STUDY GUIDE FOR LOW VISION

(UNIT 1-9)

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Prepared by:
Mr. Hassan Minto
&
Mr. Zaman Armaghan
Pakistan Institute of Community Ophthalmology
Hayatabad Medical Complex, Peshawar

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COURSE TEAM

* ***Prof. Dr. Perveen Liaqat***
  Chairperson

* ***Mrs. Ḥajra Ahmed***
  Course Coordinator

* ***M. Aafaque Amin***
  Fieldworker Optometry

* ***Mr. Hassan Minto***
  Writer

* ***Mr. Zaman Armaghan***
  Writer

* ***Mr. Abdul Wodood***
  Editor

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Structure of the course

The course "Low Vision" has been structured to make it as easy as possible for you to do the required work. Like a half credit course this course consists of nine units. . One unit is study work of two week, thus the total study period will be of 18 weeks.

We have organized this course to enable you to acquire the skills of self-learning. For each unit, an introduction is given to help you to develop an objective analysis of the major and sub-themes, discussed in the prescribed reading material. Beside this, objectives of each unit are very specifically laid down to facilitate in developing a clear logical approach. We have also given you Self-Assessment Exercise, which are present at end of each unit. Questions in the Self Assessment Exercise are not only meant to facilitate you in understanding the required readings but to provide you an opportunity to assess yourself. Since the course work of one unit includes studying the prescribed reading material and carrying out the self-assessment questions, activities assignments and practicals, you are required to spend two weeks on each unit.

For this course "Fortnightly Tutorials" are arranged in the University's Selected Regional Study Centers. They provide you the facility of meeting with one another for discussion and mutual help & for group and individual discussion with fellows and tutors.

a) **How to use Reading Material:**

As this is a distance education course, we have organized the required course work in the following manner to help you in evolving a self-learning process in the absence of formal classroom teaching.

1) A detailed course introduction
2) Introduction to each unit.
3) The major theme of the unit is listed along with readings. A list of suggested & prescribed reading in given at the end of each unit.
4) Self Assessment Exercise given in the reference text are not only meant to facilitate you in understanding but will also suggest a direction in which we expect you to think and analyze.

b) How to attend Tutorials:

Tentative Tutorial & Practical schedule is provided to you in your study packs.& 70% attendance in the tutorials is compulsory in order to appear in the exam. Before attending the tutorial, you are required to prepare yourself by reading the topics to be taught in the next tutorial carefully and mark the points which you cant understand yourself in order to discuss them with your tutor and your colleagues.

INTRODUCTION TO THE COURSE

To deliver low vision services a huge gap exists between the need and what is available human resource. The priority should be to train the maximum number of personal and equipping them with essential knowledge in the shortest time. This can be achieved by bolting the low vision training modules on to the existing training programmes for different cadres and by providing in-service training to existing staff. The trainings should be appropriate and conform to the needs of the programmes.

This module attempts to do so by providing the guide line for the trainers and the trainee to learn this important part of optometry training. An important point to remember is the importance of practical training including observation, familiarization and hand on approach.

Objectives of the Course

1. To provide the participants with an overview of different components of a low vision programme, i.e. development of human resources and infrastructure needs.

2. To train the participants in planning for a low vision programme as part of a comprehensive eye care programme.

3. To train the participants in assessment of low vision

4. To train the participants in prescription of optical and non optical low vision devices.

5. To train the participants in imparting training to the client in the use of optical and non optical device

6. To train the participants in providing appropriate advice on environmental modification and additional referral to other service providers

7. To train the participants in running and managing low vision clinic independently.

UNIT 1 :

INTRODUCTION

LEARNING OBJECTIVES :-

After studying this unit, you should have a clear understanding of:

- What is low vision
- Impact of low vision
- What is low vision care
- What constitutes a low vision programme
- What are the different levels of a low vision programme
- How to evaluate a low vision programme
- The psycho-social implications of low vision

1.1 GLOBAL PREVALENCE

In the world today there are approximately 135 million people with low vision; approximately 80% live in developing countries. About 100 million can have vision improved with spectacles, sight restored with cataract surgery or other forms of treatment. Most of those with low vision are older people and the numbers will double over the next 20-30 years. Whilst the number of children is small, the burden in life years with low vision is significant.

The prevalence throughout the world ranges from approximately 10% in India (Dandona et al) to 1% or less in most developed countries (Taylor et al).

As the prevalence of low vision is very low in children, population-based surveys are not common but estimates are based on surveys in schools and registers. In the WHO report *Preventing Blindness in Children (WHO/PBL/00.77)* prevalence was reported as:

- 0.4 per thousand children in high income regions
- 0.7 per thousand children in middle income regions
- 0.9 per thousand children in low income regions.

1.2 DEFINITIONS

It is important to distinguish between the different definitions of blindness and low vision. The WHO definitions to be used in surveys define low vision as Visual Acuity less than 6/18 to 3/60 and blindness as less than 3/60. At the consultation on low vision held in Bangkok, the definition adopted was that low vision was vision less 6/18 to light perception (*Management of Low Vision in Children, WHO/PBL/93.37)**. Notes on the definition included the statement that the definitions should not be used to determine eligibility for service. The use of the functional definition ensures that people who have low vision but who have visual acuity less than 3/60 are included in low vision programs and therefore able to benefit from refraction and low vision services.

> * A person with low vision is one who has impairment of visual functioning even after treatment and/ or standard refractive correction, and has a visual acuity of less than 6/18 to light perception, or a visual field of less than 10° from the point of fixation, but who uses, or is potentially able to use, vision for the planning or execution of a task.

1.3 IMPACT OF LOW VISION

Low vision can affect normal development and education of children and all areas of daily living, work and leisure for adults. The broad areas that low vision impacts on participation is in

- education, work and leisure
- social and consumer interactions
- mobility
- emotional reaction to vision loss
- household and personal care.

It is important to note that the degree of vision impairment does not predict exactly the extent to which vision limits activities or restricts participation.

1.4 MULTIDISCIPLINARY APPROACH TO LOW VISION CARE

Not all people with low vision will need low vision services nor will they need the same type and intensity of service. Results of research using a questionnaire to establish peoples' needs for low vision care indicate

that some people with low vision do not require low vision services and that those who need them will have differing needs for the type and amount on intervention.

Results of our research with the Impact of Vision Impairment Profile (IVI) indicate that almost half of the people with visual acuity in the categories <6/12 – 6/18 and <6/18 – 6/60 report little or no problems with activities due to their vision and so would not need referral for low vision care. Almost 10% of people with visual acuity <6/60 also report little or no difficulty. The level of difficulty reported by people with low vision is not the same for all types of activities. These results confirm that visual acuity alone should not be used to determine if a person needs low vision services.

At this stage we can estimate targets for the provision of care to provide coverage for all people who need low vision care. An estimate would probably be that, at any one point in time, approximately 70% to 80% of people with low vision might benefit from low vision services.

1.41 USING PREVALENCE DATA FOR NATIONAL PLANNING

The number and distribution of services can be estimated based on the prevalence of low vision, and the need for service by people with low vision. Population-based epidemiological surveys provide data on the prevalence and causes of vision impairment in a defined population. Many countries have recently conducted surveys of adults. Presenting visual acuity is a person's "everyday" or functional acuity, that is with their current glasses or without. This compares with best corrected which is the visual acuity of those people with refractive error measured after refraction. The prevalence figures using best corrected acuity exclude those people who can have their visual acuity corrected to within the normal range. It is the best-corrected acuity that is the relevant one to estimate the number of people in need of low vision care.

In countries where there have not been population-based surveys, estimates can be made from studies in countries with similar demographic or economic characteristics (Keeffe et al). The prevalence of low vision and blindness in children can also be estimated with knowledge of child mortality in a country (*preventing Blindness inChildren, WHO/PBL/00.77).*

The presence of age-related eye disease causing low vision such as age-related macular degeneration and glaucoma can be estimated with knowledge of the life expectancy within a particular population or country.

Another source of estimation of the number of people with low vision is from the data summarised in the WHO publication *Global Data on Blindness: Update 1994 (Thylefors, Negrel, Pararajaseagaram).* The estimate of the number of people with low vision is that there are three times the number with low vision than there are people who are blind (visual acuity <3/60). It should be remembered that most of the people with vision less than 3/60 have useable vision, that is they have low vision.

The combination of the known or estimated prevalence of blindness and the reported need for low vision care can be used to estimate the national need for the number of people needing low vision care. The aim is to increase the number of people with low vision with access to appropriate services.

1.42 ESSENTIAL ELEMENTS OF A LOW VISION PROGRAMME

In a country with a developed low vision service, a team of professionals carries out low vision assessment. A social worker, functional assessment by a low vision therapist, optometric assessment by an optometrist and follow-up visits to the client by the social worker do the initial interview and history. The low vision clinics in these countries are usually very well equipped and the aids are provided to patients on long term loans, free of cost or are covered by medical insurance.

Unfortunately, this is not the case in most developing countries that have either poorly developed low vision services or no services at all. Most of the clients come from a lower socio-economic group and cannot afford expensive devices. Two major impediments that encountered in developing a low vision service are paucity of trained people and non-availability of low vision devices.

Under these circumstances, it is necessary to develop a low vision service that can fit into the existing health and social welfare infrastructure of the country.

OBJECTIVES

- To formulate strategies and an action plan to develop appropriate, affordable and sustainable low vision services for individuals with low vision
- To improve the availability of appropriate, affordable low vision devices
- To train a suitable cadre of practitioners
- To improve awareness of the need for and benefits of low vision services amongst the public as well as eye care professionals

STRATEGIES

Low vision devices

As affordable low vision devices are not available at large especially in developing countries therefore, there is a need to train technicians in the production of low cost, robust low vision devices from locally available materials. Optical workshops will need to be developed for this purpose. For initial purposes, facilities already available in the market can be utilized e.g. lathe operators to make the stands for the magnifiers and optical technicians for grinding and fitting of lenses. There is also a need to identify potential producers of more sophisticated optical aids either from local markets or other countries capable of producing devices at low cost.

Human resource development

There is a need to identify and train a cadre of eye care workers to provide low vision services. Possibilities include ophthalmologists, the optometrists, mid level professionals and existing special education teachers. Whoever is trained in low vision work will need to have a particular interest in this specialty.

In the short term, ophthalmic paramedics could be trained to provide very simple devices in remoter rural communities. Training of low vision professionals may need to be provided by visiting experts until the expertise and experience is necessary within these countries to take on this development role.

Advocacy

Once low vision services are in place, there will be a need to create awareness in the public and improve awareness of the needs of individuals with low vision amongst ophthalmologists and teachers of visually impaired children. Generally, there already exists a cadre of community health workers in the developing countries who could assist to identify persons with visual handicap and refer them to appropriate centres. This would entail inclusion of low vision in their primary eye care training. For a sustainable development of low vision services, there is a need to create awareness amongst officials of health and special education/social welfare departments.

Development of models of low vision services delivery

The national program for prevention of blindness needs to identify tertiary resource centres that would be involved with human resource development and provision of specialty services, low vision being one of them. There is a need to develop expert centres of low vision as per need of the country, ideally within established eye departments. The functions of the Expert Centres would be to:

- Produce low cost, simple low vision devices
- Obtain or produce more sophisticated low cost, low vision devices
- Train technicians in the manufacture of these devices
- Train practitioners in assessing, prescribing, dispensing and maintaining simple low vision devices, as well as more complex devices
- Manage the complete range of cases, including those with more complex needs
- Improve awareness through health education and continuing medical education
- Evaluate models of services delivery to determine its appropriateness to that country
- Audit service provision
- The Expert Centres would train personnel and supply low vision devices to satellite clinics run in smaller eye units

RECOMMENDATION FOR PLAN OF ACTION

Short term (1- 2 years)

- Establish an Expert Centre, and identify further Eye Units that can become Expert Centres during the first years
- Train practitioners to work in the Expert Centre, which may require input from external experts in short, term
- Produce low cost, simple low vision devices at the nominated centres using locally available materials. This will entail establishing optional workshop and training technicians
- Obtain sophisticated devices as required, form inexpensive sources of supply

Medium term (2- 5 years)

- Consolidate and develop the Expert Centres
- Start to develop the satellite outreach clinics, which will prescribe from a range of simple magnifiers
- Improve awareness among health professionals and teachers in special education of the needs of people with low vision and how these can be met
- Improve awareness among the general public

Long Term (5 years +)

- Undertake epidemiological research to assess the need for low vision services
- Undertake operational research to evaluate the model of low vision service delivery
- Produce low cost, sophisticated devices

Some of the essential elements for starting a low vision service include:

1. Persons interested in low vision e.g. optometrists, ophthalmologists, special education teachers and nurses
2. Clinic space for low vision practice e.g. in a hospital or clinic, government or private or NGO run
3. A referral base of patients
4. An optical laboratory with optical technicians to support the production of high power plus and minus lenses

5. Opticians who are familiar with optical principles of magnifiers and telescopes and can fit low vision devices
6. Semiskilled/skilled technicians (e.g. lathe operators) who can cut moulds for the low vision devices
7. Basic assessment equipment and materials like ophthalmoscope, retinoscope, trial set, vision box, Lea tests and screeners, visual field perimeter, trial box of low vision devices (these could be imported or locally made)
8. Awareness amongst eye care professionals and the general public

Most specialties in ophthalmology are costly to develop and require specially trained people and sophisticated equipment. Low vision as a specialty is one area that can easily be initiated in any ophthalmic or optometric set-up with a minimum of investment and training. Most of the devices used for assessment can be produced locally, using indigenously available materials and appropriate technology. The use of simple magnifiers can help children pursue education in normal stream schools and improve the quality of vision in visually impaired adults.

Each country can identify its own relevant existing human resources, and train them in a short period of time to provide low vision care in a hospital or clinic setting. Standard manuals on production of inexpensive low vision devices can be utilized to make these devices. As experience is gained, and with some input from expatriates, a cost effective and sustainable low vision service can be developed. It would be preferable to plan the development of any such service so that it is capable of fitting in the ongoing national health and social welfare programs. This will not only ensure its sustainability and cost containment but also its early acceptability and implementation.

1.43 A TERTIARY LOW VISION CLINIC

ROLES AND FUNCTIONS OF A TERTIARY LOW VISION CLINIC

The tertiary low vision clinic's role and functions as service centre, training centre, exchange centre, model centre, low vision services promotion centre and in the planning of future development of low vision services.

Functions :-

1. **Service Centre** – To provide direct clinical services : diagnosis, refraction, assessment of residual vision, prescription and dispensing of low vision devices etc. And to refer patients for medical management, rehabilitative training, psychosocial support etc. when necessary.
2. **Training Centre** – To provide trainings to improve knowledge and skills of existing local and overseas professionals serving the low vision patients, as well as personnel for new low vision services.
3. **Exchange Centre** – To achieve service improvement through exchange of information, knowledge and skills with other centers to establish better referral system, to learn improved vision assessment methods, be informed of more cost-effective mode of human and other resources utilization, to obtain information about new equipment and low cost quality low vision devices etc.
4. **Model Centre** – The service structure developed and skills used by the Centre would be unique for the country and area that the Centre serves. It can act as a model for places of similar culture and social organization.
5. **Low Vision Service Promotion Centre** – To increase public awareness and to promote equal opportunity and better quality of life for the visually impaired through interactions and cooperation with service providers and associations of the visually impaired in referrals, joint promotional activities, studies on the visually impaired persons' needs etc. The activities can increase the accessibility of low vision services to the visually impaired, promote public awareness and social harmony as well as influence policy beneficial to the visually impaired.
6. **Plan the future development of low vision services** – The mentioned roles and functions clearly indicate that the Clinic plays a vital role in the future development of low vision services in its country and should be involved in the service development planning: where should low vision services be extended to in the next stage and its scale of operation; when the new services should start and what kind of personnel should be trained to meet the new service needs ; whether the mode of operation should be more medical or rehabilitative oriented etc.

RESOURCES REQUIRED IN A TERTIARY CLINIC

Human resources

The professionals required by a low vision clinic are ophthalmologist, optometrist, social worker, orientation and mobility instructor, occupational therapist and administrator.

1. **Ophthalmologist and Optometrist**
   - Examine patients and identify those with treatable eye diseases and refer them for medical management when necessary.
   - Assess visual functions and to prescribe low vision devices and vision training to improve visual ability.
   - Refer patients with rehabilitation, social and other needs to the appropriate professionals for assistance.
   - Provide short and long term reassessment.

2. **Social Worker/Welfare Worker/Employment Advisor**
   - Assess a low vision patient's social, financial and employment needs and to provide assistance accordingly to enable the patient to resume social, occupational and family activities hindered by visual impairment. Examples are counselling and referral to patient support associations to give psychosocial support to the patient ; identify vocational training opportunity and educational subsidies to improve the patient's skills an abilities for better chances of employment ; arrange rehabilitation trainings in self-care, home maintenance, communication for patient whenever necessary.

3. **Orientation and Mobility Instructor**
   - Assess mobility skills and spatial orientation of low vision patient.
   - Develop strategies and provides training such as mobility skills in unfamiliar environment and the use of public transport to improve the patient's mobility.

4. **Occupational Therapist**
   - To provide non-optical appliances and advices on skills, and environmental modifications to improve independence in daily living.

5. **Administrator/Educator**
   - Coordinate various services inside the Clinic to ensure good communication among different professionals and smooth delivery of quality services
   - Liaise with other service organizations for the visually impaired and associations of the visually impaired to understand and to meet the clinical service needs of the visually impaired
   - Organize publicity and advocacy for better public awareness of low vision, its prevention as well as to improve the accessibility of low vision service.
   - To promote collaboration with related organizations and bodies to carry out studies and researches on low vision, and to use the results for service publicity and service improvements.

The above human resource combination clearly indicates that low vision care service is an integration of ophthalmic, rehabilitative and social services: the ophthalmologist and optometrist provide ophthalmic care and assess the need for low vision devices, while the social worker, orientation and mobility instructor etc. assess the rehabilitation and social needs of the low vision patients and to provide them the required rehabilitative and social skills to enable them to re-integrate into the community.

Physical Resources

Other resources required by a Tertiary Low Vision Clinic are space and facilities for patient consultation, clinical training, library and access to electronic information, keeping the inventory of low vision devices, and dispensing low vision devices.

It will require space to:

1. Provide low vision consultation (ophthalmic examination, vision assessment, optical and non-optical low vision devices prescription, referral arrangement etc.) to low vision patients.

2. Dispense low vision devices

3. Train patients in the use and maintain an inventory of LV devices.

4. Keep literature about low vision care and to provide access to

electronic information of low vision services to enable the Clinic to keep up with advancement in low vision services and to find new ideas for service improvement to suit the local needs.

5. Carry out studies to identify the needs of low vision patients and to plan service provisions accordingly; conduct researches to improve skills and service quality.

6. Exchange low vision knowledge and skills with experts to improve the centre's services and to plan its future development.

7. Provide training to local low vision service providers such as optometrists, ophthalmologists, occupational therapists, rehabilitation workers etc. to improve service quality.

Standard List of Equipment for Tertiary, Secondary and Primary Levels

(1) Tertiary Level Clinic

A. Ophthalmic Equipment for Tertiary Level Clinic

Equipment
Streak Retinoscope (powered by AC)
Ophthalmoscope (powered by AC)
Lensmeter
Trial lens set (full aperture)
Adult trial frame (2)
Paediatric trial frames (3 pairs of different sizes)
Trial lens holder (8 wells)
Halberg clip
Long handle occluder with pinholes
Cross cylinders (±0.5, ±1)
Pen torch

B. Vision Assessment Equipment for Tertiary Level Clinic

Equipment
Light box for VA test
Distant LogMAR test charts for light box – letter, number, symbol (one for each type)
Distant LogMAR test chart on hard cardboard – letter
Near vision tests - LEA symbol paediatric tests for matching and pointing (with and without crowding)
Near vision test – IE, number
Preferential looking – LEA paddles and cards of differential contrasts
Contrast sensitivity test charts
PV-16 Color Vision Test(double set)
"Amsler" grids
Hand disc perimeter
Tangent screen

C. Low Vision Devices for Tertiary Level Clinic

C.1 Optical Low Vision Devices

- Spectacle magnifiers (half eyes) from 6D to 12 D in 2D steps with base in prisms
- 10-40D in 4D steps as half eye, total 9 pieces (45)
- 10-40D in 4Dsteps as full aperture R+L, total 18pcs(90)
- Foldable and hand-held magnifiers with and without built-in light source, from 5D to 42D, total 15 pieces ($21.8)

- Stand magnifiers with and without built-in light source, from 13.5D to 56D, total 9 pieces & $31.3
- Dome and bar magnifiers, total 4 pieces ($19.3)
- Hand-held monocular telescopes from2.5X,3X, 4X,6X,8X and10X with micro-lens for 8X and 10X telescopes, total 5 pieces ($56.9)
- Filters of 5 different shades with UV protection and luminous transmission of 40%, 18%, 10%, 2% and 1%, ($100)

Details of the optical devices are listed in Appendix 1.

C.2 CCTV Devices

- Black and white hand-held CCTV magnifier, US, Max Port Black & White, ($475)
- Full colour hand-held CCTV magnifier, US, Max Port Colour, ($602)
- Table top black & white CCTV with background colour choice and can integrate with computer display, New Zealand, Smart View, ($2,270)

C.3 Computer Devices

- Computer software with text enlargement and voice output, US, Zoom Text, ($680)
- The total cost of low vision devices will be C1 + C2 + C3 = $4,45 + $3,647 + $1,880 = C = $5,972 The costs of ophthalmic equipment, assessment equipment are A and B i.e. $1,584 and $3,750 respectively.
  A + B + C = $11,306.

(II) Secondary Level Clinic

D. Ophthalmic Equipment for Secondary Level Clinic

Equipment
Streak Retinoscope (powered by AC)
Ophthalmoscope (powered by AC)
Trial lens set (full aperture)

Adult trial frames
Paediatric trial frames (3 pairs of different sizes)
Long handle occluder with pinholes
Pen torch

E. Vision Assessment Equipment for Secondary Level Clinic

Equipment
Distant LogMAR test chart on hard cardboard – letter or IE
Near vision tests - LEA symbol paediatric tests for matching and pointing (with and without crowding)
Near vision test – IE, number
Contrast sensitivity test – LEA screener

F. Low Vision Devices for Secondary Level Clinic

Optical Low Vision Devices

- Spectacle magnifiers (half eyes) from 6D to 12 D in 2D steps, 16D to 20D in 4D steps, total 6 pieces & costs $54
- Hand-held magnifiers with and without built-in light source from 5D to 17D, total 5 pieces & costs $8.1
- Stand magnifiers from 13.5D to 40D with no built-in light source, total 6 pieces & costs $20
- Dome and bar magnifiers, total 2 pieces & costs $7.4
- Hand-held monocular telescopes from 4X to 8X with micro-lens for 8X telescopes, total 4 pieces & costs $42.2
- Filters of 4 different shades with UV protection and luminous transmission of 40%, 18%, 10% and 2%, total cost $100

The total cost of low vision devices is $231.7 = F.
The costs of ophthalmic equipment, assessment equipment are D and E, i.e. $1,040 and $400.
D + E + F = $1,671

(III) Primary Level Clinic

G. Equipment for Primary Level Clinic

Equipment
Vision screening with WHO Low vision Kit
Pen torch

H. For Use at Primary Level

- Four hand-held magnifiers from 5D to 14D, ($6.6)
- Four stand magnifiers from 13.5D to 40D, ($12.8)
- Two telescopes, 4x and 6x, ($26.5)

The cost of low vision devices is $45.9 = H
The cost of equipment is G i.e. $20.
G + H = $65.9.
The costs to equip clinics at the three levels are :

Tertiary : approx. US$ 11,300

Secondary : approx. US$ 1,700

Primary : approx. US$ 65

1.44 Primary Level Low Vision Care

Low vision services should be integrated into the eye and health care, education and rehabilitation systems within a country. The aim of this presentation is to outline the integration of low vision services into primary or community-based care (Table).

Activities	Personnel	Resources
Awareness Screening Referral Basic rehabilitation	PHC/ PEC CBR Teachers	Appropriate visual acuity tests (with pinhole). Samples and instructions for non-optical devices WHO Low Vision Kit

Table. The activities, personnel involved and the resources required to establish primary level low vision services.

In eye care at the primary level it is the health or eye care worker who is involved in low vision care. The role in case finding or screening to identify people with low vision is the same procedure as screening for people with cataract or refractive error. The additional knowledge needed is of the needs of people with low vision and referral networks. Appropriate low cost resources and a curriculum for training courses are available.

TEACHERS

At the primary level is a classroom teacher in a regular community school, who with on-the-job training, can provide the basic needs for a student with low vision. Ideally these teachers receive support from the secondary level, an itinerant teacher with training in low vision who provides specialised support to both the classroom teacher, the student, their parents and the community. Resources and training for community-based teachers need to be provided from a tertiary level resource centre.

Teachers also play an important role in eye health education for the prevention of vision loss. In all countries knowledge that most eye diseases can be prevented or vision restored for most people with vision loss, should be basic information to be included in health education. Health promotion to prevent vision loss and blindness in children is particularly important in areas where vision loss is associated with poor nutrition (Vitamin A deficiency), hygiene (trachoma), immunisation (especially for measles) and where rates of trauma are high.

COMMUNITY-BASED REHABILITATION

This has a parallel with teachers where existing community-based workers can be trained to appropriately meet the needs of many people with low vision. In addition to the roles of screening (case finding and referral) and health promotion is the provision of basic rehabilitation. Many people with low vision can have their ability to participate in their chosen activities with relatively simple modifications to their environment and provision of non-optical devices. With an understanding of low vision, its impact and "problem-solving" skills, simple but effective changes can be made to enhance participation in chosen activities

An important area of work is the identification of children and infants with impaired vision. Early intervention is an important role of CBR workers. Assessment of functional vision can be conducted using the comparison of visual functioning with milestones of normal visual development. Support is provided to parents and the community to stimulate vision and general development of the child.

Low vision is a part of the spectrum of vision impairment and thus low vision services should not be separate from services to people who are blind. Essentially the same people and existing organisations will provide care. Similarly in the provision of eye care, low vision is part of that care utilising the same personnel (with training in low vision) and often using the same facilities. What is needed to ensure low vision care for all who need it, is trained personnel to assess needs and provide specialised skill training for people with low vision and the special equipment and materials.

Training Community-based Workers

Training of primary or community level workers is mainly to detect people with low vision, refer them for diagnosis, treatment and low vision assessment and care, and to provide basic rehabilitation. There are five main topics. An understanding of low vision and the specific needs of people with low vision are necessary in any training course. This understanding should include knowledge of the elements of vision:

- distance and near vision (size and distance of objects)
- visual field
- contrast
- illumination.

Another important aspect is the need to create awareness through health promotion about low vision as part of the national program for prevention of vision loss and reducing its impact. The other topics are:

- Vision testing for screening
- Nature and implications of low vision
- Basic rehabilitation techniques

The emphasis will vary depending on the roles of the workers involved and their previous training.

PRIMARY EYE/ HEALTH CARE WORKERS

The need for training is that they can carry out case-finding and make referrals. They also need knowledge of the services at secondary and tertiary levels so that they can follow up recommendations for care.

The minimum topics for training in low vision are:

1. Vision Screening
2. Referral Pathways
3. Health Promotion
4. Basic Rehabilitation

This training can be conducted in a minimum of one day but up to 2 days.

COMMUNITY-BASED REHABILITATION (CBR)

Many CBR workers will work with people with all disabilities. They require the special knowledge and skills to work with people with impaired vision, and particularly low vision. Their training would include all the same topics as for primary eye care workers but with emphasis on assessment of functional vision and rehabilitation techniques

Whilst they will not normally prescribe low vision devices, they need training in the knowledge of what devices are for and how they should be used. The knowledge of the concepts of vision should be applied to obtaining or making non-optical low vision devices.

Whilst much of the rehabilitation will be with older people, topics on early intervention for infants and pre-school children is critical in CBR.

TEACHERS

The aim of training for teachers in local/ mainstream schools is so that they can detect children with impaired vision and include the students with low vision in all aspects of school life.

Teachers can also be taught vision screening if it is not conducted regularly by others. They need to be able to test vision or conduct a functional assessment to determine if a student has normal or impaired vision, and for those with impaired vision to assess if the student has low vision or is blind. Knowledge of referral pathways is also essential.

For effective inclusion in school and community activities an understanding (and assessment) of appropriate learning medium using the five categories of functional vision is essential. Teachers need to be trained in assessment of functional vision to make decisions about the most appropriate medium for each student. The categories are:

Functional vision	*Learning medium*
Normal Vision	**As for normally sighted children**
Low Vision Mild – Moderate	**Regular print without low vision devices**
Low Vision Severe	**Regular print with low vision devices or large print**
Low Vision Profound	**Braille; use of vision for mobility, activities of daily living etc.**
Blind	**Braille and other non-visual media**

Assessment of the ability to use print is used in this table but it is an example only of the everyday objects and materials that people with low vision need. Assessment of functional vision should use a variety of objects and materials.

Training of Midlevel Personnel

The categories of health personnel involved in the provision of eye care at different levels vary from country to country. In this paper, reference is made to some of these categories, considering common staff at the specialist cares level, auxiliary clinical personnel, and staff developments for management and technology. In addition, there are other professional categories in many countries, for example optometrists, orthoptists, ophthalmic and dispensing opticians, and others involved in certain elements of eye care, in particular refraction and low vision services.

OBJECTIVES

- Expand the training opportunities (both quantitatively and qualitatively) for mid level eye care workers
- Standardize the existing training
- Adopt a uniform and standardized curriculum
- Offer a progressive career structure

EXPECTED OUTCOMES

- Increase coverage and uptake of high quality essential eye care services and thus ensure quality and equity.
- Produce Multi-Purpose Mid-level Eye Care Personnel (MLECP) who can provide Primary Eye Care and low vision services at community level, and assist the ophthalmologists and other eye care professionals in rendering services effectively.
- Meet the needs of refractive services of the communities through an additional training in refraction with a special module for dispensing and low vision services.
- Meet the needs of the tertiary eye care Institutions by imparting training to some of these MLECP in advance visual function skills, including low vision assessments, ophthalmic technology skills, and public eye health care management skills to work as ophthalmic technologists.

CONSTRAINTS AND DIFFICULTIES

- Inadequate manpower available for service delivery
- Quality of training is not of desirable standards
- Lack of standardized curricula and master trainers
- Resource centres for training do not have sufficient materials and equipment
- Insufficient exposure to practical work

STRATEGIES

To achieve of the objectives the following two strategies i.e. short and long term are recommended.

Short Term

- Extension of Low Vision modules in the existing training programmes
- Training workshops for existing cadres
- Curriculum Standardization workshops & External Faculty where needed
- Equipment for the training institute
- Training of National Focal persons in Low Vision & Training of trainers
- Up gradation of skills of master trainer by exposing them to latest advances in the field of Low Vision through attendance of training programmes, conferences etc
- Provision of necessary books, journals and manuals on the subject
- Extension of training module
- Advocacy at the relevant levels
- Resource mobilization
- Faculty support to conduct the module
- Up gradation of teaching and training aids

Long Term

It is recommended that a three tier course be developed, which could meet the need of mid level eye care workers at primary, secondary and tertiary low vision services.

The course duration would range from one to three years, depending on the exit points for each cadre. The entrance qualification should be ten or twelve years of schooling with science subjects or paramedic training certificate with 5 years experience.

The training will be split into theoretical and practical modules. The first year will focus on primary eye care, at the end of which the trainee shall be able to detect, diagnose, treat and refer basic eye diseases and detection & referral of low vision patients. On the completion of first year, the trainee will be awarded a diploma by faculty as Ophthalmic Technician. More than 50% of the total course strength will leave the course at this point.
The second year will focus mainly on optics and refraction with some orientation in orthoptics, contact lens fitting/practice and low vision. This cadre will work as refractions at the secondary level. (DHQ

Hospitals), where they will provide refractive services and management and basic treatment of low vision. 50% of the remaining trainees will leave the course at this level and will be awarded a diploma in Optics & Refraction.
The remaining 25% will move on to the 3rd year where they will be given an advanced training in specific areas (such as Advanced Refraction & Optometry, Orthoptics, Low Vision and Ophthalmic Technology) according to their aptitudes and country needs.

In the third year the trainee will specialize in following subject: Advanced Visual Function Skills (Advanced Refraction & Optometry, Low Vision, Orthoptics, Contact Lenses, Caring for the Blind, Rehabilitation of the Visually Impaired & Blind)

RESOURCES REQUIRED

- To conduct different workshops
- To equip the training centre
- Human resources as master trainers
- Institutional support to house the program
- Training material
- Logistic support

To deliver low vision services a huge gap exists between the need and what is available human resource. The priority should be to train the maximum number of personal and equipping them with essential knowledge in the shortest time. This can be achieved by bolting the low vision training modules into the existing training programmes for different cadres and by providing in-service training to existing staff. The training should be appropriate and conform to the needs of the countries and programmes.

EVALUATION OF A LOW VISION PROGRAMME

Evaluation of a low vision programme is useful because it provides an opportunity to take a step back and view the whole programme holistically. It helps in measuring progress and seeing if objectives have been met; it allows one to determine what has been achieved; it improves monitoring and management; it identifies strengths and weaknesses; it determines the effectiveness and impact of the

programme; it provides information on the efficiency or cost benefit of the programme; it makes available information for revised plans and is a good opportunity and mechanism for sharing experience.

The main steps in evaluation are:

1. Deciding when and how to evaluate
2. Selecting the objectives and method to be used
3. Carrying out the evaluation
4. Looking at the results
5. Using the results to improve the programme

Resource Mobilization For Low Vision Programmes

Resource mobilization is an expression that is commonly used in development terminology. It simply means enhancing or augmenting the means of support. In programme terms, this enhancement of means of support may be financial, human, technical or in kind.

Resource mobilization is a critical element in low vision programme development and is vitally important because:

1. Programmes and projects cost money
2. They are usually in addition to on-going government eye care, educational and rehabilitation activities
3. Even long term horizontal programmes and interventions have vertical components and these need extra resources
4. Pilot programmes are often required to effect a change in policy

Mobilization of financial and other resources can be 'resourced' from:

- National government, private funds or donations
- Governmental agencies
- Inter-governmental agencies
- Non-governmental organizations
- Other forms of funding – multilateral and bilateral aid, INGO support

NATIONAL RESOURCES

In the planning stage of a low vision programme, it is vital to identify governmental and non-governmental resources. In addition, it is essential to undertake an assessment of current needs and document an inventory of existing activities. This is usually followed up by a carefully prepared plan of action. A firm national commitment can be very helpful in mobilizing external resources and assistance.

Other strategies to harness the potential of national resources includes the need to increase public awareness of blindness and low vision, generate support from influential 'opinion makers' or celebrities, use of professional societies, print, television and other media (mass media), and recognition and contribution of NGOs and motivating them into increasing their support.

INTERNATIONAL COOPERATION

A variety of options exist for mobilizing support from the international agencies. The WHO Prevention of Blindness and Deafness programme can offer assistance to national programmes. International non-governmental organizations can provide support to various components of a national programme. Multilateral and bilateral aid is very useful in transfer of financial resources and creates a sense of responsibility. Technical Cooperation among Developing Countries (TCDC) is another mechanism for resource mobilization, particularly for training of human resources and organization of low vision programmes.

ROLE OF GOVERNMENT

The role of governments in the context of resource mobilization can be summarized as below:

1. Policy and institutional framework for disabled persons
2. Adoption and facilitation of a national programme
3. Running schools with inclusive education (or schools for VI children where such a policy does not exist), and vocational training centres for the disabled
4. Creating a fund for disabled persons
5. Providing grant and aid to disabled persons
6. Running Trainer of Trainers programmes
7. Supporting university departments of education and special education

ROLE OF NGO

Similarly, the role of NGOs can be considered as that involving:

1. Support to training programmes – human resource development
2. Capacity building of existing institutions
3. Filling in gaps in programmes
4. Assistance in strengthening of government run components of the programme
5. Advocacy
6. Technical assistance, supplies and equipment
7. Support to organizational development and strengthening of management structures/for a at national, provincial and district levels

Resource mobilization is often equated with finances. However, a very important and oftentimes vital element of a programme is the human capital. Initially, financial resources are required to roll out a programme (e.g. a low vision programme), but as a critical mass of trained persons is reached, the programme growth becomes less dependent on finances and its expansion and sustainability are to a large extent driven by the human resources developed.

Resource mobilization is one of the key components of a project cycle from planning, to monitoring to evaluation. Opportunities to resource a low vision programme can be sought from various donor agencies (and oftentimes significant funding can also be found in-country) through networking and presentation of a well conceived plan on low vision as an integrated part of a larger national plan e.g. a national plan for prevention of blindness/comprehensive eye care. Designing of a budget that is segmented into different 'fundable' components also helps to attract donors that may wish to support a component or a set of components in a programme.

1.45 PSYCHOLOGICAL IMPLICATIONS OF LOW VISION

THE LOSS OF VISION

Vision impairment can be congenital or adventitious, the latter meaning acquired. The adjustment to blindness in a sighted world is different in each case. The adjustment to any loss of sight depends on many factors, such as etiology, rate of progression, stability, and extent of the

loss. Very different psychological effects must result between a loss from congenital syphilis versus congenital toxoplasmosis. The loss of vision can be rapid, a in trauma, or slowly progressive, as in loss of sight from retinitis pigmentosa. In the former case, the loss is an immediate fact: in the latter, it can be a dreaded eventuality, monitored with daily reminders, such as the onset of night blindness with every setting sun. Each patient responds in unique ways based on his or her personality and the parameters of vision loss.

Common stages of reaction to any adventitious and significant loss may be:

- Shock ..... *Oh my God!*
- Denial..... *This can't be happening to me.*
- Anxiety..... *Now what will I do*
- Anger ..... *I don't deserve this.*
- Depression..... *I will never again be a worthwhile person.*
- Acceptance..... *I guess I might as get use to it*
- Adjustment..... *I'm going to make the most of it.*

An individual may not progress through all of these stages, particularly those of acceptance and adjustment. Some examples of indicators of poor adjustment are continual unwarranted hope of recovery, unnecessary or exaggerated displays of dependence, personal devaluation, social reclusion, lack of motivation, prolonged depression, continued denial, and exaggerated blind behaviorism.

The consequences of lost vision may explain some of the reactions to it. there is, for example, a loss of confidence is one's remaining senses without the ability to verify a massage visually. *"Is the sound of cloth resulting just the curtains moving in the breeze or mouse running across the floor?" "is that odor of smoke coming from the neighbor's outdoor grill, or is my apartment on fire?"* vision contribution on to communication by allowing us to interpret facial expression, gestures body language, and lip movements. None of these is available to the severely visually impairment. Our sense of independence depends on ability to drive, which is lost or curtailed with a loss of vision. The ability to continue in a chosen occupation may vanish along with financial security, the sense of meaningful role in society, and the ability to provide for the retirement years. All of these losses and other may diminish one's self-concept, and that can be the greatest loss of all.

The provider of low vision care will encounter patients with many types of vision loss and all degrees of recreation to the loss. Referral to other who can help the patient deal with loss of vision should always be a consideration but should never be an assumed necessity.

THE FEAR OF BLINDNESS

A fear of blindness is share by most of us, second only to cancer and perhaps recently AIDS. It is not difficult to imagine how a fear of blindness might have originated with the first humans on earth, because defence against natural enemies depended on the ability to see, early humans were most vulnerable in the absence of light. The inability of humans to see in dark made them easy prey for large carnivores with keen night vision. In mythology tales, blindness was often interpreted as a sign of divine disfavor. The ancient Greeks believed that blindness was caused by god against mortal who displeased them the idea that light good and darkness is not is reinforced by Biblical references such as Genesis 1:4, *"And God saw the light, that it was good: and divided the light from the darkness."* Wasn't the dark also good? The implication is that it was not. Lucifer, "son of the morning," was transformed to the angel of darkness when he fell from heaven (Isaiah 14:12) to become the embodiment evil. The notion of darkness has been equated with death in recurring Biblical reference such as Job 10:21. *"The land of darkness and the shadow of death"* ; Psalms 107:10, *"such as sit in the darkness and in the shadow of death";* and Luke 1:79, *"to give to them that sit in darkness and in the shadow of death."*

BLINDNESS VIEWED AS A CURSE OR A PUNISHMENT

In order to explain the unexplainable, mythologists often interpreted blindness as a sign of divine disfavour. Zeus allegedly punished Phineus because he was cruel to his son or, for inappropriate use of his gift of prophecy, by blinding him and sending the Harpies to pollute his food. Tiresias was blinded in one account by Athena because he had seen her nude while bathing and in another, by Hera, for judging against her is dispute with Zues. Zues, in turn, gave her the gift of prophecy a skill often associated with blindness myth

Blindness has also been associated with guilt. Oedipus, in overwhelming guilt for committing patricide and incest, tore out his own eyes. Autoenucleation continues to this day. In review of medical literature Krauses et al. found 19 cases of bilateral self-enucleation and

31 cases of unilateral self-enucleation. The acts have been performed with finger, scissors and even a meat hook. As the stimulus, some patient cited guilt over a misdeed and referenced the Biblical passage Matthew 5:29, "..... If the right eye offends thee, pluck it out....." The authors presented a contemporary case report of a 29-year-old woman who, feeling guilty over an extramarital affair, walked onto the beach, removed her right eye with her finger, and walked to a nearby house where help was called.

BLINDNESS ASSOCIATED WITH SUPERHUMAN POWERS

In direct contrast to the view of blindness as a curse or punishment is the notion that those who are blind are endowed with special sensory gifts. This idea is surly a result of the fact that historically some individuals who were blind survived and succeeded against overwhelming odds. From this arose the belief that they were endowed with a superhuman command of nonvisual sense or that nature compensated for their loss of sight by endowing them with extra talent such as an exceptional memory, superkeen senses of touch, hearing and smell, and even gift of prophecy. To this day popular belief holds that the blind have super human power such as sixth sense, facial vision, and exceptionally acute sense. One can see a contemporary example of how these ideas are perpetuated in the television series Kung Fu, first popular in the 1970s and recently revitalized. Master Ho, a blind master of Kung Fu martial art, could hear a grasshopper walking as his feet and could defend against the strike of an enemy by seeming to sense the position of antagonist and his weapon. Unfortunately, losing one's sight is not compensated for by the development of any special senses. Helen Keller sought to dispel the myth that persons who are visually impaired are somehow different from the other beyond the mere loss of sight as evidence in an eloquent statement made in 1904, *"A blind can do nothing more then what a person with five senses can do, minus what can be done only with eyes."*

STEREOTYPIC VIEW: THE MUSICIAN AND THE HELPLESS BEGGAR

Most people have had little sustained contact with individuals who are blind or severely visually impaired. The one they are most familiar with are those seen on television – talented musicians such as Ray Charles, Stevie Wonder, and Ronnie Milsap. It is no wonder that there exists a popular notion that all or most blind people are musically talented. They are not. The other exposure to blindness that most

people are likely to have and remember is seeing the street corner beggar with dark glasses, holding out a cup for donations. The author once asked a class of 18 graduate students rehabilitation counselling to draw a picture of a blind man as an introductory exercise to learning about stereotypes. The result was 16 figures with a cane and/or dark glasses and two with a guide dog. No one drew a picture of a person with no stigmatizing characteristics.

Some totally self-sufficient blind persons even report having had gift of money stuffed in their hands or pockets when using public transportation. Such stereotypic views of helplessness were, and are, enhanced by the lack of resources for education and rehabilitation that would allow those who are visually impaired to learn to live independently. The first true school for those who were blind did not come into existence until the late 18th century in Europe and early 19th century in United States. Even at that, the U. S. school was called the New England Asylum for the Blind.

Helen Keller was a strong advocate fro public assistance in helping those who are visually impaired to become independent. When she addressed the First Annual Meeting of the Massachusetts Association for Promoting the Interest of the Adult Blind, she stated, ":Remember too, that when a man loses his sight he does not know himself what be can do. He needs someone of experience to advise him."

THE SOCIAL STIGMATA OF BLINDNESS

One disability is often unjustly associated with others. Such associations may begin inadvertently or be taken out of context, but with the reinforcement of repetition, here associations may become accepted as true. Such is the case with blindness and ignorance or blindness and ignorance or blindness and helplessness as the following literary quotations bear witness. These quotations demonstrate that misconceptions can be held literally over centuries; that is precisely how they become ingrained in our society.

Blindness and Ignorance

I know my soul hath power to know all things
Yet she is blind and ignorant in all:
Sir John Davies, Nosce Teipshum (1599), st. 44

Blind and naked ignorance

Delivers brawling judgments, unashamed
Alfred, Lord Tennyson, Idylls of the King (1859), Merlin and Vivien,l.662

Now you know – that's the happy existence you wanted to go back to. Ignorance and blindness.\thornton N. Wilder,, Our Town (1938)

Blindness and Helplessness

They be blind leaders of the blind. And if the blind lead the blind, both shall fall into the ditch.
The Holy Bible, Matthew 15: 14
An unstable pilit steers a laking ship, and the blind is leasing the blind straight to the pit.
St. Jerome (C. A. D 4th century), Letter 7

A fairer lady there never was seen
Than the blind beggar's daughter of Bethnal Green.
Anonymous, the Beggar's Daughter of Bethnal Green, st. 33

Social Reinforcement of Blind Stigmata

It has been proposed that those who are blind are forced into a stereotypic role by the same processes of socialization that have formed us all and that blindness is therefore a learned social role.5 There is nothing inherent in the condition of blindness that requires a person to be dependent or helpless, nor is there any thing about it that would lead one to become assertive and independent. If significant people in a blind person's life reinforced the idea of helplessness by doing everything for them, then helplessness will be a self-fulfilling prophecy. Agencies, while trying to help, can actually reinforce this socialization process by lumping together people who are blind, directing them into stereotypic occupations such as piano turning or broom winding, and limiting their social interaction with the sighted world.

It is regrettable that people with disabilities are also frequently stigmatized or dehumanized by the use of inappropriate descriptive terminology; it is common to see references to "the blind" or "the visually impaired." This feature, or their disease, becomes their most prominent identifying factor rather than the fact that they are people who happen to have an impairment or disability. One term used in the past for what we now refer to as low vision was "subnormal vision."

This is clearly not an appropriate term. No one wishes to be considered subnormal in any respect, nor it is proper to suggest that they might be just because they are visually impaired.

Just as blindness is a stigma, the disease, more than any more other personal trait, may identify the individual in medical setting. Unfortunately, disease identifiers often become a part of some clinicians' vocabulary. This practice must be eliminated. There are no "myopes", "aphakes," or "albinos" – just people who have "myopia", "aphakia," or "albinos".

RECOMMENDED READING LIST
PRESCRIBED READING

Notes from the study guide

SUGGESTED READING

- Epidemiology of Eye Diseases
- Low Vision In Children (WHO Consultative Meeting Report)
- Low Vision In Elderly (WHO Consultative Meeting Report)

UNIT 02:

INCIDENCE AND CAUSES

LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- Causes low vision
- Different diseases and physical conditions which lead to low vision
- The symptoms of low vision

In order to gain a better understanding of the nature of residual vision we need to examine the causes of low vision. Listed below are some causes of low vision:

- Corneal Damage
  - Neonatal Conjunctivitis (Ophthalmia Neonatorum)
  - Xerophthalmia (Vitamin A deficiency)
  - Measles and Xerophthalmia
  - Trachoma
  - Cataract
- Glaucoma
- Congenital Rubella Syndrome
- Retinitis Pigmentosa
- Diabetic Retinopathy
- Optic Atrophy
- Optic Nerve Hypoplasia
- Nystagmus
- Refractive Errors
  - ◊ Myopia (Short-sightedness)
  - ◊ Hyperopia (Far-sightedness)
  - ◊ Astigmatism
- Onchocerciasis (River Blindness)
- Trauma (Accidents)
- Posterior Uveitis
- Pseudoxanthoma Elasticum/Angioid Streaks
- Rentianal Pattern Dystrophy

- Retinoschisis
- Stargadts
- Stickler's Disease
- Tay-sachs
- Toxoplasmosis
- Traumatic Brain Injury
- Anophthmia
- Breast Disease
- CMV Retinitis
- Colobomas
- Macular degenerations/dystrophies
- Macular Holes
- Microphthalmus
- Myasthenia Gravis
- Multiple Sclerosis
- Norrie Syndrome
- Coors Blindness
- Congenital rubella Syndrome
- Cortial Visual Impairment/Blindness
- Eales Disease
- Fuch's Dystrophy
- Histoplasmosis Maculopathy
- Ischemic Optic Neuropathy and Gaint Cells
- Keratoconus
- Keratomalasia
- Laurence Moon Barder Bidel Syndrome
- Lebers Hereditary Optic Atrophy
- Lebers Congenital Amaurosis
- Achromatopsia and Color Blindness
- Acute Posterior Multifocal Placoid Pigments
- HIV and CMV retinites
- Aniridia .

Other Low Vision Symptoms and Conditions:

- Low vision people have distorted Visual Acuity, near and distance both
- They have restricted Visual Fields
- They have deprived Night Vision
- They have defected Color Vision

- They have severely reduced Contrast Sensitivity
- A low vision person has to face great difficulty to perform his/her daily living activities independently.
- With some eye conditions, a person sees better in the shade, out of bright light. With other eye conditions, the person needs bright light to see well.
- People with low vision often need more time to do activities then people with normal vision.
- When using vision for long periods, the person with low vision may become tired more quickly then other people, so it should be suggested that the
- Person takes short rests and then continues with activity.
- Some people with low vision see larger objects better and find it useful to use large print for reading. However, larger objects are not always the best for some people. The size is not always the most important factor. Other factors such as thedistance to the object, amount of light, color and contrast make the object easier to see.

RECOMMENDED READING LIST
PRESCRIBED READING

Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice of Low *Vision*
- Essentials of Low Vision Care

UNIT 03:

Clinical Assessment of Low Vision

LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- The purpose of low vision assessment
- The steps of low vision assessment
- How to assess a low vision child
- How to prescribe low vision devices

3.1 PURPOSE OF LOW VISION ASSESSMENT

The purpose of low vision assessment is to assess the residual vision present and correlate it with the individual's social, educational, vocational and other needs, and to identify ways and means to enhance the residual visual functions. Low vision assessment is different from a clinical eye exam. While the clinical procedure focuses on diagnoses and management of the eye disease, the priority in low vision assessment is to enable an individual to utilize his or her residual vision to its maximum potential. Low vision assessment is a result oriented procedure, at the conclusion of which, the examiner should have a clear perspective of what needs to be done. That is, whether the client would benefit from low vision devices, if there is any training needed in the use of these devices or if the client has to be referred to any other specific department or service provider. Following is the routine for a low vision examination.

3.2 STEPS OF LOW VISION ASSESSMENT

1- OBSERVATION

Observing the client's behavior and his physical status can provide an insight to the severity of the problem.

2- INTERVIEW

Interviewing is important in order to understand the emotional status and individual needs of the client. The interview also works as a platform for developing a rapport between the examiner and the client. The interview starts with the case history with emphasis on the visual problem. This is followed by the individual's personal history that includes occupation, education, living status and specific functional aspects, like independence, orientation, mobility and activities of daily routine.

The daily routine of the client can identify the needs of the individual and areas where help may be needed. Bringing to focus activities that may be possible can help in narrowing down the objectives of the client. All the data from the interview has to be recorded in an organized manner so it could be used effectively in finding the solutions.

3- VISUAL ACUITY ASSESSMENT (DISTANCE)

The visual acuity assessment begins with determining the distance. acuity of the patient. The procedure involves showing the patient large size numbers on sheets from a certain distance and asking him or her to identify them. Optotypes, single-letter chart gratings and crowded letters of different sizes may be shown to the patient alternatively. The same procedure is repeated for each eye individually also.

4- NEAR VISIAL ACUITY ASSESSMENT

In this step the patient identifies or reads certain typeset of a smaller size from a nearer distance. The distance is accurately recorded. The typeset size is denoted in M units. Reading acuity is the patient's ability to read a more congested and complex typeset prints from a measured distance.

5- PINHOLE ACUITY ASSESSMENT

Pinhole acuity test is used to assess the presence or absence of a refractive error, improvement in vision through indicates that the person may benefit from refractive correction.

6- ASSESSMENT OF VISUAL FIELDS

There are many techniques and equipment to measure the visual fields. The visual field test helps to evaluate central scotoma's mid, long and peripheral constrictions. The visual fields of the client are important for orientation mobility and help in searching.

The most commonly done test is the confrontation test. It is a screening test. In confrontation, the examiner compares the examiner's visual fields with his or her own visual field size. The confrontation test gives an estimation of visual field losses in different quadrants.

Bernell's perimetry is indicated when a more accurate evaluation of visual field is required. The procedure involves moving of a white target along a black curved scale. And the recognition along its path measures the extent of presence or loss of visual fields of the client in all four quadrants, that is, up, down, in and out.

Amsler's is a simple test, which helps in measuring any visual field losses in the central field by using a special grid.

7- CONTRAST SENSITIVITY ASSESSMENT

Sensitivity to contrast is the ability of the eye to perceive the smallest difference in luminance and thus to appreciate the niceties of shading and slightest nuances of brightness which are decisive for the forms. and shapes. In order to measure contrast sensitivity, a procedure is used in which the subject compares the luminance of standardized target with its surroundings.

Many tests are available to measure contrast sensitivity functions and the result can be quantified in a contrast sensitivity curve or simply by qualifying the loss as mild, moderate and severe. Lea's contrast test provides a good way to measure contrast sensitivity.

8- REFRACTION

Importance of a good refraction in a low vision examination cannot be over-stated. Improvement in visual acuity may begin with the correction of refractive error. Many times, people with low vision will have improvement with just careful refraction.

The basic techniques of refraction of low vision persons are not too different from the normal refraction procedure. Although specialized techniques like bracketing and over-fraction are commonly used. The main difference from routine refraction is reduced sensitivity to small changes in power of trial lenses and slow responses. The refraction is performed both objectively and subjectively. In both procedures it is important to adjust procedures according to the eye condition of each individual client.

After establishing the best-corrected vision and determining the client's requirement, level of magnification needed is calculated. For example, if the near acuity of our client is 4M at 15cm and he wants to read the newspaper print correctly, the vision required to read a newspaper print is 0.8M units. The magnification is calculated as actual over desired acuity. In this case it will be 4M over 0.8M is equal to 5 times. This can be achieved by bringing the text five times closer to the eye, that is, at 3 centimeters. Any device, which provides an equivalent viewing distance of 3cms, will fulfill the client's need. Different options are tried and the most suitable solution is prescribed.

Magnification needed is calculated using the same formula of actual over desired acuity equals the desired magnification of the telescope. Usually 6/12 is taken as the reference acuity to be achieved.

9- GLARE SENSITIVITY

In certain conditions, glare can significantly reduce the visual acuity of the client. Sensitivity to glare should become obvious during the interview and it can actually be assessed by taking visual acuity after exposing the client to the glare source and noting the reduction in vision. If the vision reduces by more than a factor of 1.5, some type of absorptive filter lenses may be indicated. The client is given a number of different absorptive filter lenses and the most effective filter is recommended.
Cover test and alternate cover test reveal the presence of any latent or manifesting squints and give a crude idea about the status of binocular functions. Extra-ocular movements reveal any under action or over action of extra-ocular muscles. Before the end of the assessment, client's examination and direct & indirect ophthalmoscopy is routinely carried out to follow the progress of any active pathology for further management of the disease.

The tools for low vision assessment are long handled occluders, Janelli's and Halberg clips pointer, trial lens holder, clip-on pin-hole, universal and pediatric trial frames, Jackson's cylinders up to 2 diaopters, ruler and torch. The tools also include a full aperture trial lens set and a good range of auxiliary lenses like Stenopic slit, red green filters, prisms, etc.

These may include Snellen's, ETDRS LogMarr, Sloan's Letters, Colen Blander, Lea's symbols, VA Tester, Lea's referential looking paddles, Pediatric low vision test, Fienbloom distance test, Bailey-Hall Cereal test. Other tests include brightness acuity test for glare assessment. Panel D15 for quantitative color vision assessment, Lea's low contrast symbol test for contrast sensitivity assessment, Amsler chart manual for central visual field assessment and Ishi Hara test for color blindness.

Optical aids are possibly the most helpful rehabilitation devices available for the low vision patient. Magnifiers can be prescribed as hand-held, hanging, stand, illuminated hand and stand magnifiers, spectacles magnifiers, bar and dome magnifier. It is necessary to have a wide range of magnifiers available in a low vision clinic for accurate and appropriate final prescription.

Spectacle magnifiers are the most commonly prescribed magnifiers. They come as full aperture, half-eye, bifocal with base in prisms for binocular viewing. In low vision, telescopes with magnification powers from 2x to 10x are used. They are prescribed for distance, intermediate and near tasks as hand-held, clip-on, spectacle mounted and bioptic. Absorptive filters are used to counter glare in the partially sighted. They come in different tints at various levels of absorption and different cut-off points for the visible spectrum of light.

Non-optical devices alter environmental causes through the use of enhancing illumination, contrast and spatial relationships. They may include magnifying mirrors, lamps, check registers, writing guides, needle-threaders, bold-line paper, talking watches, high contrast watches and reading stands. Close circuit televisions are indicated when higher magnification with better contrast in greater viewing distances is required. Restraining factors with the prescription of CCTV are its relative immobility and higher cost.

3.3 CLINICAL ASSESSMENT IN CHILDREN

The results of a research among parents of children with low vision developed in São Paulo on 2001 , showed that 86% of the babies were first diagnosed as being blind. Specific expertise and methodology is required to examine children and evaluate their visual response as the visual system is immature at birth and its maturation depends on both structural and functional changes. The various visual functions (as visual acuity, and visual fields) mature at different rates, very fast at the first year of life. Failure of normal vision maturation affected by ocular, central nervous system disorders or both, simultaneously implies in alteration of the image that is transmitted to higher visual centers as in prematurity, infectious or genetical diseases. If the visual situation is irreversible, the management requires more complex and well equipped infrastructure for diagnosis, a well trained team of professionals for treatment and family orientation. This is the main reason why is so common in developing countries for a baby being diagnosed as blind. The diagnosis based upon the ocular disease is not sufficient to determine if a visual response exists to be complemented by the functional vision assessment. Also in developing countries , if children don't have severe eye or health conditions may not be referred to tertiary health care or low vision care at University Hospitals, Children's Hospitals or Eye Clinics

Ideally, paediatric ophthalmologists providing services for children at tertiary ophthalmologic centers need a child- centered approach. The integration of preventive childhood blindness initiatives and low vision care at tertiary level as screening and surgical treatment of ROP in pre-term infants inter-related to infant low-vision care services is an strategy to add efforts, with more beneficial results. The Fernandes Figueiras Institute- Fundaçao Oswaldo Cruz centralizes the care for a high-risk premature babies in Rio de Janeiro The provision of low vision services attached to ROP screening and treatment programs in intensive care neonatal units can reduce significantly the impact of visual impairment. Although providing screening and surgical treatment for ROP babies only recently a service for low vision children was implemented. After the establishment of an accurate diagnosis, visual functional tests (as visual fields, contrast sensitivity and binocularity) will be relevant to understand overall visual function Existent Visual Acuity tests for young children or those with special needs include use of pictures (Allen Cards, Kay pictures) , matching tests (Lea Symbols,

Sonksen-Silver tests) or forced choice preferential looking techniques (Teller Cards, Cardiff test) that require age specific and norms for reliable interpretation. Many of these methods are useful if they determine whether an infant is totally blind or not (fixation, light reflex, eye and head movements).

Nevertheless, visual acuity remains, in many countries, as the most frequent measured visual function in children with ROP with ocular sequel and minimal residual vision (grade IV and V) can be greatly helped with magnification and environmental changes.

There are children with ROP with cerebral sequel **such** as leukomalacia periventricularis and some premature that will develop both problems as causes of vision loss. A Multidisciplinary team composed by a Vision Rehabilitation Specialist (interventionist), educator, physiotherapist occupational therapist, and other support professionals - psychologist, social worker, nurses, will orient global development and follow up till the child is ready for mainstreaming.

TERTIARY LOW VISION CARE FOR CHILDREN

Tertiary Low Vision Care is necessary because when a child has congenital visual loss depending on its severity not only the visual enhancement will be sufficient. There are also important implications for some aspects of the child's development if the child is multiple-handicapped. The impact of visual impairment at an early age can impair motor, cognitive and sensory acquisitions and consequently there are mainly educational and social barriers that need to be overcome. Children being at risk of intellectual and emotional difficulties may also impair their self-esteem and social integration.

In developing countries, it will not be efficient to provide children's habilitation only at the tertiary centers. Its important also to transfer knowledge to other professionals planning and delivering training programs at Institutions for multiple-handicapped children and other Organisations, Schools or whenever a need is identified.
Tertiary centers should take responsibility for research, the training of trainers for primary and secondary level programs and for supporting, supervising and motivating the staff of secondary centers, develop low vision information materials, to design and offer family services and administration and maintain a database.

In developing countries there are many children with mild and moderate visual loss that will not be detected, diagnosed or treated for their low vision condition. They will hardly have access to tertiary centers consequently, they will have not access to education as they will fail to follow regular schools. Community based programs for low vision children can be integrated to tertiary level centers , in an extra-mural work beyond the limits of the hospital. An organized primary health care program (mother-child health) can aggregate the detection of visual problems in babies with developmental delays. The integrated action of pediatricians, nurses, health and community agents and mothers can provide basic and local attention for populations at risk of low vision.

RECOMMENDED READING LIST
PRESCRIBED READING

Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice of Low Vision
- Essentials of Low Vision Care

UNIT 04:

MAGNIFICATION

LEARNING OBJECTIVES
After studying this unit, you should have a clear understanding of:

- What is magnification
- What are the different types of magnification
- Different methods and formulae for calculating magnification
- How to determine resolution ability
- How to predict distance required to meet resolution goal
- How to measure lens power
- How to measure Equivalent Viewing Power
- How to measure Equivalent Viewing Distance
- How to calculate EVD for different optical systems

The basic design of all telescopes and magnifiers is based on the principle of magnification. The definition of magnification is complicated and a much disputed one. One can simply say that "Magnification is the relative increase in the size of the image of an object when it passes through a medium".

Relative Size Magnification
The bigger the size of the object, the bigger is the image that is formed.

Relative Distance Magnification
The closer the object is to the eye, the bigger it will seem.

Angular Magnification
This is an increase in the visual angle subtended by the object on the eye by optical means.

In low vision, we are mainly interested in linear magnification. Linear magnification is the ratio of the image size to object size.

$$\text{Linear Magnification} = \frac{\text{Size of the image}}{\text{Size of the object}}$$

Nominal Magnification is also sometimes referred to as effective magnification or conventional magnification. The theory of this magnification is based on the widely used concept of least distance of distinct vision at a standard distance at which it is assumed that a suitable corrected normal eye could comfortably view a point. In most cases it is 25cm. Based on this we can calculate Nominal Magnification as:

$$\text{Nominal Magnification} = \frac{F}{4}$$

Where F is the dioptric power of the lens.

Maximum magnification is also referred to as iso-accomodative magnification or manufacturer's magnification. This is a definition based on the premise that a hand or stand lens is positioned and used in such a way that the object-lens eye system produces an image at the least distance of distinct vision, again taken to be 25cm.

A lens power of F positioned so that it gives rise to an image 25cm away from the eye plus the required +4.00 D accommodation/spectacle addition to focus the image is called the combined system. That is the nominal magnification of the lens F/4 plus accommodation magnification effect (i.e 4/4=1) giving a maximum magnification of

$$\frac{F}{4} + 1$$

Prescribing magnification for near vision requires an understanding of how the various low vision devices work, with knowledge of their optical properties.
There are many ways of calculating magnification but there is also a lot of confusion about these alternatives. Different ways of calculating magnification are:

$M_{25} = F_e/4$

$M_{mr} = (F_e/4)+1$

$M_{40} = F_e/2.5$

$M_a = 1+z\ (F_e)$

$M_{la} = 1+(q-z)F_e$

It is important not to rely on the manufacturer's rating of magnification, even if you know what formula they claim to use. These various formulae all assume specific viewing conditions are being used, and that some other viewing condition is the appropriate reference to which the comparison should be made.

Jaeger notation is arbitrary and not calibrated at all.
Reduced Snellen notation should only be used if the chart is at a specific distance, usually (but not always) 40cm.

For specifying resolution at near use M units, or points.

Use newsprint style test material, record print size read and take note of the viewing distance.
Magazine text = 10 point OR 1.25M
Newsprint text = 8 point OR 1.0M
Telephone book = 6 point OR 0.8M

DETERMINE RESOLUTION ABILITY FOR READING

1. Have patient read chart at a distance at which you are sure the patient will be in focus. This often requires a reading addition be used to provide correct focus.

2. Take note of the size of the smallest print read with acceptable efficiency.

3. Note the working distance (from spec plane for presbyopes)

PREDICT DISTANCE REQUIRED TO MEET RESOLUTION GOAL

For example, consider two patients who wish to read print the size of that in the telephone book. The resolution goal is 0.8M (6pt) print.

	Patient RAUF	Patient ARIF
Age	**20 yrs**	**70 yrs**
Smallest print read	2.0M (16pt)	4.0M (32pt)
Viewing distance	12cm	32cm
Addition	None	2.50D (old glasses)
Accom. Demand	8.0D	0.50D
PREDICTION		
For 0.8M print ratio is	2.0/0.8 = 2.5x	4.0/0.8 = 5x
So required viewing distance	12/2.5 = 5cm	32/5 = 6.3cm

So to read the telephone book print, these patients require a viewing condition with
EQUIVALENT VIEWING DISTANCE OF 5cm
EQUIVALENT VIEWING POWER OF 20D

VERIFY THAT PREDICTED EVD ALLOWS RESOLUTION GOAL

Using an appropriate resolution when necessary, check that patient gets clear focus at the required distance from the spectacle plane and that the resolution goal can actually be achieved. If not (very rare if proper charts are used and conditions are controlled) make appropriate adjustments.

CONSIDER OTHER OPTICAL SYSTEMS TO PROVIDE THE SAME EVD

Options to consider

- Spectacles with reading addition
- Hand held magnifier
- Stand magnifier
- Near vision telescope
- Video magnifier or other projection system

In all these cases, you must understand what the magnifying systems are doing. They must provide the required EQUIVALENT VIEWING DISTANCE (EVD)

Spectacles
Their action is simply to allow a closer working distance.

For Presbyopes, the focal length of the addition sets the EVD. For example, Patient ARIF (from the above mentioned example) requires a 16D add to read 0.8M print.

For Prepresbyopes the EVD is determined by adding the add power and the accommodation. The EVD is the reciprocal of this sum. The EVD is the actual working distance from the spectacle plane. Patient RAUF must work at 5cm to read 0.8M print. This would require 20D of power. Given that he was comfortable at 12cm with 8D accommodation. Provide a +12D addition and with 8D accommodation this allows work at 5cm.

MEASURING LENS POWERS

1. For plus lens magnifiers, the image size is dependent on the equivalent power-not the back vertex power or the front vertex power.
2. The lensometer measures only vertex powers.
3. For Plano-convex lenses, the front vertex power is equal to the equivalent power.
4. For strong single vision lenses, aberrations become important.
5. For lenses in the range of 10-18D, use cataract aspheric lenses.
6. For 20D and above, special series lenses are required (bi-aspheric lenses AO, Igard. Or doublets designs for vision, Keeler)

MEASURING EQUIVALENT POWER

Take a suitable distant (3 meters or more) object. Measure its height (h) and the distance (d). For example, if a window 1 meter wide and 4 meters away, then:
h = 1.0m
d = 4.0m

With the lens being tested, form an image on a translucent screen, making sure that the image is in focus. Measure the height (h) of the image. Calculate the image distance. The object-height to object-distance ratio (here ¼) will be equal to the image-height to image-distance ratio. If the height is 1.5cm and given the 1m to 4m ratio, the image distance is 6cm. This image distance is equal to the Equivalent Focal Length. So the Equivalent Power is 16.6D (100/6cm).

The image distance in this relationship is measured from the nodal point, not the lens vertex.

For Spectacles

- For presbyopes, the equivalent focal length of the add gives the EVD.

- For prepresbyopes, accommodation should be estimated and added to the lens power to give the equivalent viewing power. The reciprocal is the Equivalent Viewing Distance.

Example : A young patient expected to contribute 5.00D accommodation, using a +20D lens (measured by the above technique)
EVP = 20+5 = 25D
So EVD = 4cm

For Hand held magnifiers
If held at some distance from the eye, (further than the focal length of the magnifier) then best resolution will be determined by the focal length of the lens and that is the EVD. Here for best resolution, presbyopes should use their distance Rx and prepresbyopes should not accommodate.

If the lens is held close to the spectacle frame, then there will be some additivity of lens power and the add or accommodation. Here for best resolution, presbyopes should use their addition and hold the lens close by. Prepresbyopes should accommodate to maximize resolution.

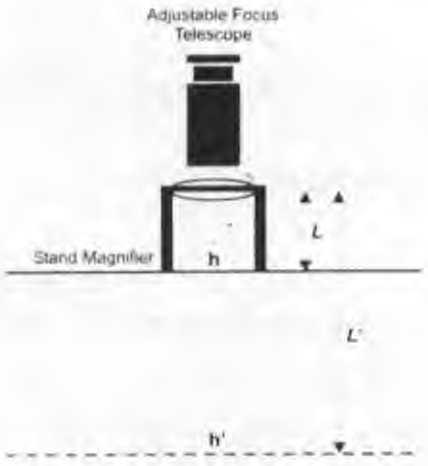
Stand Magnifiers

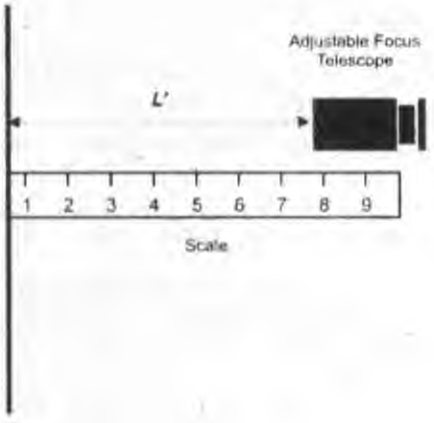
- Most are fixed focus.
- The object distance is fixed so the image distance is fixed.
- The image will be larger but more remote than the object.
- The enlargement ratio is constant.
- The enlargement ratio is the transverse or lateral magnification, or the "multi-acc factor".
- The clinician must know where the image is located and how much it is enlarged.
- EVD = $\frac{\text{Acc. Stim. Distance}}{\text{Enlargement ratio}}$

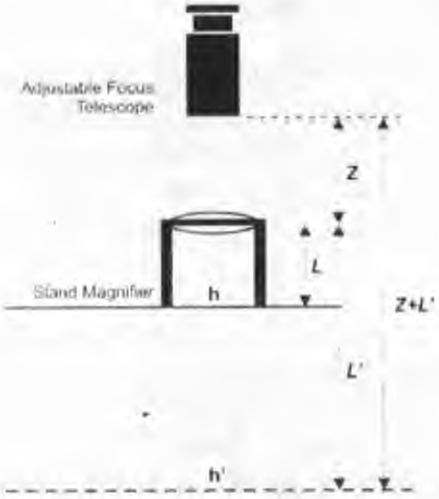
To locate the image position for a stand magnifier

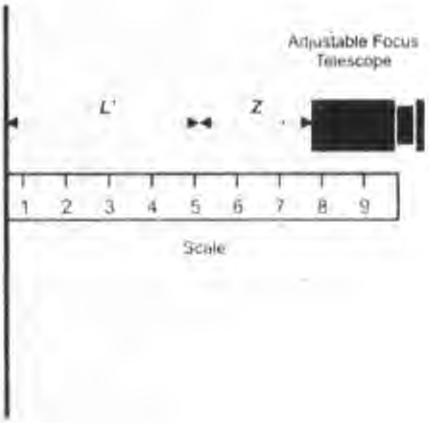
Rest a close focussing telescope against the lens of the stand magnifier (use 4x or 2.75x Walters). Focus on some print seen through the magnifier. Now take the telescope and find the distance to which it is focussed. Look at a wall and move back and forth until it is seen in clear focus. Measure the distance from the wall to the telescope objective.

When the image plane is fairly close to the lens, then the telescope might not focus to that distance. In which case, focus the telescope to its closest distance (make telescope as long as possible) and then move back until image through magnifier is clear. Measure distance from telescope to lens. Now find the distance to which telescope is focussed. Allow for telescope-to-lens separation and determine the distance from image plane to the lens of the magnifier.









To calculate the enlargement ratio

From the distance from the image plane to the lens surface (l') determine the emerging vergence L' = 1/ l', where L' is the emerging vergence in diopters.

If l' = 25cm
Then L' = -4D

Measure the equivalent power (F_e) of the lens as described earlier. Neglecting signs:

$M_t = (L+F_e)/L'$

Example :
Lens power = 20D
Emerging vergence = 5D
So $M_t = (5+20) / 5 = 5x$
This magnifier gives a 5 times enlargement and the image is 20cm (5D) below the lens.

To calculate the EVD

EVD = actual viewing distance divided by enlargement ratio.
Actual viewing distance = accommodation demand dist.
= eye-lens distance + lens-image distance
= for presbyopes is about the same as the focal length of the add.

For Patient ARIF
With a stand magnifier having image distance of 20cm and enlargement ratio of 5x wearing a 2.5D add, he should be 40cm from the image (20cm from the lens). In this situation,
EVD = 40/5 = 8cm
Given that he could read 4.0M (32pt) at 32cm, now he should read print that is smaller by 32/8 = 4 times, so about 1M or 8pt.

For Patient RAUF
With the same magnifier, but eye 5cm from the lens,
Actual viewing distance = 20 + 5=25cm
In this situation EVD = 25/5 = 5cm
Given that he could read 2.0M (16pt) at 12cm, now he should read print that is smaller by 12/5 = 2.4times, so about 0.8M or 6pt.

Near Vision Telescopes

Consider a distance telescope with a lens cap on the front to give the near focus.

EVD = focal length of cap/Magnification of telescope

Example : 3 X telescope with 4.00D cap (25cm)
EVD = 25/3 = 8.3cm

Example : 6 X Walters focussed for 50cm
EVD = 50/6 = 8.3cm

Videomagnifiers or Projection Systems

To measure enlargement ratio, place ruler under camera and with a second ruler measure the size of the enlarged image of a scale division.

EVD = Actual viewing distance divided by the enlargement ratio

Example : Viewing the screen from 40cm with a 10 times enlargement

EVD = 40/10 = 4cm

RECOMMENDED READING LIST
PRESCRIBED READING

Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice Of Low Vision
- Essentials Of Low Vision Care

UNIT 05:

LOW VISION DEVICES (Non-Optical)

LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- What are low vision devices
- What are the types of low vision devices
- What are non-optical low vision devices
- How non-optical devices help a low vision person

Introduction

Just like visual functioning Low Vision Devices also play a vital role in enabling low vision people to join in their everyday activities and also assist in promoting independent living in low vision.

There are two main types of low vision devices used for low vision people:

- Optical devices
- Non-optical devices

Non-optical Devices

These devices are those which make things easy to see by modifying their color, contrast, shape, size and position.

Electronic Devices

In case of severe visual loss where optical visual devices do not provide adequate help, electronic devices are helpful. These are basically of two types. One which displays the task in a magnified form from a television monitor; the others are conversion systems which convert text into a speech system.

The devices which display the task in a magnified form on the television monitor are called closed circuit televisions (CCTVs). The advantage of a CCTV is in its greater amplitude of magnification of 3X to 100X, normal working distance and reversed polarity. The disadvantages are mainly the cost factor and the bulk of the system which makes it quite immovable.

The other electronic devices are talking watches, talking calculators, speech and Braille conversion systems. With further developments in the electronics field, more and more devices are becoming available for low vision patients. It is important to keep a close watch on these developments and advances so as to know what best option you can offer your patient.

Non-optical Devices for Low-Vision People:

- ***Devices for lighting:***
    - ◊ Adjustable table lamps.
    - ◊ Adjustable wall lamps (bracket lamps).
    - ◊ Adjustable clip lamps.
    - ◊ Halogen lamps.

- ***Devices for reading:***
    - ◊ Reading material with enlarged & high contrast print.
    - ◊ Typoscopes (reading guides).
    - ◊ Fixed reading stands.
    - ◊ Adjustable reading stands.
    - ◊ Illuminated reading stands.
    - ◊ A CCTV.
    - ◊ An enlarged & high contrast calculator.
    - ◊ A talking calculator.
    - ◊ A talking dictionary.
    - ◊ Talking books.
    - ◊ Tape recorders.

- ◊ Reading material in Braille.
- ◊ Flash cards.
- ◊ Tactile cards.
- ◊ Cards with enlarged & high contrast English/Urdu alphabets, numbers, shapes, pictures, paragraphs etc.
- ◊ An enlarged Quran Pak.

- ***Devices for writting:***

  - ◊ Bold-line papers (English, Urdu, Math etc).
  - ◊ Writing guides.
  - ◊ Letter writing guides.
  - ◊ Signature guides.
  - ◊ Check writing guides.
  - ◊ Envelop writing guides.
  - ◊ Regular markers.
  - ◊ Bold markers.
  - ◊ Writing pens with light.
  - ◊ Stencils.
  - ◊ Frame & stylus (for writing English/Urdu Braille).
  - ◊ Slate & figures (for math-e-matical Braille).

- ***Devices for ADL:***

  - ◊ Enlarge & high contrast wall clocks.
  - ◊ Regular but high contrast wall clocks.
  - ◊ Enlarge & high contrast table clocks.
  - ◊ A talking time piece.
  - ◊ Enlarge & high contrast wrist watches.
  - ◊ Talking wristwatches.
  - ◊ Enlarge & high contrast telephone dials & pushes button phones.
  - ◊ Bright & different colored jars labeled with names of

the daily used items (hair-pins, safety-pins, needles, needle- threading devices, buttons, threads etc) to be kept in them, written in an enlarged & high contrast print.

- White crockery (2 flat plates, 2 deep plates, 2 quarter plates, 2 small bowls, 2 cups & saucers, 2 serving bowls & a dish) with black or any high contrast borders.
- A cutlery set (2 dessert spoons, 2 forks, 2 tea spoons, 2 knives) with bright & high contrast handles.
- A white teapot with a white pipe, a high contrast handle & a bordered cover.
- Transparent milk pot & sugar pot with dark colored handles & covers.
- Shaded water jug & glasses (black, brown, milky white etc).
- A dining table set (a bread box, a tissue paper box, a sugar pot & a set of salt & pepper & tooth picks bottles) of bright, dark & different colors.

***Devices for Domestic Activities*:**

- Cooking aids:
  (Refer to appendix 5a)
- A High contrast stove.
- Pans (saucepan, frying pan, griddle, wok etc) with high contrast handle & cover.
- A white enameled cooking pan set with black handles.
- A red enameled cooking pan set with black color inside & white handles.
- A set of cooking spoons with handles of yellow color & black border.
- A set of condiment jars labeled with names of each spice written in an enlarged & high contrast print.

- ◊ A set of large size white jars with bright & different colored covers labeled with the names of cereals (rice, sugar, cereals etc) to be kept in them, written in an enlarged & high contrast print.
- ◊ Kitchen tools (knives, bottle opener, strainer, vegetable crusher, peelers, cutters, lemon-presser etc) with bright colors & high contrast handles.
- ◊ A vegetable cutting board of high contrast (with one side white & the other side black).
- ◊ A bright colored vegetable rack.
- ◊ A lighter.
- ◊ A dough plate & a rolling pin of dark color.
- ◊ A whistling kettle.
- ◊ Stitching aids:
  (Refer to appendix 5b)
- ◊ Needle threading Devices.
- ◊ Blind needles.
- ◊ Frames.

Devices for recreation:

- ◊ Enlarged ludo.
- ◊ An enlarged chess.
- ◊ An enlarged & high contrast set of playing cards.
- ◊ Enlarged & colorful footballs.
- ◊ An enlarged & high contrast carem board with large & bright colored goats.
- ◊ A TV with an enlarged screen & bright colors.

Devices for Self-care activities:

- ◊ A magnifying mirror.
- ◊ An illuminated magnifying mirror.
- ◊ Lipsticks of different companies & outlook.
- ◊ Nail polishes of different companies & outlook.

- ◊ Eye shades of different companies & outlook.
- ◊ Blushers of different companies & outlook.
- ◊ Eye brushes of different colors & sizes.
- ◊ A pen shaped eyeliner with white outlook.
- ◊ Mascara with white outlook.

- ***Devices for Health & Care:***
  - ◊ A digital thermometer.
  - ◊ A talking body thermometer.
  - ◊ An insulin units measuring device.

- ***Devices for Orientation & Mobility*:**
  - ◊ White canes.
  - ◊ Red & white canes.
  - ◊ Rigid canes.
  - ◊ A sighted guide.

- ***Devices for Computer tasks*:**
  - ◊ A computer with computer & Internet access technology, talking appliances, enlarged & high contrast screens & enlarged or tactile keyboards.
  - ◊ A zoom Text (special low vision software).

RECOMMENDED READING LIST

PRESCRIBED READING
Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice of Low Vision
- Essentials of Low Vision Care

UNIT 06:

LOW VISION DEVICES (OPTICAL)

LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- What are optical low vision devices
- What are the different types of optical devices
- How these optical systems work
- What are the advantages and disadvantages of these devices
- What are low vision optical devices for near
- How to measure EVD for these devices
- How to measure EVP of these devices

INTRODUCTION

These devices are those in which lenses are use to magnify the objects. There are two types of optical devices:

- Devices for near vision
- Devices for distance vision

Optical devices, sometimes referred to as low vision aids, consist of one or more lenses placed between the eye and the object to be viewed which increase the size of the object on the retina.
Optical devices are the most commonly used low vision aids and are basically of four types:

1. Magnifiers
2. Telescopes
3. Contact lenses
4. Field Expanders

Telescopes

It is generally not practical to provide distance vision magnification. This normally requires a telescopic lens system. In LVAs, a Galilean or astronomical telescope system is utilized.

Galilean Telescope

The most commonly used telescope in LVA work is a Galilean Telescope because of its upright image, simple design, smaller size and easier handling. It comprises of a negative eye-piece lens and a positive objective len separated by the difference of their focal lengths.

$$\text{Magnification of a Galilean Telescope} = \frac{\text{F eye piece}}{\text{F objective}}$$

It is therefore possible to get some magnification with different set of lenses bearing in mind the length of the unit.

Usually in LVA work, we need a compact and easy to handle unit. The magnification with this type of system is limited to 2x, 2.5x or 3x. Greater magnification than this would result in the unit becoming excessively long. This is impractical for low vision work.

Astronomical Telescope

It constitutes a plus eye piece lens with a plus objective lens separated by the sum of their focal lengths.

This unit produces a magnified real image. Unfortunately, it is inverted and reversed. It is necessary to incorporate a third lens or prism system into this telescope to re-invert and re-reverse the image. This makes this design more difficult to produce and is certainly more expensive.

Astronomical Telescopes are available in magnification of 4x to 10x and have a greater field of vision.

Advantages and disadvantages

Galilean Telescope

Advantages

1. Small compact light unit
2. Easy to produce
3. Upright image

Disadvantages

1. Low magnification 2x-3x
2. Restricted field of view

Astronomical Telescope

Advantages

1. Larger field of vision
2. High magnification 6x-8x

Disadvantages

1. Inverted image
2. Heavy
3. Complicated design
4. Difficult to use

Some of the criteria used when looking at a telescope used in low vision work are:

1. Magnification extent
2. Ability of the telescope to transmit light
3. Field of view

Image Brightness

The relationship between the size of the objective and the eye piece determines the image brightness of a given telescope. The best

situation is where the diameters are in the following ration:

$$\frac{\text{Diameter of the objective lens}}{\text{Diameter of eye piece lens}} = \frac{fo}{fe} = \text{magnification of the unit}$$

Provided the ratio is more than 1, the larger the diameter of the lenses, the greater will be the amout of light transmitted.

Field of view

For an LVA telescope, the field of view is of great importance. The field of view is in proportion to the diameter of the objective lens.

$$\text{Size of the field of view} = \text{Diameter of exit pupil}$$

$$\text{Diameter of exit pupil} = \frac{\text{diameter of objective lens}}{\text{magnification of unit}}$$

The greater the amount of magnification, the smaller will be the field of view. So when considering a telescope unit for a visually impaired person, the smallest possible magnification with which the patient can view the desired target will be the ideal choice. Here one must remember that everybody wants maximum magnification with greater image brightness and unlimited field of view. We know that is not practically possible to incorporate all of the above in one unit. Therefore, when selecting a telescopic unit, one should have the following considerations:

1. to establish the patient's needs and advise on units that are available
2. to explain, compare and contrast different units
3. manual dexterity
4. cost
5. to make it clear to the patient what is possible and what is optically impossible.
6. train the patient in using the particular unit
7. motivation of the patient.

Most patients with visual impairment of recent onset are depressed and may not give a positive response. In many cases, several visits are

required before the patient becomes comfortable and at ease in the clinical surroundings and will respond better to different suggestions and aids.

Low Vision Devices For Near

Magnifiers for near vision involve the formation of an image that is either at a near distance (less than 1 meter) and this image is larger and more remote than the object, or alternatively the image is remote (perhaps as far as optical infinity)

Reading spectacles	-Image at infinity, may be closer
Hand Held magnifier	-Image at infinity, may be closer
Standard Magnifiers	-Image at a near distance
Near Vision Telescopes	-Image at infinity
Video magnifiers	-Image at near

Definition: EQUIVALENT VIEWING DISTANCE (EVD)

The EVD is the distance at which the object itself would subtend an angle that is equal to the angle that is being subtended by the image.

Example:

> With a closed circuit video magnifier print is enlarged – say 5 times
> If screen is 50 cm from patient, then EVD=10 cm
> It's as though the actual print were 10cm from the eye, (and accommodation is sufficient)

if patient could read 2mm high letters at 40cm with the naked (and in-focus) eye then, at 10 cm, 0.5 mm letters would be legible.

Any system giving an EVD of 10cm would allow this patient to read 0.5mm high letters

READING SPECTACLES

a) With Presbyopic patients, the addition power allows fairly good prediction of the working distance, and this is the Equivalent viewing distance

b) With pre-presbyopes, it's accommodation may be added to the power of the addition

In either case, the critical element is the lens-to-object distance; this is the EVD.
For reading glasses, the actual viewing distanced is equal to the Equivalent viewing Distance.

HAND-HELD MAGNIFIERS

As a collimator
Often the object in (or very close to) the focal plane of the lens. The image is then at infinity. The presbyopes must use the distance correction; the young patient must relax accommodation. Here the EVD is equal to the focal length of the magnifier.
The retinal image size (and the EVD) is independent of the separation between eye and magnifier when used as collimator,

a+4D magnifier has an EVD of 25 cm

a+10D magnifier has an EVD of 10 cm

a+20D magnifier has an EVD of 5 cm...and so on

Combined with an addition (or known as amount of accommodation)

The net effect depend on the separation between spectacles and hand held magnifier
Example: A +4.00D addition combined with a +20.00D hand held magnifier.

Patient will arrange magnifier and object so that the image is at 25cm (because add is +4D)
Image always at 25 cm, but the enlargement varies according to separation of the 2 lenses.

Magnifier to eye	Magnifier to focal plane of addition	Enlargement	Equivalent Viewing distance	EV power	Object to magnifier
25 cm	0 cm	1 X	25.0 cm	4.00 D	0.00 cm
20 cm	5 cm	2 X	12.5 cm	8.00 D	2.50 cm
15 cm	10 cm	3 X	8.33 cm	12.0 D	3.33 cm
10 cm	15 cm	4 X	6.25 cm	16.0 D	3.75 cm
5 cm	20 cm	5 X	5.00 cm	20.0 D	4.0 cm
0 cm	25 cm	6 X	4.17 cm	24.0 D	4.17 cm

Note: If magnifier is in the focal plane of the add, object must be against the lens so that enlargement =1
Enlargement is equal to the number of magnifier-focal-lengths separating the magnifier and the focal plane of the addition
The EVD = Eye to image distance / Enlargement ratio i.e.
EVD=focal length of add/ER

Operation Rules for Hand Held Magnifiers

If magnifiers to be held away (more than one focal lengths) from spectacles then resolution is better if patient views through distance portion of bifocals.

Best possible resolution: If magnifier held against spectacles. This adds power of addition and the magnifier together. But the object must be held relatively close to the face.

If magnifier is separated from spectacles by one magnifier-focal-length, then EVD=focal length of magnifier. Here it make no difference whether near or distance Rx used.

Field of view is equal to the magnifier-lens-diameter divided by the number of EVD's separating the eye and the magnifier i.e.

$W_{field} = A_{lens}^{(EVD/z)}$

W_{field} = width of field of view

A_{lens} = the lens diameter

Z = the eye to magnifier distance.

STAND MAGNIFIERS

Most are fixed-focus. Object distance is fixed. Image distance is fixed and usually at a near distance. For older patients a reading addition is required. The enlargement ration is fixed.

Black box concept. It is as though the patient is looking into a black box through an opening. The depth of the box is fixed (it is the lens-to-image distance)
On the back wall, imagine a photographic enlargement of the object. (Enlargement ratio is fixed) the opening to the box is the same as the lens diameter

The eye to image distance depends on where the patient's eye is located. It is equal to the eyes to the lens distance plus the lens-to image distance. This is the accommodative demand and for prebyopes, it is governed by the power of the reading addition.

Equivalent Viewing Distance = Actual viewing distance / Enlargement Ratio

i.e. $EVD = (Z+l') /ER$

z = eye to eye distance (absolute value)
l' = lens to image distance (absolute value)
ER = Enlargement ratio

Example:
Magnifier has a 20D lens. Its image is 20 cm below the lens surface (Vergence = -5 D) if emerging vergence is –5D, then incident vergence must be –25D, i.e. –25 D goes into a +20 D lens so –5 D comes out .
Enlargement ratio = 25/5 = 5 times

If eye is 5cm from magnifier, viewing distance is (20+5) = 25 cm
accommodation demand = 4D
EVD = Actual viewing distance / Enlargement ratio
= 25 cm / 5 =5cm

Eye is 20 cm from magnifier, viewing dist = (20 + 20) = 40cm.
Accommodation demand = 2.5 D
EVD = Actual viewing distance / Enlargement Ratio

Near Vision Telescopes

Telescopes for near vision may be thought of as distance telescopes with a near vision cap to focus at a near distance.
The object is in the focal plane of the "near vision cap" to focus at a near distance. The cap acts as a collimator – its image is at infinity. This distance image is then magnified by the telescope.

Example:

A 3X telescope with a +4.00 D cap for near. The object should be 25 cm from the +4 D cap. The cap by its self would give an EVD of 25 cm (its focal length) but there is further 3X enlargement from the telescope portion.
So EVD = focal length of cap / telescope magnification
Here EVD = 25 cm /3 = 8.33 cm

Video – Magnifiers

Closed circuit television magnifiers and some other electronic imaging devices present an enlarged image (of the object) on their display screen. The enlargement of the image can easily be measured. The patient has considerable freedom to choose the eye-to-screen distance but, for many, this is determined by the power of the reading addition the glasses.

EVD = Actual viewing distance / Enlargement ratio

Example: video image is 10 times larger than actual object

i.e. ER = 10 x if viewing distance is 50 cm then EVD = 50 / 100 = 5 cm.
If eye-to-screen distance shortened to 25 cm then EVD = 25 / 10 = 2.5 cm

Measuring your Own Magnifiers

Manufacturers do not give reliable information about their magnifiers. They generally use inappropriate and misleading definitions of

magnification. When they do specify dioptric power, they are often wrong by substantial amounts. Don't trust them.

Checking the Dioptric Power

Applies to high powered spectacles (especially special-series microscopic lenses), to hand held magnifiers, and to the lens systems of stand magnifiers.
For magnifiers, it is the Equivalent Power that should be specified. This is different from the Back Vertex Power or the Front Vertex power measured on the lensometer. The BVP is the important one when correcting refractive error, FVP is important when determining the working distance given by near addition, but it is the equivalent power that is relevant to near-vision magnification.

Method: In office measurement of Equivalent Power

Take a relatively remote object of known size try a window or tow separated lights, hold magnifier known distance (say 3 meters or more) from this object. Hold a screen near magnifier lens and position it so that a clear image of the object is formed. Measure the height of the image on this screen. We use a piece of clear ruler with mm marking to which attach some frosted Scotch tape (magic tape). The frosted tape acts as a screen and the ruler allows the measurement.
The equivalent focal length can be easily determined by

$f_e = h' (l/h)$ f_e = the equivalent focal length h' = the image size
l= the object to magnifier distance and h = the object size

Example: Object in window 80cm wide and it is 400 cm (4 meters) from the magnifier lens. When in focus, the image of the window as formed on the screen is 2.5 cm high

$f_e = 2.5 \times (400 / 80)$ $f_e = 2.5 \times 5 = 12.5$ cm

so equivalent focal length = 12.5 cm
so equivalent power (F_e) is 8.00 D

if the image size had been 1.0 cm then
$f_e = 1.0 \times (400 / 80) = 5$ cm and $F_e = 20D$
Checking the Image Distance of Stand Magnifiers

Method: In office determination of image location

Place stand magnifier on a page of print. Rest a close focusing telescope (e.g. a Walters 4x) against lens and focus until a clear image of the print is seen through the telescope. The telescope is now focused for the image distance. Without altering the focus of the telescope, place telescope to your eye and move back and forth from a wall until the wall surface is in clear focus. Now measure the distance from the wall to the telescope. This is lens to image distance. If the telescope range of close focus is not sufficient, it will not be possible to obtain a clear image when the telescope rests against the magnifier lens. In this case focus telescope as close as possible (make telescope as long as you can) and now back telescope away from magnifier until page is clear. Measure distance from magnifier to telescope (call this 'a'). Now direct the telescope towards a wall moving back and forth to find the position that gives clear focus. Measure the distance from telescope to wall ('call this b'). The lens to image distance = (b-a) i.e. the telescope to wall distance minus the telescope to magnifier distance.

Finding the Enlargement Ratio for a Stand Magnifier

This is most easily obtained from the measure of Equivalent power (F_e) and Image Distance (l')
If image distance = l' then image vergence = $L' = 1 / l'$

Enlargement ratio = ER = $(L' - F_e) / L'$ Note here L' is negative to signify divergence

In earlier example lens power is +20D and image distance is 20cm so that the image vergence is –5D then ER = (-5 –20) / (-5) = (-25) / (-5) = 5 times
If lens power is +12.50D and image distance is 40 cm then image vergence is –2.5D so here ER = (-2.5 –12.5) / (-2.5) = (-15) / (-2.5) = 6 times

A comparative summary of near low vision devices options presently available are:

Hand Magnifier

Comparatively low magnification

Light and easy to carry around

Binocular viewing at normal viewing distance

May be internally illuminated
cheap
Requires a steady hand

Magnification 2X and 4X

Stand Magnifier

Wide range of magnification 2X to 10X

Fairly light weight

Binocular viewing possible with lower powers

May be internally illuminated
Cheap

Suitable for patients with shaky hands

Spectacle mounted non-telescopic magnifier

Leaves hands free

Comparatively light weight

Short working distance

Good field of view

Usually monocular

Medium price range

Spectacle mounted telescopic unit

Leaves hands free

Bulky and conspicuous

Smaller field of view

Critical depth of focus

May be binocular up to 5X magnification
Expensive

Electronic Devices

No restriction on working distance

Magnification upto 50% possible

Bulky and difficult to move

Very expensive

Tints

People afflicted with different types of retinal and corneal dystrophy often suffer from visual problems in bright light. There are also difficulties associated with sudden changes of light levels. This is the result of abnormally slow recovery rate of the retinal photo pigments.

Trials with different tints have shown a strong preference for red and brown tints by patients suffering from Retinitis Pigmentosa. Although some patients experience a definite subjective liking for one tint over the other, there is no clinical proof of advantage of photochromatic over fixed tints.

Optical Devices for Low Vision People

- *Devices for near Activities:*
    - ◊ Magnifiers of various powers:
    - ◊ Hand held magnifiers.
    - ◊ Hand free magnifiers.
    - ◊ Illuminated hand held magnifiers.
    - ◊ Stand magnifiers.
    - ◊ Spectacle magnifiers (microscopes)
    - ◊ Monocular microscopes.
    - ◊ Binocular microscopes.
    - ◊ Tele-microscopes.
    - ◊ Loups.
    - ◊ Bar magnifiers.

- ◊ Pocket magnifiers (parlinda, Lady- bug).

- *Devices for Distance Activities:*
  - ◊ Telescopes of various powers:
  - ◊ Monocular telescopes.
  - ◊ Binocular telescopes.
  - ◊ Hand held telescopes.
  - ◊ Spectacle mounted telescopes.

RECOMMENDED READING LIST
PRESCRIBED READING
Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice Of Low Vision
- Essentials Of Low Vision Care

UNIT 07:

AIDS FOR PERIPHERAL FIELD LOSS

LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- What is peripheral field loss
- How does it effect vision
- Devices used for enhancing peripheral vision
- How do these devices work

The main principle in low vision work is based on increasing the retinal image size. However, sometimes the problems are of a different nature and for that we use other non-magnifying low vision devices. These include:

1. Field expanders
2. contact lenses
3. tints

Field expanders

Restriction of the visual field can impose a severe handicap, even if central acuity remains good. The most common cause of this is retinitis pigmentosa, but other problems such as Glaucoma can also cause gross field defects.

Field expanders are usually based on two principles:

1. Mirror systems
2. Prism based system

Mirror systems for hemianopia

Patients suffering from homonymous hemianopia experience severe mobility and functional difficulties. A mirror mounted on the spectacle frame angled in a way that it transfers the image from the blind part of

the retina to the functioning part can sometimes help the patient in better comparing the surrounding better. These glasses are called hemianopic mirror glasses.

HEMIANOPIC MIRRORS

Mount on nasal eyewire on blind side

Angle almost straight ahead (about 5 to 10 degrees towards eye)

Angular width of field seen about equal to mirror width (mm)

Mirror acts as an alerting system – not to fixate through mirror

Prism based System

The purpose of the prisms is to create a displacement of the peripheral field on the blind side, shifting it towards the primary visual direction. This has the effect of reducing the magnitude of the eye movement necessary for looking at or searching for objects on that blind side. Small segments of fresnel prisms are attached to the spectacle lens with the prism base in the same direction as the field restriction.

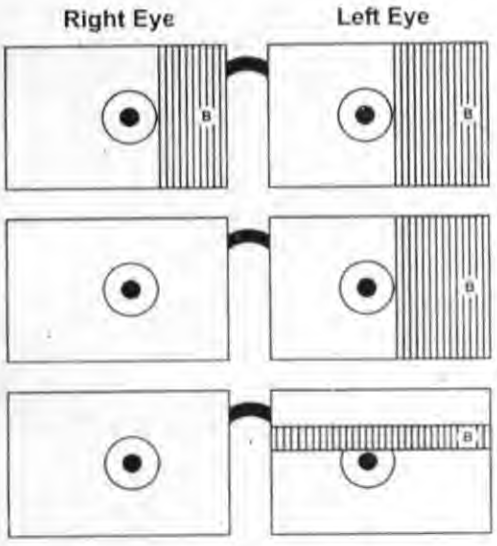
Though theoretically the prism base and mirror systems look like a good way of reducing the magnitude of field defects, but in practice, the patient acceptance of these systems is not very good. A patient would rather turn his head all the way to see the desired object than to use these systems. However, these systems do have their place and may be kept in mind as an alternative when assessing a patient with severe field defects.

PARTIAL PRISMS

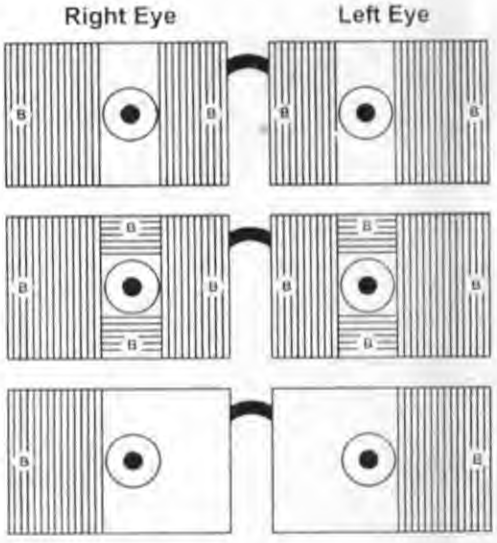
Fresnel prisms 30pd (or 20pd). Base direction always away from the pupil.

Position

- Begin with prism edge about at limbus.
- Trim back until prism is not noticed unless deliberate eye movement towards it.
- May get diplopia and confusion (especially near prism edge)



Alternative arrangement of Prisms for a left Hemianopia



Alternative arrangement of Prisms for concentric contractions of field

REVERSED TELESCOPES

- Usually low magnification 1.4-5.0X
- Reduced VA
- Hand held (3X-5X) for spotting in complex environments
- Head mounted (to 2X) for navigational or work uses
- Amorphic lenses (cylindrical lens systems) minify only in horizontal median

RECOMMENDED READING LIST

PRESCRIBED READING

Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice of Low Vision
- Essentials of Low Vision Care

UNIT 08 & 09:

Special Techniques /Orientation &Mobility, Counseling,Environmental modifications, Building Designs & Adaptive Daily Skills

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LEARNING OBJECTIVES

After studying this unit, you should have a clear understanding of:

- What is functional vision
- What is residual vision
- How to effectively use residual vision
- What is orientation & mobility
- Classification of everyday activities
- Special tips & techniques for independent living
- What are environmental modifications
- What are adaptive daily skills
- How can special alterations/incorporations in building design be of assistance

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ABOUT FUNCTIONAL VISION

Visual functioning is basically the use of vision for particular functions. Functional visual skills are very important and are needed to execute everyday activities. The dissimilarity in how people use vision is usually not related to the measures of distance or near visual acuity. A person may have very poor vision, not well enough for detailed tasks such as stitching, weaving, carving or reading but may be able to see and keep away from objects so that he can move around safely. Functional vision may be improved with training. Many people can learn to make better use of their low vision and can function efficiently with only small amount of visual information. Objects and print can be recognized when they are blurry or when only parts of them can be seen. The visual skills used to enhance functional vision are listed as follows

- Fixation
- Tracking

- Scanning
- Discrimination of objects
- Discrimination of details of the objects
- Discrimination of details in pictures
- Identification and perception of patterns, numbers and words

Fixation (awareness and attention to objects)
It refers to finding an object or target and staring at it continuously as long as to be familiar with it or recognize it.

Tracking (control of eye movements):
It refers to follow moving objects with eyes and head.

Scanning (control of eye movements):
It refers to the accurate movement of eyes from one object to another.

Discrimination of Objects:
It refers to the correct recognition of different objects from an outline or general shape.

Discrimination of details (to identify actions and matching objects)
It refers to the identification of features of the objects.

Discrimination of details in pictures
It refers to getting knowledge from pictures. Pictures can be simple outlines or difficult detailed pictures. The basic features in the pictures have to be identified to understand the theme of the picture.

Identification and perception of patterns, numbers and words
It refers to matching letters or numbers by their similar or dissimilar features. It doesn't require reading but it is a very important skill for reading.

A person with low vision may not be able to progress through all the steps without special training. Some skills may not be achieved (for example tracking moving objects) but the person can still progress on to later steps.

Visual functioning plays a very significant role in promoting independent living in low vision people. If a low vision person, no matter mild, moderate, severe or profound low vision, is given proper training of visual skills mentioned above for the enhancement of his/her

visual functioning he/she will certainly show an improved performance in the every day activities and move closer to an independent life.

- *Exercises of visual skills for the enhancement of visual functioning:*
    - ◊ Fixation excercises.
    - ◊ Tracking excercises.
    - ◊ Scanning excercises.
    - ◊ Spotting excercises.
    - ◊ Ecentric-viewing excercises.

USING RESIDUAL VISION

People must be acquainted with how to make best use of their residual vision. Guidance, counseling, rehabilitation, training of special tips, tact and techniques to perform different tasks, and environmental modification i.e. change in size, distance, color and contrast of things being used in daily living activities, the use of suitable light and simple setting of furniture and other usable in the house can have a very helpful and encouraging effect on the performance of a low vision person in every day life; low vision devices can also be useful.

In order to encourage the use of residual vision, the foremost information needed about each person with low vision is his/her:

- Visual Acuity (near and distance)
- Visual Field
- Color Vision
- Day Vision
- Night Vision
- Contrast Sensitivity
- Illumination preferred
- How the person is able to use vision for particular purposes

Secondly the features that affect how well a person can see and recognize objects are:

- Familiarity
- Distance
- Size

- Details or simplicity
- light
- Contrast
- Color
- Mobility
- Complication
- Position
- Time given

THE KEY TO INDEPENDENT LIVING

Up till now a low vision people are considered as blind people. The behavior of community towards them is either very protective or very neglecting. This attitude of society is very unfavorable and discouraging. A low vision person is not blind. Blindness means total absence of sight that is no perception of light (NPL), whereas, in low vision the client has some residual vision that can be used.

A low vision person should neither be over neglected nor be over protected, that means, the attitude to community (family, relatives, friends, teachers etc.) should be very balanced.

Low vision people are those who can lead an independent life to a great extant, provided that they know how to make best use of their residual vision in carrying various everyday activities.

Classification of everyday activities:

Different people have different activities to perform in everyday life regarding their individual needs; therefore we have classified everyday activities in different categories, which are as follow:

- Routeine activities
- Educational activities
- Domestic activities
- Recreational activities
- Self and health care activities
- Outdoor activities
- Social Activities

Routine Activities

- Orientation and Mobility
- Dining Activities
- Recognizing faces/objects
- Searching anything
- Measuring anything
- Watching Time
- Dialing phone

Educational Activities

- Reading
- Writing
- Matching
- Drawing
- Working off black board
- Moving in classroom and school
- Interaction with class fellows, friends and teachers

Domestic Activities

- Cleaning and dusting
- Washing (clothes and utensils)
- Cooking and backing
- Pealing and cutting vegetables and fruit
- Ironing clothes
- Stitching and knitting

Recreational Activities

- Indoor games
- Outdoor games
- Watching TV
- Reading (books, magazines, novels, digests, newspapers etc.)

Self and Health Care Activities

- Dressing
- Combing
- Make up
- Measuring Temperature
- Measuring insulin units

Outdoor Activities

- Shopping
- Using Landmarks
- Travelling
- Attending Functions

Social Activities

- Social Interaction
- Visiting any relatives/friends
- Entertaining guests
- Serving
- Participating in any indoors/outdoor activities

A FEW BASIC STEPS TOWARDS INDEPENDENT LIVING

In order to prevent and overcome the above mentioned problems and difficulties faced by low vision people while performing various types of everyday activities, to promote independent living in low vision people some basic factors should be considered and implemented. These factors are discussed below.

Self Awareness (knowledge and feelings about vision):

It refers to person's feelings about his vision i.e. whether he/she considers him/herself as;

Being blind
Having some but not normal vision
Having normal vision

Suggestions:

- The person should be correctly explained the difference

between the normal vision, low vision and blindness.

- The person and his/her family should be made aware of the actual results of the visual assessment.
- The Person should be told the fact that whether his/her poor vision is usable or not for everyday activities.
- He/She should be explained the implications of restricted visual fields, the effects of poor contrast or a problem with color vision, if necessary.
- He/She should be given suggestions to enhance his/her visual functioning for Example
  - Working in the best light
  - Moving closer to objects to see them better
  - Using objects with good contrast
  - Allowing plenty of time for looking

Self confidence (use of vision for obtaining information):

It refers to whether the vision is used to find out about the environment and what activities are taking place or the person waits to be told.

Suggestions:

- The person should be encouraged to use his/her vision to be aware of what is happening and to find people or objects.
- His/her attention should be attracted and directed to watch activities.
- The person should be encouraged to look for the object and reach out for it rather than giving the object in his hand.
- The person should be taught how the use of contrast and knowing the position of objects can help him/her to move safely around the community.

- The person should be encouraged to make effective use of other senses when combined with vision, for example, listening for what is happening to find where to look. Use touch to feel whole object, then look at parts.

Environmental Awareness:

It refers to whether the vision has been used to explore and learn about the common objects used by people in the community by observing behaviours and asking questions.

Suggestions:

- The person should ask sighted people to explain and describe objects and things taking place.
- The person should be encouraged to look closely at the objects in the environment. The objects should be described while the person is watching them. For objects that are too far away, too big or dangerous that can not be looked at closely, should be described in words that the person can understand from what he has seen before and already understands.
- The person should be shown where the things are kept at home, in the school, in the mosque and in shops.

Independence:

It refers to how the person can use vision to do carry out some or all the activities that other people perform without special help, and how hearing and touch is used to help.

Suggestion:

- The person should be encouraged to take part in all family and community activities and it should be made sure that the person will be safe and will be helped by others only when necessary.
- One should describe what he is doing or going to do. He/she should tell a low vision person when he/she enters or leaves the room as the low vision person may not be aware of any other person nearby or in a room.

- A low vision person should be made known how to perform activities and jobs by demonstrating close to the person. It should be described what to do and how.

Lighting:

It refers to either natural or artificial light both inside building and out side. The amount and direction of light are essential for best visual functioning. The amount of light can not always be changed. A person can move to different positions to adjust the amount of light from direct sunlight to shade or from a shady to bright position.

Suggestions:

- Some low vision people face problem with too much light. Vision can be worse for some people in bright sunlight. They are better in shaded areas. If they need to be in the sun, they should shade their eyes with the hands, umbrella or wear a hat.
- Some people face problem with little light. If a person has to work inside, it is better for him/her to sit near a window or a door to use the light, but he should not face the window
- People with certain eye conditions are almost blind at night or in dull light. They may not have sufficient vision to move safely and independently or do their normal activities that they could do during the day time. They may need extra help to move safely at night. A torch or flashlight should be used by them.
- As direction of light has an affect on low vision person's performance so it is better to have light coming from behind and to one side rather than facing the light. The person should have light shining on the work being done.

Contrast:

It refers to the fact that if there is a good contrast against the background, things are easier to see, for example, light colored accessories on a dark colored table. Poor contrast leads to poor performance, examples of poor contrast are animals which are same or similar color as their environment, for example, grass hopper.

Suggestions:

- The person should always use dark objects against light background or vice versa.

Color Vision:

It refers to the correct use or knowledge of color that is important in some situations, for example, selecting and matching colors. Certain colors are used to decorate objects and people.

Suggestions:

Colors should be named accurately. If this is not the case, person should still be able to work with colored objects by picking out different and matching similar colors.

The person should know the colors of the objects in order to find it without any difficulty, for example, knowing the color of a person's clothing can help in identifying a person.

HOW TO ACHIEVE INDEPENDENCE

Following are the ways and techniques to perform different activities:

Routine Activities:

- Obtain complete familiarity with the environment i.e. to be acquainted with how the setting is, how everything is arranged and where every object is placed.
- Apply protective techniques (upper hand and low arm techniques) and trailing technique while moving inside the building.
- Use white cane with diagonal technique and apply hands and feet discrimination techniques during ascending and descending stairs and while moving outdoor.
- Use telescopes to watch distant things easily.

- Use other senses i.e., hearing, smelling and touching as much as possible besides vision to make out what is happening around.
- Use bright and high contrast crockery
- Always put dark colored crockery on light colored mat or light colored crockery on dark colored mat; similarly put light colored food in dark bowls and dishes, for example, boiled rice in a dark dish.
- Dip the fingertip in the glass while pouring water in it when you feel water touching your fingertip stop pouring, as it means that the glass is almost full.
- Feel the temperature of the cup from outside with finger while pouring tea in it and as the leyel rises towards the mouth of the cup stopping.
- Use the sense of smelling to recognize the dish.
- Use the prescribed telescope to recognize faces and objects.
- Use the sense of hearing to recognize any person by his voice and sense of touch to recognize any object by feeling its parts with hands.
- Use protective techniques and hand discrimination techniques to find and pick any dropped object from the floor.
- Use tactile measuring tape or ruler to measure any thing.
- Use the telescope/ magnifying glasses to watch time or use enlarged, high contrast or talking wall clocks, time pieces and wrist watches Use the sense of touch to dial phone. The digit 5 is always tactile in a phone set.
- Use enlarged and high contrast telephones

Educational Activities:

- Sit near the window or in proper light (don't face the light).
- Use prescribed magnifiers
- Use lamp for proper light, reading stand for comfortable posture and other devices for reading (mentioned in chapter 4).
- Use bold line copies, black fell-tipped pens and other devices for writing.
- Use the prescribed telescope to work off chalkboard.
- Ask the teacher to repeat verbally what she writes on the chalkboard after writing.
- Use enlarged and dark graph papers.
- Use pen or marker to draw angles or pictures.
- Trace over pictures or shapes with a dark pen.
- Get familiar to the classroom, its setting, arrangement and contents.
- Get well known with all the ways, areas and portions of the school by taking rounds of the school again and again.
- Ask some one to demonstrate you every thing about your classroom and school properly and completely.
- Develop pleasant and friendly terms with class fellows, friends and teachers. Don't feel hesitant to interact with them. Don't feel shy to explain them about your impairment and problems you face due to it. In this way they can understand you and feel happy to cooperate with you and help you when ever you need their help.

Domestic Activities:

- Use the sense of touch and feeling in cleaning, sweeping, washing and dusting.
- Get familiar to each and every object and their permanent places.
- Watch all the stains before washing anything by using magnifying glasses and keep in mind the parts where the stains are, and then wash those parts cautiously.
- Always use a lighter to put on the fire.
- Keep yourself at a distance from the stove or oven when putting on the fire or while cooking.
- Use white enameled pans for cooking food, in order to increase the contrast of food being cooked in it.
- Use pans with black inside to boil the milk. It will also give good contrast.
- Use whistling kettle to boil the water. Its function is to give sound as the water boils.
- Use vegetable cutting board white from one side and black from other. Cut light colored vegetables on black side and dark colored vegetables on white side to increase contrast and to make the task easy and visible.
- Use bright colored kitchen tools, usable and other devices for domestic activities, so that they are easy to find and easily visible.
- Label all the jars containing masalas and cerials either with names or with signs, in order to recognize them easily.
- Also use the sense of smell to recognize masalas and other cereals.
- Paint the handles of pans in contrast colors to make them safe easy to see and hold.

- Use needle threading device to put thread in the needle. It involves sense of touch.
- Use big size needles.
- Use bright colored threads for stitching, knitting and weaving.

Recreational activities:

- Use enlarged and high contrast ludo, chess, carem board, foot balls and other devices for recreational activities (mentioned in chapter 4)
- Use prescribed monocular telescope to watch TV.
- Use prescribed magnifiers, reading stand and lamp and typoscope to read anything.
- Use talking books to listen to the book you want to read.
- Play video games in which bright colors are applied.

Self and Health Care Activities:

- Avoid making too many dresses of same type of cloth.
- Apply different types of laces and buttons on the dresses of exactly same material. The lace applied on one piece of a dress should be applied on other pieces as well so that it will become easy to separate all pieces of a dress from other clothes.
- To separate socks of same pair from other socks it would be better to join them with tich buttons even while washing so that they remain in pair.
- Avoid buying too much wearable or garments of same cloth, material and style.
- Select some standard shades of lipsticks, nail polishes, blushers and eye shades which can be applied with any color of the dress.

- Having less but standard variety of dresses, cosmetics shoes its leads to easy selection, separation and recognition
- Always buy lipsticks, nail polishes, blushers, eye shades and other cosmetics, of different companies; this will make it easy to recognize their shades as their outlook differ from each other.
- For more convenience label them with the initials of their colors' name.
- Use the prescribed near vision glasses to cut nails.
- Use a magnifying mirror while doing make up or combing hair.
- Use talking thermometer/insulin measuring device to hear the measurement or use a digital thermometer/ insulin measuring device and read it with prescribed magnifier.

Outdoor Activities:

- Take some sighted guide along with you when you go to shopping so that he/she can assist you to recognize objects, to move to different shops or portions of any plaza, to recognize colors and to select things you want to buy.
- Select some particular markets and other land marks permanently, get familiar to their complete environment and also get familiar to their shopkeepers and staff, in this way you can go to those places independently.
- Learn the routes by going through them again and again.
- Learn the permanent clues on the route to different places.
- Always keep the prescribed pocket magnifier along with you, where ever you go, it will be helpful to read prises of things while shopping, menu of any hotel or restaurant etc.
- Always keep the prescribed telescope along with you to read bus numbers, street signs, house numbers, shops' names and boards etc.

Social Activities:

- Develop pleasant and friendly relationship with relatives, friends and others.
- Don't hesitate to interact with the people.
- Develop self confidence.
- Tell people about your impairment without hesitation and the problems faced by you so that they can understand how to deal with u i.e. they know what to expect of you & when you need their assistance.
- Whenever some people visit you, first of all get properly introduced with them and take into account where everyone is seating.
- Serve the drinks or other refreshments very calmly without getting confused.
- Arrange the eatables on the table yourself so that you know where everything is placed.
- Whenever you visit anyone observe your surroundings carefully or ask someone to demonstrate you all the details.
- When you are served dinner or lunch, first of all try to observe what things are placed on the table and their arrangement or ask anyone to explain you.
- Try to accept and successfully cope with this impairment and try to lead an independent life as much as possible.

Although the low vision people can not be given any medical or surgical treatment to cure their impairment but the problems faced by them can be reduced to a great extent by providing them guidance and counseling, rehabilitation services, low vision aids and adaptations and guidelines and techniques so that they can perform their everyday activities in a better way.

Low vision people should know how to make best use of their residual vision, they can be encouraged to do so by enhancing their visual functioning providing them proper low vision devices according to their everyday needs (big, bold and bright), environmental modifications (proper light, high contrast and bright colors), developing self awareness in them, developing self confidence in them and suggesting ways, solutions and techniques to overcome their problems in daily life and to perform their different activities. If a low vision person understands how to make best use of his/her residual vision he/she can perform everyday activities easily and can lead an independent life to a great extent.

RECOMMENDED READING LIST
PRESCRIBED READING
Notes given in the study guide

SUGGESTED READING

- Primary Low Vision Care
- Understanding Low Vision
- Art And Practice of Low Vision
- Essentials of Low Vision Care