Vision Impairment and Blindness in New Brunswick Nursing Homes

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Abstract

A vision assessment program carried out in all nursing homes examined 89.3 percent of all residents. Results provide documentation of vision loss and blindness in the sample. The data show increasing levels of vision loss and blindness with age. This study documents the contribution of such impairment to increasing levels of supervision and nursing care. It is also evident that increasing vision loss reduces mobility, thus limiting the range of physical and intelectual activities of aged persons. The major contributory factors to vision impairment are ocular and systemic diseases. The prevalence of these conditions is established. A need is demonstrated for provision of vision care in nursing homes. The study suggests that the application of available technology for vision assessment and remediation could restore or improve the visual capability of a substantial number of persons suffering from vision impairment or blindness. The presence of age related increases in intraocular pressure and previously undetected glaucoma offers preventive opportunity.

Abrégé

Au cours d'un programme d'évaluation visuelle 89.3% des résidents de tous les foyers d'accueil de la province a été examiné. Les résultats révèlent le dégre de cécité ou pertes visuelles dans cette population. Les données font voir une augmentation de pertes visuelles et de cécité avec l'âge. Ce projet démontre la relation entre les afflictions visuelles et le besoin d'accroitre le niveau des soins et de la surveillance. La diminution progressive de la vision réduit la mobilité de ses personnes agées aussi bien que leurs activités physiques et intellectuelles.

Les maladies tant oculaires que générales sont les causes principales de ces pertes. La fréquence de ces conditions indique le besoin d'instituer un programme de soins visuels dans ces foyers. Ce projet suggère que la mise en marche d'un programme utilisant la technologie moderne résulterait dans une amélioration sensible de la capacité visuelle des personnes affligées de cécité on de basse vision.

Des démarches préventives améliorait le dépistage du glaucôme car l'âge et l'augmentation de la tension oculaire sont étroitement liées.

In 1981 the senior author was retained by the Department of Health Government of New Brunswick to plan and aid in the implementation of a vision screening program for grade 1 children of the Province. The program, known as the New Brunswick Vision Assessment Program (N.B.V.A.P.), was to be operated by a board nominated by the New Brunswick Optometric Association with two *ex officio* members representing the Departments of Health and Education. The Government funded the program in April, 1982 and it became operational on the first of that month.

The program operates from two mobile clinics, specially designed and equipped house trailers pulled by four-wheel drive 3/4 ton trucks. One of these units was donated to the project by the Lions Clubs of the Province; the other was purchased by the Optometrists.

Each unit is staffed by two optometrists and a nurse. The project is directed by the board with day to day management of the program delegated to a full-time Executive Director. To fully employ the personnel and clinical resources during the periods when the schools are not in session the N.B.V.A.P. operates a program of vision assessment and care for the 66 nursing homes in the Province. In 1982-83, the project obtained a Canada Manpower grant

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which enabled the employment of eight Senior Optometric Interns from the Schools of Optometry of the Universities of Waterloo and Montreal. During the periods mid-June to mid-August, 1982 and 1983 the teams consisting of the program staff and these interns assessed the vision and ocular health of 3119 nursing home residents, (89.3% of the N.B. nursing home population). The remainder of the nursing home population, 372 residents, were not assessed as they had either recently received vision care, or wished to attend a practitioner with whom they had a continuing relationship. Also resident in the nursing homes were 141 persons aged 10 to 49 years. While these persons were assessed, their data is excluded from the discussion of this paper. There were 51 persons of unknown age whose data has also been excluded from the discussion. This paper thus reports on aspects of data from the vision assessment records of 2927 nursing home residents.

Method

The clinical equipment available on each mobile unit enabled the following information to be obtained.

a) Snellen Visual Acuity for distance and near, with and without spectacle correction.

b) Static retinoscopy measures of the refractive errors of eyes.

c) Subjective measures of the refractive errors of eyes.

d) Measurements of heterophoria and strabismus.

e) Ocular health assessment of the external eye and funduscopy of the internal eye. The external examination was conducted under good light and an auxiliary light was used when required for pupillary reflexes, oculo-motor function, accommodative ability, and vergence capability.

f) Medical records were reviewed by the optometrists and a summary of health status and medications of each resident was incorporated in the program record. Additional ocular and visual history was recorded by the optometrists and nurses.

g) Intraocular pressures were measured by hand-held Goldmann tonometers for all persons exhibiting such ocular signs as narrow corneal-iris angles, optic disc-cup ratios exceeding 0.5, marked assymetry between optic-cups of the two eyes, reduced visual fields, persons reporting ocular pain or other symptoms of glaucoma and those whose eyes were hard on palpation.

h) All spectacle corrections in current use were measured by lensometry and their fit and comfort was reviewed.

Persons whose health or physical status would not permit them access to the mobile clinic in a wheelchair were assessed in the nursing home's examining rooms or in their beds. These assessments, while not carried out under standard conditions of luminance or test distances, do not present major flaws in the data since care was observed to accurately size test charts and to compensate for other conditions of the test environment.

The medical diagnoses of systemic health discussed in this paper were made by the patients' physicians and recorded in the institutions' health records.

Sample

The population of 3491 persons was reduced to a sample of 2497 persons for the reasons given above. The age distribution of the population in five year intervals is shown in Table 1. Females predominated over males 2.4 to 1, a ratio identical to that reported by Woodruff (1980) for an Ontario nursing home population sample.

Table 1

Age Distribution of the Population of 66 New Brunswick Nursing Homes

Age range	Number	Percent	Cumulative percent
105-109	4	0.1	0.1
100-104	40	1.1	1.2
95-99	162	4.6	5.6
90-94	464	13.3	19.1
85-89	719	20.6	39.7
80-84	672	19.3	59.0
75-79	455	13.1	72.1
70-74	315	9.1	81.2
65-69	196	5.6	86.8
60-64	126	3.6	90.4
55-59	99	2.8	93.2
50-54	47	1.3	94.5
40-49*	106	3.1	97.6
10-29*	33	0.9	98.5
unknown*	51	1.5	100.0
Totals	3491	100.0	100.0

* Not included in the discussion of this paper.

Mean age of the: population = 79.1
sample = 82.0

Results

Visual Acuity is defined as a measure of the individual's ability to discriminate form. The measure is commonly expressed in terms of a Snellen fraction in which the numerator expresses the distance at which the test is made, e.g. 20 feet or 6 metres. The denominator expresses the distance at which the test letter just discriminated would present an angular subtended to the observer's eye of 5 minutes of arc, e.g. 20/50 or 6/15.

For the purpose of this discussion, the visual acuity measures derived from the sample have been classified into the four categories listed in Table 2.

Table 2

Visual Acuity Classification

Class	Distance Acuity	Near Acuity †
Normal	20/15 to 20/49	0.37M to 0.62M
Mild impairment	20/50 to 20/69	0.75M
Moderate impairment	20/70 to 20/199	1.0M to 1.25M
Severe Impairment (legal blindness)	*20/200 or less	<1.25M

* Includes light perception and complete absence of light perception.

† Standard Near Visual Acuity cards were used as the stimulus under 15 foot candles illumination. Near Visual Acuity is expressed in terms of the metric distance at which the print provides an angle of 5 minutes of arc to the eye and thus can also be expressed as a Snellen fraction.

Visual acuity measures were not recorded for 1020 residents due to the following causes.

a) Refused assessment 372
b) Senile dementia 293
c) Alzheimer's disease 174
d) Schizophrenia 82
e) Absent 40
f) Other 59

The percentages of the sample having distance visual acuities within each classification of visual acuity are shown in Figure 1. The frequencies of near visual acuity within the age groups from 65 to 95 years are shown in Table 3.

Table 3

Binocular Near Visual Acuity

V.A. Class	Normal	Mild	Moderate	Severe
Age range	% Pop.	% Pop.	% Pop.	% Pop.
65-69	52.8	22.4	18.4	6.4
70-74	43.7	22.8	22.3	11.2
75-79	39.1	21.7	25.4	13.8
80-84	41.4	27.0	18.7	12.9
85-89	35.5	22.1	23.0	19.4
90-94	28.1	20.5	29.1	22.3

Changes in the percentages of persons in the various visual acuity classifications are displayed in Figure 2, with a loss of normal acuity of approximately 0.8% per year between ages 60-90. The percentage with mild impairment remains

FIGURE 1

DISTANCE VISUAL ACUITY STATUS OF NURSING HOME RESIDENTS

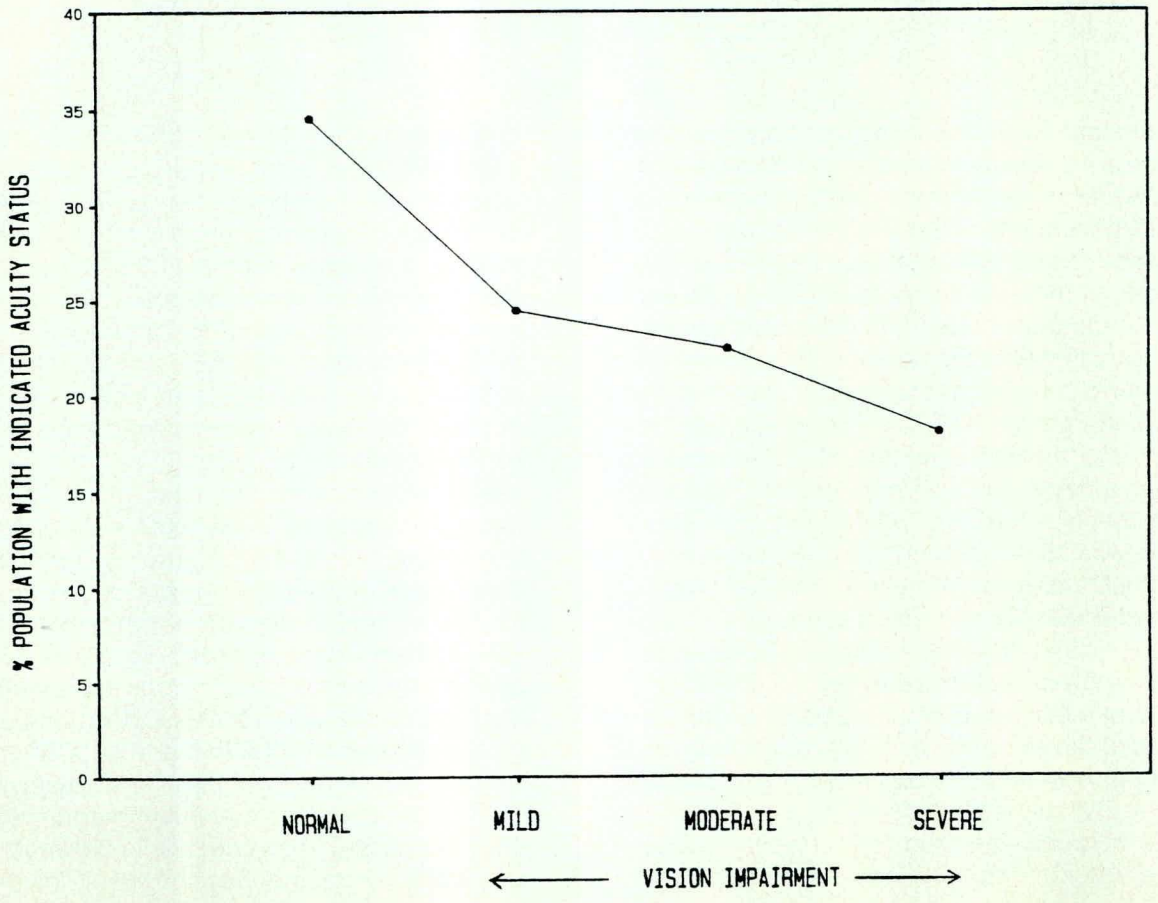
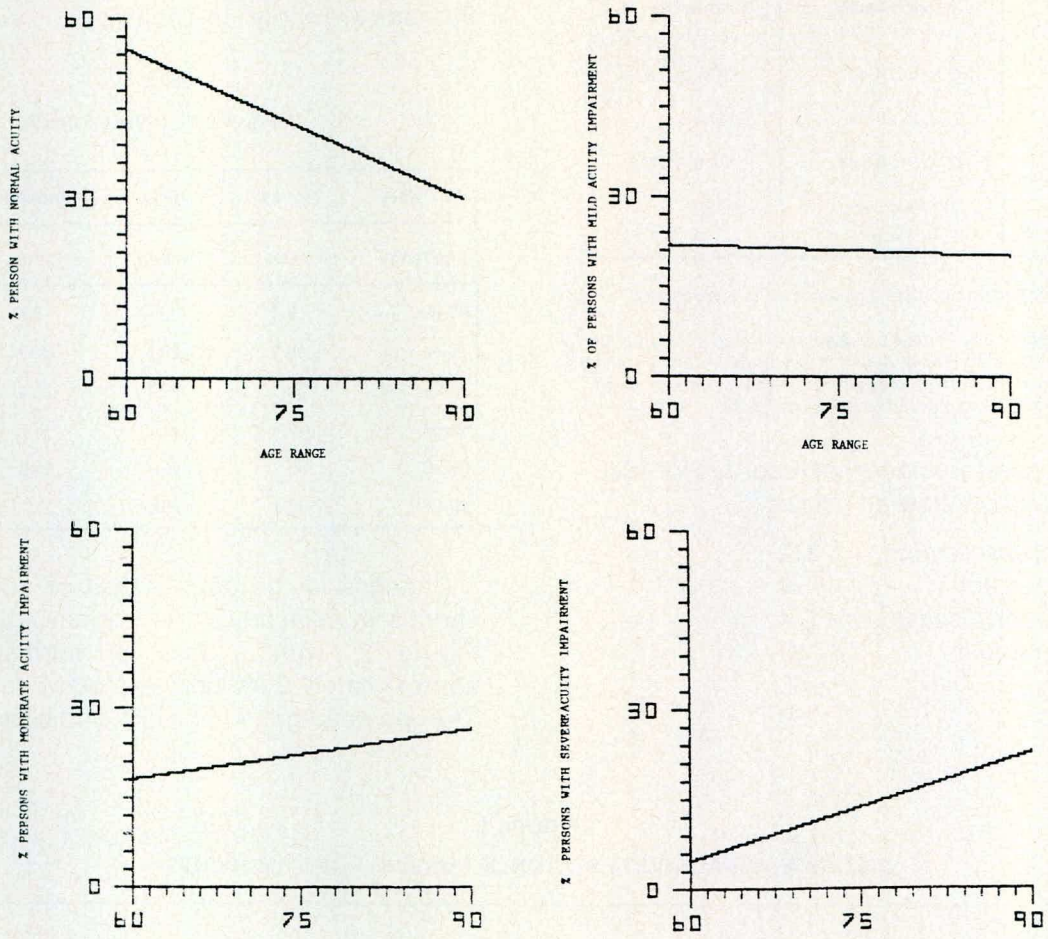


FIGURE 2

BINOCULAR NEAR VISUAL ACUITY OF RESIDENTS OF N.B. NURSING HOMES



almost constant over this same period while the percentage with severe impairment increases at a rate of 0.6% and moderate impairment increases at a rate of 0.3% per annum. The prevalence of blindness in various age ranges is illustrated in Figure 3, which shows a rate of increase of approximately 0.3% per annum. The blindness rate of 18.0% in this sample may be contrasted with the rate of 9.7% established for an Ontario nursing home sample reported by Woodruff and Pack (1980)[1]. This difference may be due in part to the fact that the New Brunswick sample has a mean age 1.5 years greater than the Ontario sample. Further, 72.1% of the N.B. population was 75 years of age or older while only 57.8% of the Ontario sample was in that age group. Another factor may also be that a southern Ontario population has a greater ease of access to eye care than the New Brunswick population.

The loss of near visual acuity affects a greater percentage of the sample in each age range from 65 years and up, with much of this impairment due to cataractous crystalline lenses.

There is a broad spectrum of refractive states among the N.B. nursing home sample, as displayed in Figure 4. Only 10.7% of the sample have no or slight refractive error requiring spectacle correction, and only 4.8% have a zero refraction. While 15% of the sample have a myopic refractive error, the errors require correction in 11.8%. Hypermetropia is the predominant refractive error with 80.1% of the sample having this condition, which was correctible in 77.4% of persons. 8.5% of the sample were aphakic, a very low figure in view of the fact that 47.8% of the sample were severely visually impaired by this condition.

Astigmatism was the next most common refractive error, being present in 59.4% of the sample, correctible in 40.4%. Figure 5 represents the distribution of astigmatic errors in the sample and is a curve of best fit derived from the collected data. Astigmatism is categorized in three forms dependant upon the position of the axis position: With the Rule (WTR) when the axis is within 20 degrees plus or minus of the 180th meridian; Oblique (OBL) when the axis is between the 21st and 69th meridians or between the 111th and 159th meridians; Against the Rule (ATR) when the axis is between the 70th and 110th meridians. Borish[2] (1970) has written a

FIGURE 3

PREVALENCE OF BLINDNESS WITH INCREASING AGE
FOR RESIDENTS OF NEW BRUNSWICK NURSING HOMES

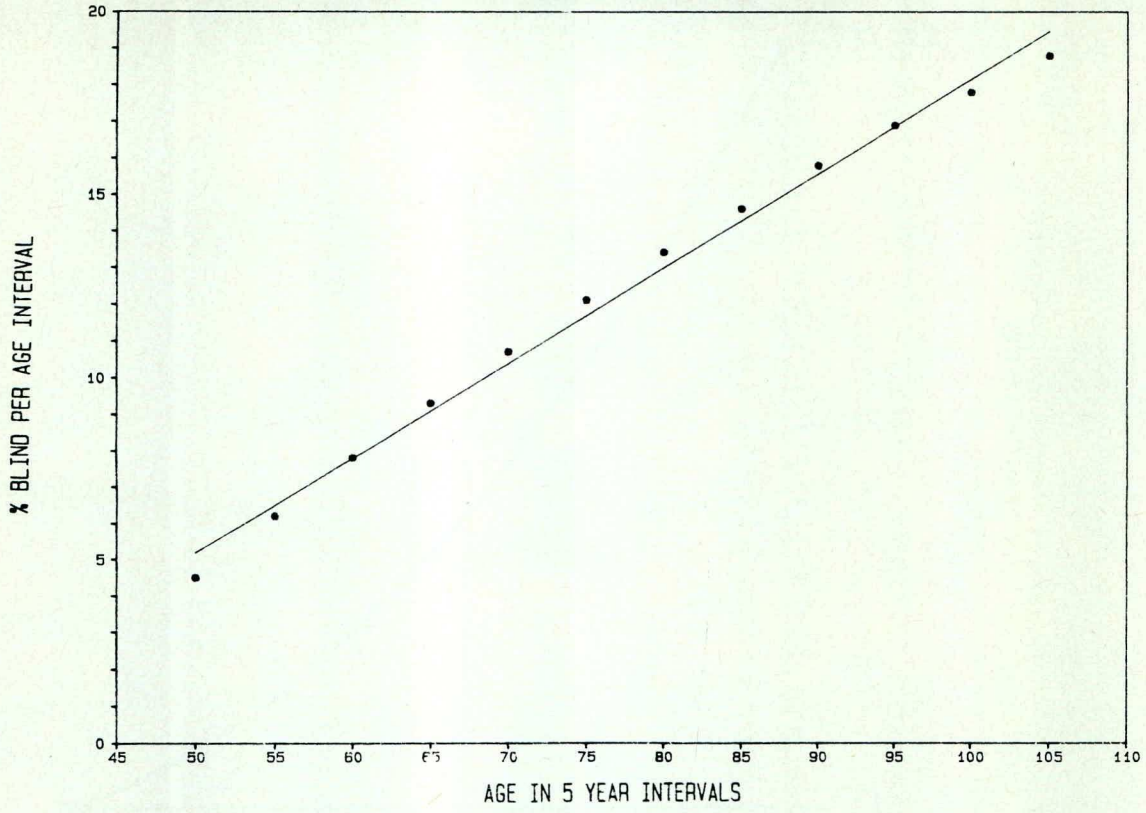


FIGURE 4

DISTRIBUTION OF SPHERICAL REFRACTION
RESIDENTS OF NEW BRUNSWICK NURSING HOMES

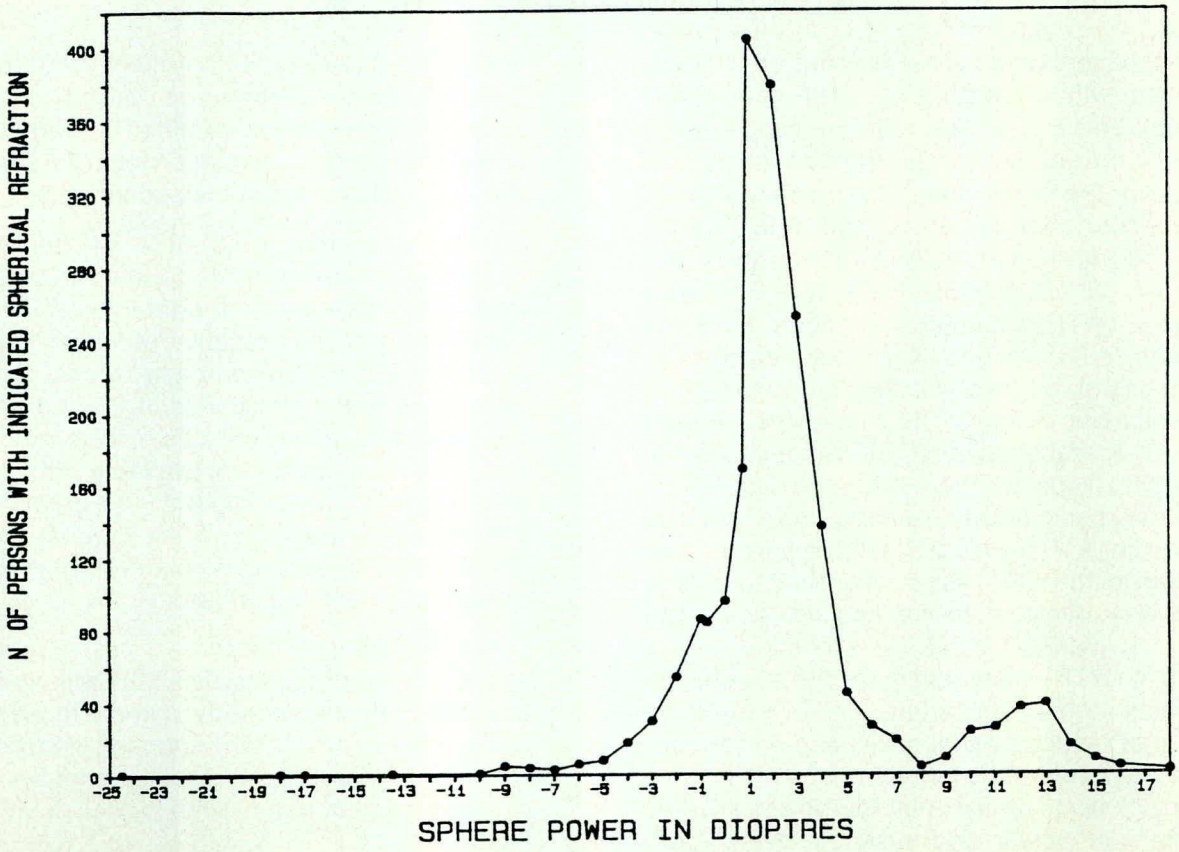
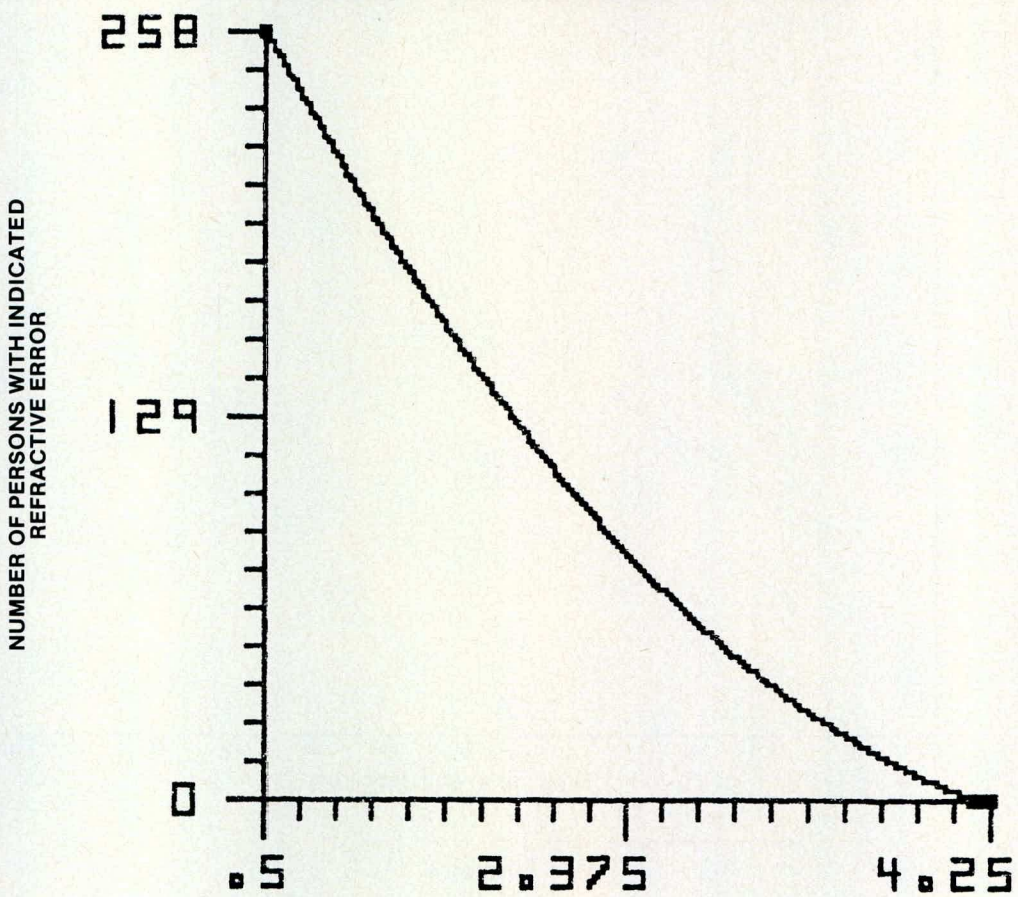


FIGURE 5

NEW BRUNSWICK NURSING HOME RESIDENTS

ASTIGMATIC REFRACTIVE ERRORS



number of papers which show an increase in (ATR) astigmatism with increasing age. The data of this study show this trend, Figure 6. The data suggest that the increase continues throughout life as opposed to the view that only relatively small changes occur past age 55, Hirsch[3] (1959), Lyle[4] (1951). The prevalence of (ATR) astigmatism was 72%, (WTR) 20%, and (OBL) 8%. Figure 6 shows a decrease of (WTR) astigmatism at about the same rate as the (ATR) astigmatism. This supports the view that growth of the crystalline lens is the cause of this astigmatic change. The data further support this view by the fact that the (OBL) astigmatism rate remains almost constant across the age range of the sample, an expected result, since adding an oblique cylinder to an (ATR) cylinder should only result in an axis change of the (OBL) astigmatism in the majority of cases. Regardless of the mechanism, the clinical effect of an increase in (ATR) astigmatism or a decrease in (WTR) astigmatism results in a change in the resolution of the retinal imagery with the likelihood of reduced visual acuity and discomfort. Such changes add to the necessity of a reasonable frequency of vision assessment for the elderly.

The state of ocular and systemic health both contribute to vision impairment and blindness. External ocular pathologies causative of vision impairment were mainly limited to corneal conditions. These had a prevalence rate of 2.3%. Table 4 shows the diagnoses in the patients' files.

It is likely that a number of the unknown opacifications result from traumas and secondary infections. Diseases of the internal ocular tissues contributory to or causative of vision impairment and blindness are presented in Table 5. Only those conditions with a prevalance of 1% or greater have been included in the table. It is evident from the data that the level of vision care available to the residents prior to the N.B.V.A. Program left a great deal to be desired since the rates of the various conditions identified by the project personnel is high relative to the extent of prior diagnoses.

The number of diagnosed systemic diseases exceeded 90 conditions. The 10 systemic diseases occurring most frequently among those persons with blindness are shown beginning with the highest frequency in Table 6. The table also shows the rank of each condition for other visual acuity classifications.

FIGURE 6

CHANGES IN TYPES OF OCULAR ASTIGMATISM WITH AGE
RESIDENTS OF NEW BRUNSWICK NURSING HOMES

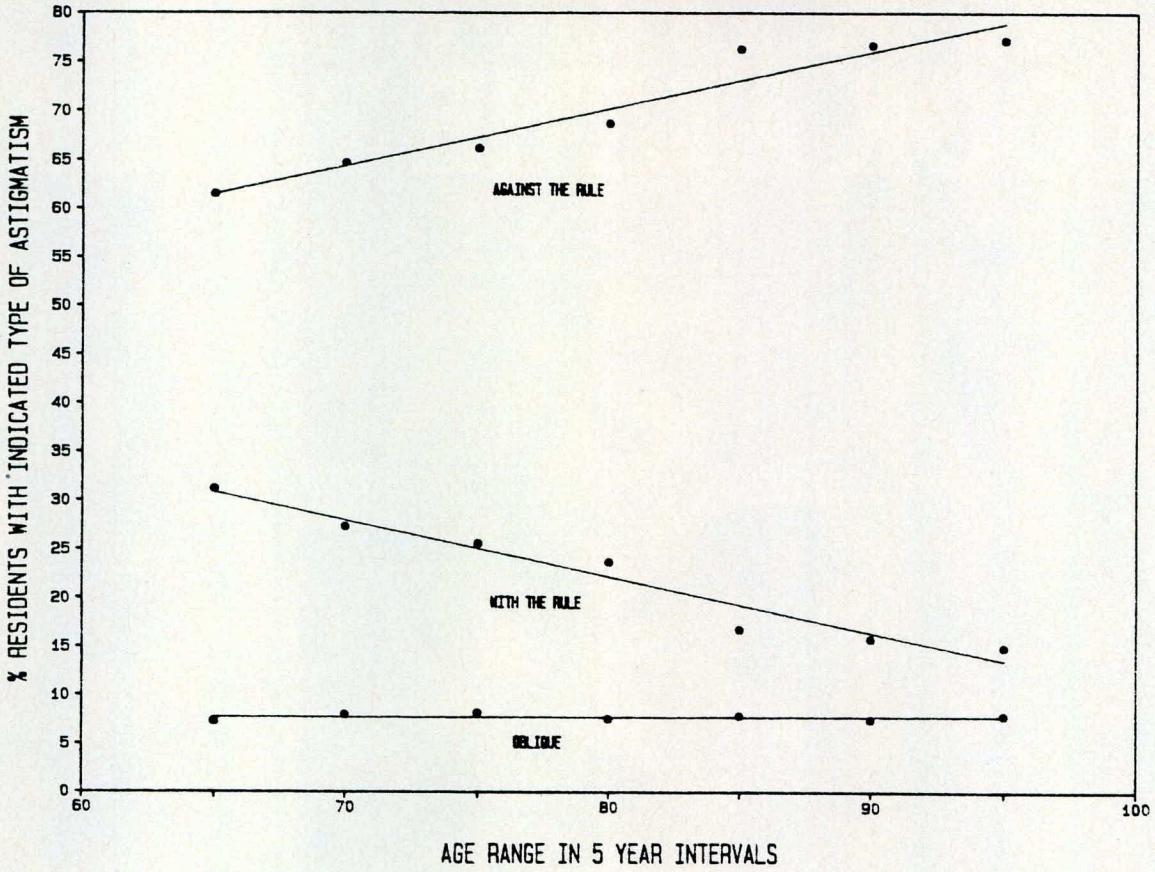


Table 4

External Ocular Causes of Vision Impairment					
Visual acuity classification	rate for Normal	rate for Mild imp.	Moderate imp.	rate for Severe	rate All
Corneal infections	0.4	0.6	1.5	0.5	0.7
Degenerations	0	0	0.2	1.7	0.4
Opacifications cause unknown	0.5	0.3	1.8	3.0	1.2

Table 5

Internal Eye Disease Causation of Vision Impairment					
Visual Acuity classification	rate for Normal	rate for Mild imp.	rate for Moderate imp.	rate Severe imp.	rate All imp.
Glaucoma †	0.4	0.6	0.7	1.9	0.9
Glaucoma *	(----------not established----------)				3.2
Iridectomy †	1.8	2.1	1.4	0.8	1.6
Cataract †	0.2	0.5	0.2	1.0	0.4
Cataract *	37.3	73.3	73.2	46.8	53.7
Senile macular degeneration *	7.5	12.4	13.1	8.2	9.7
Optic nerve atrophy †	0.5	0.8	1.4	2.7	1.2
Vitreous disease *	2.3	3.8	3.3	1.5	2.6
Uveal disease *	0.7	0.4	0.2	1.9	0.8

† Physician's diagnosis in patient's health record.

* Optometrist's diagnosis in project vision assessment record.

Intraocular pressures were measured with a Perkins handheld Goldmann tonometer for 583 residents whose vision, ocular health history and assessment of ocular structures did not meet the following criteria: Persons manifesting one or more symptoms or history items indicative of glaucoma, ocular structural changes, particularly assymetry of the optic cup, visual field loss, presence of a narrowed corneal-iris angle. Intraocular pressures of 19mm.Hg or less were considered to be within the normal range, pressures between 20 to 24mm.Hg were considered to be borderline and to require continuous monitoring, pressure of 25mm.Hg or more required referral for ophthalmological assessment. Persons having a positive history, structural changes or symptoms were also referred for an ophthalmological workup. Those persons with pressures in the normal range made up 57% of the group assessed, 31.2% had pressures in the borderline category and 11.7% had pressures in the

Table 6

rank	Visual acuity classification / Diseases *	rank	% rate Normal	rank	% rate Mild	rank	% rate Modrt	rank	% rate Sevre	rank	% rate All
1	Diabetes	3	7.1	3	6.8	4	6.9	1	8.4	3	8.2
2	Arterial Hypertension	2	7.8	1	9.6	1	7.8	2	7.0	1	8.1
3	Arthritis	4	6.6	4	6.7	3	7.0	3	6.9	4	6.8
4	Congestive heart disease	6	3.8	5	4.8	6	4.4	4	6.5	5	4.7
5	Senile dementia	8	3.0	9	3.2	5	5.2	5	5.7	6	4.1
6	Cerebral vascular attack	1	9.2	2	8.7	2	7.3	6	5.5	2	8.0
7	Arteriosclerotic heart	10	2.5	11	2.9	9	3.3	7	4.8	8	3.3
8	Arteriosclerosis	9	2.8	7	3.4	6	4.4	8	4.6	7	3.6
9	Alzheimer's disease	14	2.1	12	1.7	11	3.3	9	3.0	10	2.4
10	Mental retardation	5	4.3	8	3.4	15	1.7	10	2.6	9	3.2

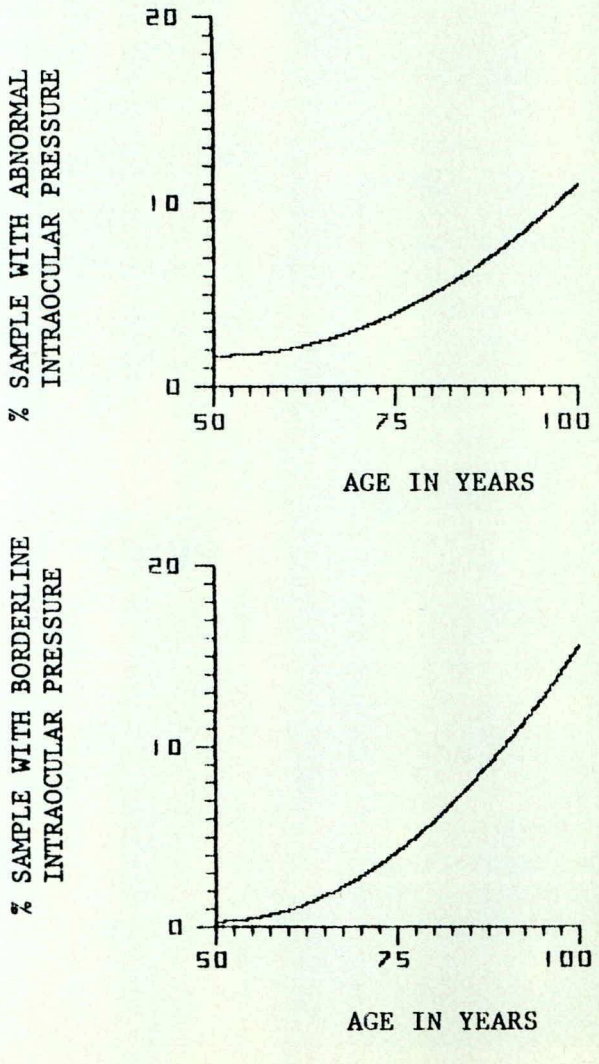
* Physician's diagnosis in patient's health record.

abnormal range. Figure 7 shows the increasing percentages of persons in both the borderline and abnormal categories. These data indicate a need for continuity of assessment of intraocular pressure and vision of aging persons, particularly after they reach age 60.

People enter nursing homes because they require care and services that they can no longer provide for themselves. 81 percent of persons in New Brunswick's nursing homes are between the ages of 70 and 90. A majority have problems with mobility which preclude their maintaining themselves outside of institutions. Moderate and severe vision impairment also contributes to their loss of independence. The extent of care required varies among individuals and a classification into three levels existed during the period when the data of this study was gathered: Level 1 care signified minimal nursing care and supervision and level 3 indicated the maximum level of care that can be rendered outside of acute care requiring hospitalization. The data displayed in Figure 8 suggest that severe vision impairment contributes to the level of care required. Figure 9 shows that severe vision impairment is also a factor contributing to loss of mobility which, in turn, increases the need for supervision and care.

FIGURE 7

INTRA OCULAR PRESSURE CHANGE WITH INCREASING AGE



Discussion

A substantial number of New Brunswick nursing homes are located in communities where there is no vision care practitioner. Many of the homes are as much as one to two hours' driving from the nearest community where vision care is available. Lack of mobility and health problems thus precludes access to vision care on a regular basis or a required frequency. Prior to the inception of the N.B.V.A. Program, many residents had not had a vision assessment for 5 years or more. Many of those persons with severe visual handicaps had not been

FIGURE 8

RELATIONSHIP BETWEEN VISION IMPAIRMENT AND REQUIRED LEVEL OF CARE

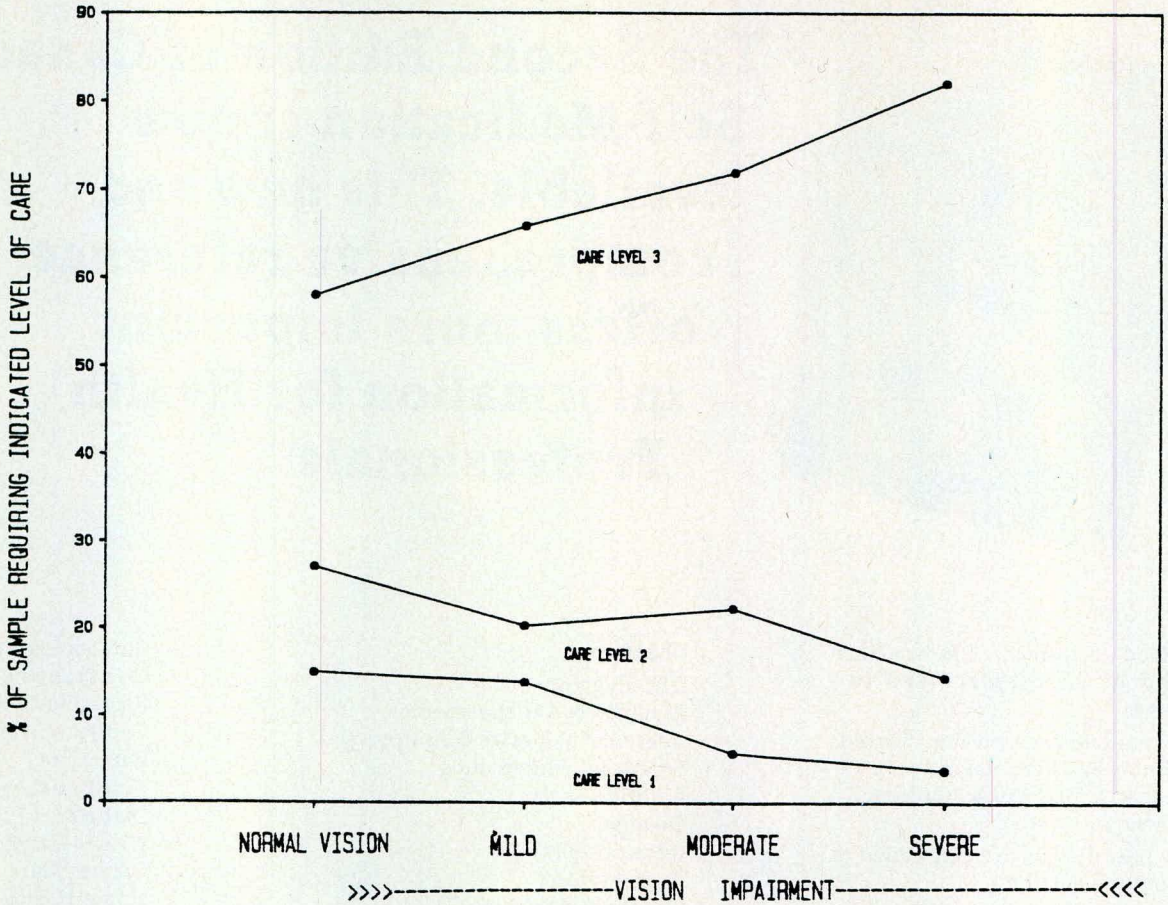
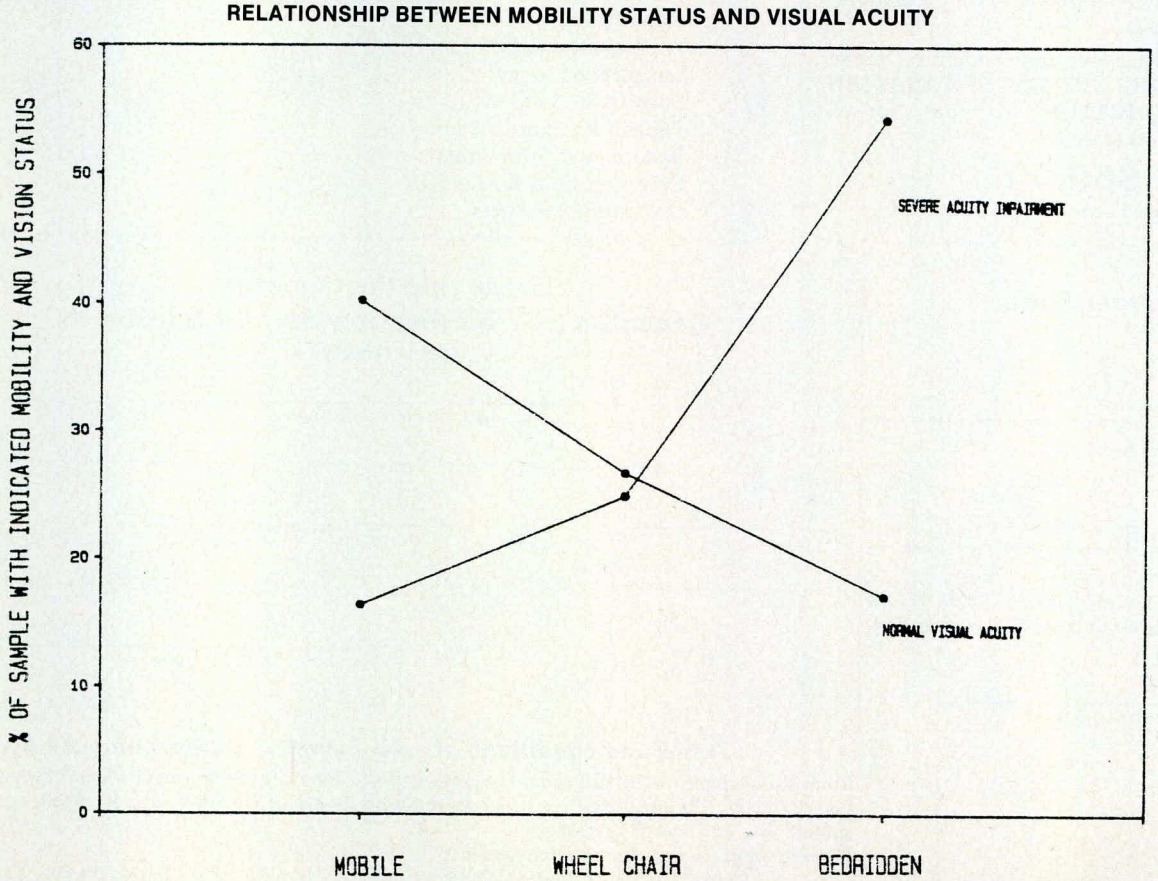


FIGURE 9

RELATIONSHIP BETWEEN MOBILITY STATUS AND VISUAL ACUITY



identified as blind and thus had not been certified and registered with the Canadian National Institute for the Blind with the result that they were not in receipt of services such as talking books, instruction in Braille or other mind-stimulating activities made available by that agency. Failure to recognize individuals as blind also meant that they were not in receipt of low vision services and as a result were denied the full use of residual visual capability. Moderate and severe vision impairments afflict 40.4% of the nursing home residents resulting in sensory deprivation which increases the amount of supervision and care required. More important is the loss of quality of the individual's day to day living since vision loss prevents participation in reading, writing, television viewing and many other forms of activity and recreation.

The prevalence rates for some of the major causes of vision deterioration in the N.B. sample are very close to those published by the United States Department of Health and Human Services, Center for Health Statistics[5] (1983) for example, Cataract prevalence U.S. 57.6% for persons age 65-74, N.B. 53.7%; Glaucoma prevalence U.S. 16.3%, N.B. 16.4%; Vascular diseases U.S. 36.4%, N.B. 34.5%. This suggests that the data can be used for health planning with some degree of confidence in other jurisdictions.

Refractive error is a major cause of decreased visual acuity and the data of this study show that these errors change as age increases. This establishes a requirement for regular assessment of the refractive state in order to maintain a high quality of sensory input. For the 51.4% of New Brunswick nursing home residents with moderate and severe vision loss, low vision assessment and the provision of assisting devices could improve their visual capabilities and increase their enjoyment of daily living. Well-staffed and fully-equipped Low Vision clinics are not available in a majority of Canadian cities and, thus, the residents of nursing homes cannot get access to such services. The N.B.V.A. program provides only a minimal service in this area, but even this level resulted in improved visual ability for a substantial number of residents.

Refractive errors are a major cause of vision deficit. The majority of these can be remedied by the prescription of spectacles. Changes in astigmatism and manifest hyperopia require that refractive assessment be carried out a minimum of once every two years. However, other causes of visual deficit can cause the requirement to be increased to an annual frequency.

While diseases of the external eye contribute only minimally to vision impairment of nursing home residents, problems of the eyelids, conjuctiva and lacrimal apparatus cause much mild discomfort for elderly persons, much of which can be easily remedied if eyecare is accessible. Most of these problems were handled by the homes' physicians after being brought to their attention. Others, such as dry eyes and blepharitis were cared for by the nursing staff when the problem was drawn to their attention.

Internal eye conditions and diseases cause the majority of vision impairment. The greatest single cause is cataract, with a prevalence rate of 48% among those with severe impairment and 73% among those with mild and moderate impairment. Since only 8.7% of the sample had received surgical treatment for cataract, one must marvel at the fact so few had received the benefit of one of the safest and most effective surgical procedures in medicine. The advent of such valid and available technologies as the laser interferometer, electroretinogram, and visually evoked cortical response apparatus provide the means of presurgical assessment of the level of retinal and cortical function, thus assuring that a surgical procedure will result in vision improvement and a patient benefit. Ocular implants and other surgical advances in cataract remediation have also reduced the length of hospital stay and minimized the inconvenience to the patient. Evidence gathered by the senior author from moderately and severely visual impaired patients in six nursing homes suggest that a minimum of *one third* of these persons could recover sufficient visual acuity to increase their mobility, intellectual and physical activities. This number would likely be increased with the application of the technical resources mentioned above.

That such improvement holds the potential for cost saving is self-evident. Senile macular degeneration of the retina (SMD) with a prevalence of nearly 10% is the second leading cause of vision impairment from internal ocular disease. This condition may be part of systemic vascular disease but individuals may be minimally impaired in functions other than vision. Optical and electronic technological advances provide the opportunity to reduce the effect of visual impairment from this condition but, until low vision services are made more widely available, the majority of the visually impaired elderly will not receive these benefits.

Glaucoma was present in 4.1% of the home residents yet undetected in 3.2%. Since the data show that borderline and abnormal levels of intraocular pressure increase with age, it indicates the necessity of frequent pressure evaluation of nursing home residents. Such checks must also include a review of symptoms, visual fields and fundus assessment. Since a majority of glaucoma cases occur without symptoms, detection cannot be left to chance or be of a sporadic nature if vision loss from the disease is to be minimized.

The early diagnosis and treatment of systemic vascular disease and diabetes, plus patient education to promote compliance, can assist over the long term in minimizing vision impairment. It will not, however, eliminate the need for an annual assessment of vision to minimize impairment.

The New Brunswick Vision Assessment Program experience has not only provided regular eye examinations for the institutionalized elderly in the province but also provides an opportunity to plan preventive care and to contribute to cost restraint.

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