**COLOR VISION SCREENING**

**What is a screening test?**
- Quick
  - The color vision screening should take **seconds!!!**
- Very cost effective – inexpensive and fast
- Designed to detect or rule out a disorder or group of disorders
- Usually nothing more than detection or rule out

**Screening Test Characteristics**

**Sensitivity/Specificity**
- Should have at least good sensitivity
  - Sensitivity = ability to detect the targeted disorder(s)
- Should have high specificity
  - Specificity = ability to identify normals as normal

Optimal combination of sensitivity & specificity depends on the prevalence of the targeted disorder(s) in the population screened

**Color Vision Screening Sensitivity/Specificity Considerations in a General Population**
- Prevalence of congenital color vision deficit: 8.5%
- Example of test with: 90% specificity & 90% sensitivity
- 1000 patients → 915 color normal, 85 color defective
  - If 90% specificity then 10% of normals fail
    → (.1 x 915) = ~ 91 patients fail the color test who are not color defective !!

**Levels of Testing Color Vision Deficiencies – Screening**
- Purpose: Determine presence or absence of color vision deficiency
- Types of tests: Many test, mainly plate tests.
  - On your HRR plates use plates #6 through 10. (Demo plates, #1-4, are not scored).
- Cost: Included in a comprehensive exam cost (no additional cost)

**Levels of Testing Color Vision Deficiencies – Diagnostic Testing**
- Purpose: Classify type of color vision loss
  - Takes more time, greater expertise in administration/interpretation → costs more
  - On your HRR plates 11-24. However this is not a part of a comprehensive exam; we charge extra for this level of color vision testing.
- Type of tests: Some plate tests, color arrainment tests, anomaloscopes
- Cost: Included in CPT code 92283, color vision evaluation with report
### Levels of Testing Color Vision Deficiencies – Quantitative Testing

- **Purpose:** Quantify the degree of the color vision deficit. More time, more expertise in interpretation. On your HRR plates 11-24. However, this is not a part of a comprehensive exam; we charge extra for this level of color vision testing.
- **Types of tests:** Whatever tests necessary, usually 100 hue, anomaloscopes, few plate tests.
- **Cost:** Included in CPT code 92283, color vision evaluation with report.

### Why screen color vision?

- To detect the ~8.5% of individuals who have congenital color vision deficiency.
  - **Why?** Color deficiency may cause learning problems in children and occupational problems in teens & adults.
- To detect acquired color vision loss.

### Who should have color vision screening?

- **New patients (no prior comprehensive exam)**
- **All children**
- **Any patient reporting a color vision problem**
- **Those with certain vision problems:** unexplained vision loss, diabetes, mac degen, optic neuropathies etc.
- **Those on certain meds that may be retinotoxic or neurotoxic.**

### Why color vision screening for new patients?

- To detect/rule out any color vision deficiency.
- Establish a baseline against which to compare in the future in the detection of acquired color vision loss.
  - **Best to use a test that can detect both congenital (mainly R-G) color loss and acquired (often B-Y) color loss.**

### ECC Comprehensive Exam New Patient Tests

- Unaided VAs
- Keratometry
- Color vision screening
- Dilated fundus exam (DFE)

Performed on all new patient exams not necessarily after that.

### CONGENITAL vs ACQUIRED COLOR DEFICIENCIES

- **Type of color loss:** R-G vs B-Y
- **Laterality:** OU, equal vs monocular, unequal
- **Symptoms:** none vs common
- **Color naming:** normal vs impaired
- **Stability:** stable vs unstable if progressive disorder
- **Axis of color confusion:** usually well defined vs often mixed.
Color Tests to Detect Acquired Color Vision Loss

- Many plates tests do NOT test for B-Y (tritan) color vision loss
- HRR plate test does
- D-15 does
- Desat D-15 (Lanthony D-15) does but compromised specificity

Why not use the Dvorine color plates by the MacBeth lamp in PC Service rather than your HRR?

- Travel time: you have to get the patient to the Dvorine color test & MacBeth lamp; HRR done test in the exam room
- Testing time: 15 plates on Dvorine; only 6 plates on HRR
- Dvorine doesn’t test for B-Y (tritan) deficits; HRR does

TONOMETRY

- Clinical measurement of IOP by the application of a force to the globe
- Manometry – direct measurement of IOP by inserting a canula into the AC

Purpose of Tonometry

- To help detect and diagnose glaucoma by detecting certain characteristics of IOP which are statistically more common in those with glaucoma
  - One of several test used to help detect glaucoma
  - NOT “the test for glaucoma”
  - There is NO single test for glaucoma
- Glaucoma management – used to monitor IOP

Color Vision Screening at ECC with the Revised HRR

1. Educate patient – For each page please tell me if you see any figures and where each figure is
2. No tinted lenses; use trial frame if necessary. Test monocularly
3. Correct for 30 inches/75 cm
4. Screen in exam lane but turn off the incandescent lamp (stand lamp)
5. Present the demo plates (#1-4) first to assure understanding, cooperation
6. Screen with plates #5-10 only. Do not screen with the plates after #10.
7. Record as: HRR: OD 6/6 OS 6/6
Who Should Have Tonometry?

- All patients who can/will tolerate tonometry
- At each primary care eye exam
- If patient refuses – record in patient file but first advise that IOP is helpful in detecting glaucoma

Why would someone not have tonometry?

- AKA “tortuometry”
- “You gonna blast me in the face with that air blaster?”

NON-CONTACT TONOMETER (NCT)

- Developed by an OD in 1972
- Developed as a form of tonometry with no physical contact with the eye - no need for topical anesthetic
- No ocular contact was important because ODs had no legislation permitting use of diagnostic pharmaceutical agents (DPAs) – no topical anesthesia was available to ODs

Advantages of No Ocular Contact in NCT

- No need for anesthesia
- No risk of corneal abrasion
- No risk of spread of disease from the tonometer to the eye
- No need for fluorescein which can stain hydrogel lenses

Advantages of NCT

- No ocular contact
- Very good accuracy if multiple readings taken
  - Compares well to Goldmann tonometer (GAT) with multiple readings
  - But is GAT really that accurate???!!!
- Technically easy procedure; can be delegated

Disadvantages of NCT

- Expensive tonometer (~$5000 to 12,000)
- Patient apprehension is higher
  - Apprehension increases with time and increases the IOP (holding breath etc) in many cases
- Multiple readings necessary for best accuracy
- Subject to same errors that compromise accuracy of other applanation tonometers
  - Central corneal thickness, corneal curvature, biomechanical/viscoelastic properties of each individual cornea – corneal hysteresis etc.
**Effect of the Cardiac Cycle on NCT Readings**

- NCT measures IOP in 1-3 milliseconds
- During systole IOP increases due to blood rushing into the globe
- During diastole IOP decreases as blood rushes out of globe
- NCT reading is independent of cardiac cycle
- IOP change during cardiac cycle is as much as 2 to 4 mmHg so NCT readings can vary 2 to 4 mmHg — best to take several readings
- Many tonometers average many readings which averages the effect of the cardiac cycle

**Tonometry with the Marco Nidek NT-2000**

1. Wipe the forehead and chinrest with alcohol. _Same first step for every forehead/chin rest on every instrument._
2. Ask patient to remove glasses, CLs
3. Pt. ed and instructions
   - This instrument measures your eye pressure. It is helpful in detecting glaucoma.
   - It shoots a little puff of air to measure your eye pressure. I will need to take 3 or 4 readings.
   - Blink anytime you need; I will let you know when to hold your eyes open. Please breathe normally, please do not hold your breath.

**Tonometry with the Marco Nidek NT-2000 - Part 2**

4. Turn on instrument lower left side of base or clear any readings showing.
5. Pull the tonometer back. Have pt. place chin in chinrest and forehead firmly against forehead rest. _Please keep you forehead firmly against the headrest and teeth together at all times._ Remind them of this after the first reading. This helps to get QUICK readings. Quick readings reduce apprehension.

**Tonometry with the Marco Nidek NT-2000 - Part 3**

6. Press the RNG (IOP range) button until it reads APC – automatic pressure control.
7. Align the instrument while looking from the side but do not get too close to the patient’s cornea. Align vertically and horizontally with the dot.
8. Push down the safety stopper and at ~7-8 mm from the patient’s cornea release it to limit the forward motion of the NCT.

**Tonometry with the Marco Nidek NT-2000 - Part 4**

9. Move the joystick up, down, left or right to get a clear image of the patient’s eye. Then center the alignment spot and _tell the patient to look at the GREEN light (not the red one)._ 
10. Fine tune alignment if needed though it is automatic - the instrument will make fine alignment movements. You may be faster than the instrument though!!
Tonometry with the Marco Nidek NT-2000 - Part 5

11. Fine tune the distance from the cornea – there should be 4 horizontal bars above and 4 below the central alignment spot.
   If you see bars only BELOW the alignment spot then push forward slightly on joystick.
   If you see bars only ABOVE the spot then pull back slightly on the joystick.
   If there are 4 bars above and 4 below the airpuff will automatically trigger.

Tonometry with the Marco Nidek NT-2000 - Part 6

12. If the puff does not automatically trigger or triggers but cannot get a good reading:
   Most common cause – lashes in way.
   Have the patient blink then open eyes wide.
   Second most common cause is tearing.
   Have the patient blink several times, open eye and try not to blink.
13. Get 3 good readings on each eye.

Tonometry with the Marco Nidek NT-2000 - Part 7

14. All 3 good readings should be written in the chart. Do not print the readings – memorize & record them.

RECORDING NCT IOPs

- With NCT take 3 (three) good readings
- If IOPs vary by >4 mmHg retake one or more readings
- Always record the time of day
- Record all 3 good readings, not just the average. No need to record the average.
- Why record all good readings and not the average?
  - NCT 10, 16, 22/14, 16, 18 10:45 AM
  - The OD readings are MUCH more variable than the left though same average. In fact, OD readings should be retaken.