

**2020-2024**  
CERTIFIED PARAOPTOMETRIC  
(CPO) EXAM:  
**STUDY RESOURCES**



AMERICAN  
OPTOMETRIC  
ASSOCIATION<sup>®</sup>

# 2020-2024 CERTIFIED PARAOPTOMETRIC (CPO) EXAMINATION — STUDY RESOURCES

This document is a combination of all the recommended AOA study resources (listed in the checklist below) that any paraoptometric can utilize when preparing for a Commission on Paraoptometric Certification (CPC) examination which are housed in AOA EyeLearn. The CPO study resources are not a prerequisite for taking the paraoptometric certification examination given by the CPC. Using these study resources does not guarantee passing the paraoptometric certification examination given by the CPC. However, these study materials are created based on the most current CPC Exam Outline.

This resource is intended to be used in conjunction with all the CPO study materials that can be found on the [American Optometric Association \(AOA\) EyeLearn: Your Professional Development Hub](#). To access EyeLearn, you will use your AOA login credentials. If you do not know your login credentials or need to have a login created, please reach out to our Member Services Department ([memberservices@aoa.org](mailto:memberservices@aoa.org)).

Please note, EyeLearn is a member benefit which means non-member paraoptometrics will be charged a fee for any EyeLearn content they choose to access.

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## RECOMMENDED CPO STUDY RESOURCE CHECKLIST

- Certified Paraoptometric Review Course (CPO):
  - 2024 Paraoptometric Candidate Handbook
  - CPO Exam Outline
  - 2020-2024 Certified Paraoptometric (CPO) Exam: Study Resources
  - CPO Review Course (Webinar)
    - CPO Review Course Workbook (PDF)
    - Presentation Slides (PDF)
  - CPO Review Course Follow-Up (Webinar)
    - Presentation (PDF)
  - Optometric Terminology (PDF)
  - Test Taking Tips (PDF)
  - Para Certification Study Halls (ALL)
  - Basic Anatomy and Conditions of the Eye (Webinar)

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## CLINICAL PRINCIPLES AND PROCEDURES (36%)

### PREPARE PATIENT CHART FOR WORKUP

- Confirm patient's identity
- Obtain identification
- Obtain insurance card
- HIPAA Form

### RECORD CASE HISTORIES

**CHIEF COMPLAINT:** A concise statement of the symptoms that caused a patient to seek medical care.

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#### PATIENT INFORMATION:

- **Ocular History:** Do you or anyone in your **IMMEDIATE** family have any of the following:
  - Cataracts
  - Glaucoma
  - Macular Degeneration
  - Color Vision Deficiencies
  - Eye Trauma
  - Eye Surgeries
- **Pertinent Medical History:** Do you or anyone in your **IMMEDIATE** family have any of the following:
  - Hypertension
  - Diabetes
  - Cancer
  - Stroke
  - Heart Attack (myocardial infarction)
- **Additional Patient Information:**
  - Current Medications: Prescriptions, Over the Counter & Supplements
  - Allergies: Medical & Environmental
  - Social Habits: Tobacco, Alcohol & Substance Use
  - Nutritional Status
  - Sleep History (Importance): Sleep Apnea, Lagophthalmos – abnormal or incomplete closure of the eyelids & Myokymia – eyelids twitching (can be caused by stress, lack of sleep, lack of electrolytes, etc.)
  - Work/School/Hobbies: Important to know how a patient uses their eyes on a day-to-day basis

### PERFORM CLINICAL PROCEDURES

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#### BLOOD PRESSURE MEASUREMENT (MANUAL OR AUTOMATED)

- Blood pressure is the force of your blood pushing against the wall of the arteries.
  - How to check blood pressure with a sphygmomanometer and a stethoscope,

- Wrap cuff around upper arm (Proper cuff length can completely encircle upper arm with 80% of cuff)
- Lightly press the stethoscope's bell over brachial artery just below cuff's edge
- Rapidly inflate cuff to 180mmHg or higher
- Patient should refrain from talking during measurement
- 1<sup>st</sup> knocking sound (Korotkoff) = systolic pressure
- When knocking sound disappears = diastolic pressure

Blood Pressure Category	Top Number (systolic) in mm Hg	And/Or	Bottom Number (diastolic) in mm Hg
Normal blood pressure	Below 120	and	Below 80
Elevated blood pressure	120-129	and	Below 80
Stage 1 high blood pressure (hypertension)	130-139	or	80-89
Stage 2 high blood pressure (hypertension)	140 or higher	or	90-higher
Hypertensive Crisis (consult your doctor immediately)	Higher than 180	and/or	Higher than 120

## VISUAL ACUITY TESTING

Visual acuity is a measure of the clarity or sharpness of vision. The central area of the retina, the macula, is responsible for seeing fine detail. Visual acuity is the way we measure how much detail the eye can appreciate. The letter chart most often used to measure acuity at distance is called the Snellen Chart. Visual acuity is typically described as a Snellen Fraction.

**Snellen Fraction =  $\frac{\text{Testing distance}}{\text{Distance at which letter is standardized to be read.}}$**

The numerator (or top number) of the fraction is the testing distance, which is typically 20 feet. The denominator (the bottom number) represents the distance at which that letter is supposed to be read. When you see the Snellen fraction 20/20, for example, it means that the eye reads at 20 feet the letter that is standardized to be read at 20 feet. If a person read the 20/40 line on a visual acuity chart, that would indicate they could read at 20 feet the letter standardized to be read at 40 feet. Because different letters that are on the same line of the acuity chart vary in difficulty, a patient may not be able to read an entire line of letters. They may miss some letters on the smallest line they are able to see.

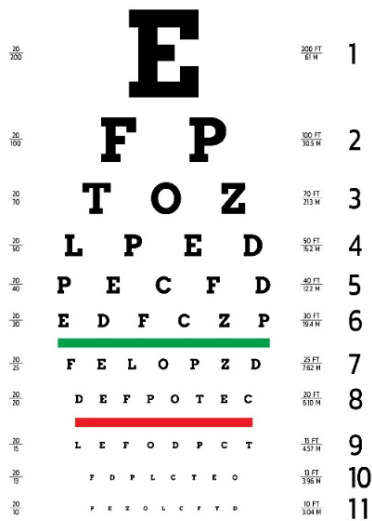
When this occurs, one usually records the line for which the patient reads all but one or two letters correctly. As you can see, 20/20 does not mean perfect vision; it just tells how well that small part of the visual system is performing.

Some additional visual acuity charts include Tumbling E and Allen Figures.

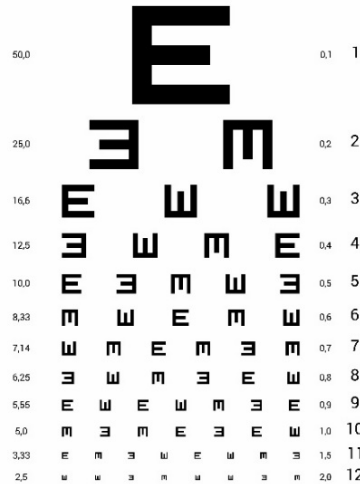
Tumbling E Chart (also known as an E Chart): Useful for patients who are unable to read the alphabet.

- Example: small children, non-verbal or non-English speaking patients.

Allen Figures: Useful for testing on children or a patient with a developmental disability. Instead of using letters, it uses familiar pictures such as a birthday cake, airplane and bird.



SNELLEN CHART



TUMBLING E



ALLEN FIGURE

#### Alternative Assessments of Visual Acuity

- Counting Fingers
- Hand Motion
- Light Perception
- No Light Perception
- Pinhole Acuity Testing: Determines if reduced vision is correctable by lenses
  - A pinhole occluder is a special occluder with one or many small holes. It can be paired with the Snellen Chart to determine whether a patient has a correctable refractive error or a retinal pathology. It functions as a rapid tool to screen for best-corrected visual acuity without having to refract the patient.
  - To perform pinhole acuity, the para has the patient place a pinhole over the eye being tested, and the para occludes the other eye. The patient lines the pinhole up to read the smallest possible line on the Snellen chart. The procedure is repeated for the opposite eye as well.
    - Increases depth of focus and decreases retinal blur
    - Visual acuity will increase if the patient's retina and visual pathway are free of abnormalities
    - Taken when visual acuity is worse than 20/30





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## STEREOACUITY TESTING

The measure of depth perception provides an indication of the level of sensory binocularity an individual has, meaning it measures the patient's fine depth perception through their ability to fuse stereoscopic targets. Stereo testing is performed with both eyes open while wearing polarized lenses. By wearing polarized lenses with different orientations for each eye, it allows each eye to see slightly different images. The brain fuses these different images together and it appears as if the image jumps off the page.

- Equipment: polarized glasses or red-green glasses, test booklet (Randot, Stereo Fly, etc.)
- Patient wears polarized glasses and holds stereo target @ 40 cm with lamp directed towards target
- Randot Stereotest - Has images in a group where only one image appears to be off the page. The patient must select the figure that appears to be closer to them than the others in each grouping to pass the test. The more the images are misaligned, the further the image jumps off the page towards the patient. The test gets harder as it goes on since the images are misaligned by smaller and smaller amounts. Each category corresponds with a level of stereopsis, measured in arcseconds. The amount of arcseconds the patient is able to see is listed on the back of the testing manual and is recorded in the patient's chart.
  - Simplified, identify which circle appears to be floating above the page or appears closest; stop when two consecutive incorrect answers are given.
- Stereofly - With the polarized lenses, the patient will see a fly with wings that stands off the page. The patient is instructed to pinch the wings. If the patient pinches the wings above the page, this is considered passing the test. If the patient doesn't see wings that come off the page then it is a fail.
  - Simplified - pinch wings of fly



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## COLOR VISION ASSESSMENT

Color vision deficiency is the inability to distinguish certain shades of color. The term "color blindness" is also used to describe this visual condition, but very few people are completely color blind. Color vision is possible due to photoreceptors in the retina of the eye known as cones. These cones have light-sensitive pigments that enable us to recognize color. Cones are found mainly in the macula, the central area of the retina. Each cone is sensitive to red, green, or blue light (long, medium or short wavelengths). The cones recognize these lights based on their wavelengths. Normally, the pigments inside the cones register

different colors and send that information through the optic nerve to the brain. This enables us to distinguish countless shades of color. But if the cones do not have one or more light-sensitive pigments, colors cannot be seen.

Color vision defects can be genetic (present since birth) or acquired (developed later in life). Acquired color vision defects occurs as a result of ocular, neurologic, or systemic disease. A wide array of conditions may affect color vision, ranging from diseases of the ocular media through the pathology of the visual cortex.

➤ Most common test types:

- Ishihara (Pseudo-Isochromatic Plates): tests for detection of red-green color deficiencies.
  - Equipment: occluder, lamp, test book
  - Test each eye separately
  - Ask the patient to identify a number or figure on the page



- D-15 (arrangement test):
  - Color blindness test based on a set of colored plates or discs which have to be arranged in the correct order. It identifies color vision deficiencies, such as red-green and blue-yellow deficiencies, as opposed to testing full-color acuity.
  - Example: Farnsworth Dichotomous Test
    - Organizing 15 color caps in order of color
    - Tester maps out the pattern to find which type of color anomaly the patient has using the panel.
  - Another Example: Farnsworth Dichotomous 100 Test: which uses 100 color caps.



- Color Deficits:
  - Red/Green (most common) - There are four types of red-green color deficits:
    - Deuteranomaly is the most common type of red-green color deficiency. It makes green look more red. This type is mild and doesn't usually get in the way of normal activities.
    - Protanomaly makes red look more green and less bright. This type is mild and usually doesn't get in the way of normal activities.
    - Protanopia (red) and Deuteranopia (green) both make you unable to tell the difference between red and green at all.
  - Blue/Yellow (less-common): There are two types of blue-yellow color deficits:
 

Note: This less-common type of color deficiency makes it hard to tell the difference between blue and green, and between yellow and red.

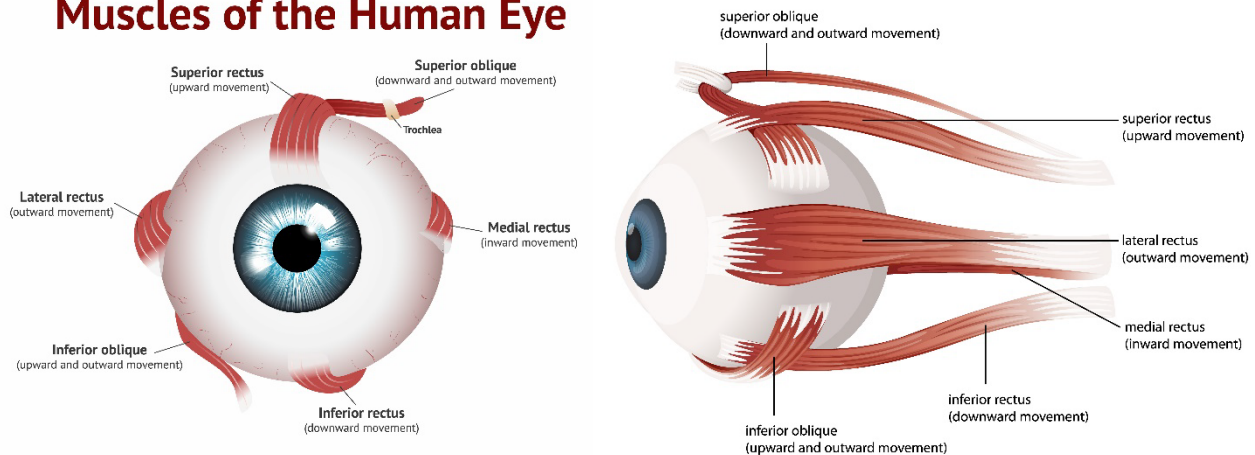
    - Tritanomaly makes it hard to tell the difference between blue and green, and between yellow and red.
    - Tritanopia makes you unable to tell the difference between blue and green, purple and red, and yellow and pink. It also makes colors look less bright.

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## OCULAR MOTILITY TESTING

Extraocular Muscles - The six muscles attached to the sclera from the bones surrounding the eye that serve to aim the eyes in the direction we wish to look. If not for the extraocular muscles, we would have to move our head each time we look at something else. The extraocular muscles are listed and defined below:

### Muscles of the Human Eye



#### Muscles of the Human Eye:

- Medial rectus - The most powerful of the extraocular muscles. Its only action is to turn the eye toward the nose (adduction).
- Inferior rectus - Its primary action is to turn the eye downward (depression). It also adducts the eye. Additionally, it can rotate the top of the eye toward the temple and the bottom of the eye toward the nose (extorsion/lateral rotation).
- Lateral rectus - Its only action is to move the eye away from the nose (abduction).

- Superior rectus - Its primary action is to move the eye upward (elevation). It also adducts the eye. Additionally, it can rotate the top of the eye toward the nose and the bottom of the eye toward the temple (intorsion/medial rotation).
- Superior oblique - Its primary action is intorsion. It is also responsible for depression and abduction.
- Inferior oblique - The only extraocular muscle that has its origin at the front of the orbit. Its primary action is extorsion. It is also responsible for elevation and abduction.

Cover/Uncover Testing & Alternating Cover Test: To assess the presence and magnitude of phoria (eye posture) or tropia (eye turn).

- Equipment: Visual Acuity Chart, Near Test Target, Occluder, Prism Bar
- The patient is asked to fixate on a distant or near target. The patient's eyes are observed. If they appear to be misaligned, one eye fixates and the other eye will either deviate outward (exotropia), inward (esotropia) or upward (hypertropia).
- There may be one eye that dominates fixation, or this may switch freely between the eyes.
- If an occluder is placed over the fixating eye, the deviated eye will rapidly re-fixate. Look for movement of the uncovered eye. This test is completed using a distance target and then a near target.
- If you then rapidly switch the occluder other eye, the previously covered eye will re-fixate. By the nature of the direction of these fixation movements, you can easily identify the problem, and measure it using prisms.
  - Cover-Uncover Test:
    - Cover portion tests for phoria vs. tropia
      - If one eye moves = tropia
    - Uncover portion test for unilateral vs. alternating tropias
  - Alternating Cover Test:
    - Move occluder from one eye to the other
    - Magnitude of deviation can be measured using prism bar

Direction of Eye Movement as Eye is Uncovered	Direction of Deviation	Direction of Prism Base for Neutralization
In	Exo	Base In
Out	Eso	Base Out
Up	Hypo	Base Up
Down	Hyper	Base Down

Extraocular Motilities (EOM): Assesses the patient's ability to perform conjugate eye movements.

- How to identify and properly record restrictions:
  - No glasses
  - Examiner holds penlight or fixating target and asks patient to follow target with eyes only
  - Examiner observes smoothness of movement, accuracy of following penlight, extent of movement and if gaze is full in all 6 positions of gaze.
  - Ask if there is pain or diplopia

- Recording EOM: SAFE



- Pursuits: Eye movement that allows patient to follow or track a smooth target.
  - Test – a near target is used at 40cm and is slowly moved in a circular pattern about the size of the patient’s face. The paraoptometric is looking for smooth and accurate eye movement while tracking the near target. Any non-smooth eye movements are noted, as well as any errors in following the target. Common errors in target tracking include lagging, catch-up and non-symmetrical movements.
- Saccades: Quick, simultaneous movement of both eyes between two or more phases of fixation
  - Test – two fixation points where the patient is asked to look alternately between the two spots. Evaluation is based both on speed and accuracy in finding the correct target. Common errors include overshooting or undershooting the target.

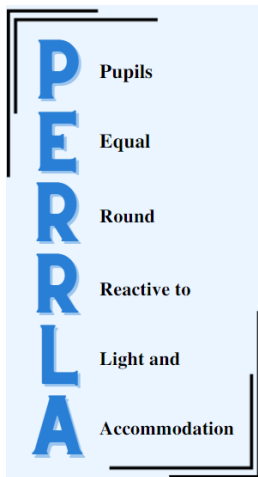
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## PUPILLARY RESPONSE TESTING

Assess afferent and efferent neurological pathways responsible for pupillary function. Normal pupil constriction and dilation occur as a result of a delicate balance between the sympathetic (fight or flight) and parasympathetic (rest and digest) nervous systems. Therefore, examination of the function of the pupils is utilized to evaluate the function of the patient’s nervous system.

- Equipment: Penlight, Distant Fixation Target
- Observe size and speed of pupil constriction in both eyes
- The examination of the pupil is often done in multiple steps.
  - Pupil size and shape in normal illumination should be noted. The paraoptometrics should specifically look for any signs of anisocoria (where one pupil is larger than the other) or a misshapen pupil.
  - Paraoptometrics should observe the direct pupil response or constriction of the pupil when the light is shone into the eye and pupil size should be measured again.
  - Paraoptometrics should observe that the opposite eye’s pupil should also constrict when light is shown in the first eye. This is known as the consensual pupil response.
  - Steps one through three are repeated with the opposite eye/pupil
  - Patient is given a small target to read at near distance while the paraoptometric monitors the patient’s pupil size. In normal functioning pupils, when a patient accommodates to read a small target, the pupils will constrict or get smaller.

- Last, a swinging flashlight test should be performed. In this test light is shone or swung back and forth in front of the two pupils. There should be a normal direct constriction in the pupil with the light and a consensual constriction in the pupil without the light. In the pupil abnormality known as a relative afferent pupillary defect or Marcus Gunn Pupil, when the light is directly shown in the affected pupil it will actually dilate or enlarge in pupil diameter a bit even though the light is shining in that eye. This occurs as a result of many neurological conditions and should be brought to the doctor's attention.
  - *Swinging flashlight test (Simplified)* - move light between eyes rapidly, if either or both pupils fail to respond directly or consensually then investigate deeper




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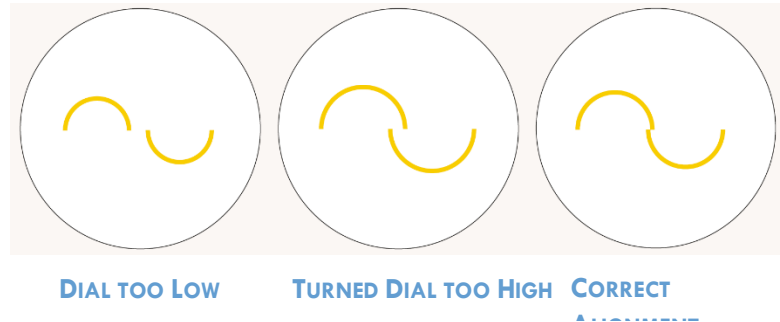
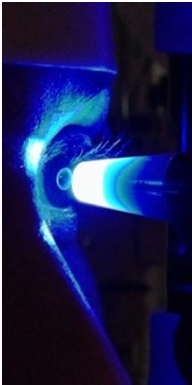
## TONOMETRY (CONTACT AND NON-CONTACT)

The test used to measure the intraocular pressure in the eye. It is also one of the tests used to diagnose glaucoma. Glaucoma is a condition in which the optic nerve, which carries the images we see to the brain, is damaged. With most forms of glaucoma, the intraocular pressure (IOP) is too high and causes damage to the optic nerve, cutting the blood supply to the retina. There are different instruments (tonometers) used to measure this pressure.

- Non-Contact Tonometer (NCT) - a device used to measure IOP. The NCT sends a puff of air against the eye to measure the pressure within. It does not require a numbing (anesthetic) drop in the patient's eye.



- Goldmann tonometer - the standard tonometer for accuracy. This tonometer has a small plastic probe and is mounted on a slit lamp biomicroscope. The patient requires fluorescein and an anesthetic drop because the probe needs to touch the cornea to get a reading.



- Tono-pen - another tonometer that requires an anesthetic drop to get a reading. The hand-held Tono-pen allows for pressure reading to be done away from the exam room.



- Rebound Tonometry - a portable handheld device to measure IOP. It uses a small rebounding probe that touches the cornea and quickly measures IOP multiple times to gather an average. Anesthetics are not necessary, and there is no startling burst of air.




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## CONFRONTATION VISUAL FIELD SCREENING

A quick and easy way to measure a patient's overall field of vision.

- Proper Testing Distance: 40-60cm
- How to Perform a Screening:
  - Comparing a known field of vision (yours) to an unknown field of vision (your patients).



- Test each eye separately.
- Hold up 1 or 2 fingers in each quadrant of peripheral vision.
- If you can see the fingers, the patient should be able to see them.
- Recording Restrictions:
  - Make sure to record any areas where the patient cannot see your fingers.
  - Remember that you are standing opposite of them when recording the location of the defect.
  - Record defects that are nasal, temporal, inferior or superior.

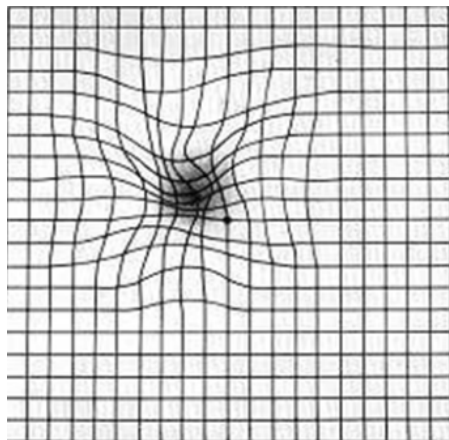
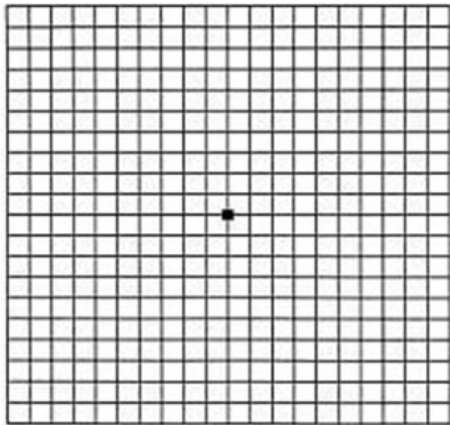
**FCF** - Finger Counting Fields Full to Confrontation

### AMSLER GRID TESTING

This is a simple tool to evaluate a patient's central vision. It is often used to detect vision problems that occur as a result of macular disease or degeneration. The grid is often sent home with patients so that they can self-monitor for any progression in vision changes.

- Conditions that Necessitate Testing
  - Macular Degeneration
  - Central Serous Retinopathy
  - Epiretinal Membrane
  - Cystoid Macular Edema
  - Pituitary Tumors
- Performing Test
  - This test is completed monocularly with correction on at a distance of 12" from the eyes.
- Recording Results
  - Does the patient see any areas of wavy lines or distortion (metamorphopsia)?
  - Does the patient see any missing pieces or black areas in the pattern (scotoma)?

Note: Make sure to record where the abnormalities are on the grid
- Home Test
  - Available on a tear pad for patients to check at home.
  - Have the patient check usually once a week.
  - Patient reports any abnormalities ASAP to their eye care provider.



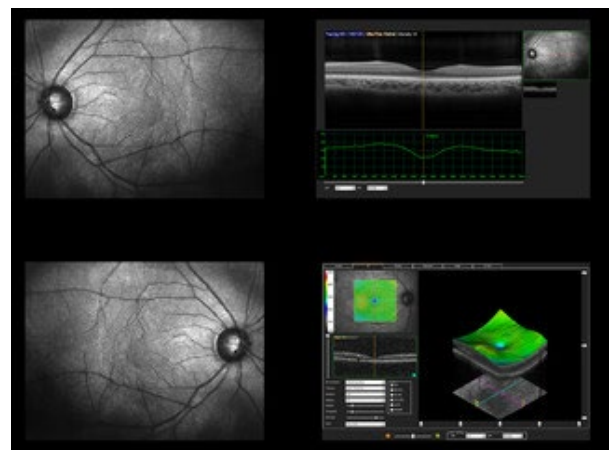
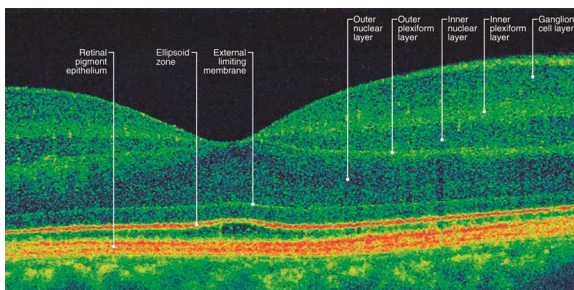


## TEST TO EVALUATE RETINAL AND OPTIC NERVE DISEASE AND DISORDERS

- Fundus Photography – taking pictures of the back of the eye, which are needed to document the health of the optic nerve, vitreous, macula, retina, and blood vessels.
  - It is a customized camera that uses high-power lenses that visualize the back of the eye by focusing light through the cornea, pupil, and lens.
  - These photographs are used for comparison, documentation, and sometimes to diagnose certain eye conditions.



- Ocular Coherence Tomography (OCT) – a laser-based, non-contact, non-invasive imaging technique that is capable of obtaining high-resolution images of the retina and its components as well as the optic nerve. It uses light waves to obtain cross-sections of the retina and optic nerve. Clinically useful in visualization of: Macular holes, Macular edema, Age-related macular degeneration, epiretinal membranes and central serous chorioretinopathy, optic nerve edema, optic nerve disease and glaucoma.

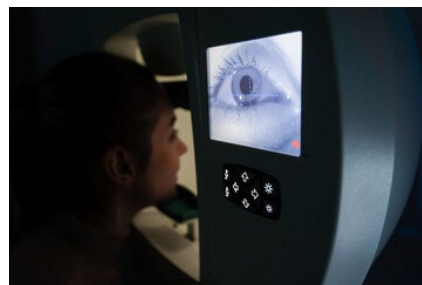


- Macular Pigment Optical Density (MPOD) – Measures macular pigment known as lutein and zeaxanthin
  - More lutein and zeaxanthin = more blockage of wavelength from sunlight and blue lights



- Visual Fields (Automated) - The visual field represents the area in space that is visible to the eye. The test used to measure this area is called *perimetry*. The test requires patients to report when they can see targets with their side or peripheral vision while they are looking straight ahead. This test can help differentiate the type of disease. Different machines: Humphrey, Dicon and Octopus

30-2	Measures 30 degrees temporally and nasally and tests 76 points
24-2	Measures 24 degrees temporally and 30 degrees nasally and tests 54 points
10-2	Measures 10 degrees temporally and nasally and 68 points



- Diopsy (Visual Electrophysiology) – Measures the electrical response of light-sensitive cells in the retina known as rods and cones. It helps diagnose both rare and common retinal conditions.
  - Electrooculogram (EOG) VS Electroretinography (ERG):
    - EOG – investigates abnormalities of the outermost layer of the retina. It assesses the function of the pigment epithelium.

- ERG – measures the electrical response of the retina to light. It places an electrode on the cornea after it has been numbed, allowing the doctor to evaluate the retina for disorders.
- The EOG has advantages over the ERG since the electrodes do not touch the surface of the eye.

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## SLIT LAMP EXAMINATION

Performed as part of the ocular health examination. It gives the doctor a highly magnified view of the structures of the eye, including the eyelids and lashes.

- Evaluates the health of the anterior segment of the eye.
  - Lids & Lashes: level of closure, debris/blepharitis status and lash quality & quantity
  - Conjunctiva: level of hyperemia (if present), any redundant tissue (i.e. Pinguecula/Pterygium)
  - Cornea: clarity, smoothness, limbal vasculature
  - Iris & Pupil: iris color, depth & PERRLA
  - Angle Evaluation: Gonioscopy – a test using mirrored lens that checks for signs of glaucoma by visualizing anterior chamber angle structures.
- It is used in conjunction with lenses to view the anterior chamber angle and ocular fundus.
- Used in the evaluation of contact lenses on the eye.
- This is the instrument used when performing the Goldmann Applanation Tonometry Test.



## DRY EYE DISEASE

### ➤ Testing

- SPEED Symptom Questionnaire: evaluates frequency and severity of dry eye symptoms

**SPEED™ QUESTIONNAIRE**

Name: \_\_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_ Sex: M F (Circle) DOB: \_\_\_/\_\_\_/\_\_\_

*For the Standardized Patient Evaluation of Eye Dryness (SPEED) Questionnaire, please answer the following questions by checking the box that best represents your answer. Select only one answer per question.*

1. Report the type of SYMPTOMS you experience and when they occur:

Symptoms	At this visit		Within past 72 hours		Within past 3 months	
	Yes	No	Yes	No	Yes	No
Dryness, Grittiness or Scratchiness						
Soreness or Irritation						
Burning or Watering						
Eye Fatigue						

2. Report the FREQUENCY of your symptoms using the rating list below:

Symptoms	0	1	2	3
Dryness, Grittiness or Scratchiness				
Soreness or Irritation				
Burning or Watering				
Eye Fatigue				

0 = Never    1 = Sometimes    2 = Often    3 = Constant

3. Report the SEVERITY of your symptoms using the rating list below:

Symptoms	0	1	2	3	4
Dryness, Grittiness or Scratchiness					
Soreness or Irritation					
Burning or Watering					
Eye Fatigue					

0 = No Problems  
 1 = Tolerable - not perfect, but not uncomfortable  
 2 = Uncomfortable - irritating, but does not interfere with my day  
 3 = Bothersome - irritating and interferes with my day  
 4 = Intolerable - unable to perform my daily tasks

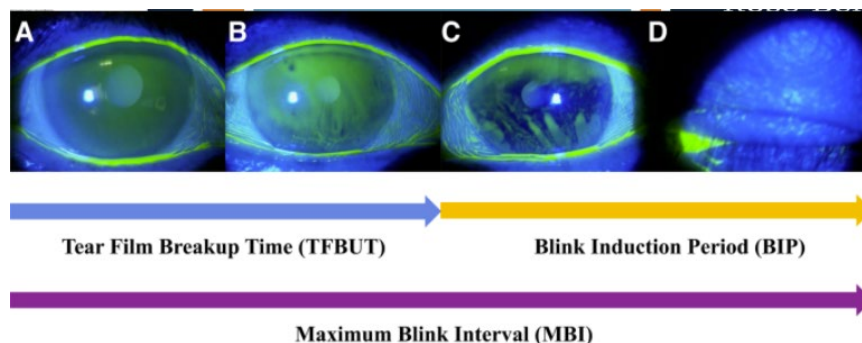
4. Do you use eye drops for lubrication?     YES     NO    If yes, how often? \_\_\_\_\_

Cornea 2019 Sep;32(9):1204-10  
 © 2011 TearScience, Inc. All rights reserved.  
 13-ADV-123 A

For office use only  
 Total SPEED score (Frequency + Severity) = \_\_\_/28

SPEED Questionnaire provided by: Korb, D. R., Scaffidi, R. C., Greiner, J. V., Kenyon, K. R., Herman, J. P., Blackie, C. A., Glonek, T., Case, C. L., Finnemore, V. M., & Douglass, T. (2005). The effect of two novel lubricant eye drops on tear film lipid layer thickness in subjects with dry eye symptoms. *Optometry and vision science* : official publication of the American Academy of Optometry, 82(7), 594–601. <https://doi.org/10.1097/O1.opx.0000171818.01353.8c>

- Tear Breakup Time (TBUT) - measures stability of tear film.
  - Place fluorescein on the conjunctiva
  - Patient blinks several times and hold eyes open
  - Count seconds until there are dark spot/streaks on cornea = dry spots
  - <10 second = unstable tear film





- Vital Dye Staining
  - Fluorescein
  - Lissamine Green
  - Rose Bengal



- Tear Volume (Schirmer's Test) – evaluates integrity of lacrimal secretion system
  - Measures amount of total excretion within 5 minutes
  - <5mm in 5 minutes = lacrimal insufficiency
  - >25mm in 5 minutes = excessive reflex tearing



- Tear Osmolarity (TearLab) – Objective and quantitative test that assesses tear film




- Tear Inflammation (InflammaDry) – tests tears for the enzyme known as matrix metalloproteinase-9 (MMP-9)
  - Identifies inflammation
  - Obtain tear sample and activates it with a buffer solution
  - Results: 2 lines = inflammation



- Meibography – images the meibomian glands
  - Meibomian Gland Evaluator or Expression
    - Responsible for oil portion of tear film
    - Dysfunction of meibomian glands leads to dry eye



- Treatment Options/Modalities
  - OTC Lubricating Eye Drops
    - Artificial Tears
    - Preservative Free Options
    - Liquid Gels
    - Ointments
  - Prescription Eye Drops
    - Restasis
    - Cequa
    - Xiidra
    - Tyrvaya
  - OTC Supplements
    - Omega 3 Fish Oils 
  - Mechanical or Heat Treatments
    - Hot Compresses
    - Thermal Pulsation – treatment of meibomian glands (Lipiflow, iLux & TearCare)
  - Intense Pulse Light Therapy
    - An in-office procedure focusing on reducing inflammation deep in the eyelids.

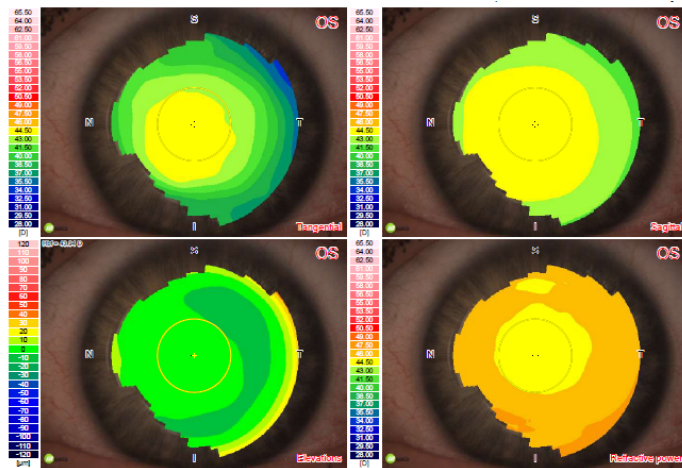
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## TESTING TO EVALUATE THE CORNEA

- Keratometry – Assesses curvature, power and toricity of the cornea.
  - Allows you to estimate the focusing power of the cornea, the amount of astigmatism present, and give an evaluation of the integrity of the front surface of the eye.
  - Measures 4 points across the cornea that are 3mm within the optic zone.

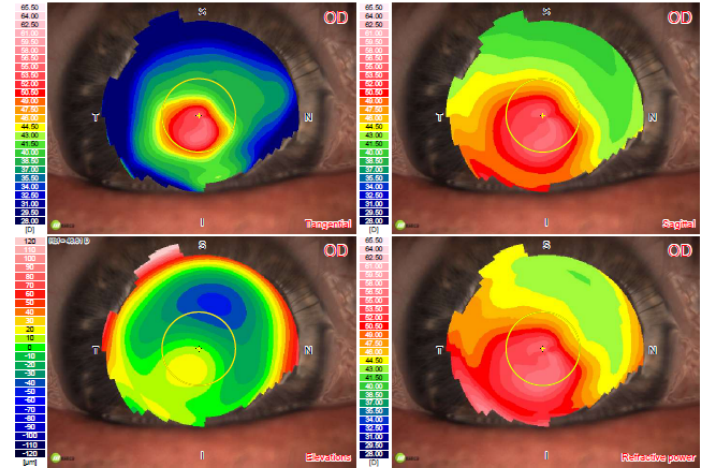


- Corneal Topography – imaging technology that maps surface curvature of the cornea.
  - Measures thousands of points across a much broader area of the cornea.
  - It is a special photography technique used to map the front surface.
  - It is used for screening patients before refractive surgery, for fitting contact lenses, for adjusting post-surgical corneal transplants, and for diagnosing refractive disorders and diseases.



Summary Indices	K readings	Shape indices
HVID* = 11.29 mm Pupil (Topographic) r = 0.04 mm @ 256° Ø = 3.37 mm	K1 = 44.27 D @ 1° K2 = 44.63 D @ 91° Avg = 44.45 D Cyl = -0.36 D Ax = 1°	rf = 44.51 D Ax 177° rs = 44.84 D RMS/A = 0.01 µm/mm²
<b>Keratoconus screening</b> AK = 45.12 D (r = 2.20 mm @ 247°) KVF = 1 µm (r = 1.64 mm @ 225°) SIf = 0.36 D BCV = 0.19 D @ 239° Rbf = 7.56 mm RMS/A = 0.03 µm/mm² Class: - 'Normal'	Q=3mm K1 = 44.38 D @ 3° K2 = 44.79 D @ 93° Avg = 44.58 D Cyl = -0.42 D Ax = 3° Q=5mm K1 = 44.30 D @ 3° K2 = 44.65 D @ 93° Avg = 44.48 D Cyl = -0.35 D Ax = 3° Q=7mm K1 = 44.15 D @ 3° K2 = 44.41 D @ 93° Avg = 44.28 D Cyl = -0.26 D Ax = 3°	Q=4.5mm rf = 44.69 D Ax 0° rs = 44.89 D p = 0.71 RMS/A = 0.03 µm/mm²

**NORMAL**



Summary Indices	K readings	Shape indices
HVID* = 13.08 mm Pupil (Topographic) r = 0.20 mm @ 148° Ø = 3.35 mm	K1 = 48.84 D @ 30° K2 = 51.78 D @ 120° Avg = 50.27 D Cyl = -2.94 D Ax = 30°	rf = 52.91 D Ax 22° rs = 55.12 D p = -1.69 RMS/A = 0.28 µm/mm²
<b>Keratoconus screening</b> AK = 56.71 D (r = 0.80 mm @ 267°) KVF = 21 µm (r = 0.82 mm @ 225°) SIf = 7.89 D BCV = 3.59 D @ 232° Rbf = 6.80 mm RMS/A = 0.24 µm/mm² Class: - Keratoconus compatible Area = 4.0 mm² Volume = 0.029 mm³	Q=3mm K1 = 50.96 D @ 30° K2 = 53.65 D @ 120° Avg = 52.27 D Cyl = -2.70 D Ax = 30° Q=5mm K1 = 49.24 D @ 25° K2 = 50.99 D @ 115° Avg = 50.10 D Cyl = -1.74 D Ax = 25° Q=7mm K1 = 47.84 D @ 17° K2 = 49.20 D @ 107° Avg = 48.51 D Cyl = -1.35 D Ax = 17°	Q=4.5mm rf = 51.57 D Ax 163° rs = 52.29 D p = -0.55 RMS/A = 0.24 µm/mm²

**ABNORMAL**

- Pachymetry – an instrument that measures the thickness of the cornea. It is used to monitor the progression of certain disorders that cause the cornea to become thickened (or filled with water), resulting in the loss of vision.
  - Uses reflections of light from the anterior and posterior corneal surface as a means to distinguish corneal layers and measure central corneal thickness.
  - Commonly used for glaucoma, refractive procedures and corneal conditions.
  - Average corneal thickness = 555 microns



- Specular Microscopy – a noninvasive instrument that evaluates corneal endothelium.
  - It analyzes the shape, size and population of endothelial cells.




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## ABERROMETRY

- A test that measures the way a wavefront of light travels through the cornea and lens.
  - Measures the optical monochromatic aberrations for the eye enabling objective assessment of the retinal image quality.
  - Analyzed three different ways:
    - Outgoing wavefront aberrometers
    - Ingoing retinal imaging aberrometers
    - Ingoing feedback aberrometers
  - Helps diagnose refractive error, distorted images, blurring, ghosting, starburst, poor night vision

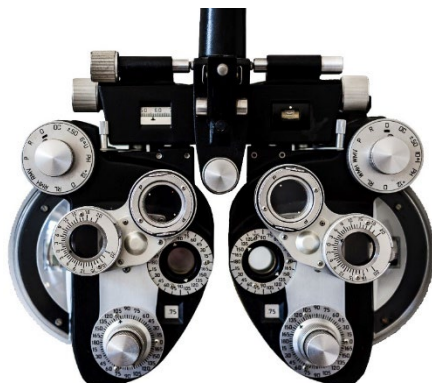



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## REFRACTION (MANUAL AND AUTOMATED)

Refraction is the bending of light rays as they pass through one object to another. The cornea and lens bend light rays to focus them on the retina. If the total refractive power of the eye is too strong or weak, it prevents the light rays from focusing on the retina which can cause blurry vision. A refraction exam determines what lens power will bring light into focus on the retina (clear vision).

- Types:
  - Undilated – Typical refractive exam, may not measure total refractive error if the patient is farsighted (hyperopic).
  - Cycloplegic – Eye drops are used to temporarily immobilize the ciliary body of the eyes, to identify a patient’s total refractive error.
  - Autorefraction – A machine that is used to measure how light changes as it comes into the eye, provides an objective estimation of refractive error.



PHOROPTER – USED FOR MANUAL

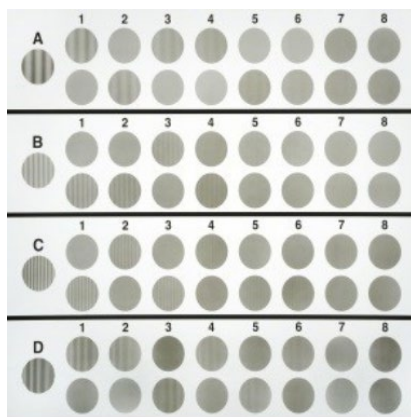


AUTOREFRACTION



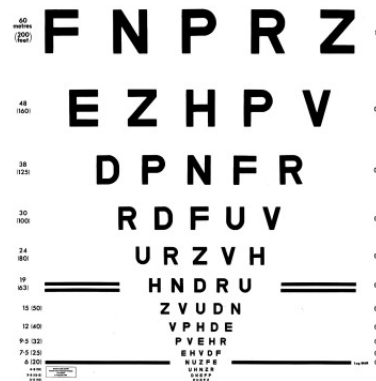
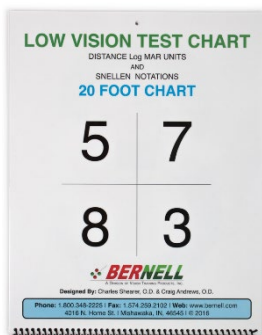
## CONTRAST SENSITIVITY

- Purpose of Test – Measures the ability to distinguish between different increments of light (i.e. light vs. dark). It is influenced by the pupil size and measures the least amount of contrast needed to detect a visual stimulus.
  - It is important to measure visual function, especially for situations of low light (nighttime, fog, glare). This is when an object and its background are often reduced.
  - Used to look for early symptoms of ocular diseases, such as cataracts.
- When should it be performed?
  - Does the patient have trouble seeing at night? Or do they notice that their eyes tire easily when reading or watching a screen?
  - Not typically included in a routine eye exam but the doctor might perform the test if the patient has specific visual complaints or if they suspect you have a condition affecting your ability to recognize contrast.



## LOW VISION

- Defined – Vision loss that cannot be corrected with glasses, contacts or surgery. There is limited sight, and it includes blind spots, poor night vision, and blurry sight.
- How it affects patients' activities of daily living (ADLs):
  - Six standard ADLs: bathing, dressing, toileting, transferring (getting in and out of bed or chair), eating and continence.
  - Patients who experience low vision can experience restrictions in their independence, mobility and educational achievement leading to symptoms of depression and feelings of anxiety.
  - They are at a higher risk for falls, fractures, injuries, poor mental health, cognitive deficits and social isolation.



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## SPORTS VISION

- Purpose - Evaluation includes standard eye exam-refractive condition, ocular skills and visual health and certain visual skills such as eye-hand coordination, peripheral awareness, response and reaction time, visual concentration and balance.
- Training Program: Goals are to improve visual performance related to specific sport.
  - Tracking- The eyes ability to follow target (ball). Important visual skill in dynamic sport where ball is moving.
  - Eye-hand coordination: Allows an athlete to react to incoming visual information with proper body part movements.
  - Reaction time: How quickly you can process the visual information into the necessary body part reaction.

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## VISION THERAPY

- Understanding Conditions
  - Convergence insufficiency – normal eye movements at a distance but unable to converge at near.
  - Accommodative disorders – “focusing system” does not perform properly at near.
  - Oculomotor disorders - saccadic dysfunction (point to point) and pursuit dysfunction (smooth movement, needed for fluency while reading). Eye turns/tropias.

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## CHAIR-SIDE SCRIBING

- Dictating exam findings from the doctor, typically in an electronic health record (EHR).
  - Observe patient
  - Update patient’s medical record
  - Write down results of tests
  - Help identify correct diagnosis and treatment/plan

## TRAUMATIC BRAIN INJURIES (TBI)

A traumatic brain injury occurs when sudden trauma causes damage to the brain. It can result from the head suddenly and violently hitting an object or when an object pierces the skull and enters the brain tissue.

- A TBI evaluation is similar in many ways to a vision therapy evaluation and is often provided by the same developmental/behavioral optometrists.
- Patients with a traumatic brain injury can experience difficulties with the following:
  - Vision blur and sensitivity to small changes in refraction
  - Light sensitivity
  - Binocularity (eye teaming)
  - Accommodation (eye focusing)
  - Oculomotor (eye tracking)
  - Peripheral vision (side vision)
  - Visual perception and processing
  - Balance
  - Motion sensitivity

## RECORD AND TRANSMIT PRESCRIBED MEDICATIONS

- E-Prescribe – allows doctor to prescribe medications directly/securely with a patients pharmacy
  - Brand vs generic, amount, sig & refills
- Dispense prescribed samples – Allows important to document samples dispensed to patients in their chart
- Transmit authorized refills – complete/copy medication refills

## DIAGNOSTIC & THERAPEUTIC MEDICATIONS

Ophthalmic drugs can be delivered in two different ways: topically in the form of eyedrops or ointments, or systemically, in the form of an oral or injected medication.

- Ocular drugs/medications can be used to aid in diagnosing eye conditions (diagnostic) or to treat eye conditions (therapeutic):
  - dilate the pupil for fundus examination
  - paralyze accommodation
  - constrict the pupil
  - treat eye conditions
  - anesthetize the eye
- Different types of drugs/medication:
  - Anesthetic drugs cause a temporary numbing of a nerve, which results in loss of feeling in the surrounding area.
  - Artificial tears and lubricants are used to treat keratoconjunctivitis sicca (dry eyes).
  - Cycloplegic (dilates) drugs dilate the pupil by temporarily paralyzing the muscle that constricts the pupil (iris sphincter muscle). A secondary act of a cycloplegic drug is preventing accommodation by paralyzing the ciliary muscle.
  - Injectable anesthetics, such as lidocaine (Xylocaine), are used to anesthetize the eyelids, globe and ocular muscles. These agents may be combined with epinephrine to cause constriction of the blood vessels, resulting in a decrease in bleeding.
  - Miotic (constricts) drugs act by stimulating the sphincter muscle of the iris, causing constriction of the pupil.
  - Mydriatic (dilates) drugs stimulate the iris dilator muscle, causing the pupil to dilate.
  - Ophthalmic stains, or dyes, are topically used to stain the eye. They outline defective areas of the cornea and conjunctiva. Ophthalmic stains can highlight defects in the blood vessels and retinal structures when injected intravenously. Sodium fluorescein, the most commonly used dye, is available in liquid form or impregnated on dry, paper filter strips. Liquid fluorescein is available mixed with an anesthetic for convenience in performing applanation tonometry.
  - Therapeutic drugs: A large variety of medications that treat eye conditions and disease.

## OPHTHALMIC THERAPEUTIC DRUG CATEGORIES

Type of Drug	Action
Glaucoma Medication	Reduction of intraocular pressure
Antibiotics	Treat virus-caused ophthalmic conditions
Antivirals	Treat ocular fungal infection
Corticosteroids (steroids)	Reduce inflammation
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)	Treatment of inflammatory conditions and ocular allergies without the side effects associated with steroids
Decongestant	Constricts conjunctival blood vessels to reduce eye redness
Antihistamines	Relief of seasonal or allergic conjunctivitis symptoms
Mast Cell Stabilizers	Relief of seasonal or allergic conjunctivitis symptoms
Low-Dose Atropine (0.01% or 0.05%)	Myopia control

## COMMONLY USED DIAGNOSTICS: CYCLOPLEGICS, MYDRIATIC, AND TOPICAL ANESTHETICS

Generic Name	Example of Trade Name	Concentration	Onset/Duration of Action
<b>Cycloplegics and Mydriatics</b>			
Phenylephrine	AK-Dilate	2.5% and 10% solutions	30-60min/3-5 hrs
	Mydrfrin	2.5% solution	
	Parenyd	1% solution	15-60min/4 hrs
<b>Hydroxyamphetamine</b>			
Tropicamide	Mydracyl	0.5% and 1% solutions	20-40min/4-6 hrs
Cyclopentolate	AK-Pentolate	1% solution	30-60min/2 days
	Cyclogyl	.05%, 1% and 2% solutions	
Homatropine	Isopto-Homatropine	2% and 5% solutions	30-60min/3 days
Scopalamine	Isoto-Hyoscine	.025% solution	30-60mins/4-7 days
Atropine	Isopto-Atropine	.05%, 1%, 2%, and 3% solutions	45-120min/7-14 days
<b>Topical Anesthetics</b>			
Proparacaine	Ophthetic, Alcaine	.05%	10-30sec/15-20 min
Tetracaine	Tetracaine	.05%	

\*Cycloplegics and mydriatics are used for pupil dilation and ciliary muscle suppression

**Note:** Every effort has been made to ensure that the drug dosage schedules within this text are accurate and conform to standards accepted at time of publication. However, as treatment recommendations vary in the light of continuing research and clinical experience, the reader is advised to verify drug dosage schedules herein with information found on product information sheets. This is especially true in cases of new or infrequently used drugs.

## PROVIDE PATIENT EDUCATION

As a patient goes through the intake process, it is natural for them to ask questions. It is the paraoptometric's job to educate the patient on the processes, diagnoses and procedures to be expected throughout the patient experience. This starts with the moment the patient is taken through the exam door and continues through the testing room. It is up to the paraoptometric to gauge the informational needs of each patient. Explaining testing procedures and disease education should always be done in a way that makes sense to someone with no background in eye care. Avoid using jargon and acronyms and stick to terms that make the patient comfortable. If possible, a paraoptometric can use digital aides and educational content videos to assist in informing patients on issues such as dry eye disease, contact lens care and surgery preparation. These small steps can save the doctor valuable time and give the patient a feeling of ease and understanding while in the clinic's care.

## ASSIST WITH SURGICAL PROCEDURES

- Lacrimal Irrigation – performed to open an obstructed tear duct and allow the tears to flow properly.
  - Informed consent is needed for this procedure
  - Make sure all instruments are disinfected
- Foreign Body & Rust Removal
  - Nonpenetrating foreign bodies can be removed after numbing the eye.
  - Loosely embedded corneal foreign bodies are often easily removed with a sterile cotton tip applicator, foreign body spud or a small-gauge needle.
  - Informed consent is needed for this procedure
  - Make sure all instruments are disinfected
- Myopia Management – the process of slowing down the progression of myopia in kids. Myopia is known as nearsightedness, which is usually caused by the eye being too long and can be corrected with a minus lens.
  - High myopes are at higher risk for retinal detachment (and other conditions) due to the shape of the eye (too long).
  - Methods of management:
    - Low dose atropine (eye drop)
    - Multifocal contact lenses (MiSight)
    - Ortho-K (reshaping the cornea with a specially designed and fitted contact lens, typically worn overnight and removed in the morning)

## MAINTAIN OPHTHALMIC EQUIPMENT

- Clean and calibrate equipment
  - Important to clean equipment between each patient. Each piece of equipment will have it's own recommended schedule for calibrating.
- Sterilize instruments and tools/Perform aseptic procedures
  - Prevent contamination from pathogens

## OPHTHALMIC OPTICS AND DISPENSING (20%)

- Potential responsibilities of a paraoptometric:
  - Meet with sales representative
  - Order eyewear
    - Specify the frame color, eye size, bridge size, and temple length.
    - Confirm the prescription for the lenses in each eye, patient's P.D. at far and near, lens design (single-vision, bifocal style, etc.), lens material, segment height (if not single vision) and any tints or coatings that should be used.

### COMPONENTS OF EYEGLOSS PRESCRIPTIONS

A spectacle prescription is a formal communication from a physician to the eyecare professional ordering/manufacturing lenses. The information noted can vary depending on the patient's needs.

#### SPHERICAL/CYLINDRICAL/AXIS

- Spherical (SPH) – Indicates correction for nearsightedness or farsightedness is needed. The correction needed is spherical and equal in all meridians of the eye. If the number appearing under this heading is a minus sign (-), the patient is myopic (nearsighted); if the number has a plus sign (+) or is not preceded by a plus sign or a minus sign, they are farsighted.
  - 1<sup>st</sup> number listed on Rx
- Cylindrical (CYL) – This indicated the amount of lens power for astigmatism and represents the difference in the greatest and weakest powers of the eye, usually separated by 90 degrees. If the column is empty, the patient has no astigmatism. When writing a prescription, cylinder power always follows sphere power in an eyeglass prescription.
  - 2<sup>nd</sup> number listed on Rx and represents astigmatism
- Axis – If an eyeglass prescription includes cylinder power, it also must include an axis. The axis indicates the angle (in degrees) that determines the angle of the cylinder correction of the astigmatic eye. The axis is defined with a number from 1 to 180 degrees. The number 90 corresponds to the vertical meridian of the eye, and the number 180 corresponds to the horizontal
  - Can be from 1 to 180 degrees

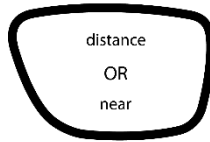
#### PUPILLARY DISTANCE

- Pupillary Distance (also known as interpupillary distance or PD) – the distance between the center of the pupil of each eye. This is considered the patient's binocular PD and is measured in millimeters. The monocular PD can also be measured as the distance from pupil of each eye to the center of the nose.

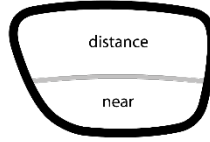
#### OPTICAL CENTER/SEGMENT HEIGHT/FITTING CROSS HEIGHT

- Optical Center (OC) – Area of lens with most accurate correction, most easily found in lensometer. Induced prism effect occurs if not looking through optical center.
- Segment Height (Seg Height) – The height of the reading portion of a multifocal lens (bifocal, trifocal or progressive segment) as measured from the deepest part of the eyewire to a reference point, such as the lower eyelid (bifocals) or pupil center (progressive addition lenses).
  - This measurement is taken in millimeters.

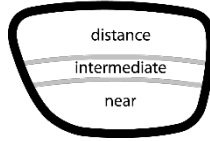
Single vision Lens



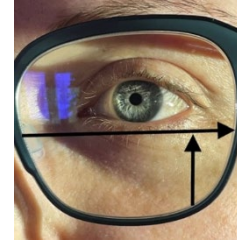
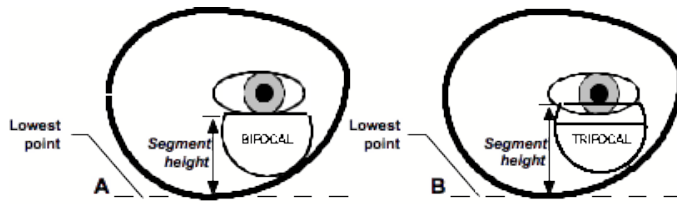
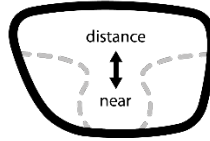
Bifocal Lens



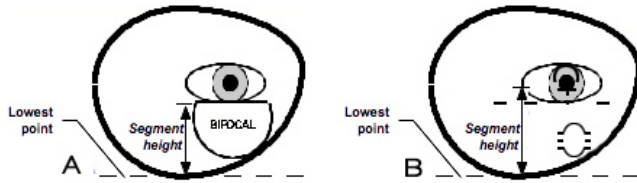
Trifocal Lens



Progressive Lens

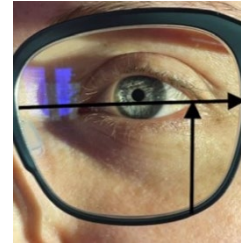


BIFOCAL

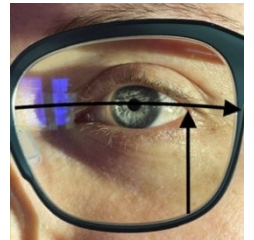


Bifocal

Progressive



TRIFOCAL



PROGRESSIVE

- Fitting Cross Height – The fitting cross is part of fitting a progressive addition lens. There are two pieces of information about the lens that the fitting cross defines.
  - The horizontal line, in the fitting cross, is the point where the segment height is measured, to the base of the lens where it meets the frame.
  - The vertical line defines the monocular PD.
    - The monocular PD is the distance from the vertical line to the center of the bridge at its shortest width.
  - The vertical and horizontal line should bisect the pupil. Once aligned, this information will allow to find the different measurement areas of the PAL. (Distance, Near, Prism)

## LENSOMETRY

The instrument used to measure the power of spectacle lenses.

- Measures sphere power, cylinder power, cylinder axis and prism of a lens
- Measures amount of prism:
  - Measures amount of prism in the lens and the orientation (base direction) of that prism.
  - The location of the optical center of a lens
  - Powers of multifocal adds



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## MANUAL LENSOMETER

Single Vision, Progressive, Bifocal & Trifocal all are read the same way.

- With multifocal lenses be sure you are not reading through the near vision areas.

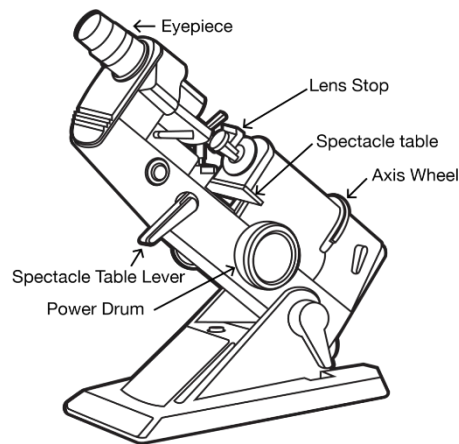
### Steps:

1. Place glasses on the platform, starting with the right lens, secure the glasses with the gimbal
2. Use the power drum to dial in the three thin lines until clear. This is the sphere reading. Write it down.
3. Turn the power drum dial again to focus the three thick lines. This is the cylinder reading. Write it down.
4. Adjust the axis wheel until the thick lines are straight. This number on the axis wheel is the axis.
5. Continue to the left lens.



**THIN LINES ARE SPHERE**

**THICK LINES ARE CYLINDER**



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## AUTOMATED LENSOMETER

Single Vision, Progressive, Bifocal & Trifocal all are read the same way.

- With multifocal lenses be sure you are not reading through the near vision areas.

### Steps:

1. Secure glasses with the lens holder.
2. Adjust lens until it is centered and the + appears in the center.
3. The prescription will be presented on the screen.
4. Using the PD arm will allow measuring the PD while reading the lenses.





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## PRISM

Prescribed for patients if their eyes do not align properly. It is a wedge-shaped transparent body that deviates or bends light. Prism will allow two eyes to work together better, eliminating double vision.

- Top of the prism is called the apex.
- Bottom of the prism is called the base.
- Light moving through the prism is bent toward the base.
- The direction of the prism can be adjusted to meet the needs of the patient.
- The power of a prism is measured in prism diopters.

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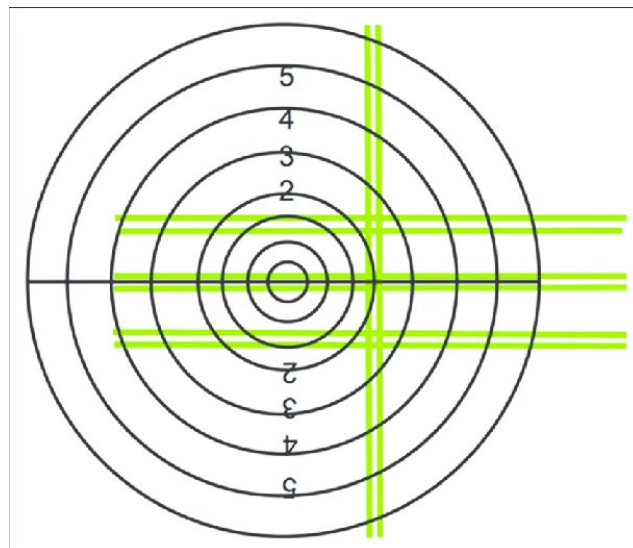
*1.00 prism diopter deviates light 1 centimeter at 1 meter*

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### Prescribed Prism:

- To read a lens with prescribed prism, you must start with the lens with the highest prescription. Center the area where the sets of lines cross and then switch to the other lens.
- With vertical prism (base up or base down) the place where the line cross will be higher or lower.
- For horizontal prism it is necessary to first mark the pupil center, then place the marking directly over the center on the lensometer.
  - The place where the lines cross should be offset to the amount prescribed.

- 
- *May not be able to center lines in reticle.*
  - *Dot lens at location of patient's line of sight and place this location in center in reticle.*
  - *Read amount of prism using prism scale on lensometer.*
- 



## INTERPUPILLARY DISTANCE MEASUREMENT

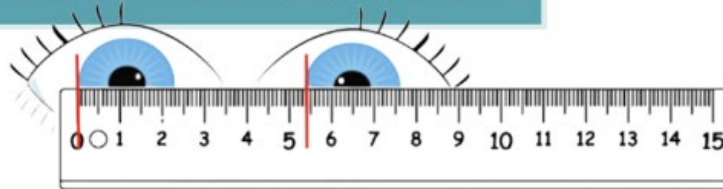
To ensure accuracy pupillary distance measurement should be taken for each lab order. There are three ways to take this measurement; manually, using a pupilometer and digitally. There are three common pupillary measurements: distance, intermediate and near.

### MANUAL PUPILLARY MEASUREMENT

To measure a pupillary measurement, use a small ruler called a PD stick.

#### Steps:

1. Have the patient sit squarely in front of you at the same height.
2. Instruct the patient to look at your right eye or ear.
3. Line the PD stick up with the outside of the temporal side of the limbal ring (dark circle around the iris) of the patient's right eye.
4. Ask the patient to look at your left eye/ear.
5. Read the measurement on the nasal side of the limbal ring of the left eye.



**THE DISTANCE PD IN THIS EXAMPLE IS 54MM**

### PUPILOMETER PUPILLARY MEASUREMENT

#### Steps:

1. Adjust the pupilometer to the working distance desired
  - o Distance vision set to infinity ( $\infty$ )
  - o Reading set to 40
  - o Intermediate set to 50
2. Have the patient sit squarely in front of you at the same height.
3. You can instruct the patient to hold the pupilometer like they are looking through binoculars, or you can hold it for them.
4. Instruct the patient to look directly at the light inside.
5. Take the measurement by looking through the opposite side and by sliding the lines over the light reflecting off the retina.



#### **BINOCULAR PD**

The number in the middle. BI means two and this measurement is for two eyes.

#### **MONOCULAR PD**

The numbers under right/left. Mono means one and this measurement is for one of two eyes.

### DIGITAL PUPILLARY MEASUREMENT

Digital measurements are gathered by using a device/machine that takes a picture/image of the patient wearing a frame. Often there is a device, or markings placed on the front of the frame, to allow the machine conducting the measuring to "see" the frame and eyes. These machines will collect the position of wear measurements as well.

- Position of wear measurements are measurement taken in addition to the PD. They are used in manufacturing compensated digital lenses and include measurements of vertex distance, pantoscopic tilt, and the wrap of the frame. Compensated lenses are a way to provide the wearer with the prescription determined by the refraction during the eye exam. They provide precision not possible with other methods of lens processing. Patients with a high or complicated prescription will benefit most.

Near pupillary measurement – used for reading glasses as it measures the distance between pupils while looking at a near target. Changing the pupilometer setting to 40 will measure the near PD exactly, which is usually the distance PD minus (-) 3 but can be more or less than that.

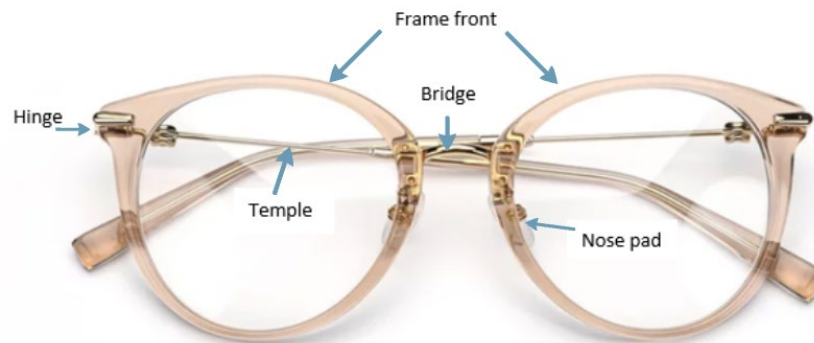
Intermediate pupillary measurements – most commonly used for computer glasses. Can be measured with pupilometer setting at 50. Subtracting 1.5mm from distance PD will usually be the intermediate PD.

## SELECTING EYEWEAR

The first and most important step in frame selection is the patient's prescription. The paraoptometric should assist the patient in selecting a frame that is not only cosmetically appealing but fits properly too.

The following are some rules for proper frame fit:

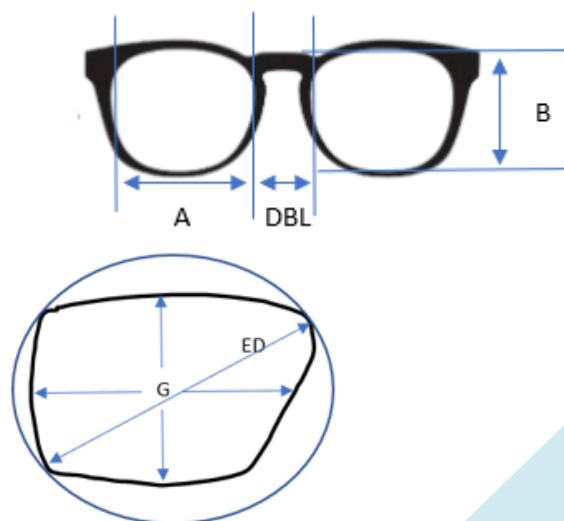
- The width of the frame should be approximately equal to the width of the patient's face. The longer the face, the greater the vertical depth of the frame should be; the shorter the face, the smaller the vertical depth of the frame.
- The bridge of the frame should rest flat on the sides of the nose. The bridge distributes the weight of the frame, so this is a critical component of the frame fit.
- The temples should be long enough to extend over the patient's ear and far enough beyond to balance the weight of the front of the frame. They should be shaped to fit the contour of the head.



## PRINCIPLES OF FRAME SELECTION

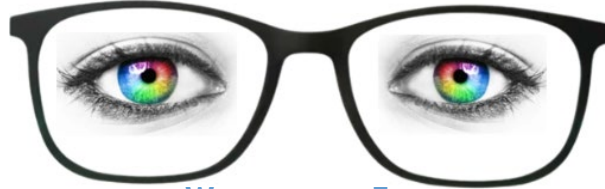
- Frame Sizes:

A	Eye Size
B	Eye Height
DBL	Distance Between Lenses
ED	Effective Diameter
G	Geometric Center
Frame PD	A + DBL

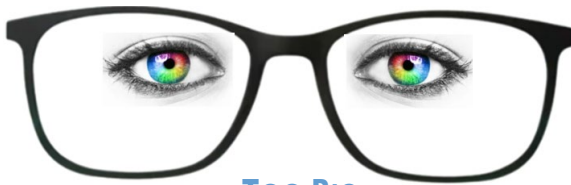


➤ Well-Centered Eye:

- Best indicator of a well-fitting frame.
- A frame that is too big will cause the eyes to be positioned near the bridge of the frame.
- A frame that is too small will cause the eyes to be positioned near the outer portion of the frame.



WELL-FITTING FRAME



TOO BIG



TOO SMALL

NOSE PIECE FIT



Saddle bridge: Most common. For best fit it should be like a saddle on a horse, no gaps.



Keyhole bridge: Great for smaller noses. The smaller space between the lenses are the best point of contact.



Low Bridge fit: Best plastic option for very small and flat bridges.

➤ Frame Materials:

- Plastics – Made of many rugged polymers. These are the most common types of frames. Adjusting these frames usually requires warming them to make the material more pliable and then bending the material to shape to fit the face.
- Metals – The front and temples are comprised of metal. Adjusting these frames usually requires some special pliers and other tools. The lenses are inserted into the eyewire that is tightened in place with a screw.

➤ Pros and Cons:

- Metals:
  - Pro: very adjustable
- Titanium:
  - Pros: lightweight, strong, durable and hypoallergenic
  - Cons: expensive
- Monel:
  - Pros: inexpensive

- Cons: can cause an allergic reaction
- Beryllium:
  - Pros: very lightweight, durable, flexible and extremely corrosion resistant
  - Cons: expensive
- Stainless Steel:
  - Pros: light to medium weight, strong, less expensive than titanium and hypoallergenic
- Flexon:
  - Pros: very flexible, can return shape, lightweight and corrosion resistant
  - Cons: expensive
- Aluminum:
  - Pros: lightweight, durable, corrosion resistant and slightly flexible
  - Cons: expensive
- Plastic:
  - Pros & Cons: not available when it comes to plastic frames
- Zyl/Acetate:
  - Pros: lightweight, easily adjustable and many colors
- Nylon:
  - Pros: strong & lightweight (great for sport glasses and sunglasses)
- Optyl:
  - Pros: epoxy resin (available in translucent & opaque colors) & very bendable

## LENS MATERIAL

- What does the refractive index refer to?
  - It is the measure of bending a light ray when passing from one medium to another.
  - The ratio of velocity of a light ray in an empty space to the velocity of light in a substance.
  - Formula:

<b>N</b>	refractive index
<b>C</b>	speed of light (186,000 miles per sec)
<b>V</b>	phase velocity of light

$$N = \frac{C}{V}$$

- Types:
  - Crown Glass:
    - Refractive Index = 1.523
    - Pros: great optics
    - Cons: easily breakable and heavy
  - Cr-39 Plastic:
    - Refractive Index = 1.498
    - Pros: great optics and tints easy
    - Cons: medium weight and not impact resistant
  - Polycarbonate:

- Refractive Index = 1.586
- Pros: highly impact resistant and lightweight
- Cons: does not tint
- Trivex:
  - Refractive Index = 1.532
  - Pros: impact resistant, lightweight, great optics and tints easily
  - Cons: slightly thicker than polycarbonate
- High Index:
  - Refractive Index = 1.60/1.67/1.74
  - Pros: thinner lens
  - Cons: optical quality reduces and not impact resistant

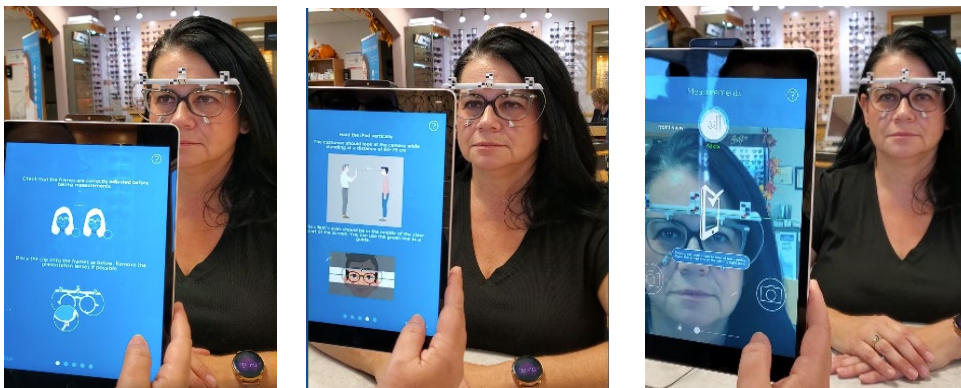
## LENS FEATURES/FABRICATION/EDGING

- Scratch resistance - coating made from resin
- Anti-reflective coating – eliminates internal lens reflections, reduces glare at night, good for computer, more visibility of wearer’s eyes
- Ultraviolet (UV) coating - filters out UV light
- Mirror coating - reflects some of the light striking lens, increases density of lens
- Sports coating– improves contrast sensitivity, reduces glare
- Photochromic lenses- Darken when exposed to UV light and clears when indoors
- Blue light protection– blocks or filters blue light given off digital screens, glare protection, reduces damage to retina
- Edging lenses: minimum blank size
  - Absolute smallest lens blank that can be used to edge a lens.
  - ED + Decentration + 2mm = minimum blank size
    - Example: ED 64 + Decentration 2mm + 2mm
      - $64+2+2=68$
      - Minimum blank size is 68mm

ED	Effective Diameter
Decentration	Difference between the optical center and pupil distance

## DIGITAL DISPENSING TECHNOLOGY

Using a digital tablet and a specific app or software program, paraoptometric can take accurate patient measurements, demonstrate the performance of different lenses and offer virtual frame try-ons. Special clip on frame allows for measurement of pantoscopic tilt, face wrap, PD, and seg height unique to each patient/frame combination. Allows for digitally designed lenses.





## ➤ Basic Adjustments:

- Fitting triangle – A picture representation of the pressure points between an eyeglass frame and the overhead view of the patient's head.
  - The goal during the adjustment process is to equalize the pressure of the frame over the bridge of the nose and the widest part of the head on each side of the ears.
- Frame height – Determined by the height of the frame (“B” measurement) and the way in which the frame rests on the wearer's nose.
  - If the frame has adjustable nose pads, the frame height can be altered somewhat. However, if the frame has a fixed bridge, the frame height is determined during the frame selection process.
- Vertex distance – Describes the distance from the back of the lens to the cornea.
  - Generally, we do not measure the vertex distance except in high prescriptions (more than 6 diopters), but when fitting the frame to the patient's face, you want to be certain both lenses rest an equal distance from the eye.
- Face form – Describes the way the frame front follows the contour of the face.
  - Normally, the frame front protrudes slightly at the nose and is farther back near the temples. Some frames (such as wrap-around sunglasses) have a high degree of face form, with the bridge of the frame resting substantially forward of the hinge on the frame front.
  - The amount of face form can be assessed by taking the frame with the temple extended and placing a ruler against the back of the frame front from the outside edge of one eyewire to the outside edge of the other eyewire. The ruler will be straight and the amount of curve to the frame front will show the amount of face form.
- Pantoscopic angle – The pantoscopic angle or pantoscopic tilt refers to the angle the temple of the frame makes with the frame front.
  - When the frame is on the wearer, the bottom of the eyewire should be closer to the cheeks than the top of the eyewire is to the eyebrows.
  - In rare cases, the bottom eyewire may protrude away from the cheek. This is called retroscopic angle or retroscopic tilt and is not desirable.
  - Generally, a small amount of pantoscopic tilt is needed for the wearer to achieve the proper optics through the lenses and have the widest possible field of view through multifocal lenses.
- Temple adjustment – The temple bends should begin at the top of the ear. The end of the temple should be bent at a 45-degree angle and bent in so that its flat side touches the skull, behind the ear.

## ➤ Ophthalmic Bench Tools:

- Interpupillary distance ruler (PD): used to make sure the frame front is even.
  - Lay your PD ruler across the ocular side of the frame front, just below the temples at the endpiece.
  - When the PD ruler is touching both endpieces, it should be equidistant from the frame at its two nasal points, just above the nose pads.

- This is also known as vertical alignment or four-point touch.
- Temple-angling pliers: used if the temples are not even when viewed from the side.
  - If the endpiece is aligned with the hinge, then the temple hinge is bent and must be straightened.
  - The hinges themselves must be realigned.
  - This would be a cold bend (i.e., the frames are not heated), regardless of the frame material.
- Other tools: Fiber jaw pliers, needle nose pliers, nose pad pliers, straight cutting pliers and pin vice (screwdriver)
- Frame Warmer: used to heat the temples with hot air before bending frames, regardless of the frame material.
- Salt Pan: used to heat the temples with small, warm beads.
- Bench Alignment: Before dispensing the eyewear to the patient, it should be inspected and evaluated to make sure it is aligned.

### Steps:

1. Place the eyewear on a flat surface upside down.
2. Both eyewires and the crest of each temple should rest on the surface.
3. Once the eyewear is turned over, both eyewires and temple tips should touch the surface.
4. The temples should be near parallel and the frame should have a slight face form.
5. The lenses should be in the same plane and the same height.
6. When the temples are closed, they should overlap and be near parallel with the top of the frame.
7. Align temple closure.
8. Align nose pads.



**TEMPLE-ANGLING PLIERS**



**FIBERJAW PLIERS**



**NEEDLE NOSE PLIERS**



**STRAIGHT CUTTING PLIERS**



**NOSE PAD PLIERS**



**PIN VICE (SCREWDRIVER)**

**FRAME WARMER**



**SALT PAN**





## CONTACT LENSES (20%)

A corrective, cosmetic or therapeutic lens is usually placed on the cornea of the eye. Contact lenses usually serve the same corrective purpose as glasses.

- Overall Diameter (OAD): size of the lens when measured from edge to edge at the widest point.
- Optical Zone Diameter (OZD): central area or zone that provides optical correction.
- Back Vertex Power (BVP): the reference point for corrective power.
- Base Curve Radius (BCR): the primary curve on the posterior or backside of the lens; the curve is designed to match the shape of the cornea.
- Peripheral Curve: additional curves on the back surface of the lens that surround the optical zone to help tailor the contact lens fit to the patient.

### MAINTAIN/ORDER/INVENTORY CONTACT LENSES

Each clinic will have a procedure for ordering, maintaining and inventorying contact lenses. The key is to accurately communicate the parameters of the contact lens needed accurately whether that is verbally or electronically.

- Trials/Diagnostic Lenses:
  - Refill trial lenses
    - Running list of trials, scan barcode and get ordered automatically
    - Check weekly to see what needs to be reordered
    - Visit from contact lens representative
  - Ordered from third-party vendor that has access to all brands

### EDUCATE PATIENTS ON CONTACT LENS OPTIONS AND FEES

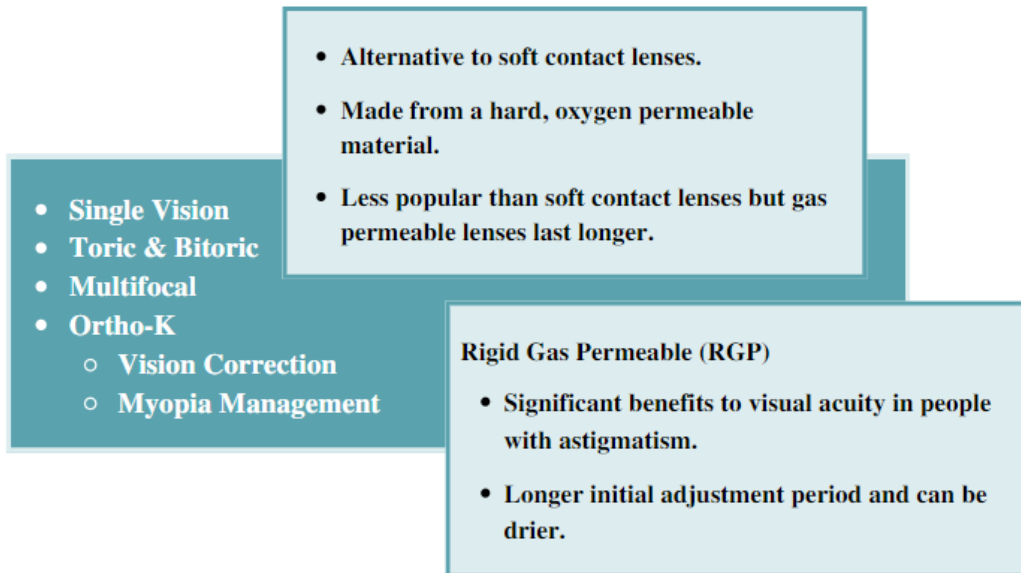
#### UNDERSTAND TYPES OF AVAILABLE CONTACT LENSES & FEES

- Soft Contact Lenses:
  - Comprised of polymers capable of absorbing a substantial amount of water
    - Hydrogel - type of plastic polymer that absorbs and binds water into its molecular structure
    - Silicone hydrogel – Higher oxygen permeability than traditional hydrogel lens
  - Water-soluble substances may enter a hydrogel lens if they are smaller than the areas of interconnecting spaces in the plastic
  - Average diameter of spaces increases as the water content in the hydrogel increases

- Daily Disposable
- Frequent replacement
  - 2 weeks, monthly, extended wear
- Daytime vs. Overnight Wear
- Spherical
- Toric
- Multifocal
  - Presbyopia
  - Myopia Management

- Soft, flexible plastics that allow oxygen to pass through to the cornea.
- Easier to adjust to and provide better initial comfort.

- Gas Permeable Contact Lenses (GP):
  - Made from polymers and plastic materials that are oxygen-permeable.
  - Provides oxygen to the cornea by direct transmission through the lens material
  - They are also known as rigid gas permeable
    - Permeability (Dk)- ability of the material to allow oxygen to pass through it
      - Higher Dk means oxygen can easily diffuse through the material
      - Transmissibility (Dk/t) – Permeability/lens thickness. Thinner the lens, more oxygen will reach the cornea



- Hybrid Contact Lenses:
  - Combines gas permeable (GP or "hard" lens) center with a soft skirt to give you the clear, crisp vision of a "hard" lens and the comfort and easy wear of a soft lens.
  - These can last up to six months.
  - Great for patients with corneal astigmatism or presbyopia with astigmatism.



- Scleral Contact Lenses:
  - Large-diameter gas permeable contact lenses that vault over the cornea and rest over the scleral.
  - Used on patients with irregular corneas due to trauma, infection, keratoconus, etc.

- Single Vision
- Multifocal

## DETERMINE/VERIFY GAS PERMEABLE CONTACT LENS MEASUREMENTS

- Base Curve Radius (BCR) – one of the most important parameters to verify, because it affects the lens-to-cornea connection by using a radiuscope.
- Lensometer – measures power of a contact lens
- Reticle – measures overall diameter or optic zone diameter
- Calipers – center thickness or edge thickness
- Radiuscope: microscope with a dial gauge attached to read curvature.

### Using a Radiuscope:

- Lens needs to be clean and dry.
- Fill the lens mount with saline.
- Real image is located on the lower end of the scale.
- The aerial image is approximately 6mm to 9mm on the scale.
- Both images appear as spokes or stars.
- After centering the aerial image, lower the instrument to the real image.
- Once clear, zero the radiuscope and return to the aerial image.
- When the aerial image is in clear focus, read the BCR from the scale.



## PERFORM CONTACT LENS FITTING

### SOFT CONTACT LENSES

- Check fit of contacts
  - Centered Limbus to Limbus
  - Is there excessive movement or no movement?
  - For toric lenses, are they positioned correctly?  
\*LARS (Left Add Right Subtract) – to adjust axis if toric alignment off
- Check vision with contact lenses in
- Review care
- Make patient aware of follow-up schedule

### GAS PERMEABLE/HYBRID/SCLERAL

- Clean and sanitize lens upon arrival
- Verify parameters are correct
  - They have lens IDs engraved on them
- When using fluorescein and the cobalt filter on a slit lamp, you're able to check vaulting, movement, touch and stability.
- Check vision with and without lenses
- Perform topography to check any change in curvature of the cornea
- Review care
- Make patient aware of follow-up schedule
- Something to note with GP lenses:
  - Is any imaging needed? (Anterior Segment Imaging)

## SLIT LAMP EVALUATION OF CONTACT LENS FIT (SOFT & GAS PERMEABLE)

### Both Soft & Gas Permeable:

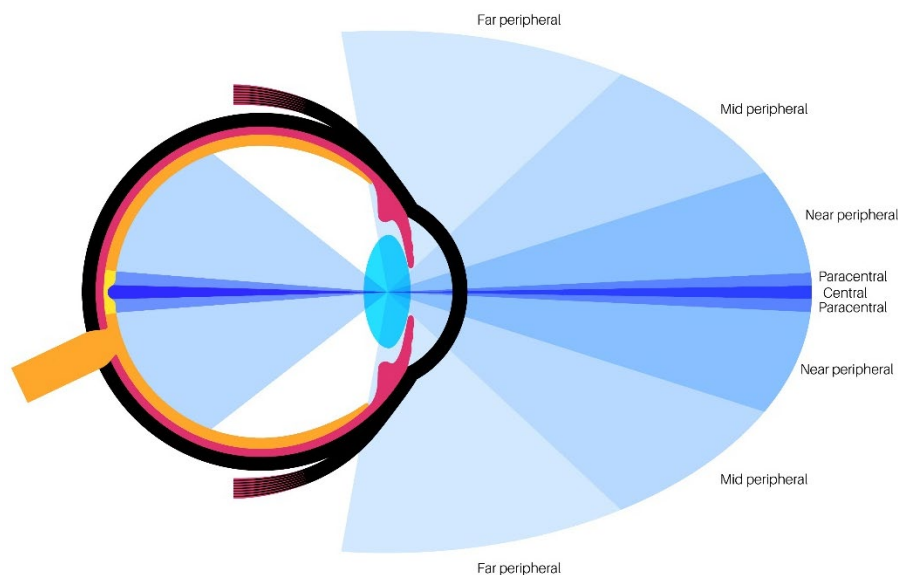
- Diameter: distance across the lens surface, determining how the lens sits on your eye. (usually between 13mm -15mm for soft lenses and 8-9mm for GP)
- Movement: lens should move about 1mm with upward gaze or blink; same should happen with gentle pressure on the lower eyelid. If a lens is too tight, it will resist movement and tear exchange will be restricted.
- Centration: position of the contact lens edge relative to the corneal center, or equivalently the limbus. Ensures that the area of the lens where the prescription is most effective is placed at the ideal point for the patient.

### Soft Lenses:

- Toric Orientation: lens should cover the cornea in all the gaze positions, allow adequate tear flow to enable metabolic debris to be removed and remain in alignment with the cornea and conjunctiva.
  - When viewing the lens, observe the toric markings and the lens position; a thin vertical beam of the slit lamp light can be lined with inferior lens markings.
    - Should match with 6 o'clock.
  - If lines are horizontal, they should line up at 3 and 9 o'clock.

### Gas Permeable Lenses:

- Use of Dyes:
  - Fluorescein strips are used to assess tear film and assess how large lacrimal lake is underneath lens. Used in conjunction with cobalt blue filter.
  - Central clearance (green) = well-fitting lens
  - Too much clearance (deep green) = air bubbles, poor-fitting lens
  - Touch (dark spot) = different lens design requires different touch patterns.
  - Mid periphery stabilizes lens on eye
    - Some corneal touch (dark spot)
  - Periphery/Edges of Lens
    - Some clearance (green)
    - Too much clearance = edges appear to lift off of cornea



## INSERT AND REMOVE CONTACT LENSES

### HYGIENE/HANDWASHING

- Hygiene:
  - Consider habits of patient
  - Cleanliness of patient's fingernails and hands
  - Consider patient's occupation
- Handwashing:
  - The goal of handwashing is to remove microorganisms from the hands, preventing their potential transfer. It is known that organisms survive and multiply on human hands, creating the opportunity to infect others. Although hands cannot be sterilized, most transient organisms can be removed by 30 seconds of proper scrubbing with soap and water.
    - Proper scrubbing would include vigorous motion with the hands rubbing together and fingers working in between the finger web space on both sides of the hands.

### RIGID GAS PERMEABLE

Note: To help keep the eyelids out of the way during insertion and removal, a finger on the opposite hand holds the upper eyelid up and a finger (usually the ring finger or middle finger) on the hand inserting the contact lens holds the lower lid down.

- Insertion:
  - Place the lens as if it were in a bowl position on a clean, dry fingertip.
    - It is easiest to use the pointer finger for insertion, but whichever finger is most comfortable for the patient is best.
  - With the eyes wide open, the finger comes close and places the contact lens on the cornea.
- Removal:
  - Patients use their lids to help break the lens suction on the eye.
  - With the patient looking straight ahead, place one pointer finger horizontally along the upper lid and another finger along the bottom lid. Push the fingers toward one another trying to keep the edges of the eyelids close to the globe.
  - Once the suction is lost, the lens pops off the eye.
  - Alternatively, many people simply pull the temporal corner of the eye towards the ear which narrows the palpebral fissure and breaks the suction of the contact lens on the eye.

### SOFT

- Insertion:
  - With clean hands, place the soft contact lens on a dry fingertip with the contact lens in the bowl position.
    - It is important for the fingertip to be dry otherwise the lens will stay on the finger rather than stay on the eye.
  - Using both hands to open the eyelids, place the contact lens on the cornea.
    - It is sometimes helpful for the patient to look in the mirror while doing this and tell them to aim for the colored part of their eye.

- Some patients don't enjoy watching a contact lens and their finger come close to their eye, in which case they may find it easier to look up and place the contact lens on the bottom part of their cornea.
  - Once the lens is on the cornea, it can sometimes settle better if they look around the room in different directions and blink.
- Removal:
  - Patient will take a clean pointer finger, place it on the contact lens and pull the lens down.
    - By pulling the lens down, it helps break the natural settled position of the lens on the eye and makes it easier to remove.
  - Then place the thumb on the lens really close to the pointer finger and pinch them together to remove the lens from the eye.

## HYBRID

- Insertion:
  - Like scleral lenses, requires insertion solution.
  - In order to insert the lenses, the patient needs to fill the lens well with solution while balancing the lens between three fingertips (thumb/pointer/middle finger) in a bowl-like configuration.
  - Then the patient pulls the lids back, holds their head facedown and brings the lens near the cornea gently, blinking once the solution hits the eye.
- Removal:
  - Gently break the suction of the lens on the eye.
    - To do this, have the patient look up and place their pointer finger and thumb toward the bottom of the lens.
  - Then they can pinch the bottom of the lens together on the soft portion of the lens in a similar fashion to how you would remove soft lenses.
    - This breaks the suction, and the lens will fall forward.

## SCLERAL

Note: Inserting and removing scleral contact lenses looks very different than other lenses! Since scleral lenses are usually much larger than the other lenses, they require lens plungers to help assist in the insertion and removal process. There are two types of lens plungers: one to insert and one to remove the scleral lens. The insertion plunger is larger and has a solid bowl base. The removal plunger is smaller and has a hole in the middle of the bowl base and runs down the middle of the holder. This hole is important to help suction onto the front surface of the lens, which helps you break the suction of the lens on the eye.

- Insertion:
  - Place the scleral lens onto the bowl of the insertion plunger.
  - Then take non-preserved sterile saline and generously fill the bowl of the scleral lens.
  - The patient will look face down towards the floor, open the eye wide with the assistance of fingers on both hands and bring the plunger toward the eye to insert the lens.
    - It works best to hold the lower lid with one of the fingers on the hand that is holding the plunger.



- While inserting the lens, the eye will feel the saline solution before the lens is in place, so it is important to tell the patient to move the plunger toward the eye a little more than they expect.
- Once the lens is in place, it is suctioned onto the surface, and it will not move.
  - Insure there are no air bubbles in the space between the contact lens and the eye.
  - Bubbles are visible in the mirror but also can be visually disturbing to the patient.
- Removal:
  - Take the removal plunger, squeezing and letting go of the stem to create a tight grip on the lens.
    - It works best to place the plunger on the lower half of the contact lens while the patient is looking straight ahead.
  - With your fingers, try to gently press around an edge of the lens to help break the suction onto the eye.
  - Once the suction is broken, the lens will stick to the plunger, and the lens is removed from the eye.

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## REMOVING A DISLODGED LENS

- Use a steady stream of sterile saline, multipurpose contact lens solution or contact lens rewetting drops to irrigate the stuck contact and your eye for a few seconds.
  - Once done, close your eye and carefully massage your upper eyelid until you can feel the lens start to move.
    - When the contact starts to move, it will be noticeable.
  - If the contact remains stuck repeat these steps several more times.
  - Blinking after each rinse can help make the lens move.
  - Once the lens starts to move, it can be removed as normal.
- Note: This could take up to 10 minutes.

## PROPER CARE SYSTEM FOR CONTACT LENSES

Routine care includes cleaning, rinsing, and disinfecting. This routine care is usually done after the lenses are removed from the eye, not prior to insertion. It helps prevent infection and improves lens' comfort.

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## CARE PRODUCTS

- Multipurpose cleaners: most common, standard cases
- Hydrogen Peroxide: gas permeable - special case with cage and deactivator at bottom of case.
  - Neutralizes over six hours

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## CLEANING PROCESS

A cleaner is rubbed onto both sides of the lens to remove debris from the lens surface.

- After cleaning, the lens is rinsed with the solution that is specified by the care system manufacturer to remove the cleaner and loosen debris from the surface of the lens.
- The lens is placed in a lens storage case that has been filled with a soaking and disinfecting/conditioning solution.
- The soaking and disinfecting solution keeps the lens hydrated and disinfects the lens surface.

- The lenses have to stay in the solution for a specific period of time for disinfecting.
  - This amount of time depends on the disinfecting solution.
- Before applying the lens, the soaking solution is rinsed off and fresh wetting solution is placed on the lens to ease its placement onto the eye.
- A daily or weekly enzymatic cleaner may be added to this regimen if patients experience a buildup of protein on the surface of their lenses.
- Note: It is also important to properly care for the contact lens storage case.
  - After contact lenses are removed from the case, all solution should be dumped from the case wells.
  - Then rub the case with clean fingers for at least five seconds, then wipe dry with a clean cloth.
  - Store the case upside down with lids off.
- Cleaning and conditioner solution is used for gas permeable lenses:
  - Put a few drops of the cleanser on the lens in the palm of your hand
  - Use a gentle back and forth motion to clean any debris off the lens, avoid rubbing in a circular motion to avoid changing the power of the gas permeable lens
  - Rinse with a sterile saline product or tap water
    - Do not use tap water if inserting contacts directly into eye after cleaning.
  - Store in standard contact lens case with conditioning solution.

Note: conditioning solution is safe to put in the eye, but cleaning solution is not

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## POLISHING GAS PERMEABLE LENSES

Even with normal daily cleaning, RGPs can have deposit accumulation which impedes vision and comfort.

- A deep cleaning method can be performed in the office to smooth out scratches and remove accumulated surface protein deposits gathered over time on a rigid lens. This method will improve comfort, vision and the lifespan of the lens.
  - It involves evaluating the lens under a special microscope and then using a lens polishing unit, polishing abrasive liquid and special sponges to gently polish and smooth out both the front and back surface of the RGP as it spins inside the unit
  - Often performed by a trained paraoptometric in the office
  - The frequency of polishing will depend on the patient's care of the lens and wearing schedule but on average, it is about once a year
- Caution in performing RGP polishing:
  - Newer RGPs are produced at a very high precision and accuracy so polishing may damage the optics of the lens
  - Newer RGPs have a plasma treatment to reduce bacterial deposit accumulation and improve comfort with better lens wetting. Lens polishing may remove the treatment.
  - The patient must be cautioned that an RGP can get cracked or broken during the lens polishing process
- A possible less effective alternative to in-office polishing is using a special protein remover treatment to chemically clean the lens.

## EDUCATE PATIENTS ON CARE AND HANDLING

Patients have to be instructed on how to wear and care for their contact lenses. This education begins when the patient is in the office for a contact lens fitting and continues until they stop wearing contact lenses.

- The patient is instructed on how to apply and remove the lenses, handling procedures (always wash hands before handling the lenses, determining if the lens is inside out, right lens-right eye, etc.), and how to care for them at the dispensing visit.
- They are given a wearing schedule to follow in order to gradually build up the amount of time the lenses are in the eye.
- Patients are given a schedule of follow-up visits so the health of the eye and the contact lenses may be evaluated on a regular basis.
- Patients are asked and encouraged to adhere to, or comply with, the prescribed regimens.
  - A patient who does not adhere to the prescribed regimen of care and follow-up is considered a non-compliant patient.
  - Non-compliance and patient misunderstanding of contact lens care and handling is a common reason patients suffer complications or stop wearing their lenses.

Normal and Abnormal Adaptive Symptoms (when to remove lenses):

### Normal

- Tearing is natural response of the eyes
- Minor irritation or awareness sensation decreases over time
- Intermittent blurry vision is usually due to excess tears
- Sensitivity to sunlight is normal
- May experience minor irritation from wind, smoke, and dust
- May be mildly red from irritation

### Abnormal

- Sudden pain or burning
- Severe or persistent haze or haloes around lights
- Severe redness or irritation
- Blurry vision through spectacles for more than one hour

## TROUBLESHOOTING CONTACT LENS PROBLEMS

- **Comfort Issues**
  - Verify proper fit first
  - Excessive movement or decentration; causes discomfort or feeling edge of lens
  - Too tight; red, irritated eye
  - Too dry/loose; lens may fall out
    - Ways to improve dryness:
      - Switch cleaning solutions
      - Switch contact lens materials
      - Switch modalities
      - Rewetting drops
- **Vision Issues:**
  - Perform trial lens over-refraction: start with spherical power first
  - Toric lens rotation
  - Fluctuation in vision may be due to dryness
- **Redness:**
  - Rule out the following first: eye disease, improper fit, material or solution sensitivity.

## PROFESSIONAL ISSUES (24%)

### FRONT DESK

- Maintain a neat, orderly, up-to-date office
  - Keep patient information secure and private
- Welcome/greet arriving patients: When a patient enters the office, front desk personnel should stop what they are doing and greet the patient.
  - Check-in patient:
    - Collect/update demographics
    - Confirm identification
    - Verify insurance/vision plan cards
- Resolve Patient Complaints and Concerns
  - Listen to patient: gather and document all important details.
  - Have patience and understanding; do not place blame offer solutions instead.
  - Convey all information to manager/doctor for assistance as needed.
- Direct patient flow:
  - Optical dispensary
  - Pretesting
  - Special testing

### TELEPHONE TRIAGE

- A system of sorting and assigning priorities for medical treatment based on the urgency of the symptoms.
  - Determine patient needs by asking the following questions:
    - What kind of problem are you experiencing? (pain, loss of vision, etc.)
    - How long has it been going on?
    - Is it getting worse?
    - How does it affect your vision?
    - Does anything make it better?

<b>F</b>	<b>Frequency:</b> Does it come and go, persistent, etc?
<b>L</b>	<b>Location:</b> Where is it located?
<b>O</b>	<b>Onset:</b> When did it start?
<b>R</b>	<b>Relief:</b> Does anything make it better or worse?
<b>I</b>	<b>Intensity:</b> What number would you give on pain scale?
<b>D</b>	<b>Duration:</b> How long does it last?
<b>A</b>	<b>Associated Symptoms/Aggravating Factors:</b> Are there any other symptoms? Does anything make it worse?

- Discuss the case with the doctor and then direct the patient based on the doctor's recommendation.
- Triage categories:
  - Emergency - must be evaluated immediately.
  - Urgent - must be seen within 12-24 hours.
  - Routine - to be seen at the next available appointment.
- Important to remember - speak calmly and do not offer the patient a diagnosis or give an opinion.
- Note: If the patient claims to have persistent pain in the eye and no other symptoms schedule their appointment immediately.

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## DOCUMENT INCOMING CALLS APPROPRIATELY

- Patients, healthcare providers, and vendors/sales representatives
  - Make sure appropriate parties receive messages and information.
  - Record details in electronic health records, when necessary.
- Manage patient appointments
  - Determine in advance the length of time required for specific types of appointments.
    - A comprehensive examination may require 30 to 45 minutes.
    - An uncomplicated follow-up may only require 15 minutes.
  - Paraoptometrics should have a thorough understanding of the different types of appointments.
    - What type of testing each appointment involves.
    - The amount of time required by both the optometrist and paraoptometric for each appointment.
  - Make sure when scheduling appointments that you inquire whether patients have insurance and remind them to bring the necessary documentation to the appointment.
    - It is particularly important that you know whether your office is a participant in the health insurance plan or vision benefit plans in your area and what regulations those plans have that must be followed.
  - Confirm all appointments.
  - Reference cancellation list

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## MAINTAIN FILING AND ELECTRONIC HEALTH RECORD SYSTEMS

- Alphabetical systems are the most straightforward type of filing system. With this system, records are filed according to the first letter of the patient's last name. The records may be color coded so that records with a particular letter have a corresponding color ("A" is green, "B" is yellow, etc.). Alternatively, colored stickers may be attached to the file in a designated area to indicate the letter of the alphabet the chart is to be filed under.
- Numerical filing systems assign each patient record a number. The records are filed according to the number on the record. There is an alphabetical file that will cross reference the patient's name on the file with the file number. It is easy to find a misplaced file when using the numerical filing system. The key to a numerical filing system is the smoothness of the cross-referencing.
- Electronic health records (EHR) systems are the most used today in healthcare. These systems have evolved from a basic computerized database program to multiple tools software needed to

efficiently process and save patient records; such as maintaining, accessing and recording patient's personal and health information, scheduling appointments, communicating with patients and referral sources, e-prescribing medications, billing and coding, submitting insurance claims, managing accounts receivable, maintaining inventory, administering contact lens and optical dispensing.

- Benefits of EHR: Keeps track of health information for patients when the office is closed, increases privacy and security, decreases paperwork and reduces unnecessary tests.

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## PRESENT FEES AND INFORMATION TO PATIENTS

- Verify benefits online, when available.
- Explain insurance coverage versus out-of-pocket expenses (vision plans versus medical plans)
  - Some plans reimburse for only limited conditions, while others cover all conditions.
  - The plan may have limits on whether you can charge the patient for additional services or materials.
  - You may be required to verify coverage before the visit or submit a claim form afterward. Many patients have some type of third-party coverage that refers to vision care insurance, major medical, or both.
  - Several options are available on acceptance of insurance plans.
    - Option 1: accept payment directly from the insurance company as payment in full
    - Option 2: accept direct insurance payment as partial payments and have the patient responsible for the balance
    - Option 3: not accept assignment of insurance payments at all.
  - If possible, check the patient's insurance coverage and benefits prior to the appointment and inform the patient the amount of copayment expected to be paid, if any, on the day of the visit.
    - There are different methods to obtain information on the patient's coverage and benefits prior to the visit.
    - You may access this information through the insurance companies' provider portals, electronic health record insurance eligibility feature, or by phone.
- Additional information to consider:
  - The amount the patient is charged must be carefully explained, so there are no misunderstandings about the cost of services rendered and the method of payment.
  - When presenting a fee, explain what services are covered by the fee.
  - Many offices offer three forms of payment: cash, check or debit/credit card.
    - If the patient is concerned about the fee or does not understand a part of it, ensure that an explanation is given both verbally and in writing.
    - Show them a breakdown of the charges and review it with them, so they understand what services were performed and how those fees apply.

## BUSINESS SKILLS

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### COMMUNICATION

- Practice communication:
  - Patient correspondence
    - Consultation/referral letter: make sure to provide patient with information of referral practice.



- Records request: medical record “owned” by patient
    - Need written consent from patient and signature
  - Thank you letters or appointment reminders
- Office newsletter
- External advertising or marketing:
  - Print ads
  - Online ads
  - Social media
  - Practice website
- Educational materials available for patients
  - Brochures, handouts, or videos
  - Websites/blogs
- Contact insurance companies regarding participation

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## INTERNAL REPORTS/PAYROLL

- Run financial reports:
  - Daily transactions (record charges and payments)
    - Accounts receivable - accounts with balance due that are expected to come into the practice.
    - Daily control sheet - previous balances, charges made, payments received, new balance on every financial transaction.
    - Balancing cash and receipts
  - Inventory
  - Matching statements to invoices
- Payroll
  - Track vacation time/paid time off
  - Compile/verify hours worked
  - Provide check stubs (hard copy or electronically)
  - Maintain tax forms (hard copy or electronically)

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## OFFICE MANUALS & STAFFING

- Different types of manuals:
  - Employee handbook
  - Policies
  - Procedures
  - Training documentation
- Managing the practice:
  - Enforce practice hours versus work hours
  - Maintain patient schedule
  - Develop staff schedules
  - Schedule staff meetings
  - Perform staff training

### MAINTAIN EXAM ROOMS

Paraoptometrics are often given the responsibility of stocking and maintaining the exam lane. A thorough check of supplies and properly functioning equipment should be performed routinely, either at the beginning of the day before patients are in clinic or at the end of the day after patient appointments have concluded.

- Each office will have specific supplies that need to be readily available in each lane. A checklist could be created for accuracy in material and supply ordering.
- Patient education materials, brochures and business cards are often in the exam lane. Be sure these are current, relevant and accessible.
- It is also the responsibility of the paraoptometric to sanitize each exam lane between patients. This includes all items touched by patients. Each office will have procedures in place for how this is to be executed for all instruments and equipment. If unsure, consult the manufacturer for specific instructions on cleaning and maintaining equipment.

### MERIT-BASED INCENTIVE PAYMENT SYSTEM (MIPS)

Medicare based program aimed at improving health care quality.

- The Centers for Medicare and Medicaid Services (CMS)
- Determines Medicare payment adjustments (directly influences Medicare reimbursement amounts)
  - Based on four performance categories: quality, resource use, clinical practice activities, and meaningful use of EHR
  - May receive payment bonus, payment penalty or no payment adjustment
- Not all doctors of optometry are required to report for MIPS.
- The requirements change on a yearly basis, so it is important to be aware of your practice's reporting obligations for the year as well as any program changes.
- Four performance reporting categories:
  - Quality
    - Assesses the quality of the care you deliver, based on performance measures. You pick the six measures of performance that best fit your practice and report those to CMS.
  - Cost
    - Assesses the cost of the patient care you provide. CMS calculates cost measures, based on your Medicare claims, to determine the cost of the care you provide.
    - How much does it cost CMS for you to provide care?
  - Improvement activities
    - Assesses practice engagement in improvement activities such as care coordination, beneficiary engagement, and patient safety.
    - Think about your role in overall public health
  - Promoting interoperability
    - Formally known as “Advancing Care Information” or think “Meaningful Use”
    - CMS indicated this performance category assesses how you improve your care processes, enhance patient engagement in care, and increase access to care. You choose the activities appropriate to your practice.

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## PURCHASING & INVENTORYING OPHTHALMIC EQUIPMENT/SUPPLIES

Purchasing special equipment is an investment by the office for providing good patient care. When consulted about such a purchase, educate yourself. Research equipment companies, warranties, reviews from other users, and costs. Be prepared to present your findings to the doctor of optometry or owner.

Having dependable suppliers is important. Most suppliers offer online catalogs, and some do send physical copies. Have updated suppliers information on hand. Know what products you order and from whom, their return policy, shipping practices and of course, fees for products. Be familiar with the time frame of receiving products, so they may be ordered and received in a timely manner.

- Inventory:
  - Office supplies
  - Frames
  - Contact lenses
  - OTC sales items
  - Ophthalmic supplies

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## FEDERAL REGULATIONS

- Health Insurance Portability and Accountability Act (HIPAA) - federal law that requires the creation of national standards to protect sensitive patient health information from being disclosed without patient's consent or knowledge.
  - Requires a signed release of information to disclose records to another entity.
  - There are fines if breached.
    - Must inform those whose information is/was affected
- Occupational Safety and Health Administration (OSHA) - ensures safe and healthful working conditions for workers by setting and enforcing standards.
  - Provides training, outreach, education and assistance.



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## INFECTION CONTROL PROCEDURES

- Basics:
  - There are two main areas of concern
    - Transmission from person to person
    - Transmission via a contaminated object

- Proper handwashing
- Use and dispose of sharps safely
- Decontaminating all equipment, instruments, devices, fabrics, exam room furniture and practice environment that comes into contact with patients
- Maintain good respiratory and cough etiquette
- Wear protective gear when appropriate (gloves, masks, eyewear, etc.)
- Infection control terms to know:
  - Asepsis - The practice to reduce or eliminate contaminants (such as bacteria, viruses, fungi, and parasites) from entering the operative field in surgery or medicine to prevent infection.
  - Disinfection - Process of inactivating or eliminating most microorganisms using items such as hydrogen peroxide or bleach.
  - Sterilization - Destruction of most microorganisms usually by moist heat or ethylene oxide gas.
  - Universal precautions - Avoiding contact with patients' bodily fluids, by means of the wearing of nonporous articles such as medical gloves, goggles, and face shields in order to reduce the risk of the transmission of disease carried in the blood.

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## DIAGNOSTIC LISTINGS AND FEE SCHEDULE

- The development and revision of diagnosis codes is overseen by the Centers for Disease Control and Prevention ICD-10 Coordination Committee.
- Updated lists of diagnosis codes with new codes noted are released by CDC annually.
- Fee schedules from payers including Medicare, Medicaid and private payers are also updated annually.
- Medicare and Medicaid fee schedules can be easily accessed online and referenced as needed.
- Access these resources on an annual basis, if not more frequently.

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## BASIC BILLING AND CODING

- First steps in billing and coding:
  - Select insurance panels and credential with them
  - Set exam fees
  - Learn how to submit claims
  - Know proper optometry billing and coding procedures
- CPT Code 92004:
  - Medical exam and evaluation with initiation of diagnostic treatment program, comprehensive new patient, one or more visits
  - 92002- intermediate level ophthalmological evaluation of a new patient and initiates a diagnostic and treatment program.
- CPT Code 92014:
  - Medical exam and evaluation with initiation of diagnostic treatment program, comprehensive established patient, one or more visits



## APPENDIX: OPTOMETRIC TERMINOLOGY

### BUSINESS

**ACCOUNTS PAYABLE** - Money owed by the business to its creditors.

**ACCOUNTS RECEIVABLE** - Money owed to a business by debtors such as insurance companies and patients.

**ACCOUNTING** - The action or process of keeping financial accounts.

**ASSETS** - Property or equipment owned by a person or business that is regarded as having value.

**BUSINESS** - The practice of making one's living by engaging in a profession or trade.

**BUSINESS PLAN** - A document setting out a business's future objectives, and strategies for achieving them.

**BUSINESS TO BUSINESS (B2B)** - A type of commerce transaction that exists between businesses.

**BUSINESS TO CONSUMER (B2C)** - The process of selling products and services directly between business and consumer.

**CASH FLOW** - movement of money in and out of a company/business.

**COMPANY** - A legal entity formed by a group of individuals to engage in and operate a business enterprise in a commercial or industrial capacity.

**CONTRACT** - A legally binding agreement between 2 or more persons.

**DELIVERY** - The act of delivering ordered goods.

**DEPRECIATION** - The reduction in value of an asset over time.

**E-COMMERCE** - Commercial transactions conducted electronically over the internet.

**EMPLOYEE** - A person working for wages or salary.

**ENTREPRENEUR** - Someone who organizes & operates a business. Takes on the financial risk to do so.

**EXPENSE** - Cost required for supplies, equipment or other investments.

**FINANCE** - The management and allocation of money and other assets.

**FIXED COST** - Business costs that are constant whatever the quantity of goods and services are.

**GROSS PROFIT** - The profit business makes after subtracting the cost related to business (cost of goods).

**INDUSTRY** - Businesses that provide medical services, manufacture medical equipment, or drugs, provide medical insurance, or otherwise facilitate the provision of health care to patients.

**JUST IN TIME (JIT)** - Denoting a manufacturing system, in which materials or components are delivered immediately before they are required to minimize inventory costs.



**LIABILITIES** - Something a company owes to someone else.

**MANAGEMENT** - The act of dealing with or controlling things or people in a business.

**MARKETING** - The process of promoting, selling and distributing a product or service.

**NET INCOME/PROFIT** -What business/individual makes after taxes, deductions, & other expenses taken out.

**NET WORTH** - The total wealth of an individual/company that takes in account all financial assets and liabilities.

**PAYBACK PERIOD** - The amount of time it takes to recover the initial investment of a business.

**PAYROLL TAXES** - Taxes employees and employers pay on wages/salaries required by law to be withheld from an employee paycheck each pay period. This includes Social Security, Medicare, federal income tax, state unemployment tax and state income tax.

**PRODUCT** - Something produced or manufactured to be sold; a good.

**PROFIT MARGIN** - The amount by which revenue from sales exceeds cost in business.

**QUALITY ASSURANCE** - Measures compliance against certain necessary standards, typically focusing on individual. (Maintaining a high standard of performance.)

**RETURN ON INVESTMENT (ROI)** - A measurement of profit earned on an investment, such as measuring how much time and expenses incurred by staff on a particular task.

**REVENUE** - The total amount of money brought in by a company's operations measured over a set amount of time.

**SALES PROSPECT** - A potential customer.

**SERVICE** - In health care, provided by a health care professional to diagnose, prevent or treat any human disease or impairment.

**SUPPLIER** - The person or company that provides goods or services needed.

**TARGET MARKET** - A specific group of customers, at which a company aims its products and services.

**VARIABLE COST** - Cost varies with level of output.

**ACCOMMODATION** - The ability of the eye to focus from distance to near.

**AMETROPIA** - Refractive condition in which images fail to focus on the retina. Any refractive condition other than emmetropia (myopia, hyperopia and astigmatism).

**AMBLYOPIA**-condition usually in one eye, rarely both, with reduced visual acuity. It develops when there is a breakdown in how the brain and the eye work together.

**ANTERIOR CHAMBER** - The area inside the eye, behind the cornea, and in front of the iris. This area is filled with clear, watery fluid called aqueous humor.

**APHAKIA** - Absence of crystalline lens.

**AQUEOUS HUMOR** - Clear fluid that occupies the space between the crystalline lens and cornea of the eye.

**ASEPSIS** - The practice of reducing or eliminating contaminants (such as bacteria, viruses, fungi and parasites) from entering the operative field in surgery or medicine to prevent infection.

**ASTIGMATISM** – A refractive condition in which light rays entering the eye fail to meet in a focal point, instead for two blurred planes of light.

**ANISOMETROPIA** - When the prescription is  $\pm$  1D difference between the eyes.

**BASE CURVE** - Measurement of the single front surface of a lens.

**BIFOCAL** - A lens that provides both distance and near correction.

**BINOCULAR** - Vision using two eyes with overlapping fields of view.

**BIOMICROSCOPE (SLIT LAMP)** – Instrument that allows good depth perception for observing a fit of contact lenses and looking at all parts of the front and back of the eye.

**BLEPHARITIS** - Common chronic inflammation and flaking of the lid margin. Patients may experience redness to the eyelid, and sandy or itchy feeling in their eyes.

**BULBAR** - Conjunctiva that protects white(sclera) of eye.

**CATARACT** - An opacity/clouding of the crystalline lens capsule.

**CHALAZION** - A small, usually painless lump on the edge of the eyelid caused by blockage of the gland at the base of an eyelash.

**CHIEF COMPLAINT** - Patient's reason for the office visit.

**CHOROID** - Between the scleral and retina, consists primarily of blood vessels that nourish the retina so that it can continue to function.

**CILIARY MUSCLE** - The muscle inside of the eyeball that alters the shape of the crystalline lens. It has direct control over the focusing ability of the eye (accommodation)

**CONCAVE LENSES** - A lens diverges straight light beam from midline (minus lens).

**CONFRONTATION FIELDS** - A technique used to test each quadrant of patient's visual field using the fingers of the examiner while looking at their nose.

**CONJUNCTIVITIS** - Inflammation of the conjunctiva. "Red eye." Conjunctivitis can be caused by many things, such as infection, allergy, bacteria, virus, or fungus.

**CONVEX LENSES** - A lens converges rays of light toward the midline behind the lens (plus lens).

**CORNEA** - The clear avascular, transparent tissue that is located on the very front (anterior) portion of the eye. The cornea has five layers; from front to back: epithelium, Bowman's layer, stroma, Descemet's membrane, and endothelium.

**CRYSTALLINE LENS** - Is transparent and provides focusing power to the eye by allowing adjustment of the eye to focus from distance objects to near objects.

**DIABETIC RETINOPATHY** - A condition that can cause vision loss and blindness in people who have diabetes.

**DIOPTR** - Unit of measurement of the lens. Equal to reciprocal of focal length in meters, abbreviated as "D".

**DISINFECTION** - The process of using disinfectant to destroy or inactivate harmful bacteria and viruses.

**EDEMA** - Swelling of tissues due to excess fluid accumulation.

**EMMETROPIA** - Parallel light rays are appropriately refracted to focus on the retina. "Normal" refractive condition (NO RX).

**ESOTROPIA** - A form of strabismus in which one or both eyes turns inward. The condition can be constantly present, or occur intermittently, and can give the affected individual a cross-eyed appearance.

**EXOTROPIA** - A form of strabismus in which one or both eyes turn outward.

**EXTRAOCULAR MUSCLES** - The six muscles of the eye, that serve to aim the eyes in the direction we wish to look without moving our heads. The extraocular muscles are listed and defined below:

- **MEDIAL RECTUS** - The most powerful of the extraocular muscles. Its only action is to turn the eye in (Adduction).
- **INFERIOR RECTUS** - Its primary action is to turn the eye downward (depression).
- **LATERAL RECTUS** - Its only action is to move the eye out (Abduction).
- **SUPERIOR RECTUS** - Its primary action is to move the eye upward (elevation). It also adducts the eye. Additionally, it can rotate the top of the eye toward the nose and the bottom of the eye toward the temple (intorsion).
- **SUPERIOR OBLIQUE** - Its primary action is intorsion. It is also responsible for depression and abduction.
- **INFERIOR OBLIQUE** - The only extraocular muscle that has its origin at the front of the orbit. Its primary action is extorsion, then elevation and abduction.

**FLASHES** - Caused by mechanical stimulation of the nerves in the retina. Patients may observe some of these when they rub their eyes with moderate pressure. Flashes without stimulus may indicate a retinal tear or detachment. People noticing flashes need to have their eyes dilated and examined.

**FLOATERS** - Caused by age-related changes that occur as the vitreous inside your eyes become more liquid. Most people notice benign floaters. A change in the appearance or many new floaters may indicate inflammation or retinal detachment.

**FLUORESCHEIN** - A dye used topically to evaluate corneal integrity and intravenously to evaluate blood vessel integrity.

**FOVEA CENTRALIS** - Central (1.5 mm) area of the macula; responsible for the sharpest vision, fine discriminations and high visual acuity.

**FUNDUS** - Inside back surface of the eye. Made up of the retina, macula, optic disc, fovea and blood vessels.

**GLAUCOMA** - Disease that damages your optic nerve, leading to vision loss and blindness. Usually caused by increased eye pressure. Different types exist: Open angle glaucoma/low tension/Neovascular/Angle closure/pediatric.

**HYPEROPIA** - A refractive condition in which, when accommodation is relaxed, parallel light rays enter the eye focus behind the retina; also known as farsightedness (+) lens.

**HORDEOLUM** - "Stye", occurs when gland or hair follicle in the eyelid becomes blocked and inflamed.

**INDIRECT OPHTHALMOSCOPE** - An instrument used to examine the inside of the fundus using a beam of light with stereoscopic views.

**INTRAOCULAR PRESSURE (IOP)** - Fluid pressure of the eye.

**IRIS** - Colored muscular portion of the eye that surrounds the pupil and regulates its size. The iris consists of two circular muscles, the sphincter and the dilator that control pupil size.

**KERATOCONUS** - The corneal disease where the cornea thins and bulges forward. The image focused on the retina is irregular and thus vision is decreased, even with spectacles.

**KERATOMETER** - Instrument used to measure corneal curvature.

**LACRIMAL DUCT** - The drainage system for tears. As tears are produced by the lacrimal gland, they drain through the lacrimal duct.

**LACRIMAL GLAND** - The gland that supplies most of the tears to the eye. It is located above (superior) and temporal to the eye and behind the orbital rim. The aqueous portion of the tears.

**LACRIMAL PUNCTUM** - The opening of either the upper or the lower lacrimal duct at the inner canthus of the eye.

**LACRIMAL SAC** - The upper dilated end of the nasolacrimal duct and is lodged in a deep groove formed by the lacrimal bone and frontal process of the maxilla.

**LENSOMETER** - Instrument used for determining the power of eyeglasses or contact lens.

**LENS POWER** - The prescription strength of the contact lens or spectacle lens determines the lens power. A contact lens fits on the eye and not in front of the eye (as spectacles do), the prescription of a contact lens is often different from the prescription in the patient's spectacles. The distance from where the back of the spectacle lens rests in front of the eye to where the contact lens rests on the eye is known as the vertex distance.

**LIMBUS** - The junction of the cornea and the sclera.

**LISSAMINE GREEN** - stain used to show damaged epithelial cells on the conjunctiva and cornea.

**MACULA** - Central portion of the retina surrounding the fovea; responsible for acute central vision.

**MACULAR DEGENERATION** - A degenerative disease of the central part of retina resulting in distortion or loss of vision.

**MINUS LENSES** - A lens that diverges light (concave in shape).

**MONOCULAR** - Use of one eye.

**MYOPIA** - A refractive condition in which, when accommodation is relaxed, parallel light rays entering the eye focus in front of the retina; known as nearsightedness (minus lens).

**NASOLACRIMAL DUCT** - The drainage system for the tears to leave the eye. It is connected to the nasal passage. This is why the nose runs when one cries.

**NYSTAGMUS** - A vision condition where rapid, uncontrollable eye movements occur. These involuntary eye movements can occur from side to side, up and down, or in a circular pattern. As a result, both eyes are unable to hold steady on objects.

**OCULAR ADNEXA** - Includes eyelids, conjunctival sac, lacrimal drainage system, lacrimal gland, and orbital contents except for the eye and optic nerve.

**OPTIC DISC/OPTIC NERVE HEAD** - The circular area in the back of the eye where the optic nerve connects to the retina. It is the physiological blind spot since no rods or cones exist.

**OPTIC NERVE** - The nerve that carries impulses from the retina to the brain. It transmits the signals from the rods and cones to the brain.

**OPHTHALMOSCOPE** - A handheld instrument used in viewing the interior of the eye, especially the retina.

**ORBIT** - The bony socket that contains the eye and most of its accessory organs. The roof, medial wall, and floor are very thin and can be easily damaged by injury, infection, or tumors.

**OVERALL DIAMETER (OAD)** - The overall diameter of a contact lens is the size of the lens when measured from edge to edge at the widest point. The overall diameter of a small gas-permeable lens is generally 8.50 mm to 9.50 mm. The standard diameter for hydrogel and silicone hydrogel lenses is between 11.0 mm and 15.0 mm. Scleral lenses are another type of larger diameter GP, lens which can reach 22.0mm or higher.

**OPTICAL ZONE DIAMETER (OZD; OZ)** - The central area or zone that provides optical correction for the patient's vision is called the optical zone. This zone is measured with a magnifying reticule. The optic zone diameter varies, depending on the pupil size of the patient, the overall diameter, and the peripheral curve width. The optic zones are specified in millimeters.

**PALPEBRAL** - Conjunctiva that lines the inside of the eyelids.

**PANTOSCOPIC ANGLE OR TILT** - The angle formed by the lens tilt down toward the face.

**PERIMETRY** - The measurement of a person's field of vision.

**PERIPHERAL CURVES** - These are additional curves on the back surface of the lens that surround the optical zone to help tailor the contact lens fit to the individual patient. In a normal eye the cornea is steeper in the center and it flattens toward the periphery. Peripheral curves allow the back surface of the contact lens to imitate the gradual sloping of the cornea.

**PERIPHERAL VISION** - What you can see to each side or up and while fixating straight ahead.

**PHOROPTER** - An instrument used for determining the refractive error of the eyes.

**PHOTOPHOBIA** - abnormal sensitivity to light.

**PINGUECULA** - A pinguecula is a yellow thickening of the connective tissue at the 3 and 9 o'clock positions on the bulbar conjunctiva.

**PLUS LENSES** - A lens that converges light (plus lens).

**POLYMETHYLMETHACRYLATE (PMMA)** - A clear plastic material used for rigid contact lenses.

**POSTERIOR CHAMBER** - The area located inside of the eye, behind the iris, and in front of the retina.

**PRESBYOPIA** - The condition in which lost elasticity of the lens leads to the inability to accommodate (>40).

**PRISM** - A lens that bends light/lenses used to correct double vision.

**PROGRESSIVE LENS** - Corrective lens which corrects distance, intermediate, and near (no line Bifocal).

**PSEUDOPHAKIA** - Term used for having an artificial lens (IOL-intraocular lens) implanted after natural lens removed.

**PTERYGIUM** - A non-cancerous type of abnormal growth of pink, fleshy tissue on the conjunctiva that encroaches onto the cornea. It usually forms on the side closest to the nose and grows toward the pupil area.

**PUPIL** - The round hole in the center of the iris through which light passes.

**PUPILLARY DISTANCE (PD)** - The distance between the centers of the pupil of each eye.

**RADIUSCOPE** - An optical instrument that measures the radius of anterior/posterior surfaces of a hard contact lens.

**RETINA** - The innermost layer of the eye that contains rods and cones; the part of the eye where vision takes place. The images that fall on the photoreceptor cells of the retina are then transmitted to the brain via the optic nerve, where they are interpreted.

**REFRACTION** - measurement of focusing characteristics of an eye/eyes (determines prescription).



**REFRACTIVE STATUS** - describes how light rays that enter the eye are focused. The eye's ability to see objects clearly requires the light entering the eye to focus on the back of the eye. Some eyes will require assistance from a prescription lens to focus light; others may not.

**RETINOSCOPE** – A handheld instrument used to measure patients' refractive error/prescription.

**RETROSCOPIC ANGLE OR TILT** - Angle the bottom of frame front away from face towards forehead.

**RETINAL DETACHMENT** - An emergency situation! The retina pulls away from its normal position, separating the retinal cells from the layer of blood vessels that provides oxygen/nourishment to the eye. Surgical intervention is necessary to reattach the retina to preserve vision.

**RODS AND CONES** - Photoreceptors (light-sensitive cells) in the retina of the eye. Rods are more numerous and provide night and peripheral vision (black/white vision). They are around the edge of the retina. Cones provide color and work at bright levels of light. They are in the center of the retina.

**ROSE BENGAL** - Stain used to show damaged corneal and conjunctival cells.

**SEGMENT HEIGHT (SEG)** - The vertical measurement in mm, distance from the lowest point on the lens to the level at top of the seg.

**SINUSES** – Air-filled chambers in the bones of your face. Sinuses include Frontal, Maxillary, Ethmoid, Sphenoid sinuses; spaces within the bones. Poor drainage, infection, or cancerous enlargement of the sinuses may cause headaches, pain in or around the eye (periorbital).

**SLIT-LAMP EXAMINATION** – Examination that looks at anterior structure at the front of the eye (magnifying microscope).

**SCLERA** - The white portion of the eye made up of a tough, fibrous tissue that gives shape and structure to the eyeball.

**SPHINCTER** - A ring-like band of muscle fibers that constricts a passage or closes a natural orifice.

**SUBCONJUNCTIVAL HEMORRHAGE** - Very tiny blood vessels between the sclera and conjunctiva occasionally rupture. This may occur spontaneously or be brought on with coughing, vomiting or sneezing. Another concern is if blood pressure is running high.

**TARSAL PLATES** - Two comparatively thick, elongated plates of dense connective tissue, about 10mm in length for the upper eyelid and 5mm for the lower eyelid; one is found in each eyelid and contributes to its form and support.

**TRIAGE** - Preliminary assessment of patients to determine the urgency for treatment.

**TRIFOCAL** - A lined lens that provides correction for distance, intermediate and near.

**VERTEX DISTANCE** - The distance from the back surface of a corrective lens to the front of the eyeball.

**VISUAL ACUITY**- Measure of the ability of the eye to distinguish shapes and the details of objects at a given distance.

**VITREOUS HUMOR** - A thick, clear, jelly-like substance that fills the eye between the lens and the retina. This substance serves to support the retina and helps keep the eye round.

## THE FIVE O'S

**OPTOMETRIST** - doctor of optometry (O.D.s/optometrists) is the primary ocular health care physician. Optometrists examine, diagnose, treat, and manage diseases, injuries, and disorders of the eye and visual system. Doctors of optometry do this by prescribing medications, low-vision rehabilitation, vision therapy, spectacle lenses, contact lenses, and performing certain surgical procedures. Optometrists counsel their patients regarding surgical and non-surgical options that meet their visual needs related to their occupations, avocations, and lifestyle.

**OPHTHALMOLOGIST** - An ophthalmologist is a medical physician (doctor of medicine, M.D., or doctor of osteopathy, D.O.) who specializes in the medical and surgical care of the eye, visual system, and in the treatment of eye disease and injury.

**OPTICIAN** - An optician interprets, duplicates, manufactures and dispenses eyewear of the prescribed prescription. They prepare and dispense eyeglasses, lenses or related optical devices upon prescription from a licensed optometrist or ophthalmologist. Opticians may be apprenticeship trained or attend a community college program before becoming licensed. Some states require opticians to be licensed.

**OPHTHALMIC MEDICAL PERSONNEL** - An Ophthalmic Medical Technician (OMT) works with ophthalmologists and their patients. OMTs are assigned a variety of job duties including taking patient histories, administering tests, taking eye measurements for the purpose of diagnosis for the ophthalmologist.

**OPTOMETRIC STAFF/PARAOPTOMETRIC** - A paraoptometric is a person who works under the direct supervision of a licensed doctor of optometry, collects patient data, administers routine and technical tests of the patient's visual capabilities, and assists in office management. They may also assist the optometrist in providing primary patient care examination and treatment services, including, but not limited to, contact lenses, low vision, vision therapy, ophthalmic dispensing, and office management. State laws may limit, restrict, or otherwise affect the duties that may be performed by the paraoptometric.

## ETHICS

**CHARACTER** - Paraoptometric should conduct themselves with honesty, integrity and compassion in all of their actions to build trust and respect with patients, the public, and colleagues.

**CONFIDENTIALITY** - A paraoptometric should hold in confidence all protected health and other personal information. This is an essential element of the doctor-patient relationship to build and maintain trust. A paraoptometric may reveal protected health and other personal information only with the written consent of the patient as defined under the Health Insurance Portability and Accountability Act (HIPAA).

**CONFLICT OF INTEREST** - Paraoptometrics should avoid and/or remove themselves from any situation in which the potential for a conflict of interest arises instead of the best interests of the patient.

**EMPLOYER-EMPLOYEE RELATIONSHIPS** - Relations between optometrists and paraoptometrics should be conducted professionally. They should have the best interests of the patients in mind.

**HARASSMENT AND RELATIONSHIPS WITH SUBORDINATES** - A paraoptometric should not engage in any acts of emotional, physical, or sexual misconduct/abuse related to the health care profession. Intimate relationships, even when consensual, between any staff members and/or patients raise concern and are inappropriate.

**INFORMED CONSENT** - Paraoptometrics have a duty to inform patients or their legal guardian about the patient's health care and health care options. Patients must sign a form that states they have been informed.

**PATIENT RECORDS** - Paraoptometrics are responsible for assisting the doctor in maintaining appropriate and accurate records on every patient encounter. Upon written request and in accordance with applicable federal and state laws, patients or their legal guardian have a right to obtain or receive copies or summaries of their medical records.

**REFERRAL** - Paraoptometrics should refer a patient whenever the optometrist believes this may benefit the patient. The provider and/or facility the patient is referred to should be based primarily on the best interest of the patient.

**RELATIONSHIPS WITH PATIENTS** - Paraoptometrics should avoid intimate relationships with patients so not to compromise professional judgment or hinder the trust the patient has placed in the optometrist and the practice.

## COMPUTER APPLICATIONS

**EHR (ELECTRONIC HEALTH RECORD)** - A longitudinal electronic record of patient health information generated by one or more encounters in any care-delivery setting. Digital format capable of being shared across different health care settings.

**ELECTRONIC CLAIM SUBMISSION** - Submitting insurance claims electronically through a software vendor or a third-party clearing house.

**EMR (ELECTRONIC MEDICAL RECORD)** - The electronic record of patient health information generated by encounters at a single provider/clinic.

**INTERFACE** - A program designed to enable software to connect one information system to another in order to share certain data or outputs, and to perform tasks seamlessly without double data entry.

**NETWORK** - A set of connected computers that are able to communicate and share data or programs.

**OPERATING SYSTEM** - The software program that provides the commands and logic that operates the computer.

**SECURITY MEASURES** - Safeguarding computing resources, ensuring data integrity, limiting access to authorized users, and maintaining data confidentiality.

**STORING INFORMATION** - Also known as backing up software information and archiving of data so it may be used to restore the original after a data loss event.

## PREFIXES/SUFFIXES/ROOT WORDS

Prefixes and suffixes (syllables added to the beginning or the end of words) give special meaning to the root. Knowing these can increase your optometric terminology.

Prefix	Meaning
A, An-	without
Ab-	away
Ad-	to, toward
Aniso-	different
Anti-	against
Bi-	two
Di-	two
Ex-	away from, out of
Hyper-	excessive, above, over
Hypo-	under, below
Intra-	within
Para-	beside, beyond, around
Peri-	surrounding
Retro-	backward
Sub-	under, below

Root Word	Meaning
blephar	eyelid
chrom	color
conjunctiv	conjunctiva
cor, core, pupil	pupil
corne, kerat	cornea
dipl	two, double
irid, iri	iris
ocul, ophthalm	eye
opt	vision
orth	straight
papill	optic nerve head
path	disease
phot	light
retin	retina
scler	sclera
ton	tension, pressure

Suffix	Meaning
-ectomy	cutting out, excision
-ia	diseased or abnormal state
-itis	inflammation
-meter	measurer
-ologist	one who studies or practices
-ology	study of
-oma	tumor, swelling
-opia	vision condition
-osis	abnormal condition
-pathy	disease
-phobia	abnormal fear of or aversion to specific things
-scope	instrument used for examination
-al, ic, ious	pertaining to

## DIRECTIONAL TERMINOLOGY

<b>Anterior</b>	<b>located on or near the front of an organ</b>
<b>Posterior</b>	<b>Located on or near the back of an organ</b>
<b>Superior</b>	<b>Situated above or directed upward</b>
<b>Inferior</b>	<b>Situated below or directed downward</b>
<b>Medial</b>	<b>Pertaining to the middle of the midline</b>
<b>Lateral</b>	<b>Pertaining to the side of a position farther away from the midline</b>
<b>O.D.</b>	<b>Latin abbreviation for oculus dexter, which means right eye</b>
<b>O.S.</b>	<b>Latin abbreviation for oculus sinister, which means left eye</b>
<b>O.U.</b>	<b>Latin abbreviation for oculus uterque, which means both eyes</b>