


THE ABC'S OF CBC'S

AN OPTOMETRISTS GUIDE TO ORDERING LAB TESTING

Todd A Zelczak, OD, FAAO
Midwest Optometric Society



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“The eyes are the window to your soul”

-William Shakespeare-





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PATIENT VISITS FOR ANNUAL EXAM






Category	Percentage
Eye Care	70%
Primary Care	30%



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BASICS OF LAB TESTING

- Lab order
- Lab testing
 - Blood draw
 - Urine sample
 - Swab testing
 - Skin testing
- Pre-test requirements
 - Fasting
 - Hydration

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BASICS OF LAB REPORTING

- Time sample collected
- Time sample analyzed
- Requesting physician
- Reference ranges and normative values based on population
- Abnormal flags

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Sample Report

Different laboratories generate reports that can vary greatly in appearance and in the order and kind of information included. This is an example of what a lab report may look like. Names and places used have been made up for illustrative purposes only. Point your cursor at a **HighlightArea** to learn about the different report elements.

University Medical Center, Dept. of Pathology 02/14/2008
 123 University Way, City, ST 12345 16:53

Doc: Mr. JOHN Q.

Patient ID No: 987654321 **D.O.B.:** 01/01/1944 **67Y/M**
Ordering MD: Smith, JANE MD **Physician Copy for Dr. Smith, JANE MD**

PT Medications: Multivitamin

Specimen(s) Collected: 2/10/08 14:30 **Lab Acct No:** 223456
Specimen(s) Source: **Date Reported:** 2/10/08 14:59

Comments: Specimen is non-fasting. M. hemolyzed

Test Name	Patient's Result	Ref. Range	Units
WBC	1124	3.8-10.1	mm ³
Hgb	130	130-145	mg/dL
Hct	38.5	38.5-51.1	mm ³
RDW	13.5	11.5-14.5	%
PLT	235	130-400	/mm ³
MPV	100	98-107	fL
Pct	11.0	7.4-10.9	%
CD	10.1	8.9-10.2	mg/dL
BUN	17	8-23	mg/dL
Creatinine	0.9	0.8-1.3	mg/dL

Key: L=Abnormal Low, H=Abnormal High, WNL=Within Normal Limits, *Critical value

Specimen(s) Collected: 2/10/08 14:30 Lab Acct No: 223456
 Specimen: Blood Date Reported: 2/10/08 15:30

THE COMPLETE BLOOD COUNT SAMPLE REPORT

Different laboratories generate reports that can vary greatly in appearance and in the order and kind of information included. This is an example of what a lab report for a Complete Blood Count may look like. Names and places used have been made up for illustrative purposes only. The horizontal key to the right identifies a key part of the report structure.

1	2	3	4	5	6	7
University Medical Center, Dept. of Pathology	Report Date/Time	02/10/08	16:53			
123 University Way, City, ST 12345	123456789					
Patient ID: 987654321	Age/DOB: 67Y/M					
Ordering MD: Smith, JANE MD	Physician Copy for Dr. Smith, JANE MD					
Doc: Mr. JOHN Q.	Collection Date/Time	02/10/08	14:30			
Specimen Source	Specimen Source					
Comments: Specimen is non-fasting. M. hemolyzed						
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Specimen(s) Collected: 2/10/08 14:30 Lab Acct No: 223456
 Specimen: Blood Date Reported: 2/10/08 15:30

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TYPES OF LAB TESTING

BE FAMILIAR WITH THE MOST COMMON TYPES

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Signs/Symptoms:

- General health screening
- Weakness, fatigue, bruising or bleeding

Ocular manifestations:

- Chronic sub-conj hemorrhages
- Unexplained CWS / retinal hemes
- Recurrent infections
- Recurrent inflammation (iritis, episcleritis)

Conditions:

- Blood disorders (anemia, leukemia)
- Underlying bacterial, viral, parasitic infection
- Underlying non-specific inflammatory disease

CBC W DIFF

COMPLETE BLOOD COUNT WITH DIFFERENTIAL

- Red blood cell count (RBC)
- White blood cell count (WBC)
- Hemoglobin
- Hematocrit
- Mean corpuscular volume (MCV)
- Platelets

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Signs/Symptoms:

- Fatigue
- Confusion or vertigo
- Nausea or vomiting
- Breathing problems

Clinical manifestations:

- New migraine (aura)
- Dizziness or cramping (acetazolamide)

Conditions:

- Kidney function
- Diabetic screening
- Dehydration
- Monitor medication effects

**BMP (CHEM-8)
BASIC METABOLIC PANEL**

Glucose
Calcium
Sodium
Potassium
Carbon Dioxide
Chloride
Blood Urea Nitrogen (BUN)
Creatinine

*Fasting Recommended

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CASE #1

- 37yof FEE
- Med hx: unremarkable
- Meds: multivitamin, BC pill
- BCVA 20/20 OU
- IOP 17/17
- SLE: unremarkable OU
- DFE: CWS noted OU
- BP: 112/72 ras



- PCP evaluation: Blood glucose/a1c WNLs
- CBC w Diff: Low hemoglobin and hematocrit levels
- Diag: Anemia

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Signs/Symptoms:

- Excessive thirst or hunger
- Excessive weight gain (Type II), loss (Type I)
- High BMI
- Frequent urination
- Blurred vision
- Associated RF's (HBP, Chol, Smoking, Inc BMI...)

Ocular manifestations:

- Young cataract patients
- Rx shifts
- Retinal hemes/CWS/exudate/MA's

Conditions:

- Diabetes
- Other

GLUCOSE TESTING

Fasting Plasma Glucose (FPG)
Glycosylated Hemoglobin Test (A1c)
Oral Glucose Tolerance Test (OGTT)

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Signs/Symptoms

- Transient vision loss
- In conjunction w Diabetic and Cardio work up

Ocular Manifestations:

- Amargosis Fugax/TIAs
- Hollenhorst plaques
- Unilateral/young corneal arcus
- Xanthelasma

Conditions:

- Hypercholesterolemia
- Cardiovascular risk

LIPID PROFILE


Total Cholesterol
High Density Lipoprotein Cholesterol (HDL)
Low Density Lipoprotein Cholesterol (LDL)
Triglycerides

*Fasting

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RETINAL VASCULAR DISEASE

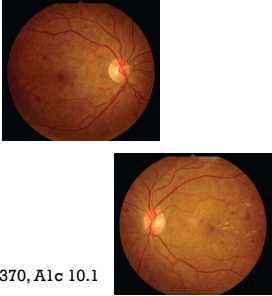
- Diabetic retinal disease
- Hypertensive retinopathy
- Sickle cell retinopathy
- Anemia
- Leukemia
- Hyperviscosity states
- Radiation retinopathy
- HIV retinopathy
- Ocular ischemic syndrome



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CASE #2

- 55yowm truck driver
- Cc: Reports glasses he got 6 mos ago not working anymore
- BCVA 20/20 OU -1.50D shift
- Med hx: unremarkable but hasn't been to PCP "several years".
- 1 pack/day smoker
- IOP 18/17 SLE: WNLs
- Fundus: see photos
- *BP 175/105 ras



- Patient referred to ER: Plasma glucose levels 370, A1c 10.1

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Signs/Symptoms:

- Chronic systemic inflammation (joint pain, rash, cough)
- Scalp or jaw pain, fever, malaise, diplopia
- Eye pain, photosensitivity, loss of vision

Ocular Manifestations:

- Uveitis (granulomatous, recurrent, bilateral)
- Chronic episcleritis/scleritis
- Unilateral/bilateral papilledema (ION)
- CRAO

Conditions:

- Inflammatory/Autoimmune disease (SLE, Sarcoid)
- **Giant-Cell Arteritis

INFLAMMATION MARKERS

ESR
(Erythrocyte Sedimentation Rate)


CRP
(C-Reactive Protein)

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CASE #3

- 72yo wm hx: controlled T2DM
- Cc: Reported vision loss OD 3 days
- Went to ER, MRI/CT/EKG/Carotid WNL's, released told vision would return
- Reported HA, R scalp tenderness, fever 1wk
- History 20-25lb weight loss, loss appetite, jaw pain
- VA OD HM OS 20/30 Ant Seg: WNLs IOP 17/17
- Fundus:?

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Diag: AION/Giant Cell Arteritis

- Immediate referral to ER for STAT ESR (85mm/hr), CRP (12mg/L), Temporal artery biopsy
- Immediate start of systemic steroids

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Signs/Symptoms:

- Eye pain/photophobia
- Dry eye, dry mouth
- Joint pain, Rash, Chronic cough, back pain
- Granulomatous nodules

Ocular Manifestations:

- Uveitis (granulomatous, recurrent, bilateral)
- Retinal vasculitis
- Severe dry eye syndrome

Conditions:

- Systemic Lupus Erythematosus (SLE)
- Rheumatoid Arthritis (RA)
- Ankylosing Spondylitis
- Sarcoidosis
- Inflammatory Bowel Diseases

AUTOIMMUNE INDICATORS

- Antinuclear Antibodies (ANA)
- Rheumatoid Factor (RF)
- Human Leukocyte Antigen (HLA-B27)
- Angiotensin Converting Enzyme (ACE)

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Signs/Symptoms:

- Recurrent or chronic symptoms related to ocular infections or inflammation
- Chronic cough
- Exposure to ticks

Ocular Manifestations:

- Hyperacute conjunctivitis/cellulitis
- Uveitis (granulomatous)
- Keratitis
- Retinal vasculitis/choroiditis
- Retinal CWS w/o known DM or HTN

Conditions:

- Chlamydia, Gonorrhoea, Syphilis, Herpetic disease
- Lyme Disease
- HIV
- Toxoplasmosis/Toxocariasis

INFECTIOUS DISEASE

- Enzyme-Linked Immunosorbent Assays (ELISAs) (LYME Disease)
- Fluorescent Treponemal Antibody Absorption (FTA-Abs)
- Rapid Plasma Reagin (RPR)
- Purified Protein Derivative (PPD) (skin test)
- Nucleic Acid Amplification Test (NAAT) (swab test)

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Table 2. Common Laboratory Tests^{1,2,3,4,5,6,7,8}

Test	Diagnostic Use with Anterior Uveitis
Complete Blood Count (CBC with diff)	Underlying bacterial or viral etiology
Erythrocyte sedimentary rate (ESR)	Measure of generalised inflammation. Non-specific to disease
C-reactive protein (CRP)	Marker of inflammation
Antinuclear antibody (ANA)	SLE or JIA
Rheumatoid Factor (RF)	Rheumatoid arthritis
Human leukocyte antigen B27 (HLA-B27)	BD (Crohn's), ulcerative colitis, ankylosing spondylitis, reactive arthritis
Human leukocyte antigen B51 (HLA-B51)	Behcet's disease
Fluorescent treponemal antibody absorption (FTA-abs)	Syphilis (current or past infection)
Microhemagglutination assay-treponema pallidum (MHA-TP)	Syphilis (current or past infection)
Rapid plasma reagin (RPR)	Syphilis (screen for active disease)
Western blot disease research laboratory (WBDR)	Syphilis (screening for active disease)
Lyme Titers	Lyme Disease
Enzyme-linked immunosorbent assay (ELISA)	Lyme Disease
Angiotensin-converting enzyme (ACE)	Sarcoidosis
Serum Lactoferrin	Sarcoidosis
QuantiFERON gold	Tuberculosis
Purified protein derivative skin test (PPD)	Tuberculosis
Chest X-ray (CXR)	Sarcoidosis, Tuberculosis

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CASE #4

- 44yo bf
- Cc: pain, photosensitivity and redness OD 4-5 days,
- Reported similar episodes in past
- SLE: Grade 2+ cell/flare in ant chamber OD
- Mutton-fat KPs inferior endothelium OD
- Early iris posterior synechia 7 o'clock
- Subcutaneous skin nodules noted on lids
- IOP: 12/18



- Plan: Anterior uveitis treated w Durezol/cyclople
- Suspect underlying granulomatous disease
- Testing: Elevated Angiotensin Converting Enzyme
- Positive Chest X-ray showed hilar lymphadenopathy
- MGMT: +Sarcoidosis, referral to pulmonologist

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CASE #5

- 15yowf non-CL wearer
- Chronic follicular conjunctivitis OD
- Unresponsive to Tdex given by Ucare
- SLE: Unilateral follicular rxn 3+ LL>UL
- 2+ Mucopurulent discharge
- Inferior limbal SEI w pannus 2+, neg PA node



- Unresponsive to topical steroids 1-2 wks
- Diff Diag: Adult Inclusion Conjunctivitis
- Plan: Azithromycin 1 g dose orally, marked improvement within 3 days
- Additional testing: Counseling, referral to PCP to r/o genitourinary infection (NAAT)

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Signs/Symptoms:

- Dry eye symptoms/Exposure
- Conjunctival injection/Exophthalmus/Pain
- Diplopia
- Heart palpitations, heat intolerance, weight loss, hair loss, skin rash (Hyperthyroidism)

Ocular Manifestations:

- EOM dysfunction (Diplopia-IMSLO)
- Lid retraction, exophthalmos
- Optic neuropathy

Conditions:

- Grave's Disease (TED)

THYROID TESTING

T3
T4
TSH
Orbital Imaging

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CASE #6

- 40yoAF "pressure behind eyes" onset few wks
- Denies diplopia
- Reports sleep difficulty, irritability
- Feels like eyes "more open"
- Weight loss 5lbs past year, current weight 96lbs

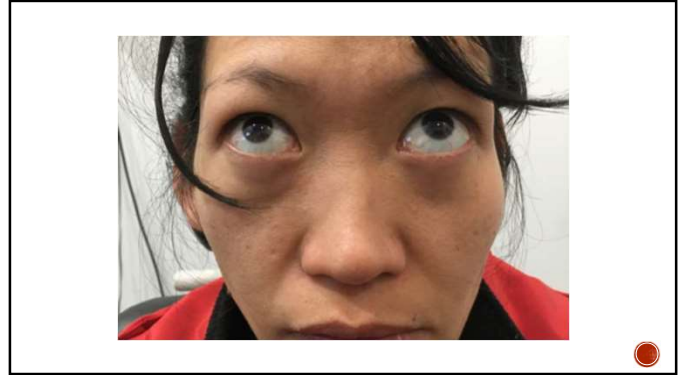


- BCVA: 20/20 OU IOP 16/17 -APD
- EOMs: possible OD restriction upgaze, -DV
- SLE: Incomplete closure OD>OS,
- Lid retraction OD>OS, 14/13 aperture, +scleral show
- Exoph: 15/13, proptosis OD on downgaze?
- Fundus: WNLs

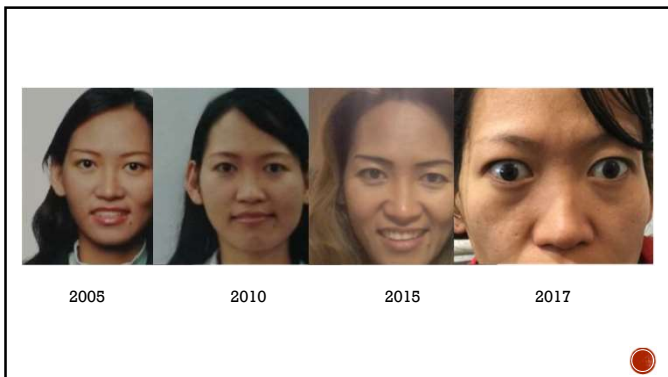
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CASE #6

Assessment:

- Suspect Grave's/Thyroid eye disease
- Pt reports previously suspected for hyperthyroid, never returned for testing

Plan:

- T3, T4, TSH testing
- Orbital imaging
- Lubrication for exposure risk
- Referral to endocrine/oculoplastics



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OTHER TESTING

- Liver
- Kidney
- Sickle Cell



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FIND LABS IN YOUR AREA TO WORK WITH

SUMMARY

- Couple that are geographically convenient
- Turn around times
- Protocol
- Pre-Printed Orders
- Relationships with PCPs and Specialists
- Be comfortable calling and sending patients to ER

Name _____	Date _____
R	
CBC with diff	FTA-ABS
Chem 8 (BMP)	RPR
ESR	Thyroid Panel (T4 & TSH)
CRP	HbA1C
HLA-B27	ANA
U Label _____	Time _____
Physician Signature/Printed _____	Dispense or Return _____

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