PRESCRIBING LOW VISION DEVICES
PRESENTATION LAYOUT

• Introduction to low vision devices
• Optical and non optical devices
• Prescribing philosophy
• Prescribing distance optical devices
  ➢ Spectacle and contact lens
  ➢ Telescope
• Prescribing near optical devices
  ➢ Microscope
  ➢ Handheld magnifier
  ➢ Stand magnifier
  ➢ CCTV
  ➢ Telemicroscope
• Prescribing non optical devices
• Summary
WHAT IS LOW VISION DEVICES?

• A device which helps to improve visual ability of a person with low vision.
• It is further divided into two categories

Optical

Non-optical
## OPTICAL DEVICES IN LOW VISION

<table>
<thead>
<tr>
<th>Distance System</th>
<th>Near System</th>
<th>Field Enhancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectacle and contact lens</td>
<td>Spectacle-mounted reading Lens (microscopes)</td>
<td>Semi reflective mirror</td>
</tr>
<tr>
<td>Telescopes</td>
<td>Telemicroscopes</td>
<td>Fresnel Prisms</td>
</tr>
<tr>
<td></td>
<td>Handheld magnifiers</td>
<td>Field expanding channel lens</td>
</tr>
<tr>
<td></td>
<td>Stand magnifiers</td>
<td>Reverse Telescope</td>
</tr>
<tr>
<td></td>
<td>Electronic Devices - CCTV</td>
<td>Amorphic or new horizontal lens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Image Minifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concave lenses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convex mirror</td>
</tr>
</tbody>
</table>
NON-OPTICAL DEVICES IN LOW VISION

• These do not rely on lenses for their effects and usefulness but rather use relative size, illumination, position, contrast, color or other sensory inputs for their effects.

• Types of non optical low vision devices are

  ▪ Relative size and larger assistive devices
  ▪ Glare, contrast, and lighting control devices
  ▪ Posture and comfort maintenance devices
  ▪ Handwriting and written communication devices
  ▪ Medical management devices
  ▪ Orientation and mobility management techniques and devices
  ▪ Sensory substitution devices
PROBLEMS WITH LOW VISION PATIENT

• Difficulty with distance visual tasks
  e.g Reading no plates, Transportation , Street signs, Seeing blackboard in school & difficulty in recognition of face of person etc.

• Difficulty with near vision tasks
  e.g Reading is the most common problem in low vision patient, Using computers & Writing etc.
PROBLEMS WITH LOW VISION PATIENT

• Problems with glare/light
e.g. Photophobia & reduce vision at light.

• Problem with mobility
  e.g. Not recognize moving object, bumps & problem in balance etc.

• Problem with home management
  e.g. cooking, phone work, eating and washing clothes etc.
PRESCRIBING PHILOSOPHY

• Aspect of vision being affected (VA or VF?)
• Requirement of a LV person as per his/her occupation or need
• Requirement based on surrounding performance
• Always consider age factor
• Access conditions that may not permit use of device
• Price factor (economic condition) not a big deal (except for high costly devices)
• Motivate LV person psychologically
PREScribing WHEN Distance Vision IS MORE Concern

• Whether the need is static or dynamic VA.

• Static VA become more of a concern when a person is looking at static target e.g: boards in class, sign boards etc.

• Dynamic VA becomes more important when the target of concern is at motion e.g: watching sports, following objects/person.
IMPROVING STATIC VISUAL ACUITY

• Determine the Best Corrected VA (BCVA) of a patient and consider your Target Visual Acuity (TVA)

• Calculate the magnification needed to achieve the TVA.

• Magnification(M)=Denominator of BCVA/Denominator of TVA

• E.g.: if BCVA =6/60 and TVA is 6/12 then M=60/12 i.e. M= 5 x

• Usually Magnification becomes more important to patient than Visual field when improvement static visual acuity.
IMPROVING DYNAMIC VISUAL ACUITY

• Calculation is similar to the static one.

• But, visual field become as important as visual acuity.

• So, balance between VA and VF is desired.

• Ultimately choice comes to final judgement of low vision patient.
AN APPROACH TO PRESCRIBE DISTANCE OPTICAL DEVICE

SPECTACLE AND CONTACT LENS

• A common misconception in vision rehabilitation is that the use of a telescope is the only way to improve distance visual functioning for visually impaired.

• Curvature of image and oblique astigmatism is always consider as the biggest problem with high power spectacle.

• High index material and aspheric design lens should always be consider as the design of choice.

• Antireflection coating should always consider because it enhance the light transmission and decreases chromatic aberration.
• High index lens should always be recommended when patient requiring prescription of – 6.00 D and above. ¹

¹(lee G. sorting out those confusing ophthalmic lens options.optom manage 1991;10;45-49.)

• High add bifocal should generally be fitted higher than the standard bifocal. ²

²(welling M. mastering frame measurement . Eye care business 1993;8:39-40)

• In case of high hyperopia always prescribe aspheric design lens above +7.00 D which reduce lens thickness and peripheral distortion .
CONTACT LENS CORRECTION

• Spectacle may not provide acceptable quality of vision because of aberration, distortion and problem of image size and other optical phenomenon so contact lens should be consider.

• It is always beneficial that the contact lens fitting for the corneal astigmatic case.

• Tinted and opaque contact lenses can be prescribe in low vision patient with
  ▪ Albinism
  ▪ Aniridia
  ▪ Keratoconus
PRESCRIBING TELESCOPE

• An optical instrument used to magnify the apparent size of an object
• Used to view objects at a distance and can be modified to view near objects
• In its simple form, a telescope contains two elements:
  1. **Objective lens**
     - Always + ve or convergent lens
     - Place towards the object
     - Large in diameter
  2. **Ocular lens**
     - Either convergent (positive lens in Keplerian telescope) or divergent (negative lens in Galilean telescope)
     - Placed closest to the eye
OPTICAL PRINCIPLE OF TELESCOPE

• Afocal (normal adjustment)
  • Separation b/w Obj. & Oc. Lens by their absolute value of focal length.
  • Produce only angular magnification
  • Parallel rays of light is incident and emerges
  • Both object and image located at infinity.
  • Equivalent power of telescope – Zero

• M_{TS} = - \frac{D_{oc}}{D_{OBJ}}
  (D_{oc} = power of ocular lens, D_{OBJ} = power of objective lens)

• In case of keplerian telescope
  \- Image inverted – Astronomical telescope
  \- Erected by prism – Terrestrial telescope
OPTICAL PRINCIPLE OF TELESCOPE

Focal telescope
• Made focal for intermediate or near

• Made focal due to relative distance magnification

• Referred as
  ▪ Telemicroscope
  ▪ Reading telescope
  ▪ Surgical telescope
  ▪ Telescopic loupe
  ▪ Near point telescope
COMPARISON BETWEEN OPTICAL SYSTEM OF TELESCOPES

**KEPLERIAN TELESCOPE**

![Keplerian Telescope Diagram](image)

**GALILEAN TELESCOPE**

![Galilean Telescope Diagram](image)
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Keplerian</th>
<th>Galilean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective lens</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Ocular lens</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Weight</td>
<td>Heavier</td>
<td>Lighter</td>
</tr>
<tr>
<td>Length</td>
<td>Longer</td>
<td>Shorter</td>
</tr>
<tr>
<td>Exit pupil</td>
<td>Outside system</td>
<td>Inside system</td>
</tr>
<tr>
<td>Magnification available</td>
<td>Low and high</td>
<td>Low</td>
</tr>
<tr>
<td>Field of view</td>
<td>Larger</td>
<td>Smaller</td>
</tr>
<tr>
<td>Image of quality</td>
<td>Better</td>
<td>Poorer</td>
</tr>
<tr>
<td>cost</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Eyepiece system</td>
<td>Compound system</td>
<td>Simple lens system</td>
</tr>
</tbody>
</table>
FEW CALCULATIONS

Diameter of objective lens (in mm)

• Exit pupil (in mm) = mm

Magnification of telescope

• Most hand held telescope, few numbers written in telescope (e.g. 8*35, 10*20). The first set number (before *) indicates the magnification whereas the second set number indicates the diameter of objective lens.

• E.g. 10*20 telescope have exit pupil size = (20/10) = 2mm
RETINAL ILLUMINANCE IN TELESCOPE

• The patient eye pupil and telescope exit pupil determines, how much light reaches the patient retina.

• The retinal illuminance is proportional to area of exit pupil of eye to telescopic system.

\[
\left( \text{EP}_{\text{telescope}} \right)^2
\]

• Reduction in brightness = \[
\left( \frac{\text{EP}_{\text{telescope}}}{\text{EP}_{\text{eye}}} \right)^2
\]

E.g. what percentage of decreased illumination when patient view through a 4*12 telescope as compare to his or her necked vision when his or her pupil size is 5 mm?

A/C formula reduction in brightness = \[
\frac{(3)^2}{(5)^2} = \frac{9}{25} = 0.36
\]

Thus the telescopic system reduce approximately 36% of illuminance.
• When exit pupil of telescope greater than eye pupil diameter brightness is same as unaided eye.

• When exit pupil of telescope is equal to eye pupil diameter brightness is same as unaided eye.

• When exit pupil of telescope is less than eye pupil diameter image brightness reduced (full eye pupil is not filled with light)

• That’s why always measure the pupil diameter in normal room brightness before dispense the telescope.
INDICATION OF MONOCULAR TELESCOPE

• In general, the telescope is prescribe monocularly for the better seeing eye.

• Monocular telescope used in better seeing eye when one eye have less visual acuity than other (at least by two lines)

Clip on monocular
INDICATION OF BINOOCULAR TELESCOPE

• Binocular prescribing is possible but should have the pre-requisite of having same acuity in each eye and demonstrating some degree of binocularity.

• In most of the case binocular system are prescribed for near use so that the telemicroscope is converge at fixed point of fixation.

• Binocularity difficult to achieve when magnification greater than (2.5* - 3*)
• Binocular telescope for prolong tasks

• Occasionally, use as biocular (alternate fixation)

• Monocular if need to change fixation at various distance
INDICATION OF HANDHELD TELESCOPE

• If the device is going to be used for temporary or occasional use, hand held telescope is preferable. Use may include: reading street signs, determining address on building, observing children at play etc.

• Focus can be change with the use of both hand

• It is important to note that for hand held telescope, if need of magnification greater than 4 times, keplerian telescope recommended because it provide greater FOV
INDICATION OF SPECTACLE MOUNTED TELESCOPE

• Task involve in long term or prolong viewing, spectacle mounted telescope is the choice and may be used for the watching television and driving

• Can be prescribe for work where hand need to be free e.g. driving, writing etc.

• Beneficial to patient with hand tremor problems
ADVANTAGE OF TELESCOPE

• One of the possible device to enhance distant vision
• May be use as for dynamic vision (magnification should be less than 2*)
• It may can be focused to give distance and near magnification
• Can be incorporate with the patient prescription or telescope focus can...
DISADVANTAGE OF TELESCOPE

• Restriction of the field of view
• Ugly appearance
• Expensive and costly
• Reduced depth perception
• Binocularity difficult to achieve
• If dynamic target appear, its speed will be magnified, as will its size
AN APPROACH TO PRESCRIBE NEAR OPTICAL DEVICE

- It is important no note that magnification calculation take place only after patients refractive error has been fully corrected.
- Calculation of EVD for the patient is the most accepted method of calculating low vision near magnification.

\[
EVD = \text{Eye to Image distance} \div \text{Enlargement ratio}
\]

Eye to image distance = Viewing distance

Enlargement ratio (ER) = \text{Best near Acuity (BNA)} \div \text{Target near Acuity (TNA)}

Equivalent viewing power = \frac{1}{EVD (m)}
PREScribing Microscope

• A low vision microscope can be describe as a spectacle mounted convex lens

• Microscope does not produce the increase retinal image; rather it acts as a converging system to neutralize the diverging rays. So microscopes only based on relative distance magnification.

Lens options

1. Full field microscope
   - Spherical lens: Due to aberration it is always good to prescribe power below than +8.00D
   - Aspheric lens: Approximately from +10.00D to +20.00D and aspheric lenticular design from +10.00D to +48.00D
• Doublet lens: A doublet lens is a combination of two vertex lenses separated by an air space and it can be found of magnification about 2° to 20°.

2. Half eye microscope: Convex lens mounted in half eye frame, power runs up to +12.00D,

• The amount of prism incorporated into each lens is equal to the power of microscope plus two additional prism diopters.

3. Bifocal microscope: Mounted in conventional frame in
vertex distance

➢ One piece molded plastic bifocals: upto +6.00D
➢ Aspheric executive bifocal: upto +32.00D
➢ Ben franklin bifocal : upto +20.00D
Once the dioptric power has been predicted to achieve an patient's target acuity, microscope is generally the first device introduced because of following three factors:

1. Microscope is generally most familiar near device.

2. Microscope is easier to use because the practitioner need only be initially concerned with the patient holding the reading material at proper focal point.

3. The microscope allows the practitioner to fine-tune the power of the lens easily by incorporating the patient cylinder correction or adding additional lens power.
• Myopia will allow for the use of a lower powered microscopic lens and hyperopia will need a higher power lens to maintain correct amount of magnification.
INDICATION OF MONOCULAR MICROSCOPE

• Microscope are generally prescribe monocularly for better seeing eye.

• When VA less than 6/60 or difference between two eye are more than two line creates less chance of binocularity and in these case monocular microscope is recommended.

• When patient use monocular microscope, an opaque patch is recommended for poorer seeing eye to eliminate any possible retina revelry between two eyes.
INDICATION OF BINOCULAR MICROSCOPE

• Some patient have equal VA in both eye and the do have potential to achieve binocularity.

• This kind of patient benefit from binocular microscope

• Advantage of binocular microscope is large FOV, stereopsis, depth of field, better acuity and psychological edge.
PRISM IN MICROSCOPE

• In ordinary condition, convergence of visual axis towards near fixation point creates base out prismatic effect by microscope

• So while reading eye must converge more than low power spectacle. This can place strain to positive fusional vergence and may lead to discomfort

• This effect can be reduced by placing distance center closer together than the patient’s distance PD

• Or by incorporate base in prism with high plus lens
PRISM IN MICROSCOPE

- Prism relocates the image towards its apex, so with base in prism image is directed out, which relieves convergence.

- *Fonda* has recommended decentering 1 mm for each eye or grinding 1 mm base in prism in each eye for each diopter of add.  

7 (bailey IL centering high powered addition lenses part 2 optom monthly 1979;70:532-527)
ADVANTAGE OF MICROSCOPE

• Most easiest to adjust because microscope are most familiar and conventional
• Cosmetically normal appearance
• Larger field of view
• Allows both hand free
• Good for patient with hand tremors or poor dexterity
• Useful for prolong reading
• Astigmatic correction can be incorporate in most lenses
DISADVANTAGE OF MICROSCOPE

• As lens power increases:
  ▪ Reduced working distance
  ▪ Depth of focus decreases
  ▪ Lighting become more critical
  ▪ Possibility of binocular decreases
  ▪ Lens distortion and aberration increases
  ▪ FOV decreases
• Fatigue neck, arm, and shoulder muscles
• No mobility when wearing full field microscope
PRESCRIBING HANDHELD MAGNIFIERS

• A handheld magnifier is a convex lens that the patient holds by the means of handle at various distance from the spectacle plan.

• Based on principles of relative distance magnification and angular magnification.

• As magnification and object are brought closer to the eye (with the object held at the focal point of the lens) RDM & angular magnification.

• If magnifier and object are pushed further away from eye (with the object held at the focal point of the lens) AM &
• Lens options
1. Spherical lens: planoconvex or biconvex power ranging from +3.00D to +14.00D.
2. Aspherical lens: most commonly prescribed power ranging from +6.00D to +40.00D.
3. Aplastic lens: two Plano convex lens with convex surface with contact with each other. This provide least distortion from the edge. Power ranging from +6.00D to +40.00D.
WILDLY AVAILABLE WITH MANY SHAPE
**EQUIVALENT POWER**

- \( F_e = F_m + F_a - dF_m/a, \)

- where, \( F_m = \) power of the magnifying lens,
- \( F_a = \) power of the add or accommodation,
  \( d = \) eye to magnifier distance

- Equivalent power is maximum when handheld magnifier is held in contact with an add.

- Equivalent power is always equal to power of magnifier alone, when magnifier held at its focal length from the add (spectacle plan).
FIELD OF VIEW OF HANDHELD MAGNIFIER

- FOV = A(f/d)

  where, A=objective lens diameter
  f=focal length of lens
  and d=eye to lens distance

- As the distance from magnifier to the eye is increased, FOV of handheld magnifier decreases. When magnifier held one focal length away from the eye, the FOV equal to diameter of the lens.
ADVANTAGE OF HANDHELD MAGNIFIER

• Portability
• Patient familiar and acceptance
• wildly available with many shapes and sizes
• Allows for the extended working distance
• Allows for head movement
• May be helpful for reduced peripheral vision who required magnification for near
• Useful for quick spotting
• Illumination available
DISADVANTAGE OF HANDHELD MAGNIFIRE

• Required steady hand and co-ordination

• Decreased field of view with increase working distance

• Decrease reading speed

• Must held parallel to the reading material to avoid print distortion
It is the convex lens that is mounted at a fixed distance from the reading material.

Based on the principle of angular magnification and RDM.

Two types of stand magnifiers:
1. Variable focus
2. Fixed focus

Focusing can compensate for uncorrected refractive error and accommodation.

In most cases of fixed stand magnifier, the distance from reading material to lens is slightly less than the focal length of the lens.
Emerging light rays are diverging so an add or some accommodation is necessary to act to form a clear retinal image.

Lens options

1. Spherical lenses: power ranges from +5.00D to +24.00D (bar magnifier limited from +2.00D to +3.50D)
2. Aspherical lenses: power range from +7.00D to +40.00D
3. Aplanetic lenses: power ranges from +20.00D to +40.00D
EQUIVALENT POWER

- $D_{eq} = D_1 + D_2 - (d) (D_1) (D_2)$
- Where $D_1 =$ dioptric power of lens of stand magnifier  
  $D_2 =$ dioptric power of add or accommodation
  
  
  $d =$ distance between lens and spectacle plan (in meter)

- Refractive error-can be compensated.
- If lens is moved closer to the page, light rays will leave with divergence , thus corrects myopia.
- If lens is moved farther out converging light rays exits which corrects hyperopia.
ACCOMMODATION

• Creates a flexible system for the prepresbyopes.

• Patients with the ability to vary their accommodation can vary the equivalent power of the system.

• To increase the magnification, patients can bring the magnifier closer to eye stimulating more accommodation.

• There is a limit for magnification of particular magnifier.

• Absolute presbyopes do not have this flexibility.
ADVANTAGE OF STANDMAGNIFIRE

• Has a fixed focus, easy for patients
• Good for patients with hand tremors/arthritis and constricted fields
• Self illuminated
• Extended working distance
• Inexpensive, good for detailed tasks
• Useful for patients with constricted visual fields.
DISADVANTAGE OF STANDMAGNIFIRE

• Accommodation or add is needed
• Decreased field of view as compare to microscopes
• Bulky
• May create posture and fatigue problems
• Difficulty in maintaining proper illumination
• Impossible to write with most designs
• Requires the use of reading stand
TELESCOPE VIEWING NON DISTANCE OBJECTS

• Viewing non distance object thorough telescope can be practically achieved by three methods:

1. **Adding a correction to eyepiece lens**: because of divergent light from near object is amplified as it passes through the telescope
   - A very strong plus lens would need to place over the eyepiece.
   - Practically very difficult and can be successful if patient already wear high power lens

2. **Altering the telescope length**: increase the length of the telescope allow a near object to be viewed clearly
   - The limit is depend upon the tube length of the telescope
   - Astronomical telescope allows greater range of focus than Galilean telescope
• **3. Adding a lens cap to the objective lens** : By neutralizing the divergence rays from object (e.g. +3.00D lens cap for an object at 33 cm), the telescope remains afocal.

• A telescope with reading cap is known as telemicroscope.

• The main advantage of prescribing the telemicroscope over microscope having same equivalent power is telemicroscope provide a longer working distance.
The depth of field of a telescope will be same as equivalent power of reading addition.\(^4\)

\(^4\) (spitzberg LA,QI M. depth of field of plus lenses and reading telescope. optom vis sci 1994;71:115-119)

Magnification of telemicroscope is the product of the telescope magnification times the magnification of reading cap.

Equivalent power of telemicroscope: \(D_{eq} = D_{cap} \times |M_{TS}|\)

- \(D_{cap}\) = dioptric power of cap
- \(M_{TS}\) = magnification of telescope

The depth of field varies inversely with the square of equivalent power.\(^5\)

\(^5\) (spitzberg LA,QI M. depth of field of plus lenses and reading telescope. optom vis sci 1994;71:115-119)
• When prescribing telescope attempt should be made to prescribe lowest equivalent power with weakest telescope and weakest reading cap.

• Providing weakest equivalent power will maximize the depth of field and using lowest telescope magnification will maximize the field of view.

• Providing the low powered cap will enable the longer working distance.
ADVANTAGE OF TELEMICROSCOPE

• Major advantage of telemicroscope is it will give large working distance
• Binocularity cab be achieved if both eye have grossly equal VA
• Can be fitted in spectacle (monocular as well as binocular)
• Both hand free for other work ,good for patient with tremor of hand

DISADVANTAGE OF TELEMICROSCOPE

• Constricted FOV
• Expensive
• Reduced depth perception
PREScribing CloseCircuit television

• Works on the principle of electronic magnification (projection magnification)
• Has 3 components - Camera, Monitor and movable reading platform
• Video camera is directed at an object and image is projected on TV monitor screen.
• Movable platform sits on a flat table/desk.
• Patients will assess the printed material with magnified image projected on monitor screen.

• Enables the patients to select regular polarity, e.g. black letters on white background, vice versa.

• Contrast/brightness/magnifications can be changed.

• Magnification level ranges from 4X to 65X.
MAGNIFICATION AND EQUIVALENT POWER OF CCTV

• Magnification = (X) (Y)
  ▪ X= print size on the monitor divided by actual print size
  ▪ Y = reference distance divided by working distance in (cm)

• When reference distance is not specified, it is difficult to determine precise magnification so best approach to determine equivalent power of system.
  • Deq = (X) (Z)
  • X= print size on the monitor divided by actual print size
  • Z= dioptic equivalent of working distance
APPLIED USE OF CCTV SYSTEM

• Use for educational, vocational, recreational and personal pursuits.

• Material of assorted print size and varying contrast should be selectively incorporated in the evaluation and instructional sessions.

• Patient should be instructed not to look on paper and pen while writing but look at the CCTV screen.
ADVANTAGE OF CCTV

- Adjustable projection magnification (ranges from 5 to 65 times)
- Reading distance is more variable than other low vision devices
- Polarity changes is available
- Brightness and contrast control are available
- Adjustable field of vision is possible by manipulating the magnification or screen size
- Binocularity possible with large amount of magnification
- Photographs may easily viewed
DISADVANTAGE OF CCTV

• Physical size may hinder the portability
• Training and practice time is needed to become an proficient use
• Limited available of maintenance service for components
• Initial cost may be higher than most low vision device
PRESCRIBING VMAX

• The V max is the next generation of a head mounted assistance device that address distance, intermediate and near vision.

• It is an automatic focus system with the range of magnification 0.8 to 20 times.

• One high resolution center colour camera healed on head mounted unit.

• The field of view of the camera is 47 degrees in horizontal and 36 degree in vertical.

• Vmax requires no special fitting procedure
It can be fitted over patient prescription spectacles. ADVANTAGES:

- System can use for variable distance
- Wide range of magnification
- Camera has color capability
- Automatic focus capability
- System is completely portable
- Easy to fit and operate
DISADVANTAGE OF VMAX

• Control box and battery pack are heavy

• System is expansive

• System not wildly available
PREScribing NON OPTICAL ACCESSORY DEVICES

- Non optical devices plays important role in the successful use of many low vision optical devices

RELATIVE SIZE AND LARGE ASSISTIVE DEVICES

- Concept of using large size and based on principle of relative distance magnification
- The concept of large print involve not only the size but also spatial layout of print
National institute of visually handicap recommended the followings

- A maximum sheet size is 8.5inch * 11 inch
- An off white opaque vellum paper
- Gutter margins at least 7/8 inch, with outside margin smaller but not less than 0.5 inch
- Adequate leading
- No broken letters
ADVANTAGE OF LARGE PRINT SIZE

• Large print size is best with combination of low powered optical devices

• Large print is acceptance by patient who show poor or reduced contrast sensitivity

DISADVANTAGE OF LARGE PRINT SIZE

• Major disadvantage is large print of limited magnification

• Available of large print material is not immediate and not always possible
GLARE, CONTRAST AND LIGHT CONTROL

• Glare and photophobia are seen in albinism, achromatopsia, retinal cone dystrophy, optic atrophy, aphakia, glaucoma and retinitis pigmentosa.

• Fluorescent light is normally considered harsh because its output is in blue spectrum

• Incandescent light is more directional and has main spectral output in longer wavelength, it generally provide more contrast.
• Neodymium blub emits 30% less UV rays and 28% less blue end spectrum than incandescent light which improves performance significantly over incandescent light for short term near task. 6

6 (choen JM rostneal BP an evaluation of incandescent neodymium light source on near point performance of low vision population .J bis rehabil 1998;2 :5 -21)

• Light source should be directed over the shoulder of better seeing eye and held close to reading martial to get maximum illumination.

FILTERS
• filters will attenuate excessive light to comfortable level and reduce both discomfort and disability glare
• Filter can alter colour perception ,enhance contrast by reduction of glare and scattering
<table>
<thead>
<tr>
<th>FILTERS</th>
<th>PROPERTIES AND USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4% dark plum</td>
<td>This is very dark, general purpose filter that provide good contrast and glare reduction</td>
</tr>
<tr>
<td>40% dark amber</td>
<td>Particularly help on very bright days, comfortable when working on computer</td>
</tr>
<tr>
<td>58% light gray</td>
<td>Relieves indoor glare, especially under fluorescent light</td>
</tr>
<tr>
<td>32% medium gray</td>
<td>For macular degeneration</td>
</tr>
<tr>
<td>13% standard gray</td>
<td>Diabetic patient or people who have done corneal transplant</td>
</tr>
<tr>
<td>65% yellow</td>
<td>Heightens contrast in retinitis pigmentosa and macular degeneration</td>
</tr>
<tr>
<td>FILTERS</td>
<td>PROPERTIES AND USES</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>49% orange</td>
<td>For patient of retinitis pigmentosa</td>
</tr>
<tr>
<td>44% red</td>
<td>For achromatopsia or red monochromacy and albinism</td>
</tr>
<tr>
<td>CPF 450(yellow color)</td>
<td>For glaucoma patient</td>
</tr>
<tr>
<td>CPF 511( yellow orange )</td>
<td>For early cataract</td>
</tr>
<tr>
<td>CPF 527(orange)</td>
<td>For macular degeneration</td>
</tr>
</tbody>
</table>
COATING AND TINTS

• In patient with glare and photophobia we can add different types of glare controlling mechanism with spectacle such as
  ▪ Coating and tints
  ▪ Polaroids
  ▪ Yellow or amber filters
  ▪ Photochromatic lenses
• It is very impotent for the practitioner to verify that the axis of polarization if vertical which cut of horizontal surface reflection.
• Yellow tinted lenses brighten the background on foggy, dark days and may improve reading performance and visual acuity through enhanced contrast.
• Brownish yellow tinted lens, also known as blue blocker, may be used to eliminate outdoor glare and haze.

• Gray lenses reduce intensity of transmission overall of all wavelength of light which strongly recommended for reduction of glare and photophobia outdoor use. Major advantage of gray lens is that it never alter the color perception.

• Corning photochromatic lens (CPF) eliminates virtually all of the UV and blue end visible spectrum of light.
• CPF 450 lens cut off 96% of light of wavelength less than 450nm whereas CPF 511, 527 and 550 lenses filters out approximately 98% of the light below there respective cutoff values.

• Coating improves contrast between the computer screen and background and letter or picture colors.
Gray tint for black and white screen

Violent tint for green screens

Blue tint for

Lee.J straight talk about spectacle lens coating. optom manage 1993;5:24
**TYPOSCOPE**

- *Prentice* describe typoscope is a device that excludes all light reflected from the surface of paper that except which actually affords the necessary between it and the type within the slot.
- Yellow acetate filter cab be attached to the window of the typoscope to further increase contrast.
- For large print size the slot size is 19*13 cm.
PINHOLE AND STENOPIECSLITS

• Both based on principle of paraxial rays to reduce size of blue circle on the retina

• Peripheral distortion, reflection from ocular media finds the largest application for pinhole.

• Suggested diameter of pinhole should be 1mm.

PICTURES

• Distance between pinhole should be equal or greater then the pupil size under normal light conditions

• Best effect of multiple pinhole seen under high illuminance with media opacities, corneal involvement or possibly cataract.
POSTURE COMFORT MAINTENANCE

• High powered optical system prescribed to make relative distance magnification, the reading material must be maintain at close and fixed working distance.

• For elderly, infirm, arthritic, multiple sclerotic patient with tremored correct posture most be maintain to help to prevent premature fatigue.

• Reading racks and book stand can aid in the placement of book and other material at unusually close working distance to achieve RDM.
MEDICAL MANAGEMENT NON OPTICAL DEVICES

• Daily task involve identification of medication, measuring dosages, taking blood pressure, checking once weight, self monitoring blood glucose level and temperature.

• The glucometer may have large display screen or an auditory output or both

• Syringe magnifier is not strictly non optical but can be use for identification

• Large readout thermometers and talking thermometers make taking blood pressure easier
ORIENTATION AND MOBILITY DEVICE

• Mobility deals with process of moving with in the environment
• Visual field approximately 20-50 degrees required for the good mobility with safe orientation

• Sighted guide technique : depend on other for mobility
• Canes : the long can has the advantage of being highly maneuverable, reliable and required virtually no maintenance except for
• Dog guide: the total program of guide involves not only the skill that are taught between user and dog guide but also involve breeding and training of the dog as well matching the dog with person.

• Electronic travel aids: it consist of an ultrasonic device that was chest mounted and emitted pulses to aids in the detection of obstacle.
OTHER NON OPTICAL DEVICES

• Patient with poor grip due to paralysis, paresis or arthritis may find wide barrel pens, wide bodies pen or pen stuck at rubber ball useful in providing enough bulk to allow good manipulation.

• Colored paper is not recommended.

• We also have other sensory substitute devices such as:
  • Talking books
  • Talking product e.g. watches, calculators, scales, computers and clocks
  • Tactile substitute: most common form of tactile input is braille.
SUMMARY

• Before prescribing low vision device always have detail examination of all aspect of vision

• Always access the physical and surrounding environment that may not permit use of device

• Calculate appropriate magnification with the use of appropriate method for different cases

• For a static vision, VA is the major factor to be consider

• For dynamic vision VA and FOV both are the major factor to be consider
SUMMARY

- Always compare two optical device of same system on the basis of equivalent power
- Compression working distance of near optical devices having same equivalent power

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>EQUIVALENT POWER</th>
<th>WORKING DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>+20.00D microscope</td>
<td>+20.00D</td>
<td>5cm (microscope to object)</td>
</tr>
<tr>
<td>4* telescope and +5.00D reading cap</td>
<td>+20.00D</td>
<td>20cm (cap to object)</td>
</tr>
<tr>
<td>5*telescope and +4.00D reading cap</td>
<td>+20.00D</td>
<td>25cm (cap to object)</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>EQUIVALENT POWER</td>
<td>WORKING DISTANCE</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>2*Telescope and +10.00D reading cap</td>
<td>+20.00D</td>
<td>10cm (cap to object)</td>
</tr>
<tr>
<td>+20.00D handheld magnifier (object held at focus)</td>
<td>+20.00D</td>
<td>Variable (magnifier to eye) 5cm magnifier to object (not working distance)</td>
</tr>
<tr>
<td>+28.00D stand magnifier and +2.50D bifocal</td>
<td>+20.00D</td>
<td>15cm(magnifier to eye)</td>
</tr>
<tr>
<td>CCTV ,2mm print projected to 20mm on monitor (while using a +2.00D add)</td>
<td>+20.00D</td>
<td>50cm (eye to monitor)</td>
</tr>
<tr>
<td>CCTV 3 mm print projection to 15mm on monitor screen (while</td>
<td>+20.00D</td>
<td>25cm (eye to monitor screen)</td>
</tr>
</tbody>
</table>