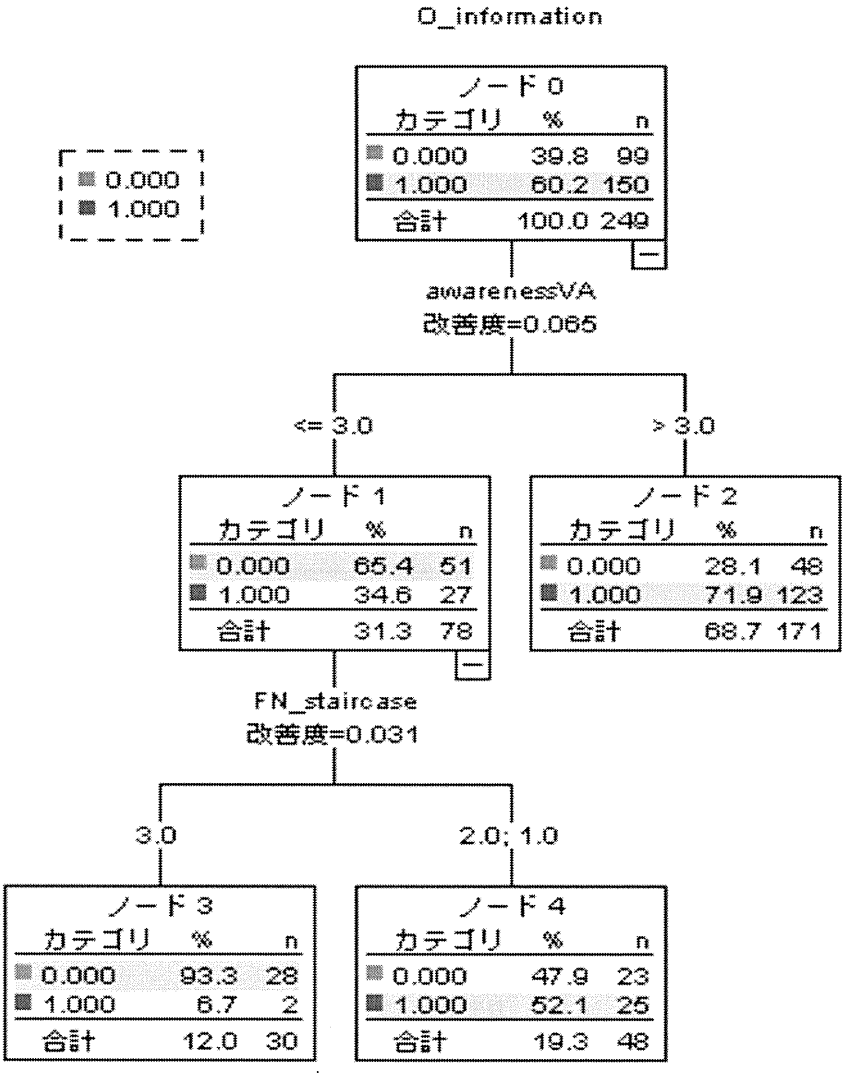
(27) その他の情報提供



awarenessVA が 4 以上の場合、必要とし判断終了。

awarenessVA が 3 以下の場合、FN_staircase が 3 または 4 のとき不要、1 または 2 のとき必要とし判断終了。

【記号の説明】

ADL_eating：どこでも一人で食事中の動作ができますか（1:はい・0:いいえ）

age：何歳ですか（数値記入）

awarenessVA：現在のあなたの視力は、どのくらいだと思いますか？0 を全く見えない状態、10 を最高の視力として、11 段階評価でお答えください。普段、眼鏡等を使っている方はその場合でお答え下さい。（数値記入）

CCTV：拡大読書器を使用していますか（1:持っていて使用している・2:持っているが使用していない・3:持っていない）

CES_D_15：この 1 週間のうち「皆がよそよそしいと思うのは何日ありましたか（1:1 日未満・2:1-2 日間・3:3-4 日間・4:5 日以上）

CES_D_16：この 1 週間のうち「毎日が楽しい」と思うのは何日ありましたか（回答選択肢は同上）

DLTV_05：ドライブに出かけた時に景色を楽しみますか（4:まったく困難なし・3:少し困難あり・2:かなり困難あり・1:できるだけの十分な視力なし）

DLTV_09：腕を伸ばした距離で人の外観を見分けられますか（回答選択肢は同上）

DLTV_15：暗い場所から明るい場所に来たときに、明るさに目が慣れますか（回答選択肢は同上）

DLTV_19　：新聞の見出しを読めますか（回答選択肢は同上）

DM：糖尿病にかかっていますか（1: はい・0: いいえ）

FN_bus：バス・電車の利用ができるようになりたいですか（1:できないのでそう思うことがある・2:できるけれどもっとよくと思うことがある・3:できているのでそうは思わない・4:必要がないのでそうは思わない）

FN_cellphone：携帯電話が使えるようになりたいですか（回答選択肢は同上）

FN_cloths：服選びができるようになりたいですか（回答選択肢は同上）

FN_cooking：調理ができるようになりたいですか（回答選択肢は同上）

FN_destination：バスの行き先表示を見分けられるようになりたいですか（回答選択肢は同上）

FN_meeting：集会（集まり、寄合い）への参加ができるようになりたいですか（回答選択肢は同上）

FN_out：外出ができるようになりたいですか（回答選択肢は同上）

FN_PC：パソコンができるようになりたいですか（回答選択肢は同上）

FN_staircase：階段の昇り降りができるようになりたいですか（回答選択肢は同上）

FN_voting：投票ができるようになりたいですか（回答選択肢は同上）

fromWhenVA：視力低下を自覚したのは何歳頃からですか（数値記入：生来の場合は 0 とする）

fromWhenVF：視野狭窄を自覚したのは何歳頃からですか（回答選択肢は同上）

glassesNear：近用眼鏡（老眼鏡）を使用していますか（1:持っていて使用している・2:持っているが使用していない・3:持っていない）

hearingREHA：ロービジョンケアまたは視覚リハビリテーションという言葉を聞いたことがありますか（1:ある・0:ない）

higherBrainDysfunction：高次脳機能障害がありますか（1:ない・2:あるが支障はない・3:支障がある）

incomeSource：主たる収入源は次のうちのどれですか（1: 就労・2: 年金・3: 生活保護・4: その他）

keyperson ：緊急連絡先にあたる人はどなたですか（1:親・2:兄弟姉妹・3:配偶者・4:子供・5:その他・6:なし）

magnifier：拡大鏡（ルーペ）を使用していますか（1:持っていて使用している・2:持っているが使用していない・3:持っていない）

recreation：日中には主に余暇活動（テレビなども含む）をしていますか（1:はい・0:いいえ）

RP：網膜色素変性症ですか（1:はい・0:いいえ）

VF_blind：視野検査で全盲と言われていますか（1:はい・0:いいえ）

VFQ_01：あなたの全身の健康状態はどうですか（100:最高によい・75:とても良い・50:良い・25:あまり良くない・0:良くない）

VFQ_02：現在、あなたの両眼での「ものの見えかた」は、どうですか（100:最高によい・80:良い・60:あまり良くない・40:良くない・20:とても良くない・0:全く見えない）

VFQ_05：あなたは、ふだん、新聞を読みますか（100:全く難しくない・75:あまり難しくない・50:難しい・25:とても難しい・0:見えにくいので読むのをやめた・欠損値:別の理由で読むのをやめた、または、もともと読まない）

VFQ_21：ものが見えにくいために、欲求不満を感じますか（0:まったくそのとおり・25:ほぼあてはまる・50:何とも言えない・75:ほとんどあてはまらない・100:ぜんぜんあてはまらない）

表に決定木の分岐点と各項目における的中率を示す。用意したすべてではないが、そのうちの医療（眼科）、視機能評価、光学的補助具、非光学的補助具、視覚支援の情報提供、点字、パソコン、感覚訓練、白杖歩行、盲導犬、日常生活動作、行動支援の情報提供、就労、相談、調整、制度紹介、介護紹介、社会支援の情報提供、医療（眼科以外）、カウンセリング、スポーツ、娯楽、心理その他支援の情報提供の 23 の支援項目の必要性を判定することができるようになる。この同定に必要な決定木の分岐点となる質問項目は、前述の 36 項目であった。すなわち、23 の支援項目から必要なものを選択するには最大でもこの 36 項目の質問をすればよいということである。

c) 各支援項目の支援プロトコールの作成

分担研究報告書 III-2 に記載する。

d) インターネットを介した入出力システムの作成

サーバー構築が遅延し、本年度中にはシステムが完成しなかった。次年度の第 1 四

半期に、特定端末からのアクセスを可能と
する閉鎖システムを構築する予定である。

表. 決定木の分岐点と各項目における的中率

	支援内容	質問項目1	質問項目2	質問項目3	質問項目4	質問項目5	質問項目6	的中率
視機能支援	医療（眼科）	awarenessVA	DLTV_15					87.1%
	視機能評価	VF_blind	awarenessVA	RP				88.4%
	光学的補助具	VFQ_02	awarenessVA	FN_staircase				85.5%
	非光学的補助具	VF_blind	awarenessVA	FN_staircase				83.9%
	情報提供	awarenessVA	higherBrainDysfunction	VFQ_02	VFQ_01			85.5%
行動支援	点字	age	VFQ_02	FN_voting				84.3%
	パソコン	FN_PC	awarenessVA	age	FN_meeting			83.5%
	感覚訓練	DLTV_09	awarenessVA	DLTV_19	fromWhenVA			86.7%
	白杖歩行	awarenessVA	VFQ_21	glassesNear				83.1%
	盲導犬	age	ADL_eating	FN_PC	awarenessVA			84.7%
	日常生活動作	awarenessVA	higherBrainDysfunction	FN_destination	VFQ_05			83.1%
	情報提供	awarenessVA	higherBrainDysfunction					83.1%
社会支援	就労	age	awarenessVA	FN_cooking				83.9%
	相談	awarenessVA	higherBrainDysfunction	ADL_eating	fromWhenVA	hearingREHA		85.5%
	調整	awarenessVA	higherBrainDysfunction	DLTV_05	FN_cloths	magnifier		82.7%
	制度紹介	awarenessVA	higherBrainDysfunction	CCTV				80.7%
	介護紹介	ADL_eating	awarenessVA	higherBrainDysfunction	age	FN_out	FN_bus	81.1%
	情報提供	awarenessVA	fromWhenVF	FN_out	age			81.5%
心理その他	医療（眼科以外）	DM						76.3%
	心理面談	CES_D_16	keyperson	awarenessVA	VFQ_21	fromWhenVF		72.3%
	スポーツ	age	awarenessVA	FN_cellphone	incomeSource	VFQ_01		77.1%
	娯楽	awarenessVA	CES_D_15	recreation				82.3%
	情報提供	awarenessVA	FN_staircase					70.7%

4) 考察

a) 総合的視覚リハビリテーションシステムプログラムのあり方

(1) 初心者が広く使用できるものであるには

今回は、その必要性からも支援の初心者向けのソフトウェアの開発を目指した。本ソフトの使用目的から、広く使用されることが望ましい。使用者を制限することで、満足度を上げ、利用率を上げたいという狙いがある。そして、使いやすく、アクセシビリティを高くするために、インターネットを活用することにした。そのためには、個人情報保護のハードルを下げなければならず、その点が課題である。そこで、個人特定を放棄すると重複入力を排除することができず、今度は統計としては信頼性を欠くことになる。しかし、あえてその犠牲を払ってもアクセシビリティを高く保つことは、視覚リハビリテーションの裾野を広げ、専門家への橋渡しがスムーズに行われるようになると思われる。

(2) オプティマイズ可能な仕組みであるには

当面は、支援項目選択に必要な質問のほかに後述のマクロニーズを特定するための質問を使用して、決定木分析を繰り返し、最適化を図る。

次の目標としては、ベイジャンニューラルネットなどの他の方法を模索する。

(3) 提案ソフトの解析と同時にマクロニーズの解析ができるには

提案ソフトの解析に必要な質問とは別に、マクロニーズを知るための質問を用意する。前章において、視覚の最適モデルを模索したときに因子分析で重要とされた 60 項目から、総合点である 4 項目を除いた 56 項目を採用する。ただし、このうちの 13 項目は、今回決定木分析で抽出した 36 項目と重複する。また、これに残りのフェルトニーズ 10 項目と性別、「物心ついたときにはすでにかなり眼が悪かったか」「最近だんだん見えにくくなってきているか」と視覚障害をきたした主たる眼科病名（選択式）、障害程度区分に用いられている視力検査の結果、羞明（屋外）、羞明（屋内）、夜盲、複視、動揺視、色覚異常、眼瞼けいれんを加えた計 100 項目を当面観測する。

この 100 項目から 10 項目を調査の度にランダムに抽出し、支援項目を決定する質問に織り交ぜて使用する。100 項目を 100 名に聞いたアンケートは、10000 個のデータからなるが、同等のデータ量を収集するには 10 項目を 1000 名に行えばよい。このデータからは、個人の特性を問うことはできないが、マクロな特性を知ることはできる。

b) 展望

(1) 視覚の特性に一致したソフトウェアへ

視覚の最適モデル（図 29、p.25）が示すように、視覚障害特性を吟味すると視覚というもの自体の特性が浮き上がってくる

ものと思われる。逆に視覚というものが如何なるものかが明確になればなるほど、視覚障害の特性は詳細に検討できることになる。たとえば、現在、質感感覚という概念が視覚科学では研究され始めている。見ただけで対象の材質を推定できるような視覚特性をそう呼んでいる。もしかしたら世の中にはこの視覚特性が失われるような障害があるかもしれない。また、羞明のメカニズムについては、現代科学においてまだ解明されていない。この解明が進めば、また別の軸での視機能評価が生まれる可能性がある。

そしてさらに、今回の因子分析でも最適モデルでも大きく関わりがあった心理要因もまた、視覚の一部として扱うことができるかもしれない。それは、神経節細胞の中には、気分に非常に強く関係している脳内セロトニン濃度の最も高い縫線核に直接神経連絡があるものがあるからである。また、最近発見されたメラノプシン含有神経節細胞は、セロトニンと陰陽関係にあるメラトニンの分泌に関係していることがわかってきている。

今回得られた支援ソフト選択の分岐点となる項目だけでなく、理論的な視覚特性として独立の軸となるような項目についても評価して、実数を蓄積することで新たな視覚の特性を見いだすことや、また、その特性を用いてより的確な支援を実現することのできるソフトウェアへと進化していくことが望ましいと思われる。

(2) 必要な入力項目として眼球運動反射を

視覚の最適モデルの中で、構成概念「視野」が何を意味しているか、さらに詳しく調べる必要があることを提案した。そのためには、口頭の質問では、その本質が見極められない可能性がある。それは、今回用いられた数多くの質問項目をもってしても視野の特性を分解することができなかったからである。その一方で、網膜の神経節細胞の機能分化に端を発する視機能の分化を根拠とすれば、視野には少なくとも意識されるパラソル細胞系の視野と視線方向を無意識に変えるための眼球運動反射を引き起こす視野は独立して存在することが容易に想定される。

視野狭窄の自覚が生じにくいのは、もしかしたらこの視線方向を無意識に変えるための眼球運動反射を引き起こす視野が、意識に上るいわゆる視野よりも後まで残っているせいかもしれない。今後、この眼球運動反射を引き起こす視野を測定する方法を開発し、その数値を組み込むことが視覚障害者の ADL や QOL を予測する際に有用になるのではないかと思われる。

(3) 必要な支援体制として中間型アウトリーチを

図は、視覚障害の発生時期とそれに伴った支援体制の変化についてまとめたものである。視覚障害が発生する場所は、ほとんどの場合、眼科である。ときにそれは予防されるが、やむなく発症した場合は、早期に発見されることが望ましく、また治療に

より回復することが望まれる。しかし、期せずして障害を残し、リハビリテーションが必要になる場合も少なくはない。さらに、多くの眼科では、リハビリテーションは行われず、闇雲に治療を優先され、治療不能な場合であっても、次のステップに踏み出すのには時間を要する。

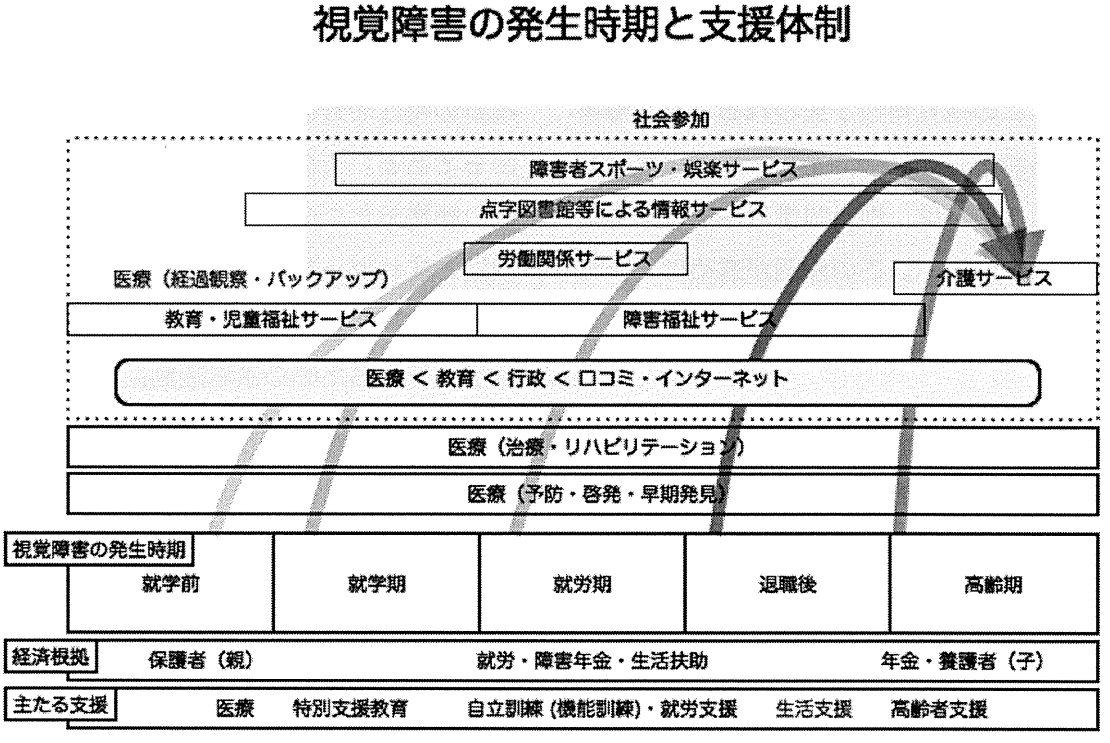


図. 視覚障害の発生時期と支援体制

この遅延は、眼科医にも責任があるが、当事者の心理的要因が最も大きく関係すると思われる。治らないと諦めた視覚障害者は、眼科への通院をやめ、自宅に引きこもることが多い。本来は、その時点で相談支援・権利擁護を受けられる体制が存在すべきである。しかし現実には、そのような支援は得られず、その後に入る情報は、医療機関や教育機関からの直接の情報ではなく、役所の福祉窓口であったり、多くは知人からの口コミやインターネットで家族が調べたものになる。そして、運が良ければ、その後にようやく様々な支援サービスにつながることになる。

この眼科治療後の空白を如何になくすかが、現時点での視覚障害者支援の最大の課題であると言えよう。そして、眼科医療は、治療ができなくなったらそれでおしまいというものではなく、経過観察と様々な支援サービスのバックアップ体制として機能しなければならない。

視覚障害の発生時期により、経済根拠が

変わり、そして主たる支援の内容も変わる。その中で、今回の調査によってわかった日中活動の「余暇活動」と「家事」に対する支援が望まれており、特に退職後の世代にとっては、これらの生活支援の項目が大変重要になるものと思われた。

では、そのような支援を治療が終了する前からシームレスに提供するためにはどうしたらよいであろうか。これまで、訪問型、通所型、入所型と呼ばれたサービス体制では、そのような対応が困難であった。しかし、眼科など、視覚障害の当事者が普段いるところに支援者が出向くような方法が認められれば、当事者にとってはとても楽にスタートが切れることになる。これを筆者らは「中間型アウトリーチ」と称した。本ソフトは、このような支援体制の中で、専門家へ繋がるための入り口になりうるものである。

今後、本ソフトの作り込みとともに、中間型アウトリーチ支援の普遍的実現に向けた社会整備が必要であると思われる。

Ⅲ. 平成23年度　分担研究報告書

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CLINICAL INVESTIGATION

Reconsideration of the most appropriate criterion in the lowest classification of vision disability in Japan

Tomomi Nishida · Noburo Ando · Kazushige Sado · Satoshi Nakadomari

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Abstract
Purpose To verify the current Japanese classification of vision disability in regard to visual acuity.
Methods A questionnaire was sent to 100 ophthalmology services in Japan. Each service was asked to extract 300 of their outpatient records. From these records, patients who had a sum of corrected visual acuity in both eyes of less than or equal to 0.62 were selected for the questionnaire. The questionnaire consisted of items related to prevalence, age, sex, with or without vision-disabled certification at any grade, the corrected visual acuity of each eye and the name of any disease the subject may have had.
Results Sixty-five services responded, and, of 20,235 total records reviewed, 971 patients were eligible for the questionnaire. The average age was 66.9 ± 20.0 years, and 74.6% were over 60 years old. The distribution of corrected visual acuity showed three categories.
Conclusions Our analysis indicates that a new candidate criterion for vision-disabled certification is needed for the sixth grade, which, at present is defined as, "The sum of the corrected visual acuity of both eyes is more than 0.2, but less than or equal to 0.4."

Keywords Low vision · Visual acuity · Vision-disabled certification · Visual impairment

T. Nishida (✉) · S. Nakadomari
Department of Ophthalmology, Hospital of National Rehabilitation Center for Persons with Disabilities, 4-1, Namiki, Tokorozawa, Saitama, Japan
e-mail: nishida-tomomi@rehab.go.jp

T. Nishida
Department of Ophthalmology, Yokohama City University School of Medicine, Kanagawa, Japan

N. Ando
Department of Ophthalmology, Saiseikai Niigata Daini Hospital, Niigata, Japan

K. Sado
Sado Eye Clinic, Miyagi, Japan

S. Nakadomari
Department of Ophthalmology, Jikei University School of Medicine, Tokyo, Japan

Introduction

Although both the prevalence and causes of visual impairment have been widely studied [1–10], it is known that prevalence data are vulnerable to multiple country-specific factors involving sanitation, health care, diet and social economics. In Japan out of a population of 120,000,000, 310,000 are holders of vision-disabled certifications as defined by the Physically Disabled Persons Welfare Act of Japan [12]. However, the Japanese Ophthalmological Society reports that there are about 1,640,000 people with impaired vision in Japan [13, 14]. Of these, about 188,000 are blind, and the rest have impaired vision. These data were generated using the criteria of the United States, which has a criterion for low vision of a corrected visual acuity of over 0.1 and less than 0.5 in the better eye, and a criterion for blindness of a corrected visual acuity of less than or equal to 0.1 in the better eye. Both with and without vision-disabled certification, there are probably more than 1,000,000 persons in Japan with impaired vision that need impaired vision care [11, 13]. The demographic composition of Japan has been changing dramatically, and Japan is becoming an aging

society with fewer children [15]. The Japanese Ophthalmological Society reports that, of the 1,640,000 people with either impaired vision or total blindness, the elderly, aged more than 70 years, occupy about a half [13].

According to the Act on the Welfare of Physically Disabled Persons in Japan, there are at present six classifications for vision-disabled certification based on visual acuity. This classification has been used for more than 50 years since the end of World War II with no change in the basic criteria. Recently, conflicting cases were encountered in the Japanese classification system, especially for grades five and six. The Japanese rating of vision disability for the sixth grade is defined as the corrected visual acuity in one eye of less than or equal to 0.02 and in the fellow eye of less than or equal to 0.6. Furthermore, the sum of the corrected visual acuity of both eyes needs to be more than 0.2. The sum of the corrected visual acuity of both eyes in the fifth grade is defined as being more than or equal to 0.13 and less than or equal to 0.2. It is generally accepted that the corrected decimal visual acuity needs to be at least 0.5 to be able to read Chinese characters in Japanese newspapers and books [16]. Under the current Japanese classification, a person with a corrected visual acuity of 0.6 in one eye is certified as visually disabled; however, a person with corrected visual acuity of 0.2 in each eye is not considered disabled, whereas in fact, the latter person has multiple visual problems including in reading and writing.

Persons with visual impairments need to compensate for their visual problems with optical aids including glasses, magnifiers and closed circuit television. These can assist a person with visual impairment to read and write. Without certification, such patients are unable to receive any publicly funded social services or resources, and the financial burden rests entirely on the patient, since both the municipal and the government funds are limited to those patients who have a vision-disabled certification. Hence, the rating criteria are very important.

To verify the validity of the criterion for the sixth grade of classification, we surveyed records of ophthalmology services in Japan to estimate what proportion of patients had a sum of corrected visual acuity for both eyes of less than or equal to 0.62. In addition, we evaluated the data to see if a new Japanese rating for the classification of vision-disabled certification should be added.

Subjects and methods

One hundred ophthalmology services participated with all communication conducted by e-mail. The ophthalmology services were selected regardless of whether they were members of The Japanese Society for Low-vision Research and Rehabilitation or not, or whether a low vision clinic was available at each ophthalmology service. A questionnaire was sent via e-mail to each ophthalmology service in June 2009, and responses were collected till the end of November 2009. Each ophthalmology service was required to extract 300 outpatients' visit records. The extraction procedure was done either at random or by using numerical, name and service visiting order, which depended on the preference of each ophthalmology service. Of the first 300 extracted records, those of patients with a sum of corrected visual acuity in both eyes of less than or equal to 0.62 were selected, and the data requested in the questionnaire were extracted from the records. The questionnaires requested information relating to prevalence, age, sex, the existence of vision-disabled certification and the grade of classification for those that held such certification, corrected visual acuity in each eye and the names of any other medical problems. After the questionnaires were filled in, each ophthalmology service returned them to us via e-mail.

All procedures followed the principles of the World Medical Association Declaration of Helsinki. The Ethical Review Board of the National Rehabilitation Center for Persons with Disabilities approved this research.

Results

Of the contacted 100 ophthalmology services, 65 services responded (Table 1). The prefectural distribution of the 65 services is shown in Fig. 1. Kanagawa had the largest number of responders with 25 responding ophthalmology services, followed by Tokyo with 13 and Saitama with 5 services. There was no significant difference in the responding rates between members and non-members of the Japanese Society for Low-vision Research and Rehabilitation, or with and without low vision clinics determined by Student's t test ($P > 0.05$). In total, 20,235 records from 65 services were reviewed. Of the 65 services, 19 examined more than 300 (304–1,085) records, and 13 did less than 300 (25–265) records. Of the total extracted and reviewed records, 971 patients corresponded to the criterion of a sum of the corrected visual acuity in both eyes of less than or equal to 0.62, and were regarded as subjects for the study.

There was no significant difference between the extraction methods, which were at random (5.3%), numerical order (3.6%), name order (7.0%) and service visiting order (7.2%) by Student's t test ($P > 0.05$) and the frequency with which the patients met the criteria. There was, however, a significant difference between the general or university hospitals (9.4%) and the private clinics (2.2%) by Student's t test ($P < 0.01$).

Table 1 Questionnaire response

Response rate [% (*n*/*n*)]	65 (65/100)
Total examined records (*n*)	20,235
Number of surveyed subjects (*n*)[a]	971
Corresponding rate by extraction procedure[b,*]	At random 13 (5.3), numerical 13 (3.6)
Values are *n* (%)	Name 2 (7.0), visiting order 37 (7.2)
Corresponding rate by category of medical service[b,**]	Hospital (university and general) 34 (9.4)
Values are *n* (%)	Private clinic 31 (2.2)

n means the number of ophthalmology services by extraction procedure and category of medical service, and (%) means the percentage of 65 responding ophthalmology services

* No significant difference among extraction procedures ($p > 0.05$, Student's *t* test)

** Significant difference between medical services ($p < 0.01$, Student's *t* test)

[a] Patients with a sum of the corrected visual acuity of both eyes is less than or equal to 0.62

[b] Rate of surveyed subjects to the amounts of examined records in each ophthalmology service

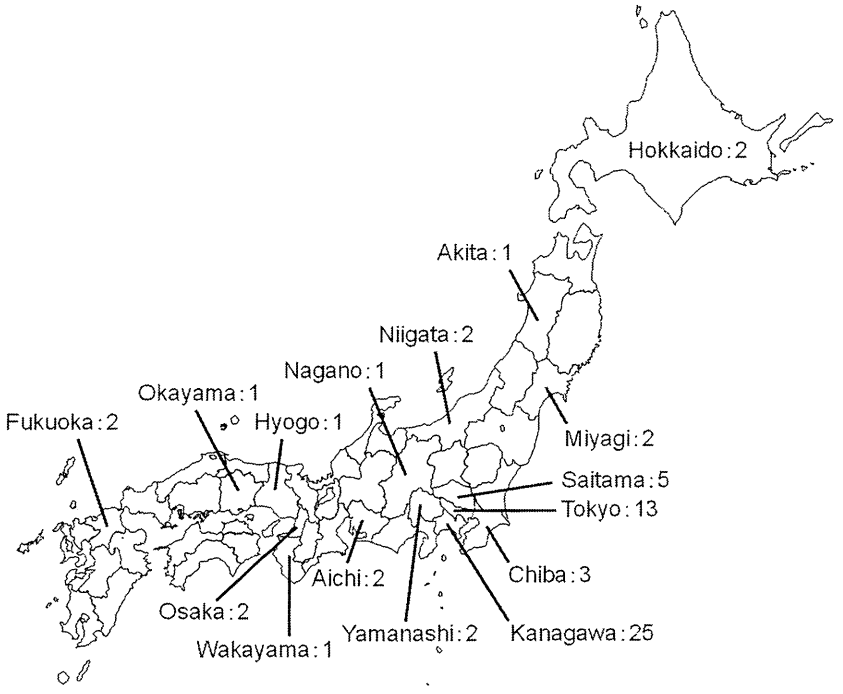

Fig. 1 Distribution of responding ophthalmology services on the map of Japan. Each prefecture's name and the number of ophthalmology services who responded are shown on the map

The age range of the 971 surveyed subjects was from 0 to 106 years old, and the mean ± standard deviation of age was 66.9 ± 20.0 years (Table 2); of these, 724 were over 60 years old and accounted for 74.6% of surveyed subjects (Fig. 2). Of the 971 surveyed subjects, 424 were men and 547 were women. Of the surveyed subjects, 277 already possessed vision-disabled certification (Tables 2, 3). The mean age of the 277 holders was 59.9 ± 21.2 (4–94 years old), and subjects over 60 years of age accounted for 61.0% of holders. Of all the surveyed subjects, 628 were eligible for vision-disabled certification according to the present criteria. The mean age of the 628 certificate eligible patients was 66.4 ± 19.9 (0–106 years old), and the subjects over 60 years of age accounted for 72.6% of certificate eligible patients. Moreover, of the 971 surveyed subjects, 369 were eligible to apply for vision-disabled certification but had not acquired any. The mean age of the certificate eligible patients was 70.4 ± 18.3 years old (0–106 years old), and 80.0% were over 60 years of age. The age distribution of the surveyed subjects eligible for certification that were both holding and not holding certification showed the same skewed distribution pattern toward the older population (Fig. 2). There was no significant difference between the proportion of men and women (Table 2).

Figure 3 shows the distribution of the corrected visual acuity in each eye of all 971 surveyed subjects. Four peaks

Table 2 Age and sex

	Age (years old) mean ± SD (range)	Sex *n* (%)
Surveyed subjects ($n = 971$)	66.9 ± 20.0 (0–106)	Men 424 (43.7)
		Women 547 (56.3)
Certificate eligible subjects ($n = 628$)	66.4 ± 19.9 (0–106)	Men 285 (45.4)
		Women 343 (54.6)
Holders ($n = 277$)	59.9 ± 21.2 (4–94)	Men 125 (45.1)
		Women 152 (54.9)
Non-holders with certificate eligibility ($n = 369$)	70.4 ± 18.3 (0–106)	Men 166 (45.0)
		Women 203 (55.0)

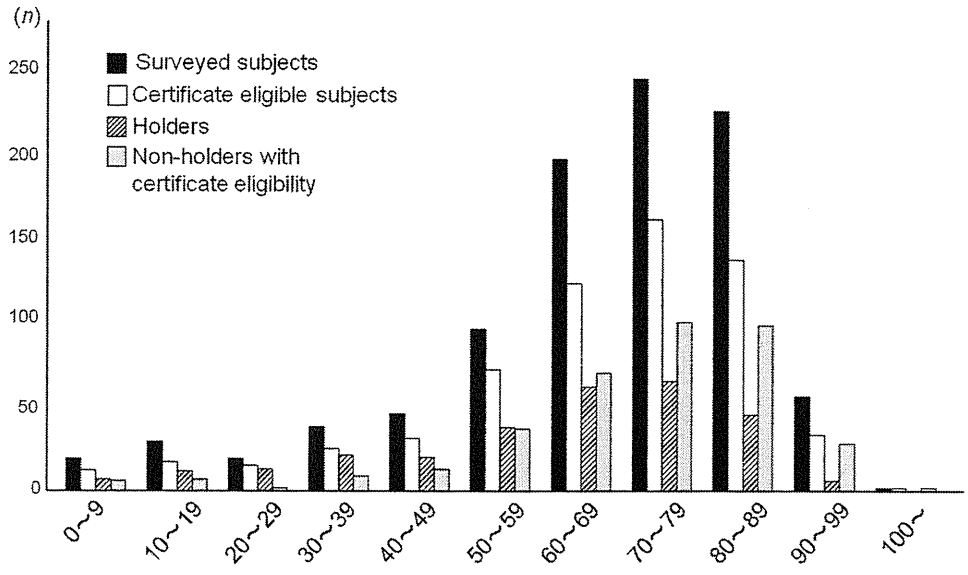

Fig. 2 Distribution of age in each examined group. *Black square* surveyed subjects. *Square* certificate eligible subjects. *Cross-hatched square* certificate holders. *Shaded square* non-holders with certificate eligibility

Table 3 Acquisition rate in each grade of vision-disabled certification

Grade	Holders (*n*)	Certificate eligible subjects (*n*)	Non-holders with certificate eligibility (*n*)	Acquisition rate (%)
1st	80	88	18	91
2nd	81	64	16	126.6
3rd	33	70	31	47.1
4th	27	91	62	29.7
5th	42	150	112	28.0
6th	14	165	130	8.5
Subtotal	227	628	369	44.1
Non-holders	681			
Non-correspondent	–	343		
Unknown	13			
Total	971	971		

Holders and certificate eligible subjects were detected from 971 in surveyed subjects

Acquisition rate (%) = [holders (*n*)/certificate eligible subjects (*n*)] × 100

can be observed, and the cluster composition is classified into three categories. The first cluster is of 88 (9.0%) subjects with less than or equal to 0.01 of the corrected visual acuity in each eye (Fig. 3, peak a). The second cluster is of 128 (13.2%) subjects with less than or equal to 0.01 of the corrected visual acuity in one eye and over or equal to 0.1 of the corrected visual acuity in the fellow eye (Fig. 3, peak b), seen in two zones. The third cluster is of

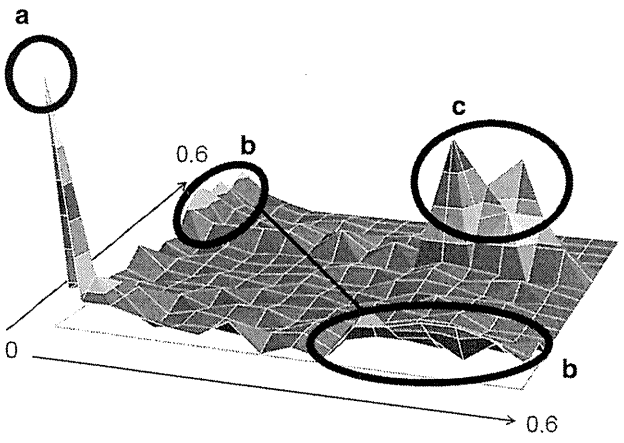

Fig. 3 Distribution of the corrected visual acuity in each eye of surveyed subjects ($n = 971$). Both the X and Y axis are decimal visual acuity (0–0.6). The elevation of the graph denotes the number of the visual acuity's pattern in the right and left eye in the corresponding person. **a** Less than or equal to 0.01 of the corrected visual acuity in each eye. **b** Less than or equal to 0.01 of the corrected visual acuity in one eye and over or equal to 0.1 of the corrected visual acuity in the fellow eye. **c** 0.1–0.3 of the corrected visual acuity in each eye

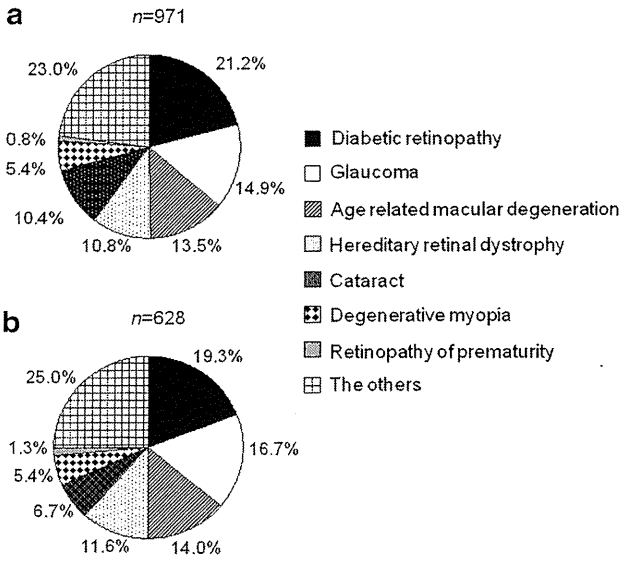

Fig. 4 The percentage by causative disease in each group. **a** Surveyed subjects. **b** Certificate-eligible subjects

261 (26.9%) subjects with 0.1–0.3 of the corrected visual acuity in each eye (Fig. 3, peak c).

The reported causative diseases of the 971 surveyed subjects showed that diabetic retinopathy, glaucoma and age-related macular degeneration were the top three causative diseases in the surveyed subjects (Fig. 4a). The top three causative diseases among the certificate eligible subjects were the same three, diabetic retinopathy, glaucoma and age-related macular degeneration (Fig. 4b).

Figure 5 shows the difference in the population of holders and non-holders both with and without eligibility in each causative disease of the 971 surveyed subjects. All those with premature retinopathy were holders. Among the patients afflicted with hereditary retinal dystrophy, including retinitis pigmentosa, the high population of holders and the low population of non-holders with eligibility was evident. The lowest number of holders was of those with cataracts.

Of the 277 holders who acquired vision-disabled certification, 80 (28.9%) had the first grade, 81 (29.2%) the second grade, 33 (11.9%) the third grade, 27 (9.7%) the fourth grade, 42 (15.2%) the fifth grade and 14 (5.1%) the sixth grade (Table 3). Since 628 subjects were eligible to acquire vision-disabled certification, distribution based on their grade eligibility shows that there were 88 (14.0%) in the first grade, 64 (10.2%) in the second grade, 70 (11.1%) in the third grade, 91 (14.5%) in the fourth grade, 150 (23.9%) in the fifth grade and 165 (26.3%) in the sixth grade (Table 3). Therefore, the ratio of acquisition of vision-disabled certification is 44.1% (Table 3). The acquisition rate was high among the patients who were eligible for the first and second grades who had already acquired the certification (Table 3). However, the acquisition rate was low for the patients who were eligible for the other grades, with 47.1% with a third grade certificate, 29.7% with a fourth grade, 28% with a fifth grade and 8.5% with a sixth grade certificate (Table 3).

By World Health Organization (WHO) standards, the criterion for blindness is a corrected visual acuity of less than 0.05 in the better eye, and the criterion for low vision is corrected visual acuity of less than 0.3 in the better eye. Of 971 surveyed subjects, the percentage by causative disease in each group when classified on the basis of the WHO criteria indicates that, of 971, 176 were blind, 406 had low vision, and 389 were neither blind nor had low vision. Hereditary retinal dystrophy including retinitis pigmentosa was the most common causative disease in those with blindness, and diabetic retinopathy was the most common causative disease in those with low vision and those who had neither blindness nor low vision (Fig. 6).

Figure 7 shows the percentage in each grade arranged by the difference of the criteria for visual disability. Of the 971 surveyed subjects, all the certificate-eligible subjects from the first to the sixth grade were classified according to the better eye based on the current criteria; among these, 22.9% were certificate-ineligible subjects (Fig. 7b). The population in each grade of our proposed criteria is very similar to the current criteria, and only the percentage of the sixth grade eligible subjects is increased in our proposed criteria, whereas the population of the certificate-ineligible subjects is lower than that in the current criteria.

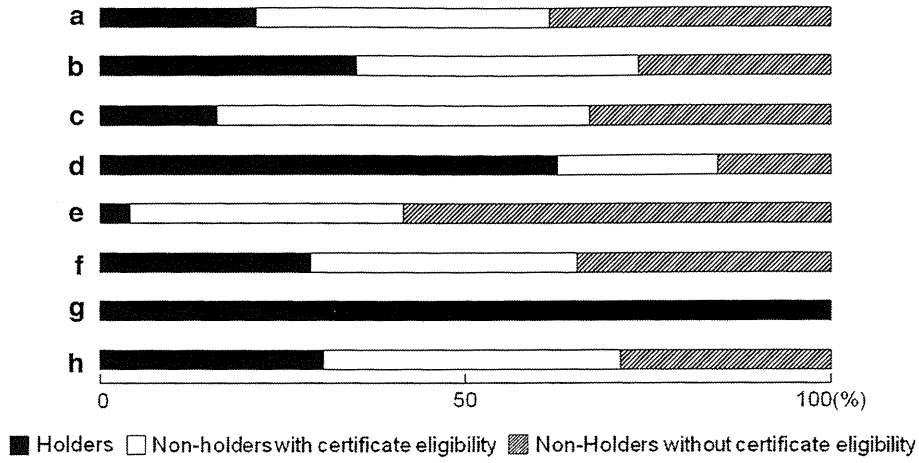

Fig. 5 Percentage of holders and non-holders both with and without eligibility in each causative disease. **a** Diabetic retinopathy, **b** glaucoma, **c** age-related macular degeneration, **d** hereditary retinal dystrophy, **e** cataracts, **f** degenerative myopia, **g** retinopathy of prematurity, **h** the others

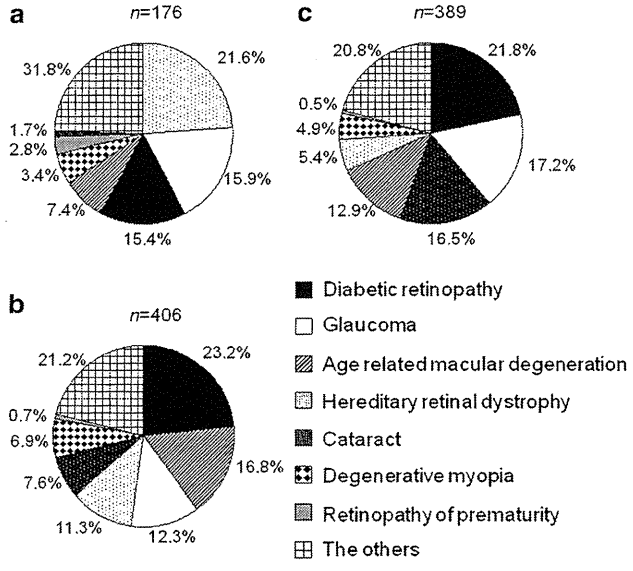

Fig. 6 Of 971 surveyed subjects, the rank of the percentage by causative disease in each group classified on the basis of the WHO criteria. **a** Blindness: corrected visual acuity of the better eye is less than 0.05. **b** Low vision: corrected visual acuity of the better eye is less than 0.3. **c** Out of blindness and low vision

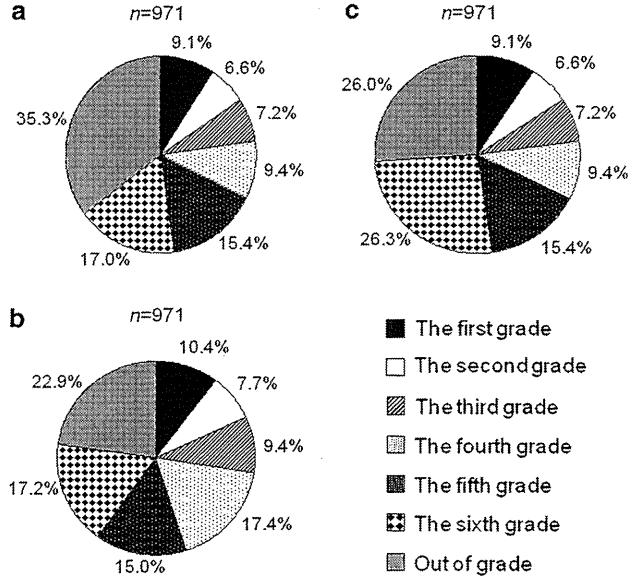

Fig. 7 The percentage of each visual disability classification in each group on the basis of each criterion of the 971 surveyed subjects. **a** Current criteria: sixth grade definition with the corrected visual acuity of one eye of less than or equal to 0.02 and the other eye less than or equal to 0.6, and the sum of the corrected visual acuity in both eyes is more than 0.2. **b** The better eye based on the current criteria: sixth grade definition of the corrected visual acuity of the better eye of more than 0.2 and less than or equal to 0.6. **c** Our proposed criteria: sixth grade definition is the sum of the corrected visual acuity of more than 0.2 and the other eye less than or equal to 0.4

Discussion

In this study, 20,235 records were reviewed by 65 ophthalmology services in Japan. Among these, there were occasional instances of patients who displayed a conflict between the fifth and sixth grade of the vision-disabled certification. To see if this conflict can be resolved, we surveyed the patients who had a sum of corrected visual acuity in both eyes of less than or equal to 0.62, and tried to reconsider them as new candidates for the sixth grade of vision-disabled certification. The criterion was the borderline of eligibility for the current sixth grade. Although it is obvious that the visual field was also important in the discussion of all the criteria for visual-disabled certification, we tried to see how these patients could be included in the sixth grade; we therefore made some changes to the criterion of the current lowest grade. In other words, we tried to consider a new possible criterion while making only minimal changes. This is the main reason why we focused on visual acuity alone. There are several reports related to the prevalence of visual impairment in Japan; however, none of them discusses any new criterion for vision-disabled certification as far as we found [9, 10, 17–20].

In this study, we received questionnaire responses from 65 ophthalmology services concentrated in the capital

region including Tokyo, Saitama, Chiba and Kanagawa Prefectures; however, all the regions of Japan were represented, although at a lower frequency. As for the corresponding rate, although regional deviation was observed, there was no significant difference among the ophthalmology services regardless of whether they specialized in low vision care or not. Moreover, there was no significant difference among the extraction methods; however, there was a significant difference between the hospitals (university and general) and private clinics. This is probably due to the fact that patients with more severe diseases will tend to frequent hospitals, which provide more sophisticated treatment than small private clinics.

Of the 971 surveyed subjects, there were 628 certificate eligible subjects; however, only 277 were certificate holders. The difference between the 628 certificate eligible subjects and the 369 non-holders with certificate eligibility was 259, 18 less than the 277 holders. It is possible that 18 holders received their certificates on the basis of a disorder in the visual field, not on visual acuity. We tried to include only holders with certification due to visual acuity; however, it was sometimes difficult to distinguish among the different subjects. The age distribution of the surveyed subjects, certificate eligible subjects, holders and non-holders with certificate eligibility reflected the current age structure of the population in Japan. According to the National Institute of Population and Social Security Research in Japan, there were 28.2 million elderly people who were over 65 years old in 2008, accounting for 22.1% of the total population [15]. It is expected that this percentage would increase to 39.6% in 2050.

With an aging population the prevalence of diabetes mellitus, glaucoma and macular degeneration will be increasing. Diabetes mellitus is a lifestyle-related disease, and its prevalence has been increasing with serious social consequences not only in Japan but also in the world. It has been reported that by 2025 the global number of people living with diabetes will exceed 380 million [21]. In addition, the Tajimi study revealed that the prevalence of glaucoma increases with age in Japan [19, 20]. Presently, the foremost cause of visual impairment in Japan is glaucoma, which we found to be a leading causative disease in the subjects that are eligible for vision-disabled certification [12]. Because of a minor change in 1995 in the criteria of visual field defect analysis, glaucoma has replaced diabetic retinopathy as the leading vision-impairing disease. Furthermore, the prevalence of age-related macular degeneration has increased as more Western-style dietary habits are adopted along with an aging population [17, 18]. Surprisingly, with widely available ophthalmology services for cataract surgery, cataracts are still the main causative disease of visual impairment, particularly in rural areas of Japan [10]. In the Tajimi study, cataracts were the top causative disease of visual impairment [9].

In our study, cataracts accounted for 10.4% of the surveyed subjects (Fig. 4a). Also, among the subjects with cataracts were the lowest percentage of holders and the highest percentage of non-holders without certificate eligibility (Figs. 4, 5). The top three causative diseases of holders were retinopathy of prematurity, hereditary retinal dystrophy, including retinitis pigmentosa and glaucoma (Fig. 5). On the basis of the WHO criteria, hereditary retinal dystrophy, including retinitis pigmentosa, is the foremost causative disease of blindness (Fig. 6a). Unlike cataracts, the lowest population of non-holders without certificate eligibility was seen those with hereditary retinal dystrophy, including retinitis pigmentosa (Fig. 5). This study indicates that the more severe hereditary retinal dystrophy, including retinitis pigmentosa could be registered and the enhancement of patients' association boosted. Through these associations, patients are able to obtain information about their disease from other patients. On the other hand, diabetic retinopathy was the top causative disease of low vision and of blindness and low vision, and almost accounted for a quarter of the total (Fig. 6a, b). In other words, the diabetic retinopathy in the subjects could be milder. Moreover, in age-related macular degeneration, the second lowest percentage of holders and the second highest percentage of non-holders with certificate eligibility were seen. Age-related macular degeneration, diabetic retinopathy and glaucoma are possibly in need of highly technical therapies, because these were the top three diseases of non-holders with certificate eligibility. Under such circumstances, the acquisition of vision-disabled certification could be delayed. Our results of disease ranking in surveyed subjects were different from previous studies, because our study was not population based and our surveyed subjects were extracted based on visual acuity, not visual field (Fig 4a). Likewise, disease ranking based on blindness according to the WHO criteria was also different from the previous studies (Fig. 6a).

The distribution of visual acuity in the 971 surveyed subjects was clustered into three categories. Under the current classification of vision-disabled certification, patients in category a (less than or equal to 0.01 of the corrected visual acuity in each eye) and category b (less than or equal to 0.01 of the corrected visual acuity in one eye and over or equal to 0.1 of the corrected visual acuity in fellow eye) could acquire vision-disabled certification. However, most patients in category c (0.1–0.3 of the corrected visual acuity in each eye) were ineligible to apply for certification, because the definition of the fifth grade is the sum of the corrected visual acuity of both eyes of less than or equal to 0.2. Most subjects that fall into category c have impaired visual abilities that prevent them from

reading books or newspapers, because their visual acuity is less than 0.5, the minimal visual acuity needed to read Chinese characters. Such patients are often seen in the ophthalmology services, and they encounter a problem in the current classification of vision-disabled certification that prevents adequate access to low vision assistance.

We found that the acquisition rate decreased in the lower grades. Presently, services provided to the first and second grade are much more efficient than those for the other lower grades of vision disability, and this is reflected in the high certificate acquisition rate for patents with first and second grade vision disability. As the acquisition rate of second grade vision disability is 126.6%, it may mean that some certificate holders have acquired them with disorders based on the visual field, not on visual acuity. In contrast, the certificate acquisition rate for sixth grade vision disability is only 8.5%. This low rate may be the reason why their disease needs more advanced treatment and better medical attention, and patients tend to disregard vision-disabled certification.

There have been arguments as to whether the sum of the corrected visual acuity in both eyes is really necessary. The current criteria of vision-disabled certification were created in the 1940s to treat disabled veterans of World War II. Nowadays, the WHO and many countries use the corrected visual acuity in the better eye as the criterion. The current criteria of vision-disabled certification in Japan has a problem in that the decimal visual acuity cannot be added because of discrete-valued data and that it is difficult to compare the Japanese criteria with the criteria of other countries. To change all of the criteria would be best. The criteria of the visual field are also very important for visual disability. However, it is never simple, and a total change cannot be executed without considering additional resources for welfare assistance. If the sum of the corrected visual acuity in both eyes is to remain part of the criteria, then we propose that the new candidate criteria for the sixth grade of vision-disabled certification should be that the sum of the corrected visual acuity of both eyes is more than 0.2, but less than or equal to 0.4. As Fig. 6 shows, to target the 971 surveyed subjects, we used the three criteria to simulate the percentage of eligible subjects for each grade. In the current criteria for the better eye, the percentage of each grade increased, but that of the non-correspondent decreased. In this case, more public funds are needed, and even this change could be quite difficult to substantiate. On the other hand, our proposed criteria require only a minor change. Since only the range of the sixth grade will be slightly extended, the revised proposal is not going to greatly affect any available public funds, yet it could help the patients whose corrected visual acuity in each eye is 0.2. Although the percentage of each grade in Fig. 7b seems balanced, we have to consider that the standard of the parent population was the sum of the corrected visual acuity of both eyes that was less than or equal to 0.62. If the better eye is defined as being less than or equal to 0.6 in general, the number of corresponding persons must be extremely high, and this may lead to financial difficulties. Since the size of printed characters in books and newspapers is getting larger, a corrected visual acuity of slightly less than 0.5 should be sufficient to enable visually challenged people to read. Moreover, according to the WHO criteria, the corrected visual acuity criterion for low vision is less than or equal to 0.3 in the better eye. Using our proposed changes, the correspondents in the sixth grade were up 9.3% from those in the current criterion (Fig. 7). According to one report, the cost of one case associated with aid for visual disabilities in 2003 was JPY 16,000 [22]. Adapting the increase of 9.3% to that data, an addition of about JPY 22,410,000 will be required. However, considering that at present the acquisition rate of sixth grade certificates is 8.5%, approximately JPY 1,900,000 are being spent. Thus, we regard the extra cost as reasonable. As our data were not extracted from a population-based study, we may not be in a position to openly advocate these changes. However, we could determine the tendency of the status of the patients who are visiting ophthalmology services in Japan and consider a new, revised lowest criterion. The new candidate criterion for the lowest grade will make it possible to place patients who have visual impairments that prevent reading and writing in a borderline region of the lowest grade so that they will be eligible for low vision assistance, helping them to return to a more productive and fulfilling life.

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III-2.

支援プロトコール

国立障害者リハビリテーションセンター学院　小林　章

総合的視覚リハビリテーションシステムプログラムの出力画面として使用するための支援プロトコールの素案について述べる。視機能支援、動作支援、社会支援、心理その他の支援の 4 つの大項目に、それぞれ 5～9 項目の小項目をたて、これらの解説と必要と思われる関連リンクを提案する。さらにその各小項目に関連する用語解説を 200 文字以内で記述した。

全項目とも、使用者が初心者であることを想定し、文章を平易で簡潔なものとした。そのため、内容については厳密性を欠く部分が余儀なく生じたが、この点については今後、複数の専門職の間で追加、校正を行うとともに、解説すべき用語の種類についても随時改善を図る予定である。

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視力検査

眼科での視力検査では、裸眼視力と矯正視力を測ります。裸眼視力は、眼鏡などを使用しないで一定距離（日本では遠見視力を 5m、近見視力を 30cm）で測定したもので、矯正視力は、レンズを使ってどこまでよい視力がでるかを測定したものです。矯正視力は、充分な明るさの照明下で最もよく見えたときの視力ですが、必ずしもそのレンズを眼鏡として使えるわけではありません。また、遠見視力と近見視力は必ずしも一致しません。

問診

眼科を初めて受診すると診察の前に問診を受けます。まず、何が問題なのか、そして、それはいつから起きて、どのような経過を辿っているかについて詳しく聞かれます。これまでにどんな病気にかかったことがあるか、どんな薬を飲んでいるか、アレルギーを起こしたことがないかも治療に際して重要な情報です。さらに、ご家族で同様のご病気の方がいるかを知ることも診断に必要な情報なため聞かれる場合があります。

眼底検査

眼科ではレンズと強い光源を使用して眼の奥を診察します。眼球を、瞳孔を入り口とする丸い壷に例えると、眼のフィルムにあたる網膜は壷の底にあたります。そこで、これを眼底といいます。ただし、眼科医が眼底という場合、底にあたる一部の範囲だけではなく、瞳孔から覗いて見える網膜表面の全範囲を指します。必要に応じて瞳孔を広げる点眼薬を使用して行いますが、この場合は検査後も、かなりまぶしい状態が4〜5 時間続きます。

細隙灯顕微鏡検査

眼科では細隙灯顕微鏡という器械を使って眼の表面からやや奥を診察します。黒目の表面にある角膜などの透明な組織を見るために、暗室で細い光をあて、それで照らされた部分を観察します。顎台に顎をのせ、