REHABILITATION MANUAL 5

LOW VISION MANUAL

Editor
KENJI YANASHIMA

NATIONAL REHABILITATION CENTER
FOR THE DISABLED
JAPAN

(WHO COLLABORATING CENTRE)

March, 2002

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1 To undertake research and development of disability prevention and rehabilitation technology, and to disseminate information on the use of such technology through education and training of WHO fellows and other professional staff.
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3 To undertake studies of community-based rehabilitation, primary health care, and other social support mechanisms for people with disabilities.
4 To undertake research and development of new equipment and devices in rehabilitation and daily life of people with disabilities.
5 To develop and prepare manuals for education and training of rehabilitation professionals.
6 To support organization of conferences and/or seminars on rehabilitation of people with disabilities.

National Rehabilitation Centre for the Disabled
WHO Collaborating Centre for Disability Prevention and Rehabilitation

Rehabilitation Manual 5
Low Vision Manual
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Editor: Kenji YANASHIMA

Ryuichi NAKAMURA, M.D., Ph.D., Prsesident
4-1 Namiki, Tokorozawa City, Saitama Prefecture 359-8555, Japan
Tel. 81-42-995-3100
Fax. 81-42-995-3102
E-mail:whoclbc@rehab.go.jp

PREFACE

The Japan Ophthalmological Society estimated that there are more than 1 million low vision patients, who have visual difficulties in their daily life. According to the estimate made by a national survey there are 30,5000 legally blind. As most disease have decreased the quality of life for the patient, the purpose of rehabilitation should be followed back to their previous conditions. However, the current system stands a patient has long treatment followed by a long orientation back into being steady. Therefore most patients lose their occupation and forced to take one direction. I. E. taking job-training courses.

Our purpose is keeping them in their chosen occupation. If an ophthalmologist could give low vision services in the early stage of medical treatment, the patient could keep their previous occupation. Our proposal is that we bring both treatment and low vision information together to be full and comprehensive service and such a system can and is being improved by our clinic.

We established first low vision clinic of Japan in 1985. Furthermore, since 1991 we have held annual training course for ophthalmologists. Essence of our experience was edited as this manual, hoping that this will contribute to promote spread of low vision service.

K. Yanashima

EDITOR

Kenji YANASHIMA
National Rehabilitation Center for the Disabled

CONTRIBUTORS

Akio KUBO
National Rehabilitation Center for the Disabled

Hiromi HAYASHI
National Rehabilitation Center for the Disabled

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I Rehabilitation team in hospital

The rehabilitation for low vision patients needs not only to be implemented at the centers but also to be treated by hospitals. Our purpose is promoting quality of life regarding the visual disturbance for each patient. This is a "patient-oriented" medical service. To meet the needs of patients in many ways, we achieve this via a team of ophthalmologists, orthoptists, training specialists and caseworkers.

The process of vision evaluation (see Figure 1) starts from an understanding of the pathology based on general ophthalmologic tests, medical assessments and prognosis. It continues to low vision evaluation with visual aids and social assessments of mobility, communication skills and Activities of Daily living (ADL).

An effective rehabilitation program focuses on attaining programmatic goals for their adjustment is shared with all staff. Although this whole process is usually completed in one week or so, post-training follow-up is so important that it is provided as an extension of services. It is then subdivided into three assessment processes: social assessment regarding the area of rehabilitation social work; visual assessment concerning the availability of optical aids; and training of social skill assessment.

Usually in the service of welfare, the visual impairment is referred to rehabilitation facilities for social adaptation and professional training. In our clinic, if people are able to use their remaining visual functions, we provide training and guidance to return to previous life: the work, study, home life, etc.

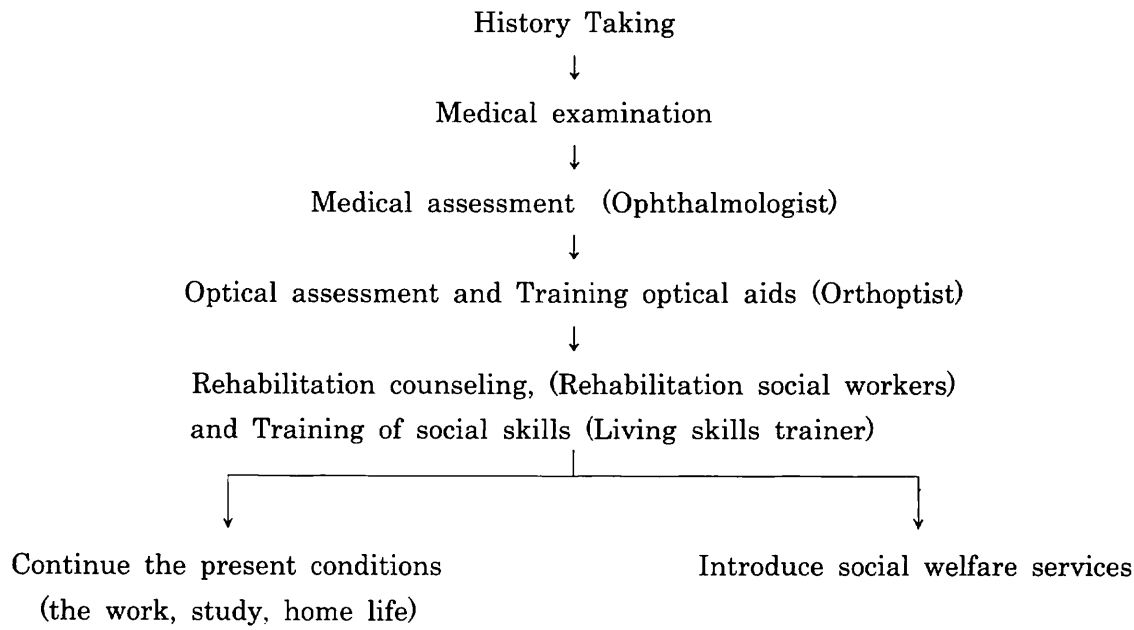

Figure 1 Flow chart of services

Ophthalmologist

1 Conduct an evaluation of medical history and treatment
2 Give medical advice diagnosing and prognosis
3 Seek treatment to improve visual function

Orthoptist

1 Select of optical aids and training for them
2 Select monocular telescopic guides to perceive objects at a distance and training their usage
3 Select absorptive lenses for photophobia
4 Select visual field expansion aids and training their usage

Living skills trainer

1 Evaluate residual vision
2 Provide training social life activities (usage of the white cane, communication skills, etc)

Rehabilitation social worker

1 Conduct a social evaluation
2 Advice welfare services
3 Coordinate the patient's needs
4 Restructure the personal environment (domestic, work, etc)
5 Provide follow up support

Interpreting the patient's needs is the major challenge of low vision care. In our hospital patients can be interviewed with both doctors and case workers.
First, a routine history including medical conditions and family history is completed for every patient by ophthalmologist. It's the most important to know what the patient want to do and what their difficulties are.

Secondary, the patient has a chance to talk with case workers. After the whole assessments, the patient can be interviewed again if it's necessary.

II Medical assessment

The staff in ophthalmology make the assessment, based on precise medical examinations. When the treatment is necessary, they provide it to enable their patients to make full use of their vision. Improved vision becomes an exponentially advantageous factor at the stage of selecting optical aids. If there is even a slight possibility of improving vision, ophthalmologists should seriously consider performing an operation. Precise medical examinations such as electro-physiologic tests (functional tests) and ultra-sound tests (morphologic tests) are performed to obtain a better scientific understanding of visual functions and to decide the prognosis. If there is a limit to treatment, patients are fully informed of their prognosis and oriented to the future. Perfunctory reporting of prognosis should be carefully avoided, however, as it could adversely affect the lives of patients.

Functional Assessment

1 Visual acuity (far)
2 Visual acuity (near)
3 Refraction
4 Visual field (full,30degree,10degree)
5 Special testing
  a. color vision
  b. contrast sensitivity
  c. ERG
  d. VEP
  e. fixation / dominant eye
  f. binocular vision
  g. accommodation
  h. others

Ⅲ Visual assessment

The first step in choosing appropriate optical aids to look at patient's history. If someone has a task that requires both hands to be free, hand and stand magnifiers are essentially eliminated.

The second step is to determine the power of magnification necessary for the patient. Reading the print size of the newspaper is considered a useful goal in low vision because it is similar in size to average typeface in books and magazines.

Determination of required magnification

For low vision patients we established the goal to read newspapers. We use the original chart based on the letter size of the newspaper (photo 1) and then calculate the required to achieve that goal. The magnification needed is calculated relative to size and distance.

Example) A person is barely able to read 4X print when held at 24 cm.
For reading the newspaper (1X), the relative distance should be 6 cm.
Then calculate the lens power to focus at 6cm. Therefore that is 16.6D.
From the formula :4D=1X the magnification is therefore:

Distance / magnification	24 / 4 = 6	
Recalculate to diopter	100 / 6 =16.6 (D)	
4D = 1X	16.6 / 4 = 4	M= 4X

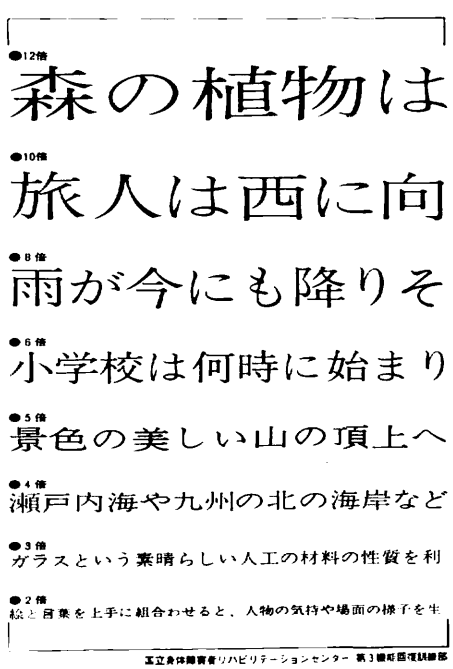

Photo 1
Assessment chart for magnification

To magnify objects such as the letters of a book, an image on the retina must be magnified. There are four methods for magnifying the retinal image.

Relative size magnification

This is a way of increasing the retinal image by enlarging objects themselves such as characters, e.g. books written in large-sized letters or enlarged photocopies.

Relative distance magnification

This method rests on the principle that an object looks bigger when it is placed closer to the eye. For instance, for an object viewed at 12.5 cm, the retinal image becomes the twice the size when viewed at 25 cm. The result is obtained either by using the distance or a lens power D as the standard.

Angular magnification

This method enables a patient to get a relatively wider visual field. Since two lenses are used for a telescope, the visual fields become narrower and the image darkens. When the distance between the eye and the eye lens becomes wider, the visual field narrows. For these reasons, the patient has to place the eye lens as close to the eye as possible, and be trained to align the object on the central line of the loupe.

Projection magnification

This method is used to project an enlarged image of slides on a screen through a projector. Closed Circuit TV (photo 2), a method for projecting letters scanned by an optical character reader on a TV monitor is classified in this category. It is also used to read the letters on a blackboard through an OCR scanner and project them on a TV screen. By enlarging the size of the TV monitor, it is possible to obtain 40 times magnification. Also there are functions of reverse characters, masking, and contrast adjustment possible.

Ⅳ Optical aids and non optical aids

Optical aids

1 Spectacles

Spectacles are the low vision aids that are often prescribed. They are simply reading glasses with high powers than normal. It is the most important to check the patient's refractive error. If a patient is 4D myopia, he already has a 4D add. If the patient needs 8 D for reading, he just needs remaining 4D. And reading distance is 25cm. Similarly, if a patient is 4D of hyperopia and need 8D for the near focus, they need +12D spectacles for reading.

2 Hand magnifier (photo 3)

Hand magnifiers consist of a convex lens surrounded by a plastic carrier attached to a handle. Sometimes they have a light attached. For maximum magnification, hold the lens a distance from the reading material that is equal to the focal distance of the lens. Changing the magnifier to print distance will make that the image size will be smaller and resolution will diminish. When holding at the focal distance, no accommodation is needed to focus the image and no reading correction.

3 Stand magnifier (photo 4)

Stand magnifier is similar to hand magnifier. They consist of a convex lens surrounded by a plastic. They are attached to leg or some other support. Some have an internal light source.

The eye to lens distance is constantly maintained by the leg. So the patient can keep constant image. Sometimes the height of the stand magnifiers is shorter than the focal length of the lens. At that time, image rays emerging from the back of the lens are not parallel and somewhat divergent. To be focused, the patient need accommodations or near glasses. Also these stand magnifier do not achieve the maximum magnification from the power of their lenses.

4 Telescopes (photo 5)

Telescope consists of two lenses separated by a short distance in a metal tube. Sometimes a prism and mirror are incorporated to decrease the distance. Telescope can provide clearer view but have several shortcomings. As an image is viewed, there is decease in the amount of transmitted light. So the image appears darker. Also as the power increase, the field of view decrease.

Photo 2

Photo 3

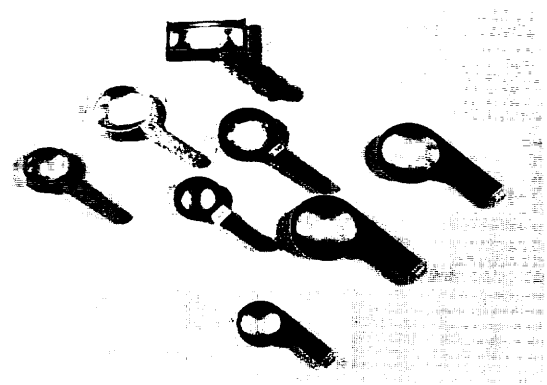

Photo 4

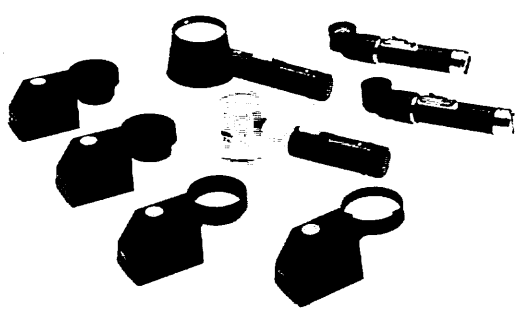

Photo 5

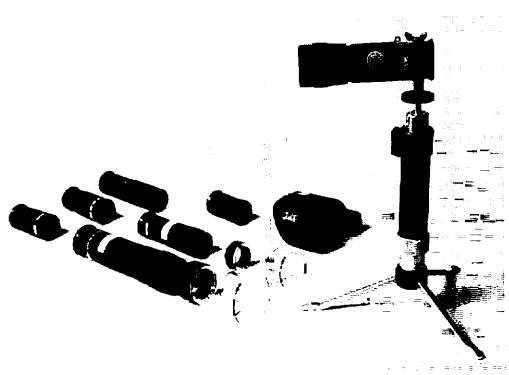

Table 1 Summary of low vision devices

	Positive	Negative
Spectacles	hand free, wide visual field	poor working distance
	acceptable	high add-close distance
Hand magnifier	convenient, handy	hand tremors
	may have light source	reduced field of view
	familiarity	
Stand magnifier	convenient, hand free	narrow field,
	normal reading distance	reduced light gathering
Telescope	spectacle mounted	narrow field

Non Optical aids

1 Typoscope (photo 6)

Typoscopes are cardboard stripes with rectangular section cut out which isolate one or two lines of print on a page. They can be homemade of laminated black construction paper.

2 Reading stand

Reading stand hold a reading material at a proper height and angle.

3 Black felt tip markers

4 Bold line writing paper

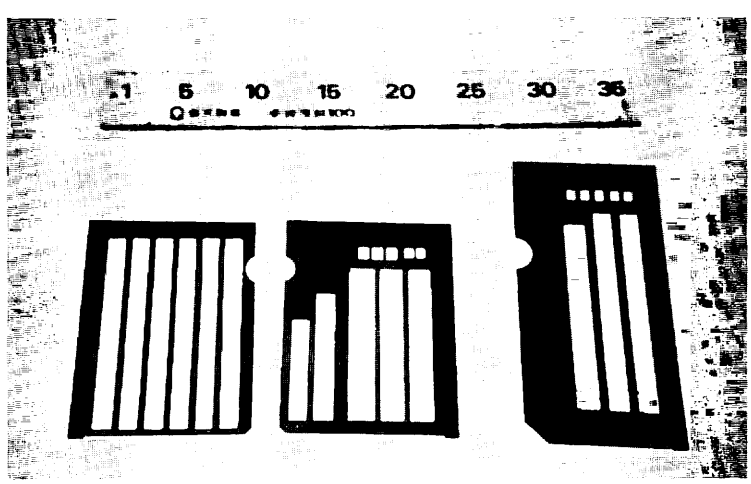

Photo 6 Typoscope

V Glare cause veiling and discomfort sensation

Photophobia is often experienced in patients with cataract, macular degeneration, and diabetic retinopathy. And severe complains are encountered in retinitis pigmentosa, which have been the main causes of blindness in Japan. They often choose the absorptive lens as a first choice of low vision equipment. Those lenses provide selective filtering protection from ultraviolet and blue light.
The table shows the numbers of the prescribed for 5 years since 1993.

Table 2 Prescribed Absorptive lens

RETINEX	R.P. (110)	D.R.(18)	M.D.(23)	GLA(23)
SY (slight yellow)	15	4	3	3
YG (yellow green)	10	1	3	2
DG (dark green)	10	4	4	3
YE (yellow)	24	7	7	8
OR (orange)	8	0	1	1
RE (red)	6	0	1	0
YB (yellow brown)	25	2	1	2
OB (orange brown)	9	0	2	1

R.P. retinitis pigmentosa, D.M. diabetic retinopathy, M.D. macular degeneration, GLA glaucoma

Also some low vision patients need side-shield with glasses, hats and visor to reduce the light coming into the eye. Advice and guidance services concerning appropriate lighting systems are provided to many low vision people who need to obtain a good contrast for mobility. Appropriate advice should also cover such aspects as angles, illumination, and heat from lighting systems in the office. It should also be remembered that light reflected on white paper could deteriorate the visual environment. The most preferable light is a cold source, as it does not emit heat. A goose-neck-type light is also convenient, as its angle is adjustable.

VI Training

The assessment of optical aids and training in using them for low vision people is effective to use their remaining visual functions capable.

1 Reading training

a.	near	reading newspapers or books
b.	distant	signboards
		traffic lights
		surrounding landscapes
		fare table in the station
		the blackboard
c.	CCTV	The most difficult aspect of using a CCTV is moving the object in a coordinated manner since the relative motion on the screen is different than would be expected with direct viewing of the object.

2 Eccentric fixation training

This training enables people to find and use the best point of their eyes to see objects when they do not see the center of visual fields. One way of doing this is to make them see above, below, to the right of or to the left of the character they want to see.

a. blind awareness (with Amsler grid, clock position, CCTV)
b. eccentric direction and degree
c. eye-hand coordination

Once they find the best position to see the character, they will learn such positional relationship by training until they are accustomed to using it.

d. guided practice techniques
e. specialized training sheets (large to small)
f. actual reading with optical aids

3 Writing

This training is provided to people having difficulties in writing because they find it hard to see the ruler lines. As far as the size of characters is concerned, people can usually write characters without any optical aids if they can see them.

But it is necessary to provide guidance as to the selection of writing tools. Such sharp contrast tools as water-based pens or felt-tipped pens should be used.

4 Visual field enhancement

a. Scanning

This is the simplest method of enhancing one's visual field.

When the field of vision is restricted, it is necessary to learn systematic approaches to scanning the environment.

b. Reversed Telescope

Through a telescope in the reverse direction, there is an increase in the field of view approximately equal to the power of the telescope.

c. Fresnel Prism

Place a prism in front of the eye with the base in the direction of the field loss. This allows the person to see the object with a smaller head turn.

Photo 7 Case with a left hemianopsia:
The prism is placed over the temporal portion of the left lens with the apex just lateral to the viewer's line of sight.

Ⅶ Social assessment

Following to medical assessment, social assessment is necessary for social adaptation. We provide counseling and training based on these assessments.
We need to make schedules for rehabilitation based on the various conditions (acceptance of disability, relationship with others, mobility, ADL, communication skill).

We often provide counseling and training on the process of assessment at the same time.

1 Psychology

Assessment of psychological condition and the range of acceptance to visual impairment are effective sources of progress on rehabilitation in social life.

2 Social role

It is necessary to invest the present situation of patients with low vision, such as occupation, status and age, and to know their backgrounds to understand the patients.

If he is a businessman, he needs to get enough skills to work. But if he is an old age and stay at home, the skill of letter recognition is not always necessary. So everything is different with each person.

3 Economical condition

We check the income (salary, pension) if which is enough for cost of the living.

4 Adaptive range of ADL

We check their ADL skill (tooth brush, comb, cosmetic, nail), knitting, cleaning, washing, eating, money, cloth, shopping and telephone.

5 Assessment of mobility

We check their safety walk by themselves: go to school/ work, shopping.
If it's necessary to be guided, we check who can do and how to use white cane.

6 Communication skill

We choose the kind of optical aid that is necessary for reading and writing, and select the proper aid from CCTV, computer system of large print, talking computer and Braille.

7 Understanding in society

It's necessary the neighbor (family, co-worker, friend, teacher, case worker) to understand their disability on the process of rehabilitation.

Ⅷ Social and vocational counseling

1 Counseling of home care

Social and personal information plays an important role in the management of the patient. Sometimes low vision patients are adapting to the vision loss but are not yet ready to face their disabilities. At first they are asked their history by the doctor and are checked their functions. In our experience, most of the patients aren't satisfied with the first interview. We believe comprehensive low vision evaluation may take several visits. The patient interview is devoted to understanding the patient as a person and how the vision impairment affects their lives. In the society, people still have a prejudice against the disabled. It's very difficult for both the person himself and others to accept the handicap. Also comparing physical handicapped, visual handicapped is not easier to express that. Other people will not understand their disabilities unless they inform them.

2 Employment

The purpose of most patients is continuing their job and goes back to previous condition. In our low vision clinic, we advise them to use their residual vision as well as possible. We provide counseling to the patients regarding each condition. Those will be the bases for deciding their schedules. If it is necessary, we can discuss with coworker, their director, etc. Sometimes caseworker should go to their business place and adjust the circumstances.

3 School life

If the patients were students, we need to communicate with their teachers. The major visual task of children is to see in school. Then we try to find proper way for studying. Also, it is important to support their parents and teachers, because children can't recognize their own disabilities. Quite often parents are wondering if the children should go to public school or go to school for the blind. Moreover we need to communicate with teachers and counselors at school.

4 Economic condition

It is the most important point for the patients to think the loss of a job. That leads to lack of income. When they have families to have to afford, it is easier to continue their present job with residual vision. We advice and introduce pension, insurance and vocational training, if necessary.

Ⅸ Training social functioning ability

1 Activity of daily living

In the activities of daily living, we can classify the management to personal and home. The personal management is a get-up, tooth paste, the hair care, shaving, make up, nail care, washing clothing, eating skills, using the telephone, money identification, the usage of the home appliance, etc. We instruct the method to utilize not only their vision effectively but also to become oriented to their surrounding by paying attention with other senses (the sense of hearing and the tactile sense).

2 Orientation & mobility

It is important that patients can walk indoors safely. We have the following two methods.

a. Change the way for the management: walk slowly, see the right and left, take the defense attitude and walk along the wall while using their hand.
b. Change the environment: flat floor (walk without tripping), replace wallpapers to make contrast with the wall and the floor

We assess the walking skill outside with the residual vision. We instruct self-protective technique and the use of white cane. Especially for the patient with retinitis pigmentosa, a white cane is indispensable to walk at night.

3 Communication skills

1 Computer

Recently the people who have visual loss are possible to work by utilizing the computer. There are many progresses of the program of the expansion and black-and-white reversal function of the font. Also, recently the voice synthesis has come to be carried out with a program. It is getting easier for the vision handicapped to participate in the work by using personal computer. The continuation of their job will become possible by the change with the contents of operation.

2 Braille point

Usually the study of the Braille point is not indispensable for a low vision person. If they hope, we provide Braille point training. Braille is not always for the blind but low visions person. Some patients may be insufficient with only computer skill and the combination of several skills are needed.

X Follow up

1 Support Groups

We offer the service to our patients by facilitating a way for similar patients to meet. Providing patients with the opportunity to share experience can be helpful and ease them through the meeting. The name of the meeting calls it with "Ai-ai-kai"(the meeting of loving eye). The main purpose of the meeting is to make mutual interchange and information exchange. The activities of this meeting are general meeting, the issuance of a report, a trip, outdoor cooking, a study meeting, the regular conference in each month, etc. All activities are managed by the patients themselves and the staff of the low vision clinic is related as just an adviser.

2 Real guidance

We will go to the workplace (the school, home etc.) of a patient, if it were necessary.

We provide the environment adjustment and training in their scenes, because the guidance of the real scene is necessary.

Appendix

Each patient, even among those with the same diagnosis, will have unique individual needs. She was with retinitits pigmentosa in her fifties. Her visual field was very narrow and visual acuity was hand movement in both eyes. What she need was going to the beauty room by herself. Sometimes final goal is not always reading and writing of documents again. Therefore we provided orientation training to the beauty room with a white cane. While the training she said to me. "'I can see a white line slightly on the road, even it isn't focus besides. But I can understand it is the white line of the path side. Then I can walk by myself with a white cane."

Nobody supposed she could utilize her slight vision effectively. Practical use of remained vision can raise the QOL of a patient.

Now she requires more sophisticated device such as a guide dog and enjoys her life.

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