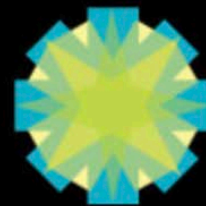




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SCIENCES



**PATHOLOGY  
INFORMATICS  
SUMMIT 2017**

May 22-25, 2017  
Pittsburgh, PA

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# Clinical Informatics and Clinical Decision Support

Pathology Informatics Summit

David McClintock, MD

May 22, 2017

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- Relevant disclosures include:
  - Scientific Advisory Board, Philips Digital Pathology
  - Strategic Advisory Board, Sunquest Information Systems
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# Case Scenario

An 46-year old African-American man has a primary care visit, during which his PCP informs him of the need for a colonoscopy.

**Patient:** "A colonoscopy? Why do I need to do that already? I heard that doesn't start until age 50!"

**PCP:** "Recent guidelines recommend colonoscopy in African Americans at age 45 and higher. Our newest EMR update allows us to integrate national cancer screening guidelines into our care practice – I received an alert upon opening your medical record that you hadn't yet had a screening colonoscopy."

# Case Scenario

The patient undergoes colonoscopy during which an advanced adenoma is found. It is fully resected and the patient is declared cancer-free.

Five years later, the patient receives a reminder through his patient portal recommending repeat colonoscopy given his prior diagnosis.

# What Happened Here?

Electronically captured clinical data  
was combined with a simple rules-based algorithm  
comparing patient demographics with known  
procedure history  
resulting in an effectively timed electronic alert  
that improved patient care

# What Should You Get Out Of This Presentation?

- Defining clinical decision support (CDS) within the realm of clinical informatics
- Considerations for implementing CDS tools and systems
- Examples of current and future state CDS tools for laboratorians, pathologists and clinicians

# What Is Informatics?

The science of information

Study of how data is:

Acquired

Structured

Stored

Processed

Retrieved

Analyzed

Presented / Communicated



Modified from: John Sinard. Practical Pathology Informatics, 2006

[illegible]

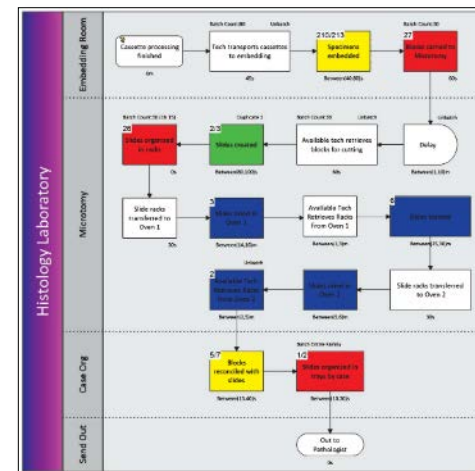
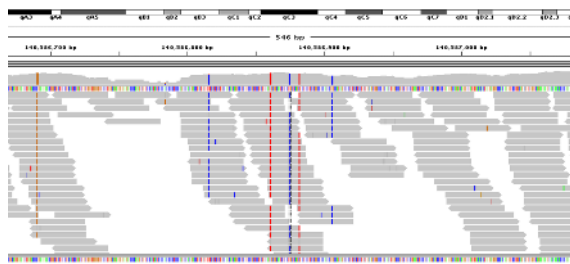
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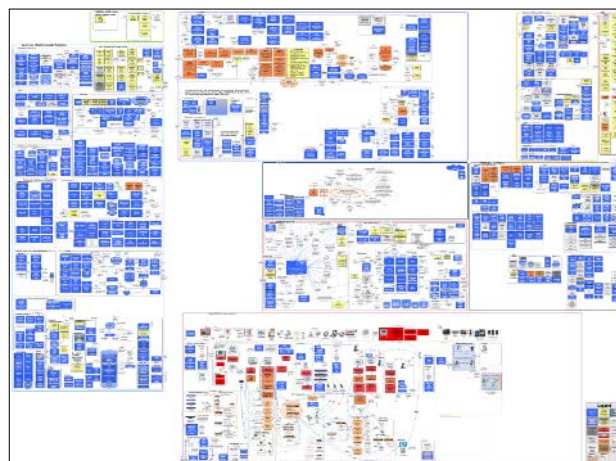
# What Informatics is ALL About



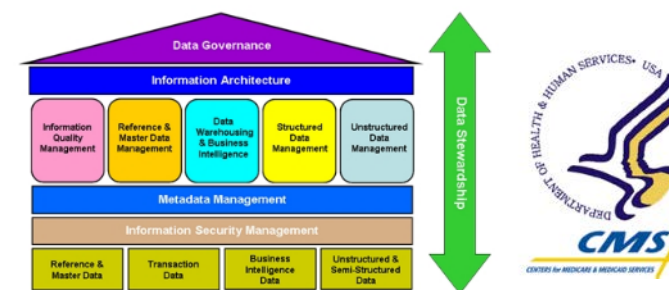
Understanding the fundamentals of information and how its used



Understanding and optimizing information workflows



Understanding information systems ecosystems and leveraging resources



Applying proper information governance within regulatory frameworks

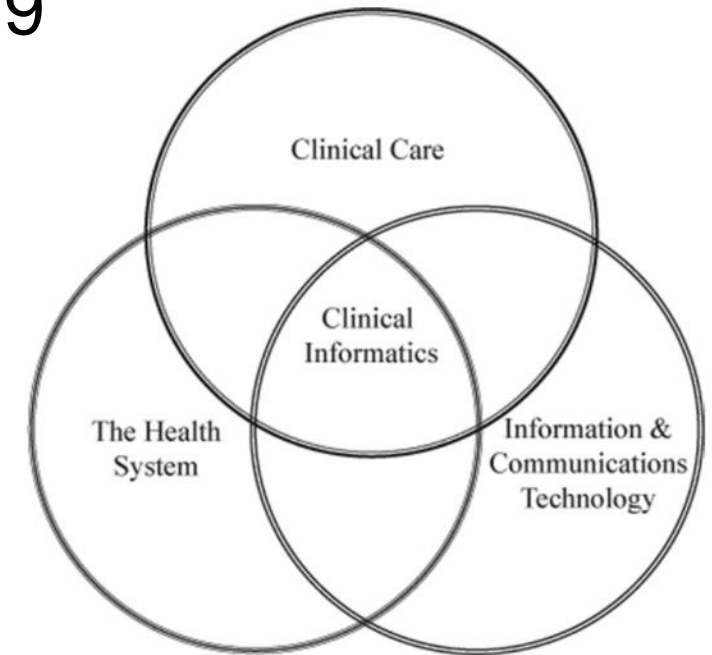
# Clinical Informatics (CI)

The application of informatics to the practice of medicine and clinical care

*Delivering the right clinical information to the right person, in the right place and time, in the right way*

# Scope of Clinical Informatics

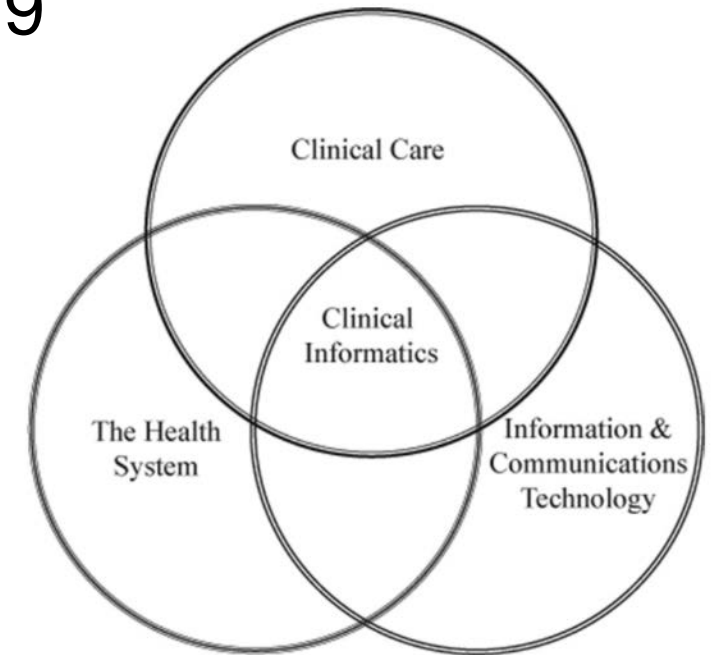
- AMIA Core Content for Clinical Informatics, 2009
  - Assess information and knowledge needs of health care professionals and patients
  - Characterize, evaluate, and refine clinical processes
  - Develop, implement, and refine clinical decision support systems
  - Lead or participate in the procurement, customization, development, implementation, management, evaluation, and continuous improvement of clinical information systems



**Figure 1.** Domains of Clinical Informatics.

# Scope of Clinical Informatics

- AMIA Core Content for Clinical Informatics, 2009
  - Assess information and knowledge needs of health care professionals and patients
  - Characterize, evaluate, and refine clinical processes
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**Figure 1.** Domains of Clinical Informatics.

# Clinical Decision Support - Defined

Providing clinicians, patients or individuals with knowledge and person-specific or population information, intelligently filtered or presented at appropriate times, to foster better health processes, better individual patient care, and better population health

# Clinical Decision Support - Defined

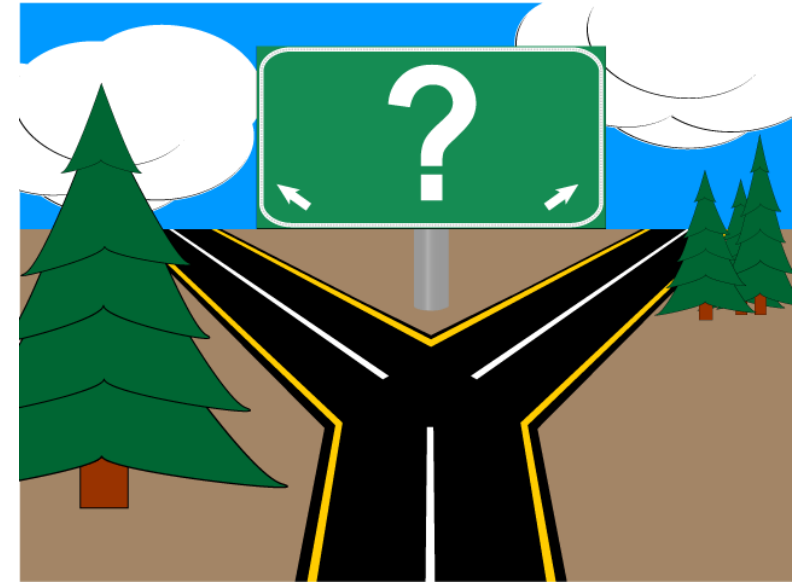
Providing **clinicians, patients or individuals** with **knowledge and person-specific or population information**, intelligently filtered or **presented at appropriate times**, to **foster better health** processes, better individual patient care, and better population health”

# Clinical Decision Support (CDS)

- Adding the capability to AID clinical judgment
  - Does NOT make clinical decisions for providers
  - OFFERS information to providers to PAIR with their clinical knowledge
- Driven by knowledge
- MUST take clinical workflows and goals in account
- End game is to improve patient outcomes and overall health

# Why do we need Clinical Decision Support?

- ALL medical decisions involve uncertainty; many involve risk
- The following are rarely 100% "certain" in medicine:
  - Patient histories / accounts of health
  - Results of lab / procedural testing
  - Diagnosis of disease
  - Natural course of disease
  - Effects of treatment
  - Patient outcomes



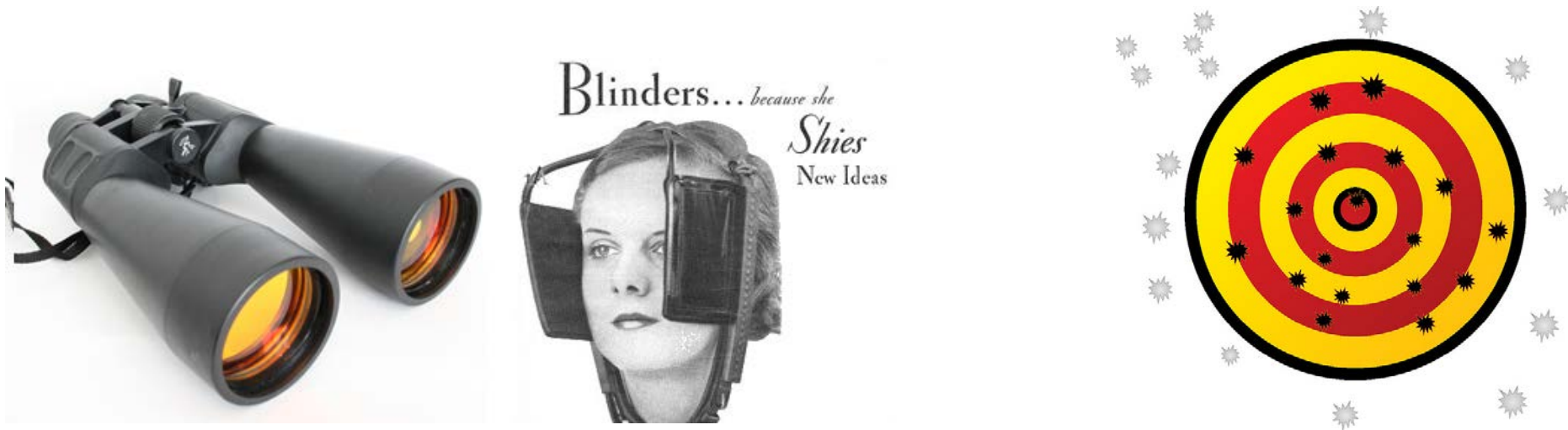


# Challenges in Clinical Decision Making

- Goal is to move quickly from chief complaint → clinical history → findings/results → diagnosis → therapy → outcome
- In many cases, there is no definitive answer
  - Each patient can be both unique and complex
  - Getting to an acceptable answer takes time

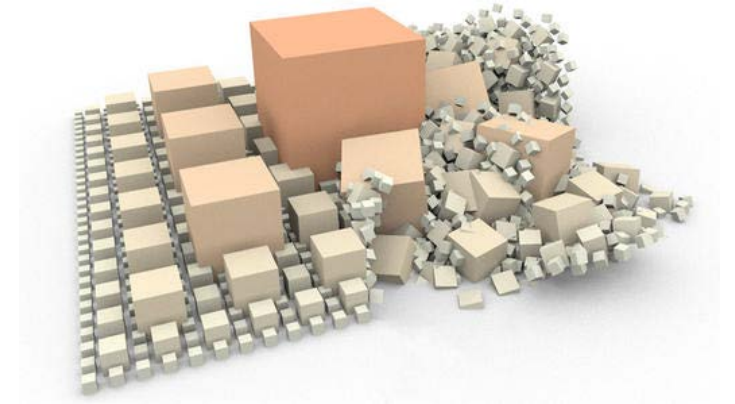
# Challenges in Clinical Decision Making

- Issue → TOO MANY variables to test everything
  - Increased complexity of testing
  - Increased numbers of tests available
    - E.g. Mayo Medical Laboratories lists **over 3400** tests in their test catalog!!
- For many clinicians, approach is to:



# Bringing Order to Chaos

- “Five Rights” of Clinical Decision Support
  1. The right information
  2. To the right person
  3. In the right intervention format
  4. Through the right channel
  5. At the right time in workflow



From: The five rights of clinical decision support: CDS tools helpful for meeting meaningful use [Internet]. [Cited 21 May 2017].  
Available from: [http://library.ahima.org/xpedio/groups/public/documents/ahima/bok1\\_050385.hcsp?dDocName=bok1\\_050385](http://library.ahima.org/xpedio/groups/public/documents/ahima/bok1_050385.hcsp?dDocName=bok1_050385).

# The Right Information

- Evidence-based information
  - From literature, national guidelines, national performance measures, expert opinions
  - Source of information should be clear to user (e.g. link to guidelines)
- ONLY ENOUGH information for the user to act on

# The Right Person

- GOAL: present information only to individuals who can take action
- Examples:
  - Medication alert requiring a change in dose should be triggered within physician workflows (since they are responsible for changing the dose) and not nursing workflows
  - Refine order preference lists for each clinical subspecialty (one size does not fit all!)

# The Right Intervention Format

- Identify issue/problem and choose the best format for resolution
- Requires knowledge of current systems to determine CDS tools available
  - Included in HIS
  - Developed in-house
  - 3<sup>rd</sup> party vendor

# The Right Intervention Format

- Various CDS formats:
  - Computerized alerts, reminders, and prompts
  - Order sets
  - Documentation templates, Smart forms
  - Protocols
  - Patient monitoring systems
  - Reports and summaries
  - Decision algorithms
  - Knowledge and references

# Alerts

The screenshot displays a medical software interface with a top navigation bar containing tabs: Home, Select, Desktop, Chart: Medications, Oncology, Custom, PG, Reports, Admin, Sign, Other EMRs, Results, ?, Resource, and Popup. Below the navigation bar, a red circle highlights an alert: "Allergies: Penicillins - Itching".

The main area shows a medication entry form with tabs: Basic, Variable, and Alternate. The "Basic" tab is active, showing fields for Dose (10 MG), Strength & Form (10MG TABLET), and Take (1). Below these fields is a yellow box labeled "Special Instructions".

On the right side of the form, there are checkboxes for "Patient Understands" and "Expire". Below these is the text "Initially Entered: 05/04/2015" and a link "Add 2nd Rx".

At the bottom of the form, there is a section for "Add to" with checkboxes for "My" and "Practice", and a field for "Favorites as:". To the right of this section are radio buttons for "Rx" (selected) and "no Rx".



# Order Sets

▼ ICU: IP Sepsis Admission — **Required**

Add Order

▼ Patient Care — **Required**

▼ Admission — **Required**

- ☐ Admit to Inpatient with Anticipated Length of Stay Across Two (2) Midnights
- ☐ Admit to Inpatient per CMS Addendum E for procedure/surgery (CMS Inpatient Only List)
- ☐ Place in Observation With Anticipated Length of Stay LESS than Two (2) Midnights
- ☐ Place in Ambulatory
- ☐ Admission/Obs/Amb Order Previously Entered

## ▼ Vital Signs/Monitoring

☒ Adult Cardiac Monitoring - Uninterrupted



**P** ROUTINE, UNTIL SPECIFIED starting Today at 1606 Until Specified  
Type of Cardiac Monitoring: Uninterrupted

☐ Arterial Pressure Monitoring

EVERY HOUR & AS NEEDED

☐ Central Venous Pressure (CVP) Monitoring

EVERY HOUR & AS NEEDED

☐ Continuous Pulse Oximetry

ROUTINE, UNTIL SPECIFIED

☒ Orthostatic Blood Pressure & Heart Rate

ROUTINE, ONCE First occurrence Today at 1606, On Admission

☐ Pulmonary Artery Pressure Monitoring

☐ Pulmonary Wedge Pressure

☒ Strict Intake & Output

ROUTINE, EVERY HOUR First occurrence Today at 1606 Until Specified, Intake and output documentation to include ALL fluids and/or meds administered as well as, any drain(s) output if applicable.

☒ Vital Signs

ROUTINE, EVERY HOUR First occurrence Today at 1606 Until Specified  
Continue Vitals Throughout the Night: Yes

☒ Weight Once

ROUTINE, ONCE First occurrence Today at 1606, Once on Admission

☒ Weight Daily (0600)

ROUTINE, DAILY (0600) First occurrence Tomorrow at 0600 Until Specified

## ▼ Laboratory

### ▼ Arrival

☐ Arterial Blood Gas

ONCE

☐ Basic Metabolic Panel

ONCE

☐ Blood Culture (Bacterial & Fungal)

ONCE, Peripheral #1

☐ Blood Culture (Bacterial & Fungal)

ONCE, Peripheral #2

☐ Blood Culture (Bacterial & Fungal)

ONCE, Central Line

☐ C. difficile Toxin Assay by PCR and Contact Isolation Panel

☐ CKMB Isoenzyme Panel

ONCE

☐ Complete Blood Count

ONCE

☐ Comprehensive Metabolic Panel

ONCE

☐ Cortisol

ONCE

☐ Differential

ONCE

☐ Hepatic Function Panel

ONCE

☒ ICU Methicillin Resistant Staph Aureus Screen by PCR

**P** ROUTINE, ONCE First occurrence Today at 1606  
Specimen Source: NASL  
Regular Swab

☐ Lactic Acid

ONCE

☐ Mixed Venous Blood Gas

ONCE, Central Line.

☐ Partial Thromboplastin Time

ONCE

☐ Prothrombin Time/INR (PTI)

ONCE

☐ Renal Function Panel

ONCE

☐ Respiratory Culture & Stain

ONCE

☐ Tobramycin Peak Assay

☐ Tobramycin Trough Assay

☐ Urinalysis Chemistry Screen w/Microscopic

ONCE

☐ Urinalysis Chemistry Screen w/Microscopic and Culture Reflex

ONCE

☐ Urine Culture - Select One if Appropriate

☐ Vancomycin Trough Assay



## Medications - Infectious Disease/Antibiotics

### \*\*\*PLEASE READ THE FOLLOWING INFORMATION - Empiric Antibiotic Therapy\*\*\*

Please select one of the following regimens. Page the PharmD Resident on-call (CCD - #6338 or Mitchell - #4230) for dosing recommendations in renal impairment.

#### ID Empiric Therapy: Preferred Option

Please select cefepime AND vancomycin AND metronidazole.

A loading dose is recommended for VANCOMycin.

Add TOBRAMycin if initiating a vasopressor.

- ☐ cefepime (MAXIPIME) 1 g ICU panel for extended infusion (Adjust in Renal Impairment)
- ☐ cefepime (MAXIPIME) 2 g ICU panel for extended infusion - If TBW is Greater than or Equal to 80 kg (Adjust in Renal Impairment)
- ☐ vancomycin (VANCOCIN) IVPB (loading dose, max 2,500 mg - if patient morbidly obese (BMI greater than or equal to 40 kg/m<sup>2</sup>) max loading dose - 3000mg) - PK consult #4229 recommended for further dosing  
Intravenous, ONCE
- ☐ vancomycin (VANCOCIN) IVPB (maintenance dose, max 2,000 mg - time to start 12 hr after the loading dose; PK consult #4229 recommended)  
Intravenous, EVERY 12 HOURS, Starting H+13 Hours
- ☐ vancomycin (VANCOCIN) IVPB (maintenance dose, max 2,000 mg - time to start 24 hr after the loading dose; PK consult #4229 recommended)  
Intravenous, EVERY 24 HOURS, Starting H+25 Hours
- ☐ metronidazole (FLAGYL) 500 mg in 100 mL IVPB  
Intravenous, EVERY 8 HOURS

# Smart Forms

## Smart View: Data Display

SmartView

Filter by

☒ CAD ☒ DM ☒ Smoker

Detected: CAD,DM,Smoker

**Problems** Procedures

**CAD-related**

- Diabetes mellitus type 1 03/06/06
- Coronary artery disease 10/10/06

**DM-related**

- Diabetes mellitus type 1 03/06/06
- Coronary artery disease 10/10/06

**Other**

- Onychomycosis 10/10/06
- Elevated creatine phosphokinase 10/10/06

**Medis** Non-Medis

**Anti-Hyperglycemic**

**Aspirin/Antiplatelet**

- Acetylsalicylic ACID 325 MG (325MG TABLET take 1) PO QD 10/10/06

**ACE-I/ARB**

- Lisinopril 10 MG (10MG TABLET take 1) PO QD 10/31/06

**Beta-Blockers**

- Acetabulol HCL 200 MG (200MG CAPSULE take 1) PO QD 10/10/06

## Smart Documentation

Note Graphs Patient View

Subject: Routine Visit 11/1/2006

**History of Present Illness** ✓

75 year old man with CAD, DM, and elevated CK presents to follow up on his various medical issues. He is having no problems taking his medications. I last saw him 3 months ago.

**Review of Systems** ✓

ROS: No F, C, N, V, SOB, cough, CP, palpitations, abd pain, urinary changes, bowel changes, vision changes, hearing changes, MS pains, rashes, headaches, tingling in limbs, increased sweating, depression, swollen glands, hay fever symptoms.

**Problems** ✓

**CAD-related**

- Diabetes mellitus type 1
- Coronary artery disease

**DM-related**

- Diabetes mellitus type 1
- Coronary artery disease

**Other**

- Onychomycosis
- Elevated creatine phosphokinase

**Procedures**

**Allergies**

Save & Exit Save as Final & Exit Exit

## Smart Assessment, Orders, and Plan

Orders: AVP

Execute Assessment

No recent LDL measurement

Patient is on anti-platelet therapy

Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)

Patient is due for Pneumovax (older than 65, no record of prior vaccination)

Patient is due for Influenza Vaccine (high risk medical condition)

Patient may be Current Smoker, not thinking of quitting. Last counseled on 10/10/06.

Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)

**Lipid Management**

No recent LDL measurement

- ☐ Order Lipid Panel now
- ☐ Order Lipid Panel With Direct LDL now
- ☐ Print instructions for fasting lipid panel
- ☐ Print outside lab request for fasting lipid panel

**Antiplatelet Therapy**

Patient is on anti-platelet therapy

**Blood Pressure Management**

Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)

Start an Other Anti-Hypertensives (Help Me Choose)

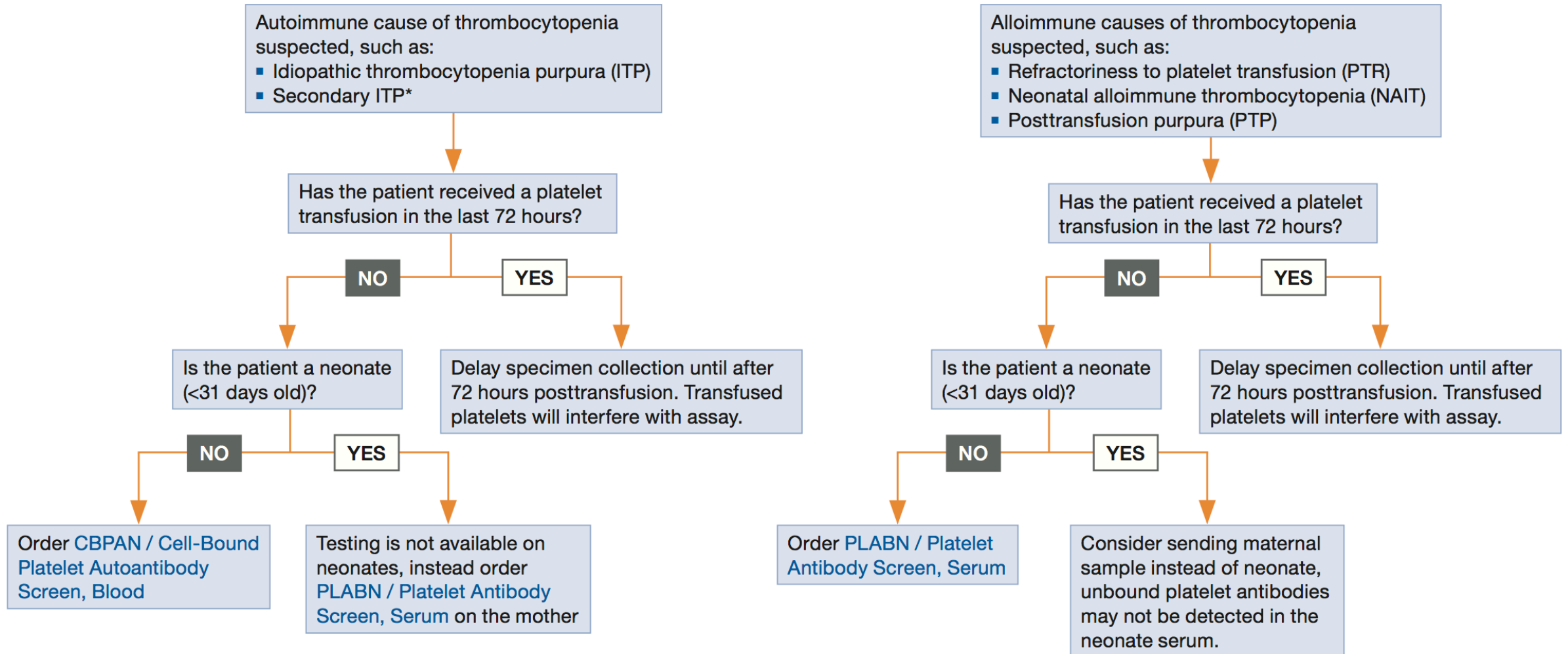
Adjust Oretic 25 MG (25MG TABLET take 1) PO QD

# Decision Algorithms

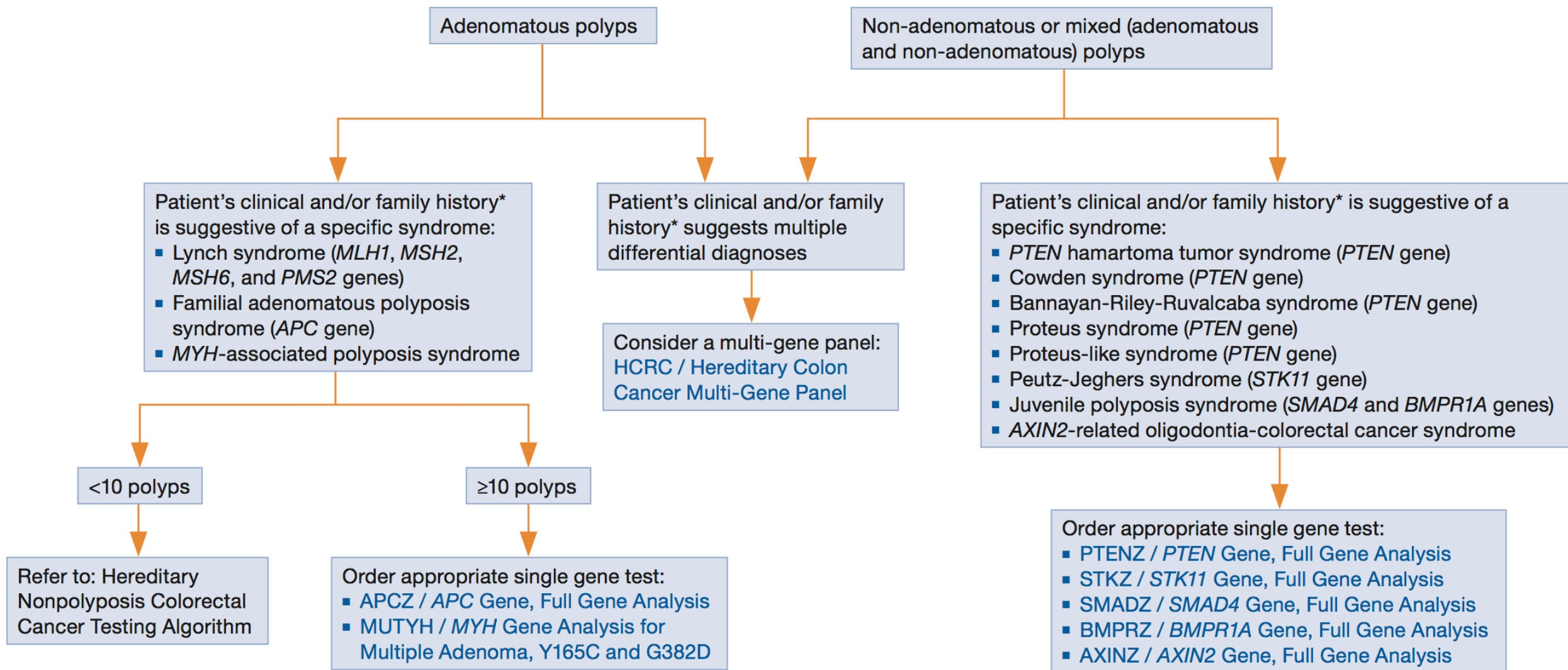
## Platelet Antibody Testing Algorithm



MAYO CLINIC  
Mayo Medical Laboratories



# Colonic Polyposis Syndromes Testing Algorithm





# The Right Channel

- What is the best way to communicate the information within the intervention to the right person?
  - EMR/EHR most common place today for providers
  - Third party application
  - Smartphone app
  - Web link
  - Secure email
  - Paging
  - Text messaging
  - Phone calls
  - Paper – labels, requisitions, forms



# The Right Time in Workflow

- For successful interventions, clinical processes must be:
  - Documented
  - Understood
  - Analyzed
- Requires subject matter expert involvement
- Intervention should **COMPLEMENT** the clinical workflow

# Workflow is IMPORTANT

- Clinician orders a medication for an patient for which a contraindication is present
- An alert fires as the physician sends the electronic script to the pharmacy
- ISSUE!!
  - Successful alert → poor timing
- Better solution
  - Fire alert upon order entry
  - Allows clinician to correct issue immediately, saves times
  - EVERY CLICK SAVED IS A WIN!!

*Synthesis of Research Paper* ■

# Ten Commandments for Effective Clinical Decision Support: Making the Practice of Evidence-based Medicine a Reality

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DAVID W. BATES, MD, MSc, GILAD J. KUPERMAN, MD, PhD, SAMUEL WANG, MD, PhD, TEJAL GANDHI, MD, MPH, ANNE KITTLER, BA, LYNN VOLK, MHS, CYNTHIA SPURR, RN, MBA, RAMIN KHORASANI, MD, MILENKO TANASIJEVIC, MD, BLACKFORD MIDDLETON, MD, MSc, MPH

**Abstract** While evidence-based medicine has increasingly broad-based support in health care, it remains difficult to get physicians to actually practice it. Across most domains in medicine, practice has lagged behind knowledge by at least several years. The authors believe that the key tools for closing this gap will be information systems that provide decision support to users at the time they make decisions, which should result in improved quality of care. Furthermore, providers make many errors, and clinical decision support can be useful for finding and preventing such errors. Over the last eight years the authors have implemented and studied the impact of decision support across a broad array of domains and have found a number of common elements important to success. The goal of this report is to discuss these lessons learned in the interest of informing the efforts of others working to make the practice of evidence-based medicine a reality.

■ J Am Med Inform Assoc. 2003;10:523–530. DOI 10.1197/jamia.M1370.

# Ten Commandments of CDS

1. Speed is everything
2. Anticipate needs and deliver in real time
3. Fit into the user's workflow
4. Little things can make a big difference
5. Recognize that physicians will strongly resist stopping

# Ten Commandments of CDS

6. Changing direction is easier than stopping
7. Simple interventions work best
8. Ask for additional information only when you really need it
9. Monitor impact, get feedback, and respond
10. Manage and maintain your knowledge-based systems

# Human Factors Engineering

- GOAL: Design systems to encourage a particular outcome
- Guiding principle:
  - Make it **easy to do the right thing** and **hard to the wrong thing**
- Examples
  - Contextually appropriate preference lists/pick lists
  - Orders only active for the services that use them (e.g. umbilical cord ABG orderable only for OB service, limit send outs to outpatient only)
  - Create a lab formulary

**Select and/or Search for Tests**

Double-click to select a test

CBC  
CBC with Diff  
PT-INR  
PTT  
U/A (urinalysis)  
Electrolytes  
Glucose  
BUN/Creatinine  
Calcium  
Magnesium  
Phosphorus  
Albumin  
Alk Phos  
Bilirubin (direct and total)  
AST/ALT  
Amylase/Lipase (plasma)  
LFTs (hepatic panel)  
Troponin T  
Sed rate (ESR)  
Ionized calcium  
Arterial blood gas (MORE)  
Crit Care Blood Gas (MORE)  
Capillary blood gas (MORE)  
Blood culture/sensitivity (MORE)  
Urine culture/sensitivity (MORE)  
Respiratory culture/sensitivity (MOF

Add &gt;

&lt; Remove

**Tests Selected**

Modify Additional Info.

**Ordering message****Collection Instructions (file with order)****Requested Collection Time for all selected tests**☒ Routine☐ Already collected☐ Fasting☐ STAT☐ Draw If/When☐ Special Billing/Research

Frequency x1

Total Collections 1

Start In AM 05/10/2014

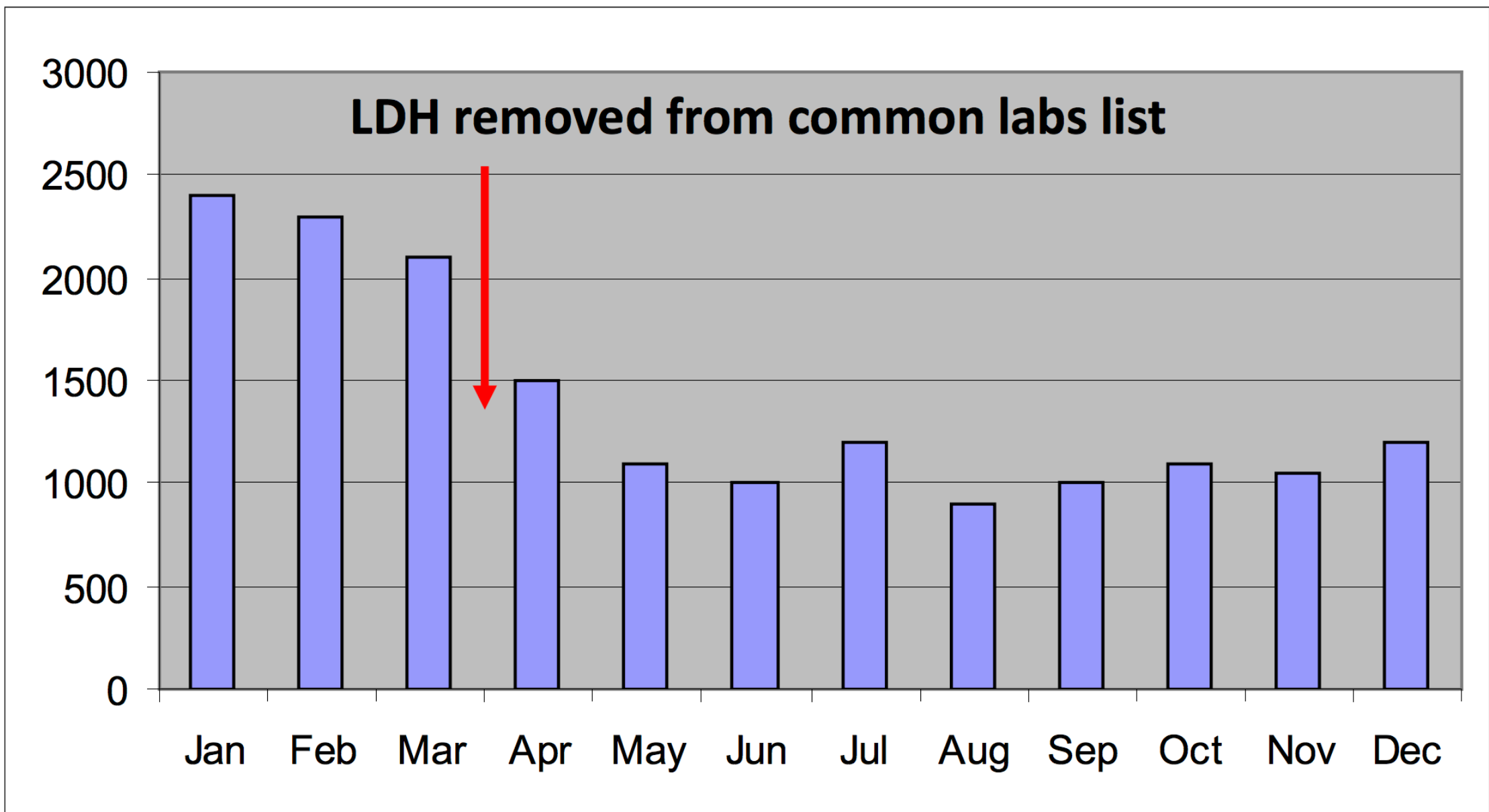
Side courtesy of Jason Baron, MD, MGH

Search

Help

OK

Cancel



Side courtesy of Anand Dighe, MD, PhD, and Jason Baron, MD, MGH



# Use Case: CDS in Whole Slide Imaging

- Issue: Whole slide imaging, by itself, adds time and cost to the typical surgical pathology clinical workflow
- Potential solution: With a completely digital workflow (using WSI) , we can add value to the process, reduce turn-around-time, improve quality, and increase case volume to offset increased costs

# CDS Tool #1

- Contextually driven workflow improvements
  - Use existing EMR and LIS data to identify contextually relevant data that aids in working up pathology cases
  - E.g. Part type = lung biopsy
    - Gather all relevant chest radiology (X-ray, CT, MRI)
    - Gather relevant prior surgical pathology cases (primary lung vs. metastatic secondary)
    - Gather relevant laboratory data, molecular data
    - Gather relevant clinical notes, op notes, etc.
- Can leverage tools from Radiology that perform similar functions

# Leveraging Informatics Tools from Radiology

The screenshot displays a medical informatics interface with a left sidebar and a main content area. The sidebar contains tabs for 'Summary', 'Orders', 'Rad Reports', 'Pathology Reports', 'Laboratory Result', and 'Feedback!'. The 'Summary' tab is active, showing the following information:

- Order summary**
- Procedure:** CT CHEST ABDOMEN PELVIS WO
- Diagnosis:** NEUTROPENIA, UNSPECIFIED
- Diagnosis Edits:**
- Clinical question:** 58 female with AML with neutropenic fever and abdominal pain. r/o pulmonary infiltrate vs. abdominal pathology. Avoiding IV contrast due to rise in creatinine
- Signs and Symptoms:** Neutropenic fever
- Problems List**
- Protocol notes**
- Tech notes**
- Scheduler notes**

The main content area on the right shows a list of studies (5) with columns for study number, description, and date/time. The first study is selected, displaying a CT scan of the abdomen. The scan is labeled 'DOMEN W' and shows a cross-section of the abdomen with various organs visible. Technical details at the bottom right of the scan include 'w/1: 500/55', '2.5mm', and '195 Images'. The interface also includes a 'Return to Worklist' button and a status bar at the bottom showing 'Internet' and the time '4:47 PM'.

Image courtesy of Paul Chang, MD

# Leveraging Informatics Tools from Radiology

The screenshot displays a medical informatics interface with two main panels. The left panel shows a 'Pathology Report' for a 'MOLECULAR DIAGNOSTIC REPORT' dated 2012-08-25. The report details a specimen received for 'A: Bone Marrow Aspirate for Molecular Diagnostics-S12-16045'. It includes procedures for 'NPM Mutation Assay', dates ordered and completed, and a detailed description of the assay: 'Sample DNA was extracted from peripheral blood or bone marrow aspirate sample. The genomic region of exon 12 of the nucleophosmin gene (NPM) was amplified by real time polymerase chain reaction (PCR) and analyzed by capillary gel electrophoresis. This assay is designed to detect the most common mutation: a four base pair insertion at a variable position within a specific 8 basepair tract of exon 12.' The report also states that the assay can detect the presence of this exon 12 NPM mutation when cells containing the mutation(s) comprise as little as 5% of nucleated cells, but the absolute lower limit has not been established. Clinical information notes a patient history of multiple myeloma and a therapy-related AML. The results comment states: 'There is NO evidence of the NPM mutation at or above the 5% level. The DNA amplified satisfactorily. All controls performed appropriately.' The report is signed by Loren Joseph, M.D. and includes a disclaimer about the test's development and performance characteristics.

The right panel shows a CT scan of the abdomen. The scan is labeled 'ABDOMEN W' and 'Series #3'. The image shows a cross-section of the abdomen with various organs visible. The scan parameters are listed as 'w/l: 500/55' and '2.5mm' slice thickness. There are 195 images in the series. The interface also shows a list of studies on the right side of the CT scan panel.

Image courtesy of Paul Chang, MD



# Leveraging Informatics Tools from Radiology

Image courtesy of Paul Chang, MD

The screenshot displays a medical informatics interface. On the left, a table lists laboratory results under the 'Laboratory Result' tab. The table has columns for Test, Unit, Reference, Date/Time, and Value. Results are categorized into Renal, Coags, Hematology, and Hepatic. On the right, a CT scan of the abdomen is shown, with a list of studies above it and patient information below it.

Test	Unit	Reference	Date/Time	Value
<b>Renal</b>				
CR	mg/dL	0.5-1.4	08-27-2012 07:34	1.0
			08-26-2012 07:09	1.3
BUN	mg/dL	7-20	08-27-2012 07:34	19
			08-26-2012 07:09	23
eGFR	mL/min/BSA	>59	08-27-2012 07:34	57
			08-26-2012 07:09	42
<b>Coags</b>				
PT	Seconds	11.8-14.5	08-27-2012 06:47	14.8
			07-30-2012 06:59	12.9
PTT	Seconds	24.0-34.0	08-27-2012 06:47	35.4
			07-20-2012 00:02	34.9
INR		0.9-1.1	08-27-2012 06:47	1.2
			07-30-2012 06:59	1.0
Platelets	K/uL	150-450	08-27-2012 07:13	17
			08-26-2012 07:16	5
<b>Hematology</b>				
HGB	g/dL	11.5-15.5	08-27-2012 07:13	8.5
			08-26-2012 07:12	8.9
HCT	%	36-47	08-27-2012 07:13	24.6
			08-26-2012 07:12	25.6
WBC	K/uL	3.5-11	08-27-2012 07:13	0.2
			08-26-2012 07:12	0.1
<b>Hepatic</b>				
Albumin	g/dL	3.5-5.0	08-27-2012 07:34	3.0
			08-27-2012 07:34	0.2

Studies:

- 5) abdomen with oblique (2v); 09/11/2002 - 12:19 pr
- 8) ct abdomen w/wo contrast; 09/11/2002 - 11:22 ar
- 6) abdomen with oblique (2v); 10/03/2001 - 11:47 ar
- 7) ct abdomen w/wo contrast; 10/03/2001 - 10:57 ar

Return to Worklist

CT Scan: A

MEN W w/l: 500/55  
#3 2.5mm 195 Images

Internet 4:47 PM

# CDS Tool #2

- Automating Image Analysis/Computational Pathology
  - Contextually driven prior to virtual slide delivery to the pathologist
- Example: Prostate biopsies
  1. Image Analysis to detect potential tumor
  2. If absent – prioritize and send to “negative for tumor” queue
    - Option – auto-verify and release negative result, similar to cytology and paps
  3. If present, perform:
    - Computational analysis to quantify tumor volume (if present)
    - Machine learning algorithms to estimate Gleason Grading
    - Order IHC on “questionable” cases
    - Prefill relevant data into synoptic report
    - Prioritize cases for pathologist

# A High Level View of Clinical Decision Support

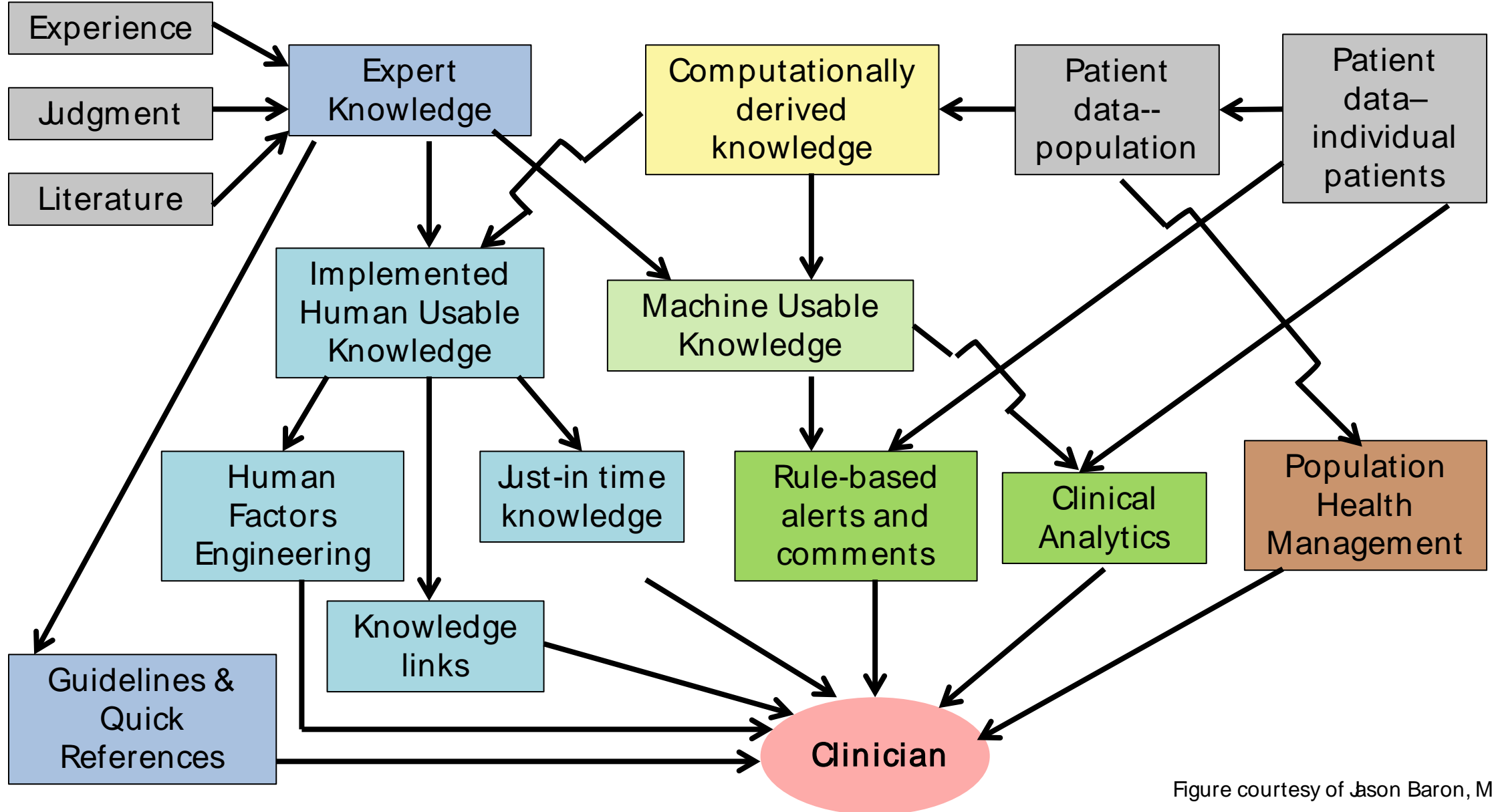


Figure courtesy of Jason Baron, MD

# Summary – Clinical Decision Support

- Clinical decision support is only possible with the proper implementation and support of Clinical Informatics
- Goal of CDS is to AID the clinician/provider by providing patient or population specific knowledge to foster better health
- Proper implementation can be summarized by the 5 "Rights" and the 10 Commandments of CDS



# Questions??

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