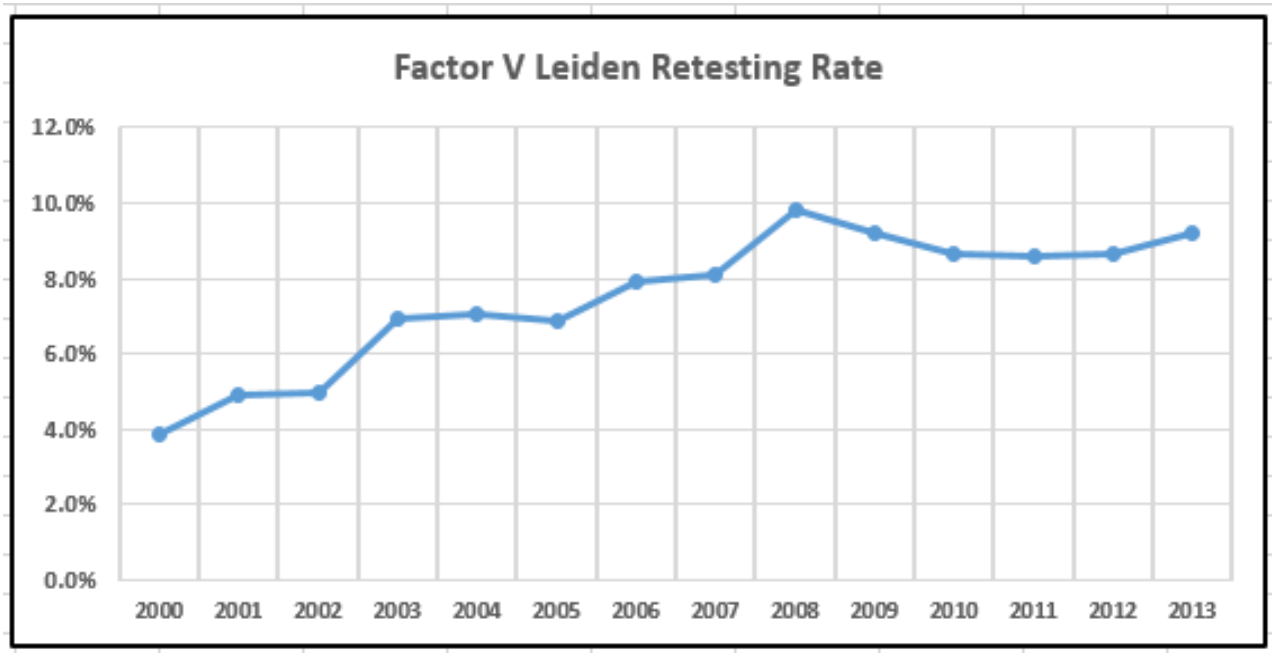
Repeat factor V Leiden testing 120 facilities

Time Between Repeat Tests							
	Percentile						
	5	10	25	Median	75	90	95
Days	2	8	59	331	1,081	2,800	3,379
Months			2	11	36	93	113
Years				0.9	3.0	7.7	9.3



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
New Patient	1,262	1,548	1,945	2,451	2,703	2,898	3,145	3,146	3,297	3,600	3,912	4,052	4,114	4,258
Retested Patient	51	80	102	183	206	213	271	277	358	365	370	380	390	432

Repeat factor V Leiden testing 120 facilities



20% retested at different facility

Effect of genotype/phenotype on repeat testing

Frequency of repeat testing by genotype or phenotype		
Mutation		**Duplicate Testing No./total (%)**
Hemochromatotis *P*=<.001	C282Y/C282Y	283/2,608 (10.9%)
	H63D/H63D	93/1,099 (8.5%)
	C282Y/H63D	135/1,758 (7.7%)
	C282Y/w	301/4,477 (6.7%)
	H63D/w	467/7,506 (6.2%)
	w/w	505/22,626 (6.7%)
Factor V Leiden *P*=.032	Homozygous	22/197 (11.2%)
	Heterozygous	488/5,596 (8.7%)
	Wild	3,205/40,456 (7.9%)
HLA-B*57:01 *P*=.16	Positive	23/410 (5.6%)
	Negative	680/8,767 (7.8%)

Genetic Test Patient Registry
Reliability of Test Results

Genetic Test Patient Registry			
	Hemochromatosis	Factor V Leiden	HLA-B*57:01
Facilities No.	118	120	94
Patients No.	46,929	47,050	9,358
Patients with one or more duplicate tests No. (%)	3,530 (7.5%)	3,762 (8.0%)	704 ((7.5%)
Patients retested at another facility No. (%)	712 (20.2%)	753 (20.0%)	282 (40.1%)
Discrepant test results No. / total duplicates (%)	**27/2,827 (0.96%)**	**24/3,786 (0.63%)**	**0/675 (0.0%)**

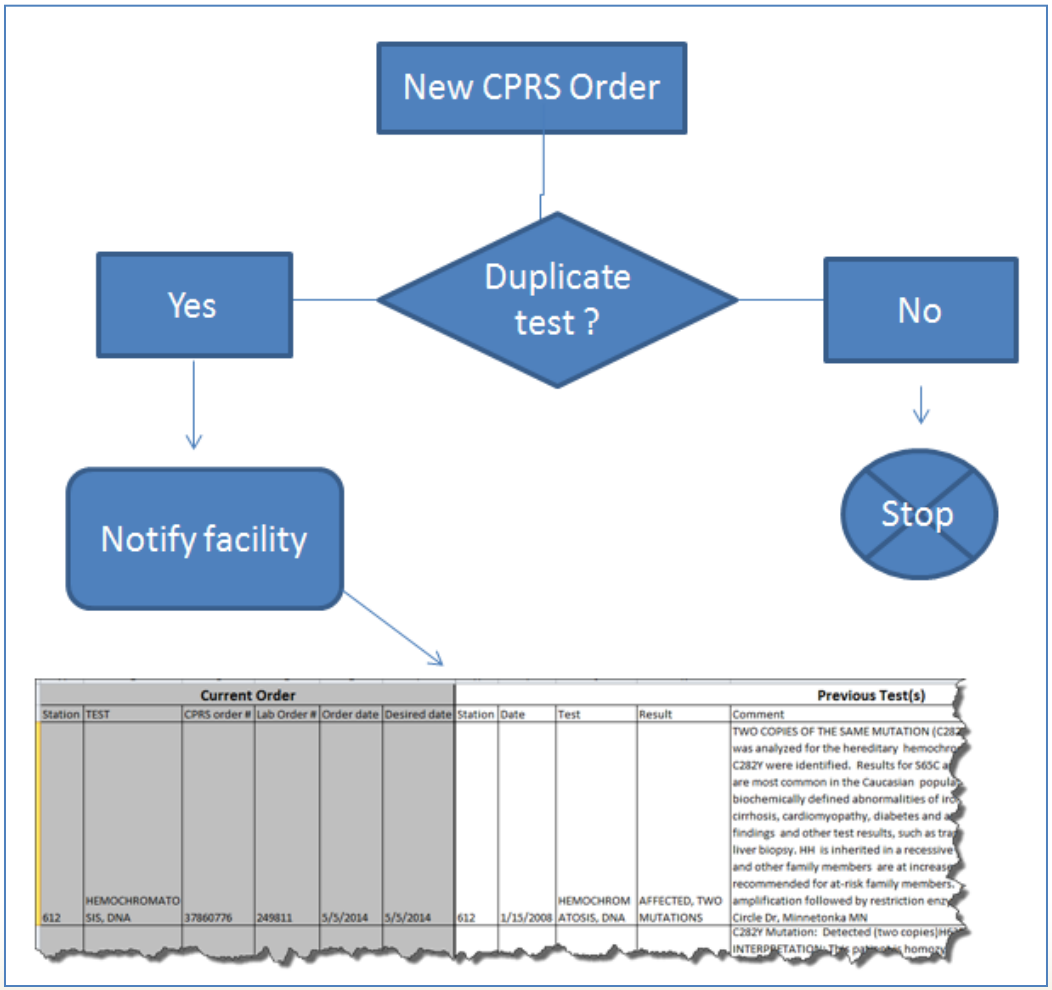
*among cases with complete information

Duplicate Germline Genetic Test Utilization Program

Process for detection and notification of laboratories about new orders for duplicate germline and phenotype orders

- **Factor V Leiden**
- **Prothrombin gene mutation**
- **Hemochromatosis**
- **IL28B genotype**
- **HLA B*5701**
- **HLA B27**

Improving utilization of genetic tests
National automated notification system



Duplicate Genetic Testing Program

February 2015 – January 2016

	Intervention	*Control*
	22 facilities	101 facilities
Previous testing performed at a different facility in 87 (37.5%) cases	232 duplicates	949 duplicates
	142 (61.2%) cancellations	32 (3.4%) cancellations
		Previous testing performed at a different facility in 280 (29.5%) of cases

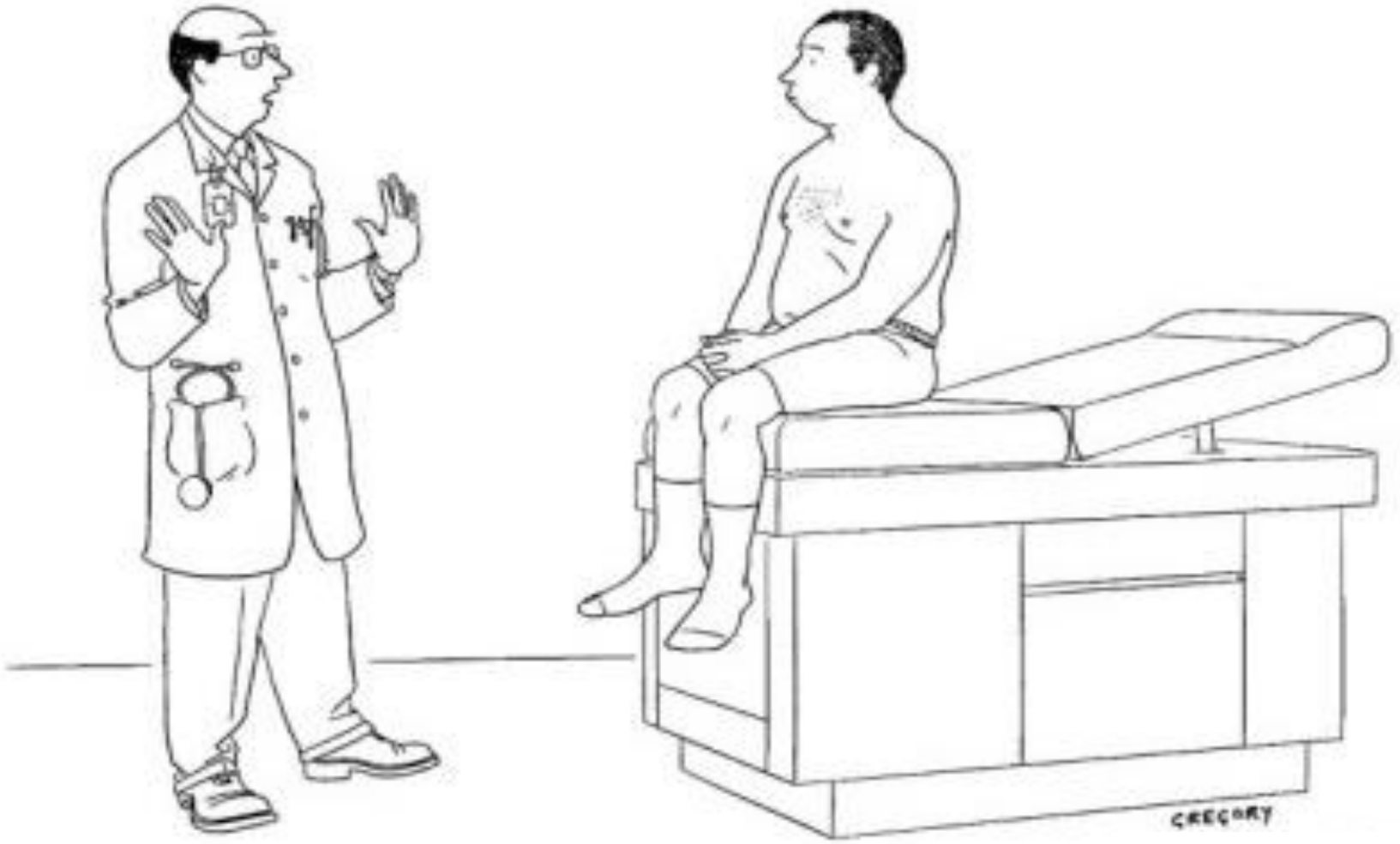
Duplicate Germline Genetic Test Utilization Program

Duplicate orders Feb 2015-Jan 2016*				
Test	Intervention (N=22 facilities)		No intervention (N=101 facilities)	
	Notifications	Cancellations	None	Cancellations
HFE	39	30 (76.9%)	313	3 (1.0%)
FVL	53	35 (66.0%)	202	12 (8.3%)
PGM	14	9 (64.3%)	94	10 (10.6%)
HLA -B27	56	23 (51.8%)	164	3 (1.8%)
HLA-B5701	70	39 (55.7%)	176	4 (2.3%)
TOTAL	**232**	**142 (61.2%)**	**949**	**32 (3.4%)**

* 367 of 1,181 (31.1%) duplicates were performed at different facility

Percentile range of cancellations by facility (%)			
Action (N facilities)	10th	Median	90th
Intervention (N=22)	22.8%	66.7%	100.0%
No intervention (N=101)	0.0%	0.0%	14.2%

Duplicate Germline Genetic Test Utilization Program



"Whoa—way too much information."

‘Big Data’ Team

Danny Luevano Evelyn Harrison Cindy Barger

ARIZONA SOCIETY OF PATHOLOGISTS

The End