

Low Vision Service Provision by Optometrists: A Nationwide Survey

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis, except where noted. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Purpose: The prevalence of age-related visual impairment is projected to increase as the Canadian population ages. As a result, the demand for low vision service is also projected to increase. However, there is a lack of healthcare planning regarding vision rehabilitation in Canada. The current study is the first study that describes optometric low vision services across Canada. The primary purposes of this study were to determine the provision of low vision services by optometrists in Canada, the barriers to providing low vision services and the pattern and perception of referrals to specialised low vision services. The secondary purposes of this study were to examine regional differences in low vision practice and referral patterns, and to identify predictive factors associated with the extent of optometric low vision care.

Methods: Practising optometrists across Canada (n=1839 or 40.5% of the Canadian optometric population) were randomly sampled so as to obtain approximately equal responses from the Western Provinces, Ontario, Quebec and the Eastern provinces. Between October 2010 to January 2011, optometrists were invited to participate in a 30-item questionnaire that included questions on personal profile, primary practice profile, types of patients seen, levels of low vision services offered, patterns of referral and barriers to provision of low vision care. Descriptive statistics were used to describe the current landscape of optometric low vision care. Chi-square analyses were used to identify any regional differences in pattern of low vision provision and/or referrals. Multivariate logistic regression was used to determine the predictive factors associated with the extent of optometric low vision care. Written comments on low vision education and provision of low vision services were first coded to represent relevant categories of information emerging from the written data. Then the patterns of coding were grouped into common themes.

Results: A total of 459 optometrists responded (24.8%). Optometrists estimated that 1% (range 0-100%) of their patients were patients with low vision, yet also estimated that 10% of their patients

had a best corrected visual acuity of $\leq 6/12$. Almost three-quarters of respondents would manage a hypothetical patient with minimal visual disabilities and simple visual goals with high-powered additions and lighting; however, the proportion of those who would manage with the same patient with magnifiers and filter lenses dropped to 43%. The most frequently cited barriers to providing more extensive low vision services were found to be related to financial non-viability, lack of affordability by the patient and the time-consuming nature of conducting a low vision assessment. The percentage of respondents who cited no interest in low vision was 33.5%. Many respondents would like to see more continuing education on low vision, preferably through a hands-on approach. The most frequent site of referral was CNIB (81.9%), although most of the respondents (57.1%) rarely (0-5% of the time) or almost never (0-25% of the time) received a written report from the low vision service providers. Chi-square analyses revealed that optometrists in Quebec tended to refer eligible patients to government-sponsored vision rehabilitation centres, while optometrists in Eastern provinces tended to manage patients on their own. The predictive factors associated with the extent of optometric low vision care were advanced years of practice (16+ years), having local low vision optometrists/ophthalmologists within one-day's travel, working in a practice within a population of less than 50,000 and working in a non-solo practice.

Conclusions: This study documents that optometrists may be undertaking more low vision (LV) in patients with relatively good vision than they tend to label as LV. Vision rehabilitation is of interest to a large portion of optometrists across Canada. To translate the interest into practice, barriers identified by the current study must be addressed.

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Dedication

Dedicated to all who suffer from vision impairment.

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List of Abbreviations

Adds	Reading additions
ADP	Assistive Devices Program
AB	Alberta
ARMD	Age-Related Macular Degeneration
BC	British Columbia
BCVA	Best Corrected Visual Acuity
CCHS	Canadian Community Health Survey
CCTV	Closed-circuit Television
CE	Continuing Education
CES-D	Center for Epidemiological Studies Depression Scale
CI	Confidence Interval
CIHI	Canadian Institute for Health Information
CRT	Cathode Ray Tube
CS	Contrast Sensitivity
CSE	Centre for Sight Enhancement
CSHA	Canadian Study of Health and Ageing
Deg	Degrees
DR	Diabetic Retinopathy
EDPRG	Eye Disease Prevalence Research Group
ETDRS	Early Treatment Diabetic Retinopathy Study
F	Female
GSES	General Self-Efficacy Scale
ICD	International Classification of Disease
ICF	International Classification of Functioning, Disability and Health
INLB	Institut Nazareth et Louis-Braille
LCD	Liquid Crystal Display
Level A	Recognition of a low vision case
Level B	Assessment of visual impairment (visual acuity, contrast sensitivity, visual fields)
Level C	Assessment of disability (difficulty with tasks that the patient would like to perform)
Level D	Manage a patient with minimum visual disability and simple goals using high powered additions and lighting
Level E	Manage a patient with minimum visual disability and simple goals using optical devices such as hand and stand magnifiers and filter lenses
Level G	Manage a patient with complex goals (e.g. vocational, requiring multiple interventions)
LOVIT	Veterans Affairs Low Vision Intervention Trial
LV	Low Vision
LVA	Low Vision Aids
LVC	Low Vision Clinic
LVR	Low Vision Rehabilitation

LVS	Low Vision Service
LV-VFQ	Veterans Affairs Low Vision Quality of Life Questionnaire
M	Male
MLVC	Multi-disciplinary Low Vision Clinic
MMRC	Montreal Association for the Blind-Mackay Rehabilitation Centre
MN	Manitoba
NB	New Brunswick
NEI-VFQ	National Eye Institute Visual Function Questionnaire
NFL	Newfoundland and Labrador
NS	Nova Scotia
OD	Optometrist
OMD	Ophthalmologist
ON	Ontario
PALS	Participation and Activities Limitation Survey
PAOG	Primary Open Angle Glaucoma
PEI	Prince Edward Island
Px	Patient
QC	Quebec
QoL	Quality of Life
RAMQ	La Régie de L'Assurance Maladie du Québec
RCT	Randomized control Clinical Trial
SAIL	Saskatchewan Aids to Independent Living Program
SF-36	Medical Outcomes Study 36-item Short Form
SF-	
36mCS	Mental Component Summary Scores of Medical Outcomes Study 36-item Short Form
SF-36PCS	Physical Component Summary Scores of Medical Outcomes Study 36-item Short Form
SK	Saskatchewan
STEP	Specialized Technical Equipment Program
US	United States
USD	United States Dollars
VA	Visual Acuity
VCM1	Vision Quality of Life Core Measures
VFD	Total Visual Field Diameter
WHO	World Health Organization

Chapter 1

General Introduction and Literature Review

1.1 Definitions of Impairment and Disability; Vision Impairment and Legal Blindness

In 1980, the World Health Organization published its first edition of the International Classification of Functioning, Disability and Health (ICF). Its purpose was to provide a framework for describing health in the context of functional status and disability.¹ Accordingly, *impairment* and *disability* were defined in the ICF as follows. *Impairment* is the result of the loss of body function or structure^{1,2} and *disability* occurs when impairment results in a loss of ability to achieve a desired task or participate in a social context.² In this regard, people with vision loss are deemed to be visually disabled if they cannot achieve a visual task or drive a car despite the desire to do so.

The World Health Organization also publishes the International Classification of Diseases (ICD). This book complements the ICF and is the “international standard for defining and reporting diseases and health conditions”.³ The purpose of establishing the ICD is to allow different countries to compare and share health information using the same definition.³ In the ICD, visual impairment and legal blindness are defined by a presenting distance visual acuity of worse than 6/18 (20/60) and worse than 3/60 (20/400) respectively.⁴ However, other definitions of vision impairment and legal blindness have also emerged in different countries due to social policy and disability benefits (Table 1-1).

Table 1-1: Definitions of vision impairment and legal blindness

	Vision Impairment	Legal Blindness
WHO ICD, 2010 ed. ⁴	VA: Worse than 6/18 Equal or better than 3/60 VF: $\leq 20^0$ diameter, equal or better than 10^0	VA: Worse than 3/60 VF: $\leq 10^0$
North American Criteria ⁵	VA: Worse than 6/12 but better than 6/60	6/60 or worse
Blind Persons Act (Canada) ⁶	--	6/60 or worse VF: $\leq 20^0$ in the better eye
Social Security Act (U.S.) ⁶	--	20/200 or worse VF: $\leq 20^0$ in the better eye

Low vision is a visual impairment that is not correctable by standard glasses, contact lenses, medication or surgery and that interferes with a person’s ability to perform common age-appropriate visual task. By this definition, low vision can be considered a disability that results from visual impairment.⁷

Although low vision and visual impairment are not synonymous, studies of low vision often do not distinguish between causes of visual impairment and causes of low vision. Furthermore, treatable ocular conditions, such as cataract, may also be considered as causes of low vision in these studies.⁵ Perhaps the rationale behind this type of classification is that not every person with a treatable condition is being treated.

Leat et al’s study⁷ may provide another perspective on the definition of vision impairment and low vision. In their study, they derived the definition of vision impairment by data from several population-based studies that measured visual acuity in the normal population. Vision impairment, as

defined by a statistical cut-off of 99% confidence interval, was a best corrected visual acuity of worse than 6/7.5, total horizontal visual field <146⁰ (Goldmann III-4e) or <109⁰ (III-3e) and contrast sensitivity <1.5 (Pelli-Robson). Leat et al⁷ also suggested a definition of visual disability as best corrected acuity of <6/12 or contrast sensitivity <1.05 based on the considerations of a number of factors including driving, reading and daily living tasks.

Lovie-Kitchin et al⁸ suggested that people with a binocular visual field of <31 to 52⁰ diameter should be considered for referral for mobility assessment, based on the experimental subject's walking speed, number of errors committed while walking through the experimental obstacle course and weighing the cost of referral relative to the cost of failure to refer. This visual field diameter, far exceeds the WHO definition for vision impairment, but could be considered as a definition for low vision, as at this point disability starts.

Vision rehabilitation encompasses multiple levels of patient management, but its major purposes are to evaluate the impact of vision loss and optimize a patient's ability to perform desired activities of daily living and social participation.⁹ This can be achieved by provision of low vision aids, task modification, sight substitution techniques, environmental modifications, and psychosocial support.

1.2 Epidemiology of Low Vision

Since low vision can both be described in the context of disability and clinical measurement, it is not surprising to observe that both types of definition are being used by researchers in epidemiological studies. The disability definition of low vision is often seen in self-reported surveys or quality of life surveys, whereas the measurement definition of low vision is often seen in clinical settings.

1.2.1 Prevalence of Eye Disease in Canada

To date, there is only one population study that looked at the prevalence of visual impairment in Canada. This was a study conducted in 2009 by Robinson et al¹⁰, in Brantford, an urban city in

Ontario, Canada. While 2.7% of the population aged 40 plus was found to have visual impairment (as defined by a presenting visual acuity of $<6/12$), the majority of visual impairment (71.8%) was correctable.¹⁰ This means that only approximately 0.76% of the study population had an uncorrectable vision impairment. The following conditions were found through ophthalmoscopic screening: 13.9% cataract, 7.0% age-related macular degeneration, 3.4% glaucoma and 2.0% diabetic retinopathy.¹⁰ A prevalence of potential ocular pathology of 23.7% was found in those 39-64 years of age and 60.0% in those 65 years of age and older.¹⁰

A Canadian study that was based on a clinical sample was that of Maberley et al⁵. The researchers sampled medical records of patients who attended ophthalmology clinics in Prince George, a medium sized city in British Columbia. The estimated prevalence of low vision and legal blindness in Canada was 0.36% and 0.04% respectively according to the WHO definition and 0.71% and 0.24% respectively according to the North American criteria.⁵

The Eye Disease Prevalence Research Group (EDPRG)¹¹ estimated the prevalence of eye disease by combined data from population-based studies conducted in United States, Canada, Australia and Europe. It was found that in year 2000, 937,000 (0.78%) of adults older than 40 were legally blind and an additional 2.4 million adults (1.98%) had low vision by the North American criteria.¹¹ The comparison between the prevalence data from recent landmark studies are summarized in Table 2. These studies adopted a clinical measurement definition of low vision.

Table 1-2: Estimated prevalence of low vision and legal blindness

Study	Location	Age of participants	Low vision criteria/ Legal blindness criteria	% Low Vision	% Legal Blindness
Robinson et al, 2013 ¹⁰	Brantford, ON, Canada	40 and older	North American	0.76%	n/a
Maberley et al, 2006 ⁵	Prince Rupert, BC, Canada	Any age	North American WHO	0.71%* 0.36%*	0.24%* 0.04%*
Copenhagen City Eye Study, 2004 ¹²	Copenhagen, Denmark	20-84	North American	0.66%*	0.20%*
Rotterdam Eye Study, 1996 ¹³	Amsterdam, Netherlands	55 and older	North American WHO	3.80% 1.42%	0.75% 0.47%
Blue Mountains Eye Study, 1996 ¹⁵	Australia	49 and older	North American	4.0%	0.7%
Salisbury Eye Evaluation Study, 1996 ¹⁶	Salisbury, Maryland, USA	65 to 84 years	North American WHO	3.69% 2.10%	0.83% 0.32%
Baltimore Eye Survey, 1990 ¹⁷	Baltimore, Maryland, USA	40 and older	North American WHO	2.98% 1.55%	1.21% 0.70%

*numbers indicate the age-standardized prevalence

On the other hand, epidemiological studies may also adopt a disability definition of low vision. They are typified by self-report prevalence surveys. The most complete self-report prevalence data in Canada has been found in Statistics Canada's Participation and Activity Limitation Survey¹⁸ (PALS) in 2006. Of note, the questions from PALS regarding difficulty with reading newsprint and seeing

faces across the street demonstrated good sensitivity (82.6% and 81.8%) and specificity (85.6% and 88.9%) for the presence of severe visual impairment.¹⁹ However, the sensitivity of these questions dropped significantly for people with mild (46.5% and 37.1%) and moderate (75.5% and 68.8%) visual impairment.¹⁹ PALS concluded that 816,250 (3.2%) Canadians 15 years or older reported having “a seeing condition”.¹⁸ Of these Canadians, 78.5% considered their seeing limitations to be mild while 21.5% were considered to be severe.¹⁸

Another Canadian study that reported self-reported data was the Canadian Community Health Survey (CCHS). The goal of this survey was to collect Canadian data on health status, health care utilization and health determinants.²⁰ The data indicates that 4% of Canadians aged 65 and over had “uncorrected” vision problems in 2003, which included vision problems that are not amenable to treatment.²¹ Moreover, the prevalence of uncorrected vision problems was the highest (8%) at age 80 and older.²¹ Other than the CCHS, another self-reported visual impairment study was one with data derived from the Canadian Study of Health and Aging (CSHA).²² When they asked Canadians aged 65 and older, “how is your eyesight (with glasses or contacts if you wear them)”, a response of “poor” was considered to be “poor vision” and a response of “unable to see” was considered blindness.²² It was found that that 6.2% (n=166) of study participants had “poor vision” while 0.7% (n=19) were considered blind.²² The data from the PALS (2006), CCHS (2003) and CSHA (1991) all suggested a higher prevalence of vision impairment and blindness compared to that of measurement-based data by Robinson et al¹⁰ and Maberley et al⁵. These self-reported surveys included people residing in communities *and* institutions, whereas Robinson et al¹⁰ and Maberley et al⁵ data may have under-sampled institutionalized persons. However, self-reported surveys may also be inaccurate, as questions may be misinterpreted and perception may differ from reality.

The Beaver Dam Eye Study is the only large-scale, population-based study on the long-term incidence of vision loss in North America. This study examined the incidence of visual impairment

and change in visual acuity over a 15-year period in participants aged 43 to 86 at the time of the baseline examination.¹⁴ It was found that 8% (n=325) of the study participants developed low vision and an additional 0.8% (n=34) became legally blind by the North American criteria.¹⁴ It was also found that people aged 75 and older were 12.8 times (95%[CI] 9.6 to 17.1, p<.001) more likely to develop low vision and 20.6 times more likely to become legally blind (95%[CI] 9.5 to 44.8, p<.001) compared with those younger than 75 years of age.¹⁴ The higher incidence of vision impairment found in the older population was also reflected in other Canadian Studies. The Participation and Activity Limitations Survey¹⁸ in 2006 found that Canadians 75 years and older were significantly more likely than the youngest respondents aged 15 to 24 to have a severe seeing limitation (30.5% versus 16.7%). Similarly, the Canadian Community Health Survey²¹ in 2003 found that, while Canadians aged 65 and older made up 14% of the population, they accounted for 23% of all people with vision problems. Thus, aged-related vision loss will likely increase in the future, given that the rate of growth of Canadians aged 54 and older is more than double the 5.9% increase for the entire Canadian population from 2006 to 2011.²³

1.3 The Cost of Vision Loss

Funding for healthcare has been a challenge due to weaker prospect for economic growth and fiscal deficits.²⁴ According to the Canadian Institute for Health Information (CIHI)²⁴, our total health care cost (including public and private sector funding) in 2010 is estimated to be 193.1 billion dollars (\$5659 per person). This amount represents 11.9% of our country's Gross Domestic Product.²⁴ The CIHI also forecasted the annual growth of health care spending in 2012 to be one of the lowest in 15 years, at 0.4% (adjusted to inflation and population changes).²⁴ Care provided by dental, vision care professionals (including services provided by optometrists and opticians, as well as expenditures on eyeglasses and contact lenses) and other health care professionals who are not medical doctors accounted for \$20.5 billion (10.6%) of the total expenditures in 2010.²⁴

Although Canadians older than age 65 account for just over 14% of the population, they consume 45% of government health care dollars.²⁴ Health dollar spending per person for seniors increases dramatically as the age increases, from \$6233 for those age 65 to 69, \$8721 for those 70 to 74 and \$12050 for those 75-79 and \$20,133 for those 80 and older.²⁴ Thus, there is a concern that funding for government health care coverage may be strained in the future.

It was well documented that vision loss has substantial financial impacts in developed countries including Canada²⁵, Australia^{26,27} and United States²⁸. In a study by Access Economics²⁵, it was estimated that the cost of vision loss was \$15.8 billion in 2007 in Canada. Of the total, \$8.6 billion was direct health system expenditure.²⁵ The remainder of the cost came from productivity loss due to lower employment, higher absenteeism and premature death of Canadians with vision loss (\$4.4 billion), dead weight losses from transfers including welfare payments and lost taxation revenue (\$1.8 billion), the value of the care for people with vision loss (\$0.7 billion) and other indirect costs (\$305 million).²⁵

1.4 Co-morbidities

Visual impairment is known to be a strong predictor of self-reported difficulty with activities of daily living (adjusted for age, gender and race).¹⁶ In addition, it has been associated with the risk of falls²⁹, hip fractures^{29,30} and depression³¹. However, vision loss is not the only factor that leads to functional decline associated with vision impairment. For example, a recent study by Steinman et al³⁰ demonstrated that the effects of poor vision in predicting disability in performing activities of daily living were substantially reduced or eliminated when other health covariates were controlled. In their study, these covariates included socio-demographic factors (age, gender, race, marital/partner status and education), biological indicators (systolic and diastolic blood pressure, glycated haemoglobin, body mass index, C-Reactive Protein), self-reported pathology/impairment (arthritis, congestive heart failure, coronary heart disease, angina pectoris, heart attack, stroke, emphysema, chronic bronchitis,

cancer), self-rated mobility/functioning (walking a quarter mile, walking up 10 steps, stooping, crouching or kneeling, lifting or carrying, walking between rooms on the same floor, standing up from an armless chair, standing for about 2 hours, sitting for long periods, reaching up over head, and grasping small objects). Nevertheless, Steinman et al³⁰ found that older persons who reported poor vision were still more than twice as likely as their counterparts with good or better vision to move to the next highest level of disability for attending movies and events (OR=2.51) and managing money (OR=2.66) and more than five times more likely to have greater disability in performing leisure activities at home (OR=5.29). These activities of daily living are highly visual, and this may account for the significant finding.³⁰ This study highlights the importance of considering comorbidities when formulating a vision rehabilitation plan.

Another consideration is the impact of cognitive decline in patients with vision loss. Cognitive impairment is found to be more prevalent and more rapidly progressive in older adults with vision loss compared with those without vision loss.³² In a study that investigated the prevalence of cognitive impairment in older adults referred to a low vision service, 18.8% (n=19) were screened positive and an additional 27.7% (n=28) had borderline scores.³³ Performance on logical memory tests, which require participants to remember a brief story that was read out loud, was worse for these participants compared with the general population.³³ Since vision rehabilitation requires a patient's ability to learn new techniques and usage of new devices, cognitive impairment has important implications in the success of vision rehabilitation.³³

1.5 Cost and Cost-effectiveness of Vision Rehabilitation

In the recent Cost of Vision Loss study in Canada²⁵, the cost of vision rehabilitation (i.e. cost of vision aids, home modifications, rehabilitation cost provided by CNIB [formerly known as the Canadian National Institute for the Blind, but now denoted by its initials alone], the Institute Nazareth et Louis-Braille and Montreal Association for the Blind-Mackay) was estimated to be \$305 million.

But even this estimate is likely incomplete because it does not seem to include the cost of low vision devices from providers other than the CNIB or Assistive Devices Program funding. Although an inpatient multi-disciplinary vision rehabilitation approach (in which the patient is treated intensively for 4-6 weeks in the VA hospital by a team including nurses, optometrists, physicians, psychologists, social workers, and blind rehabilitation therapists) may often be perceived to be superior, the cost of providing this calibre of service is high compared with outpatient low-vision service that often consists of an optometrist, low-vision therapist and administrative staff. The average cost for an inpatient blind rehabilitation centre programme for veterans with macular diseases was \$43681.70 (95% confidence intervals +/-8853.60) and that of an outpatient low-vision programme was \$5054.40 (95% confidence intervals +/-404.7).³⁴ On average, the Veteran Affairs inpatient blind rehabilitation centre costs \$38627.30 per patient more than the outpatient programme, which consisted of an initial evaluation with an optometrists and low-vision therapist, a home visit, the outpatient patient training programme, and prescription and issuance of low vision devices.³⁴ There is currently no study on the cost of low vision service provision by any other means. Understandably, the cost effectiveness of providing low vision service must be further examined as health care dollars are limited.

1.6 Effectiveness of Low Vision Rehabilitation

Studies on the effectiveness of vision rehabilitation service are needed to improve access and quality of care. Moreover, the outcome of low vision rehabilitation must be measured to justify the provision of low vision service within managed care plans.

1.6.1 How Effectiveness is Measured

A variety of quality-of-life questionnaires has been used in evaluating the effectiveness of low vision service provision. Of note, the Vision Quality-of-Life Core Measures (VCM1)³⁵, the National Eye Institute Visual Function Questionnaire (NEI-VFQ)³⁶ and the Veterans Affairs Low Vision

Quality of Life Questionnaire (LV VFQ)³⁷ are validated questionnaires which have been developed specifically for patients who suffer from vision loss due to a broad range of ocular conditions.³⁸ Thus, they allow for cross-study comparisons of low vision service provision. The NEI-VFQ focuses specifically on vision-targeted functioning and the influence of vision problems on generic health domains such as emotional well-being and social functioning.^{36, 39} The VCM1 questionnaire is considered to be weighted more towards psychological aspects of visual impairment.^{38, 40} However, both of these questionnaires were developed using participants with reduced vision from potentially treatable conditions including cataract.^{35, 36, 38} On the other hand, the LV VFQ was designed specifically to measure vision rehabilitation outcome, using subjects with uncorrectable vision impairment.³⁷ The majority of questions on LV VFQ address functional elements, including general vision, mobility, and lighting issues, reading and fine work, and activities of daily living.³⁷ It also contains a subsection on psychological adjustment.^{37, 38}

Although researchers have not arrived at a consensus on the definition of successful vision rehabilitation, they have gathered some information about the effectiveness of LVS thus far.

1.6.2 Effect of Vision Rehabilitation on Functional Ability

Numerous studies have demonstrated that low vision service can help improve reading ability in a clinical setting.^{38, 41, 42, 43} However, the clinical measurements of visual function do not always translate to improvement in patient's ability to perform activities of daily living.³⁸ In one study by Leat et al⁴¹, 75% of study participants demonstrated the ability to read 1M print in clinic after low vision intervention, but only 35% of them were able to read regular-sized print at home.

At least one well-designed study shows that low vision services have a significant positive effect on self-reported functional ability. This was the Veterans Affairs Low Vision Intervention Trial (LOVIT)⁴², Stelmack et al's waitlist controlled randomized clinical trial (RCT). The study utilized the change in LV-VFQ score to study the outcome of vision rehabilitation. The treatment group

demonstrated significant improvement in all functional domains compared with the control group. A large effect size was seen in reading (2.51), mobility (1.14), visual information processing (2.03) and visual-guided motor skills (1.82) over a four month period.⁴² However, this RCT was conducted in a Veterans Affairs Hospital, which would be both resource and funding-intensive. It is not known which component of the low vision services contributed to the large positive effect. It is also not known whether this effect will occur in other types of low vision services. LOVIT II is currently underway. This is a single masked multi-centre randomized controlled trial which compares basic low vision (low vision exam, device(s) dispensed, no low vision therapy) and low vision rehabilitation (basic low vision plus low vision therapy).⁴⁴

1.6.3 Effectiveness of Low Vision Aids

Effectiveness of low vision aids can be measured by frequency of use and rate of abandonment. Research thus far mostly indicated a high usage of low vision aids in different models of vision rehabilitation settings. In one study by Reeves et al⁴⁰, the rate of usage for at least one visual aid twelve months after initial low vision intervention was 95% (n=57) in conventional Low Vision Rehabilitation (LVR) only (vision rehabilitation provided by optometrists working in the hospital eye service, with a main focus on minimizing limitations in activities by low vision aids and lighting advice), 90.6% (n=58) after conventional LVR with supplementary home visits by trained rehabilitation officers, and 95.7% (n=67) after conventional LVR with home visits by community care workers. Similarly, Ryan et al's⁴⁵ study of a new community-based low vision service in Wales found that 80.3% of patients who were prescribed with low vision aids had used them at least once in the previous week even 18 months after they received low vision services. It appears that the usage of low vision devices is high regardless of the rehabilitation setting.

On the other hand, factors responsible for abandonment of low vision aids can indicate what hinders the effectiveness of these devices. Watson et al's⁴⁶ study of aid usage in patients who had

been prescribed visual aids in a Veteran Affairs Hospitals found that the most common reason given for discontinuation of device usage was that another aid was used for reading in place of the discontinued aid (16%, n=29), poor ergonomics of the device (11%, n=19), dislike of the optical design (11%, n=19), inadequate magnification (9%, n=17) and a further deterioration in vision (9%, n=17). Similarly, Dougherty et al⁴⁷ found the following most common reasons for visual aid abandonment; ineffective device (33%, n=6), another aid used in place of the discontinued aid (28%, n=5) and vision had worsened (17%, n=3).

Interestingly, in Watson et al's study⁴⁶, demographics factors such as age, acuity and etiology were not related to continued use. Having a person who helped to perform tasks in the home was significantly associated with continued use of devices (OR 1.9, $\chi^2 = 7.53$, p=0.006).⁴⁶ The number of tasks that the device was used for, frequency of use and ease of use of the device were significantly associated with the patient's rating of a low vision device being "extremely" or "quite a bit" important (p<.0001).⁴⁸ Thus far, the only demographic factor associated with abandonment of low vision devices was visual field loss outside the central 20 degrees.⁴⁷

1.6.4 Effectiveness of Improving Patient's Vision-related Quality of Life and Depressive Symptoms

Although a number of studies have demonstrated significant improvements in "vision-related quality-of-life" following rehabilitation, items related to functional measures (particularly near vision), have demonstrated the greatest sensitivity to intervention.³⁸ A wait-list controlled clinical trial⁴² has demonstrated that an outpatient low vision program did not reduce self-reported symptoms of depression, as measured by the Center for Epidemiological Studies Depression Scale (CES-D). However, the service did not contain a specific counselling or psychological interventions.^{38, 42}

1.6.5 Effectiveness of Vision Rehabilitation on Generic Quality of Life

Thus far, there is little evidence that low vision rehabilitation improves generic health-related quality of life except for group-based interventions.³⁸ In Stelmack et al's⁴² wait-list controlled randomized veteran affairs trial, the trends toward improvement in physical role limitation ($p=0.08$) and mental health ($p=0.07$) on the Short Form-36 Health Survey scores were not statistically significant between the treatment and control groups.

Girdler et al⁴⁹ conducted a randomized controlled trial on adults 65+ with vision loss undergoing either the “usual” low vision service by a not-for-profit community agency or an “extended care model” in which subjects received additional self-management group interventions. The group under the extended care model demonstrated significantly better outcomes on all general health measures than the group receiving the ‘usual’ care, as measured by the Australia/New Zealand version of the SF-36 Health Survey.⁴⁹ The extended care model group also demonstrated significantly better physical and mental health (measured by the SF-36 physical components summary scores and medical components summary scores) and generalized self-efficacy scale when compared with the control group ($p=0.019$ to 0.001).⁴⁹

1.7 Effectiveness of Different Models of Low Vision Service Delivery

Several studies incorporated comparison groups in the evaluation of low vision services. Most studies compared optometric versus multi-disciplinary models of low vision service using quality of life questionnaires, and observed little difference in outcomes.³⁸ De Boer et al⁵⁰ conducted a large study ($n=296$) where outcome was measured using the VCM1 and LV QOL vision-related quality of life measures one year after intervention. Participants were referred to the two widely used types of low vision services in the Netherlands – optometric low vision service or regional multi-disciplinary rehabilitation centres. The optometric low vision service provides advice on the suitability of LVA, instruction on usage and ordering of aids when appropriate, whereas multi-disciplinary rehabilitation

centres may provide, if appropriate, training in activities of daily living by an occupation therapist, counselling by a social worker or psychologist and advice on home environmental modifications.⁵⁰ No differences were found in one-year outcomes after rehabilitation between optometric and multi-disciplinary low vision services, except for the mobility subscale of the LVQOL.⁵⁰ Subjects participating in optometric low vision services showed less deterioration in mobility than participants referred to multi-disciplinary services.⁵⁰ The author suggested that chance finding and selection bias are possible reasons for this finding.⁵⁰

Reeves et al⁴⁰ conducted a randomized controlled trial that compared the outcome of patients undergoing standard optometric care with patients undergoing standard optometric care plus additional home-based vision rehabilitation, and patients undergoing standard optometric care plus additional home-based visits that did not include vision rehabilitation. The main outcome measure was the mean score of VCM1. No significant difference was found between the different treatment arms one year post-intervention.⁴⁰

La Grow et al⁵¹ used the NEI-VFQ 25 as the main outcome measure for the comparison between services typically available to persons with age-related vision loss and comprehensive low vision services. The services that were typically available included clinical low vision services and field services (assessment and instruction in independent living skills, orientation and mobility skills, communications, recreational and leisure activities). Comprehensive low vision services included assessment of ocular health and functional vision, prescription of optical and non-optical aids, loaning and training of prescribed aids and follow-up in the patient's home. Participants in the comprehensive low vision services group were compared with a control group, matched on age, sex, ethnicity, and perceived visual difficulty. Again, no significant differences were found.

1.8 Current Landscape of Low Vision Services in Canada

There is no cohesive or systematic provision of low vision services across Canada. The main providers of low vision services include optometrists, ophthalmologists, opticians and CNIB low vision specialists in various settings. Low vision services may be provided in independent professionals' offices, in hospital settings, within CNIB premises or within educational institutions.

1.8.1 Professionals Involved in Low Vision Service Provision

Low vision providers include optometrists, ophthalmologists, CNIB specialists, opticians, nurses and vendors of vision aids. The sections below are an attempt to analyze the strengths and/or weaknesses of each main type of alternative providers of clinical low vision assessment.

1.8.1.1 Optometrists

The following considerations on the suitability of optometrists in providing low vision service pertain mainly to the provision of clinical low vision assessment and prescription of low vision aids, although they also may be involved in the broader spectrum of low vision rehabilitation. Clinical low vision assessment, also defined by the Lighthouse International as a “structured low vision examination”, is an assessment of visual function, which includes the determination of visual acuity at distance and near with the ETDRS charts and functional testing techniques including the Amsler grid, contrast sensitivity testing, and the Brightness Acuity test.⁵² The information gathered from the clinical low vision assessment enables a practitioner to prescribe the appropriate low vision devices and/or refer for other services or testing procedures.⁵²

Optometrists trained in Canada receive instructional courses and clinical training on low vision during their four years of professional study. Optometrists trained at the University of Waterloo receive a 3rd year instructional course on low vision, with additional laboratory experience and 4th year clinical rotation in the School's Low Vision Clinic to gain hands-on experience.⁵³ Optometry students at the University of Montreal received similar training.⁵⁴ The combination of their extensive

training in optics and eye health prepares them to be qualified in clinical low vision assessment and provision of all optical and some non-optical low vision devices, plus training in their use. Doctors of Optometry may pursue additional training through residency programmes. Community-based optometrists typically perform functional low vision assessments and training in the use of low vision devices in their private offices. Alternatively, optometrists may also work with or within multi-disciplinary clinics or organisations such as CNIB to serve patients with vision impairment.^{55, 56} As they are primary gatekeepers of eye health, patients can self-refer for the low vision services that optometrists provide in the office setting, making their provision of rehabilitation easily accessible.

1.8.1.2 Ophthalmologists

Ophthalmologists are also suitable candidates for providing functional low vision assessment. Their training involves a four-year Doctor of Medicine programme, and an additional residency in ophthalmology for at least five years. However, accessibility to an ophthalmologist for low vision service would be challenging. First, long wait time could be a potential deterrent. Gold et al's⁵⁷ study found that approximately 90% of ophthalmologists indicated the average wait time for their patients' first consultation was about three months. Secondly, access to an ophthalmologist generally requires a referral – patients cannot access the services directly. Also, ophthalmologists who currently work in the field of low vision are typically based in hospitals^{56, 58} or educational institutions⁵⁵.

Ophthalmologists may be assisted by a nurse, orthoptist, occupational therapist or a technician depending on the set-up.⁵⁶ Whereas low vision is an integral part of the Canadian optometry curriculum, it is an elective taught during ophthalmology residency and this subspecialty training is only available in three of fifteen universities in Canada.⁵⁹ In summary, even though ophthalmologists may be capable of providing low vision services, they may not be readily accessible or have the potential of meeting the future demand.

1.8.1.3 Opticians

Compared with ophthalmologists, opticians are much more readily accessible to the public. They go through two to four years of training through one of seven optician programs available in Canada.⁶⁰ Their education on low vision is typically embedded within a course as a topic that addresses the fitting of more complex and specialized prescriptions, including low vision aids.⁶¹⁻⁶⁴ To the author's knowledge, opticians may not issue prescription head-borne low vision devices. Other than the province of British Columbia⁶⁵, opticians' scope of practice does not include refraction, except over contact lenses. Since population-based studies demonstrate that vision impairment can often be improved with proper refractive correction^{10, 17, 66}, refraction should be an integral part of a functional vision assessment. Nevertheless, opticians can be an invaluable member of a low vision team because of their knowledge and involvement in dispensing.

1.8.1.4 CNIB Low Vision Specialists

The role of CNIB Low Vision Specialists is to perform functional low vision assessments within the organization.⁶⁷ They are the staff members who perform functional low vision assessments except in several low vision clinics where CNIB has a partnership agreement with ophthalmologists and/or optometrists.^{55, 58} Low vision specialists are graduates from a post-secondary institution with a major in health science or vision rehabilitation.⁶⁷ In order to become a low vision specialist, they must "meet the requirements of the CNIB National Low Vision Specialists Training Program, which includes self-study, successful completion of the Johns Hopkins LV Training Program, practicum, one-year mentorship and final exam leading to full certification".⁶⁸ Because CNIB is the main provider of low vision service in Canada, the service of low vision specialists to Canadians would be vital. However, similar to opticians, their scope of practice does not include refraction or the prescription of head-borne low vision devices.

1.8.1.5 Other Low Vision Service Providers

Orthoptists, nurses, vendors of vision aids and other individuals may also provide low vision service to individuals in need. To my knowledge, low vision services are not regulated in Canada, with the exception that the prescription of spectacle-mounted low vision aids is a regulated act and that access to funding (e.g. ADP) may require registration to be an authoriser or provider.

1.8.2 Conceptual Framework of Vision Rehabilitation System in Canada

Low vision is a field of healthcare that integrates the services of many health professionals.⁶⁹ Low vision optometrists provide functional vision assessment and prescribe for optical aids.⁶⁹ As can be seen, optometrists are not the exclusive providers of low vision services. Other health care providers may also provide low vision services.⁶⁹

Figure 1-1 is an illustration of the prescribing rights of different personnel involved in vision rehabilitation in Ontario. The prescribing rights are based on the current policy of the Ontario Assistive Devices Program (ADP).⁷⁰ The policy of ADP is chosen for illustration because the policy manual is readily available for public access. The ADP helps eligible Ontarians fund their visual aids. Other health professionals mentioned in the purple bubble are not directly involved in the Assistive Devices Program. However, they are included to illustrate the multi-disciplinary nature of vision rehabilitation.

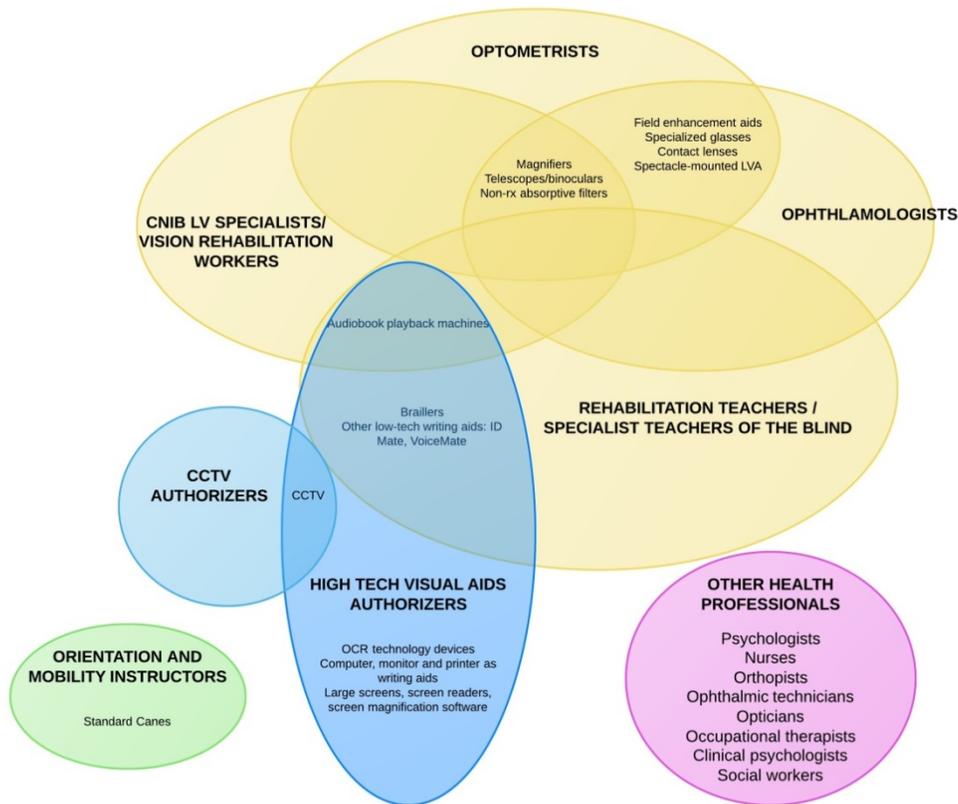


Figure 1-1: Prescribing rights of low vision service providers

Most Canadians with low vision gain access to the vision rehabilitation system via their ophthalmologist, optometrist, family physician or by self-referral. A diagram that outlines the process of vision rehabilitation is shown below in Figure 1-2. Thus, there are many ways in which people may not make their way through the system and these barriers, which prevent people from accessing low vision service, are described in more detail in the following chapter.

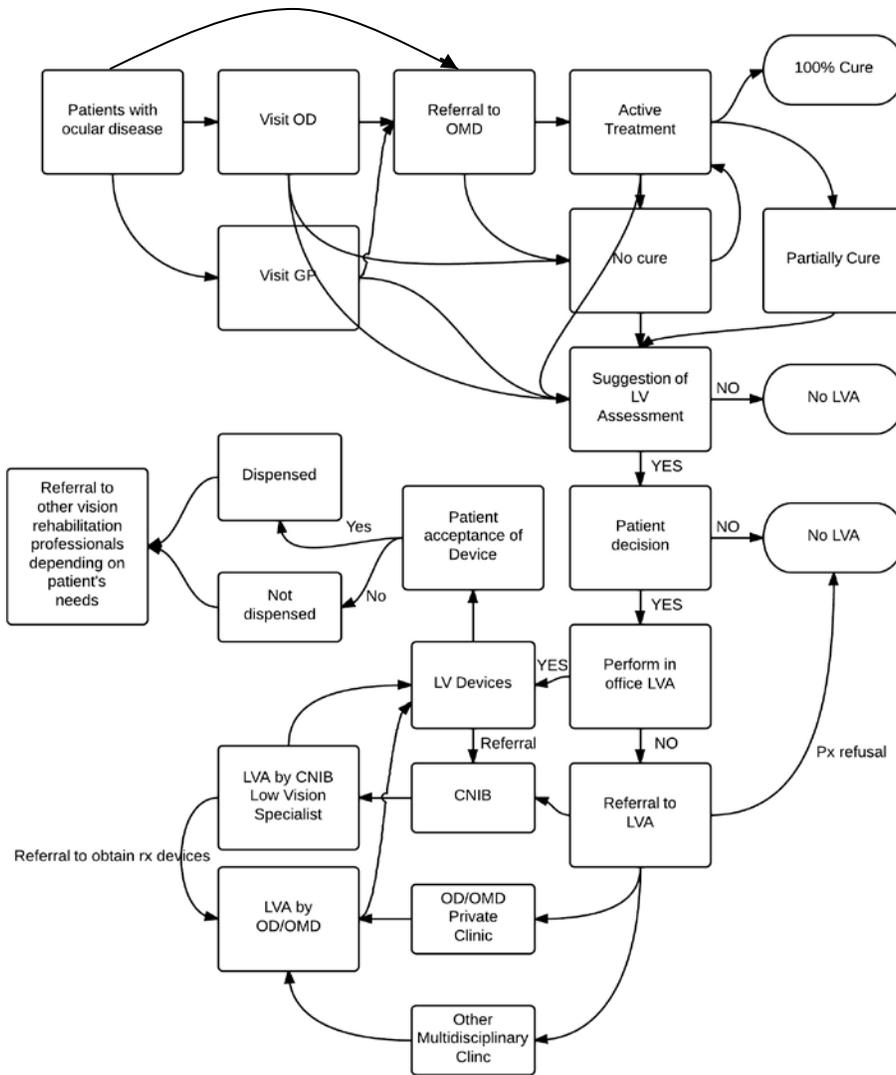


Figure 1-2: The many possible routes to vision rehabilitation

See list of abbreviations

1.9 Low Vision Clinics or Settings for Low Vision Services

1.9.1 CNIB

CNIB is a nationwide, community-based registered charity established in 1918.⁷¹ It has over 1,100 staff and over 10,000 volunteers providing programs and services for people of all ages.⁷¹ It also offers varying levels of vision rehabilitation including low vision aids, assistive technology, counselling, mobility training, independent living services and an accessible library. Although services are free-of-charge to CNIB clients, program delivery and availability varies locally and financial support is highly dependent on public donation and government support.⁷² The majority of patients are referred by optometrists and ophthalmologist to CNIB. However, it is not known how many patients are referred to the CNIB without receiving refraction, accurate low vision acuity measurements and information about eye disease.⁷³

1.9.2 Centre for Sight Enhancement at University of Waterloo (CSE)

The Centre for Sight Enhancement (CSE) is a clinical, research and teaching facility at University of Waterloo School of Optometry and Vision Science. It is the only facility in Canada that is accredited by the National Accreditation Council for Agencies Serving the Blind and Visually Handicapped (NAC)⁷⁴, a council created with the goal of bringing structure and best practices to agencies serving the blind⁷⁵. Services at the CSE include optometric low vision assessment, assessment for high-tech visual aids including video magnifiers and computers, demonstration of daily living devices, counselling and advocacy services, referral and liaison with community resources, and low vision research. These are provided by optometrists, a low vision therapist, low vision rehabilitation counsellor and high technology specialists. The CSE also houses the Sight Enhancement Equipment Pool and Assessment Centre, which administers high technology assistive devices for the Ontario

Assistive Devices Program (ADP). Low vision services provided by the CSE are not covered under the provincial health plan.

1.9.3 Government-sponsored Rehabilitation Centres in Quebec

These rehabilitation centres in Quebec provide the majority of vision rehabilitation services to people in Quebec. The centres include l'Institut Nazareth et Louis-Braille (INLB) and Montreal Association for the Blind-Mackay Rehabilitation Centre (MMRC). Multi-disciplinary services are provided through professionals including optometrists, occupational therapists, orientation and mobility counsellors, psychologists and social workers. They are fully supported through Medicare by the Quebec health insurance board, the Regie de l'Assurance Maladie du Quebec (RAMQ).

1.9.4 Other Multi-disciplinary Low Vision Clinics

There are also other low vision clinics which are multi-disciplinary to various degrees. For example, CNIB has partnered with the Department of Ophthalmology at the Royal Alexandra Hospital in Edmonton to provide low vision clinics.⁵⁸ Whereas CNIB handles referrals and bookings, the ophthalmologists provide the eye exam and low vision assessment, and the optician is available for consultation and equipment sales.⁵⁸

1.9.5 Independent Providers

Optometrists and ophthalmologists may choose to provide low vision rehabilitation in their offices. This may be done alone or in conjunction with a training assistant or another professional. This may also be done in conjunction with CNIB in CNIB premises.

1.10 Conclusion

The research studies thus far have demonstrated that the prevalence of vision impairment will likely increase as the Canadian population ages. The social, economic and societal cost of vision loss is tremendous. There is a lack of healthcare planning to address the needs of people with low vision. Currently, there are multiple routes for patients with low vision to obtain vision rehabilitation. What is not known still, is the effectiveness and quality of the different types of low vision service delivery. There is a tremendous need to build a model for vision rehabilitation in Canada. Canadians who suffer from vision loss deserve to receive high quality and effective low vision services.

A first step is to determine a more accurate picture of the current provision of low vision services by each type of provider. The purpose of the present study is a survey of the extent of provision of low vision services by optometrists, their referral patterns and their perceptions of the quality of services in their local communities.

Chapter 2

Barriers to Accessing Low Vision Rehabilitation

This chapter is published as follows:

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This article was written by Norris Lam. Guidance, editing and suggestions were by Susan Leat.

2.1 Overview

Objective: To review the literature regarding barriers that hinder access to low-vision (LV) care from the perspective of individuals with vision impairment.

Design: Literature review.

Methods: PubMed and Scopus were used to identify relevant cross-sectional studies of awareness of, and barriers to, LV rehabilitation. Studies were included if they met the following criteria: (i) year of publication within the past 20 years (between 1992 and 2012), and (ii) participants of the study included individuals with vision impairment. Fourteen studies met the criteria for inclusion and were included in this review.

Results: Barriers to accessing low-vision service (LVS), from the perspective of individuals with vision impairment, included the following: misconceptions of LVSs, miscommunication by eye care professionals, lack of awareness, location and transportation, the need to appear independent, negative societal views, influence of family and friends, insufficient visual impairment to warrant services, cost of LVS, and reduced perception of vision loss relative to other losses in life. Other factors that were associated with lower use of LVS included income level, comorbidities, and education level.

Conclusions: The reasons for not accessing LV rehabilitation are complex, and some may be more easily addressed than others. A heightened awareness of LV rehabilitation may be achieved with better communication by eye care professionals and with public education. The stigma associated with the usage of LV aids and admitting a disability still seems to exist, but may be reduced by increasing societal understanding of LV.

2.2 Introduction

In the Participation and Activity Limitation Survey (PALS) of 2006, 9% of Canadians aged ≥ 65 years reported a visual disability.¹ This age group is projected to reach 20-26% of our national population by 2025-2031.² By combining these data (25% x 9%), it can be inferred that at least 2.25% of the Canadian population may experience a visual disability as early as 2025. This is a minimum figure, as it does not include those who are younger than 65 years with visual impairment. The financial cost of vision loss in Canada has been estimated at \$15.8 billion per annum in 2007.³ This figure excluded the value of lost well-being (disability and premature death), which was estimated to be an additional \$11.7 billion.³ Thus, visual impairment is a significant problem and rehabilitation, which can reduce some of the personal costs, is an important issue. Although the demand for low vision (LV) service should be high, the rate of awareness and the use of LVSs continue to be low, ranging from 29-75%.⁴

⁷ The objective of this review is to describe the barriers that prevent access to low-vision (LV) care from the perspective of individuals with vision impairment.

2.3 Methods

This review included studies that investigated barriers to LVSs as perceived by individuals with vision impairment. Relevant studies were identified through a MeSH search in Scopus and PubMed using the following terms: “delivery of health care OR health services accessibility” AND “barrier*” AND “low vision OR vision rehabilitation.” Additional studies were sought through the citations of already identified papers.

To be included, studies had to meet the following criteria: (i) year of publication within the past 20 years (1992-2012); (ii) participants of the study included people with vision impairment. The method and results were extracted from each relevant study using a data collection form. From this form, barriers were classified into themes.

2.4 Results

2.4.1 Characteristics of the Studies

Fourteen studies were identified as meeting this study's criteria. Eight studies were from Canada, 3 were from Australia, 2 were from the United States and 1 was from Finland. A summary of the studies is given in Table 2-1.

Table 2-1: Summary of studies by study setting and participants

Study	Country	Study Setting/ Type of Study	Type of Study(s) and Type of Participants	Total # Participants Who are VI	Are Patient Participants Aware of LVR?		Do Patient Participants Use LVR?	
					Aware	Unaware	User	Nonuser
Southall and Wittich (2012) ⁷	Canada	Hospital/ qualitative	Focus group participants recruited through their involvement in the Montreal Barriers Study ¹⁵	21	YNI	YNI	YNI	YNI
Overbury and Wittich (2011) ¹⁵	Canada	Hospital/ quantitative	Three phases of this study (Montreal Barriers Study): <i>Phase I:</i> survey: patients with BCVA <6/21, from OMD clinics at 4 university-affiliated hospitals in Montreal, QC. <i>Phase II:</i> follow-up of agency files to ascertain level of vision loss at time of first contact with rehabilitation service providers for patients who choose to use the service <i>Phase III:</i> follow-up of agency files to track whether patients who were initially unaware of LVS had successfully found their way into the rehabilitation system after they were made aware of LVS by the research group	702	67% (phase 1)	33%	54% (phase 1)	46%
Spafford et al (2010) ⁷	Canada	Community/ qualitative	Semistructured interview: seniors >70 years of age, from southwestern region of Ontario who had self-reported noncorrectable vision loss affecting daily functioning and who had not sought LVS	34	26%	74%	-	100%
Matti et al (2011) ¹⁷	Australia	Nonprofit LV centre/ quantitative	Prospective review of all new referrals to the Royal Society for the Blind of South Australia over 1 year	1116	100%	-	97%	3%
Mwilambwe et al (2009) ¹	Canada	Hospital/ quantitative	Survey: patients with BCVA <6/21, from OMD clinics at 4 university-affiliated hospitals in Montreal, QC	448	71%	29%	57%	43%
Laitinen et al. (2008) ¹⁰	Finland	Finland/ quantitative	Cross-sectional population-based survey. Vision impairment defined as binocular VA <6/24	147* (out of 6645)	-	-	79% of those	21% of those
O'Connor et al. (2008) ¹³	Australia	Hospital/ quantitative and qualitative	Survey: patients with BCVA <6/12, from Royal Victorian Eye and Ear Hospital, Melbourne, Australia	98	100%	-	49%	51%
MacLachlan et al. (2007) ⁹	Canada	Setting unclear/ qualitative	Qualitative phenomenologic approach with female nonusers of LVS; two semi-structured, in-depth interviews 1. In-person with open-ended questions 2. Phone/person – clarify and probe deeper into issues that were raised during the first interview A general descriptive questionnaire NEI VFQ-25 Vision Function Questionnaire	4	YNI	YNI	-	100%
Gold and Simson (2005) ¹⁰	Canada	Setting unclear/ quantitative	Online and phone survey of adults aged ≥21 years with vision loss. Recruited randomly from CNIB client database, promotional materials in consumer publications, web sites and list serves, interviews, random contacts through professional and other organisations, and word of mouth	352	Unclear	Unclear	Unclear	Unclear
Nia and Markowitz (2007) ⁵	Canada	Hospital/ quantitative	Interview of patients with LV regarding the provision and utilization of LVS, and their satisfaction with the services provided in 2 hospitals in Toronto, ON	34	Unclear	Unclear	Unclear	Unclear
Siemsen et al. (2005) ¹⁹	United States	Hospital/ quantitative	Survey of the use of a patient-education consultation to enable patients and their families to take better advantage of VLS; participants were patients involved in a new Mayo Clinic program within the first 7 months of its operation	34	100%	-	100%	-
Gold et al. (2006) ¹¹	Canada	Nonprofit LV centre/type of study unclear	Telephone survey: seniors from the CNIB Mailed survey: OMD, OD, OO Short email questionnaire: VR workers	30	100%	-	100%	-
Walter et al. (2004) ¹⁶	United States	West Virginia/ quantitative	Telephone survey: random sampling of households in West Virginia to assess barriers to vision treatment experienced by individuals with visual health problems and individuals with LV	57** (out of 1026)	19% of those	81% of those	12% of those	88% of those
Pollard et al. (2003) ⁸	Australia	Hospital/ quantitative and qualitative	Interview: patients with BCVA <6/12, from Royal Victorian Eye and Ear Hospital, a tertiary hospital in Melbourne, Australia Focus group: people who had received assistance from LV organizations and volunteers with the Vision Australia Foundation	80	42.5%	57.5%	36%	64%

LVR, low-vision rehabilitation; YNI, yes, but no specific percentage was reported; BCVA, best corrected visual acuity; LVS, low-vision service; LV, low vision; VA, visual acuity; NEI, National Eye Institute; VFQ, Vision Function Questionnaire; OMD, ophthalmologist; OD, optometrist; OO, optician; VI, visual impaired; VR, vision rehabilitation workers

*147 out of 6645 were found to have visual impairment. The percentage of those who were users or non-users is calculated as a percentage of 174.

**57 out of 1026 surveyed had visual impairment. Percentage of those who were aware/unaware or users/non-users is calculated out of 57.

2.4.2 Outcome Measures: Barriers Perceived by Patients

2.4.2.1 Misconceptions of Low Vision Service

Misconceptions of LVS was investigated in 8 of the 14 studies^{5,7-14}, which showed that many people with vision impairment do not understand what vision rehabilitation entails. Pollard et al.'s study⁸ demonstrated that 26.3% (21/80) of the participants with vision impairment did not identify themselves as having LV or did not understand this term. Of these 21 participants, 90.4% (19/21) were individuals with mild-to-moderate vision impairment.⁸

A majority (70.6%; 24/34) of older nonusers of LVS who self-reported vision loss that notably affected their daily functioning felt that they could “manage” critical tasks, had a visually able helper, or felt that they were not “blind”.⁸ Older nonusers of vision rehabilitation service who were “managing” tended to have a misconception that the service should only be used when a person was blind^{81, 82} or required a great deal of assistance to accomplish daily living tasks.⁹ Individuals with vision loss tended to assistance only when vision was compromised enough that valued activity could no longer be performed.¹² In 2 studies^{8,13}, 40% of referred patients declined LV assessment because they did not feel the need for vision rehabilitation or felt that the service would not benefit them. In general, people felt that vision rehabilitation services can be beneficial, but they were not certain when they may access the service.⁹ MacLachlan et al.⁹ suggested that this perception may be because of the gradual nature of the patient’s vision loss and the desire to avoid the service for “as long as possible”.

Individuals with moderate vision impairment received vision rehabilitation less often than those with severe vision impairment⁸⁷ and were less likely to be made aware of LVS.¹⁵ An increased subjective severity of vision loss was associated with increased readiness to seek LV help.¹² Mwilambwe et al.’s⁵ study found that among those who were aware of LVSs, “those who had visual acuity between 20/200 [6/60] and 20/400 [6/120] and those who had visual acuity worse than 20/400 [6/120] were

more likely to take advantage of vision rehabilitation compared with those with visual acuity between 20/70 [6/21] and 20/200 [6/60]”. Therefore, better visual acuity is associated with less awareness, and once a patient with better visual acuity is aware, better visual acuity is also associated with lower uptake of services.

2.4.2.2 Miscommunication by Eye Care Professionals

This theme was explored in 7 of the 14 studies.^{7-9, 11-13, 15} The actions and inactions of eye doctors were cited to be both crucial facilitators and barriers, respectively, of the utilization of LVS. Approximately 85% of Australian participants stated that having a referral or being provided with information about vision rehabilitation was a facilitating factor for the use of LVS¹³, whereas negative behaviours and attitudes of eye doctors have been found to be barriers.^{7, 12, 13} In Ontario, 64.7% of participants reported that lack of communication or poor communication contributed to the nonuse of LVS.⁷ Individuals with LV found that their eye doctor’s attitude ranged from providing information about their vision condition¹¹, referral for rehabilitation^{11, 15, 16}, to providing little to no information^{7, 8, 13}, to stating that nothing can be done^{8, 11}. In both the studies by Mwilambwe et al.⁵ and Overbury and Wittich¹⁵, there was a strong relationship between level of visual acuity and awareness of LVS, which implies that eye doctors are not informing patients about LVS until visual acuity has deteriorated to legal blindness. In both studies, over 40% of patients with moderate visual impairment were not made aware of LVS. In Pollard et al.’s⁸ Australian study, 3 of the 5 referred patients did not attend LVS because they were “waiting until their eye treatment was finished”. In Quebec, even when patients agreed to go and the administrative work for referral had been done (as part of the research study), 25% of these patients were still not referred because of a “negative choice of the ophthalmologist”.¹⁵ We interpret this negative choice to mean that, despite the paperwork being done, the ophthalmologist still did not complete the referral.

2.4.2.3 Lack of Awareness

Seven studies included patients who were unaware of LVS.^{5, 7-10, 15, 16} In a community-based Ontario study on elderly nonusers, 25 of 34 (73.5%) of the participants were unaware that LVS existed.⁷ Pollard et al.'s⁸ study revealed that 57.5% (46/80) of participants in a hospital setting were never referred to LVS. Studies by Overbury and Wittich¹⁵ and Mwilambwe et al.⁵ found that a poorer level of visual acuity was strongly associated with greater awareness. Those who used vision rehabilitation services had a longer duration of impairment than those who were unaware of the existence of the services.¹⁵ Additionally, Blacks, those with French as a first language, those who did not know the cause of their vision loss and those with diagnoses other than age-related macular degeneration were significantly less aware of LVS.^{5, 15}

2.4.2.4 Location and Transportation

This barrier was investigated in seven of the fourteen studies.^{5, 7-10, 15, 16} Spafford et al.'s community-based study revealed that location (urban versus rural) was not an accessibility issue for nonusers of LVS⁷, nor was location a significant factor for the use of eye care services in Finland.¹⁴ These findings are surprising, as it is believed that a rural location would lead to poor access to LVS.¹¹ Alternatively, LVS being provided close to the referral site has been cited as the top factor facilitating a decision to visit the low vision centre.¹³

Transportation may be an issue for people trying to access LVS. People with ocular disorders were 3 times more likely to give up driving and transportation may have become much more difficult if it involved interacting with others who had normal vision.^{8, 12} Yet, in Australia, only 11.1% of people with vision impairment accessed volunteer transport services, although 92% lived within 50km of the low vision centre.¹⁷

2.4.2.5 The Need to Appear Independent

This theme was explored in six of the fourteen studies.^{7-9, 12, 13, 15-17} A U.S. population-based study found that there was an association between living alone and having an ocular disorder (i.e., individuals with ocular disorders being 1.65x more likely to live alone than individuals with normal vision).¹⁶ Individuals with vision impairment who lived independently were also less likely to use LVSs.¹⁵ The need to appear to be independent seems to be a barrier to accessing LVSs^{7-9, 15} even though a main purpose of LV rehabilitation is to maintain independence. Despite awareness of the negative impact of low-vision upon their lives, many people avoided LV rehabilitation. They felt that the action of obtaining help threatened their sense of independence and normalcy,^{7, 9} and that revealing their visual impairment would lead to pity, stereotyping and discrimination.^{7, 12}

2.4.2.6 Impact of Societal View and Influence of Family and Friends

This theme was explored in six of the fourteen studies.^{5, 7-9, 12, 17} The perceived negative view of people with vision impairment by society is attributable to general lack of knowledge and understanding of LV.^{7, 8} People with LV view their relationship with family and friends as stressful.¹² They find that people with normal vision do not believe that they have a visual impairment because they do not appear “blind”.⁸ They do not wish to feel devalued in their community⁸ and/or to be viewed or treated as a person with disability.⁹

Family and friends may have a substantial influence on the patient’s decision to access LV care. Matti et al.¹⁷ noted that family members made the decision for 6 of 8 candidates to decline LVS.

Healthcare providers involved in LV care shared a common view that referral refusers tend to be non-English speakers because many of these patients receive strong family support and, therefore, may not feel the need for LVS.⁵ Interestingly, Spafford et al.⁷ found that “only those who had daily access to visually able and willing people, seemed prepared to ‘let’ someone else ‘manage’ critical tasks, but usually this delegation was seen as negatively affecting their quality of life.”

2.4.2.7 Cost and Income Level

Five studies investigated cost or income level, or both, as a barrier.^{7, 10, 11, 14, 16} Only 5.9% (2/34) of nonusers identified cost as a reason for not obtaining LVS in Spafford et al.'s study.⁷ This study, however, took place in Ontario, where most of the cost of devices is paid by the Assistive Devices Program. However, a CNIB study suggested that the expense of vision aids was high and cost can be a prohibitive factor for users of vision rehabilitation services across Canada.¹¹ Studies in Canada, the United States, and Finland all showed that people with vision impairment are more likely to be unemployed or have a lower income than the general population.^{5, 10, 14, 15} The West Virginia study revealed that people with LV were 2.5x more likely to have an income of less than \$20,000 a year,¹⁶ and in 2005, 48% of Canadians with LV surveyed by CNIB had income of less than \$20,000 a year.¹⁰ The mean income for Canadians with vision loss was \$10,000 lower than Canadians without disabilities in 2001.^{1, 18}

2.4.2.8 Comorbidities

In 5 of the 14 studies, the role of comorbidities was investigated.^{5, 13-15, 17} In the studies by Mwilambwe et al.⁵ and Overbury and Wittich¹⁵, self-perception of health status was not associated with awareness of LV or participation in LVS. Alternatively, Matti et al.¹⁷ found major concurrent health problems to be among the most common reasons for declining LVS and O'Connor et al.¹³ similarly found that poor health was a common reason for refusing referral, for non-attendance, or both. Only 1 study investigated the impact of cognitive ability and institutionalisation. Both these factors were independently associated with lower uptake of LVSS.¹⁴

2.4.2.9 Education Level

This barrier was investigated in three of the fourteen studies.^{5, 15, 19} Contradictory evidence exists whether education is associated with people's awareness of LV. Overbury and Wittich¹⁵ in the

Montreal Barriers Study observed that more highly educated individuals are more likely to be aware of vision rehabilitation facilities and to use their services. Alternatively, the level of education was not significantly associated with awareness of LVS in Mwilambwe et al.'s study,⁵ a subset (n=448) of the Montreal Barriers Study (n=702), which may explain why there is an apparent contradiction in these articles. The Montreal Barriers Study, with the larger sample size, would be expected to give the more reliable result.

2.4.2.10 Relative Loss

Relative loss was investigated in 2 of the 14 studies.^{7,9} Patients with vision impairment may attempt to minimize the psychological impact of vision loss by framing other challenges or situations as being “worse-off.” For example, they may compare themselves with others who are more unfortunate or compare their vision loss to other life losses (e.g., death of a spouse or comorbidities).^{7,9} When vision loss is viewed as a “lesser loss”, the motivation to seek help may be lower.⁹

2.5 Discussion

The goal of analysing these studies was to understand the barriers that may prevent people from accessing LVSs. The results may be largely dependent on whether the participants were unaware of LVSs or had already accessed them. Investigating barriers to accessing LVSs of nonusers is crucial. Yet, only 2 studies focused on this group of individuals.^{7,9} Therefore, it is probable that the results of this review are biased toward users of LVS. More studies on barriers for nonusers of LVSs are needed to improve service accessibility.

Individuals with a longer duration of visual impairment may be more likely to be aware of LVSs, but only 1 study discussed the effect of this potential bias in their sample.¹¹ Gold et al.¹¹ stated that “nearly 2/3 of participants [who were users of LVS] had been diagnosed with vision loss for more

than 10 years.” The duration of vision loss can be an influential factor and it should be studied in future barrier studies.

It is not clear how important the factor of location is in the update of LVSs, although it is generally expected that proximity would be important. Studies have not examined this factor in ways that can be directly compared. For example, urbanicity was not significantly associated with the use of LVSs in 1 study,⁷ whereas another study found that LV consultation immediately after a patient’s hospital visit¹³ and at a LVS location proximal to the hospital led to a high utilization rate for LVSs.¹³ People with vision impairment have lower levels of income,¹⁴ although cost was not perceived as a barrier in 1 study of nonusers⁷ but was perceived to be a prohibitive factor for users of LVS.⁸ Some of these findings are the opposite of what one would predict. Possibly nonusers of LVS were simply not aware of the cost of vision aids. Further studies are indicated to clarify these points. Only 1 study has investigated cognitive decline and institutionalization, which were found to be factors related to non-participation of LVS.¹⁴ Further studies are required to confirm this.

There is agreement among studies regarding certain barriers, despite the fact that different populations and research settings were included. Some of these barriers can be addressed straightforwardly by changes in approach by eye care professionals. Earlier and more ready referrals should be made, including patients of any ethnicity with early and moderate visual impairment and with eye disease due to any untreatable condition (not only macular degeneration). Families of patients should also be counselled so that they understand the issues involved and will help to encourage the patient to avail themselves of resources, rather than the reverse. Better and more positive information can be given regarding what LVSs are and who can benefit. Changing societal attitudes may take longer, but is possible with public education and it is necessary so that people are not only aware of LVSs but are willing to take advantage. People will not want to use LV aids when their visual disability is viewed negatively by society.

2.6 Conclusion

This review describes the common barriers that prevent people with vision loss from accessing LVSs. The results illustrate the depth and complexity of health-related, psychological, societal and institutional influences on an individual's participation in vision rehabilitation services. The eye care provider can help to decrease these barriers by educating the patient in the early stages of vision loss regarding the effectiveness of low vision rehabilitation and by making appropriate referrals to local LVSs.

Chapter 3

Rationale, Purpose and Research Questions

We learned from the literature review that the prevalence of age-related visual impairment will increase as the Canadian population ages. Careful healthcare planning is needed to accommodate for this growing demand. An important part of this planning would involve research on community service utilization and population health data. There is a paucity of Canadian research on low vision that addresses population needs and gaps in service provision to meet those needs.

From the literature review, we also learned that the cost of health care increases as the Canadian population ages. Although multi-disciplinary low vision services may appear to be more desirable compared with single provider low vision services, they would require consistent funding for their operation and the means to gather qualified professionals to establish these centres. Fortunately, not all patients with low vision have complex needs and therefore, not all may require multi-disciplinary low vision services. The literature review also found little evidence that vision rehabilitation would improve generic health-related quality of life except for group-based interventions. The areas that demonstrated the greatest sensitivity to intervention were items related to functional measures of vision-related quality-of-life, especially reading ability. Using quality of life questionnaires, most studies that compared optometric versus multi-disciplinary models of low vision services observed little difference in outcomes. With these research findings in mind, community-based optometric low vision care may be a more cost-effective approach to address a significant portion of the growing demand for low vision services.

The current study is the first study that describes optometric low vision services in Canada. The main purpose of the study is to describe the current self-reported provision of low vision services by optometrists and potential barriers to providing optometric low vision service using descriptive statistics. The secondary purposes of the study are to examine regional differences in low vision

practice and referral patterns, and to identify predictive factors associated with the extent of optometric low vision care. A survey was designed and used for these purposes.

3.1 Research Questions

1. What is the proportion of Canadian optometrists who offer basic low vision services versus more comprehensive low vision services?
2. What are the barriers to providing more comprehensive low vision services?
3. How would Canadian optometrists manage three hypothetical low vision patients?
4. What are the patterns and perception of referrals to specialized low vision services in Canada?
5. How do Canadian optometrists perceive the current landscape of low vision service provision and low vision education?
6. Are there any regional differences across Canada in low vision practice patterns, patient management patterns in the hypothetical low vision cases and low vision referral patterns?
7. What are the predictive factors associated with the extent of optometric low vision care?

Research questions 1-4 were explored through multiple choice questions and descriptive statistics, question 5 was explored through open-ended questions and question 6 was explored through multiple choice questions and chi-square analyses. Research question 7 was explored through multivariate logistic regression analyses.

Chapter 4

Methods

4.1 Survey Design

This study used a quantitative observational survey design that employed quota sampling. The survey design began in September 2009 with the careful review of previous literature of provision of low vision services by eye care professionals.⁹³⁻⁹⁶

Based on my knowledge, none of the questionnaires published in the literature had been validated. Some demographics and practice-related items (A1, A2, B1, B2, B4, B6, B7, C1) on this questionnaire (Appendix B) were later used in the questionnaire “Investigating Optometric Vision Care for the Elderly”⁹⁷ for future data comparison. Questions on visual acuities of patients (C4), number of patients seen in respondent’s primary practice per week (C7), visual acuity and visual field criteria for referral used by optometrists for referral of patients to low vision service (C8), rating on availability and quality of low vision services in respondent’s local area (D2), frequency of receiving a written report from low vision providers (D4) were adopted from Lovie-Kitchin et al’s⁹⁵ 1996 Australian optometric survey and from Keefe et al’s⁹⁴ 1994 Australian ophthalmologic survey. Questions on the type of low vision equipment available in the office (C9) and reasons for not providing low vision service (C11) were partially adapted from Lim et al’s⁹⁶ Australian optometric survey.

Several questions were created with the purpose of comparison with findings from previous literature. Because a majority of low vision optometrists in Australia were found to be working in private practice⁹⁶, a question on practice setting was created (B3) to investigate whether this is true in the Canadian optometric population. Also, travel distance has been found to be a potential barrier to accessing low vision service. Therefore, a question (B8) on the type of low vision service available

within one day's travel was created. The term "low vision" was purposely not defined in the questionnaire, so as to allow respondents to answer the questions according to their own definition of low vision.

One unique aspect of our questionnaire was the use of three hypothetical clinical cases (C5-C7). These cases were created to understand how respondents would have actually treated patients in each scenario, rather than more generic questions about how patients in general would be treated.⁹³ In addition, a direct inquiry on the level(s) of low vision service provided by the respondents was aimed to provide further information on the current state of low vision provision by respondents. Another unique aspect of the questionnaire was the use of two open-ended questions (C13 and C15). These open-ended questions allowed respondents to comment on the current provision of low vision services in their practice/area and give ideas/comments on low vision education. The open-ended questions would also allow researchers to obtain answers that were unanticipated.⁹⁸ They would allow respondents to answer the question in their own words, which would represent a more realistic view of their thoughts than closed questions.⁹⁸ The disadvantage of these types of questions is that they cannot be analysed quantitatively, thus the use of both multiple-choice questions and open ended ones.

In the current study, barriers to providing low vision service were examined through Questions C11, C12 and C14. These questions directed respondents to answer only if they do not manage many patients with at least simple optical devices (high additions on spectacle, magnifiers and filter lenses) and lighting. The goal was to further examine the relationship between the barriers through a series of follow-up questions.

The 30-item questionnaire included information in the following sections: A. personal profile; B. primary practice profile; C. level of low vision services offered and barriers to provision of low vision care; and D. referral patterns. The questionnaire began with questions that were relatively

straightforward and easy to answer. This would help to encourage the respondent to get started on the survey. Open-ended questions and hypothetical cases, which required more thought, were put into the middle section.

Six practising optometrists, with varying amount of practice experience, were asked to complete the draft survey. As a result of their feedback, questions were adjusted in cases where they thought there was ambiguity. After several iterations, the content of the questionnaire was finalized by Susan Leat and me. Table 4.1 summarises the final survey questions. The cover page (letter of information) and questionnaire can be seen in Appendices B and C respectively.

Table 4-1: Summary of the questionnaire

	Question	Description	Multiple Choices Available
Demographics - Respondent's profile	A1	Years of practice	0-5 years 6-10 years 11-15 years 16-20 years 21-25 years 26 or more years
	A2	Gender	Male Female
Demographics -Primary practice profile	B1	Province of primary practice	BC, SK, MN, AL, ON, QC, NS, NB, PEI, N
	B2	Population of primary practice city	Under 2500 2,500 to 9,999 10,000 to 49,999 50,000 to 99,999 100,000 to 499,999 500,000+
	B3	Type of practice	Private single practice Private group practice/Cost-sharing Practice beside an optical Practice within an optical Educational institution
	B4	# OD practicing at the primary practice at one time	1 2 3 4 More than 4
	B5	% patients seen that have LV at primary practice	Open answer - respondent write the percentage
	B6	Appointment booking method	By appointment only By a mixed drop-in/appointment system

			Accepts emergencies Does not accept emergencies Other
	B7	# patients seen in practice in a typical week	0-20 21-40 41-60 61-80 81-100 101-120 >120 (please specify)
	B8	Type of LVS available within one day's travelling distance	Local OD or ophthalmologist CNIB Multi-disciplinary low vision clinic Other
	B9	The presence of optometric colleague in primary practice specifically offering LVS	Binocular vision therapy Paediatric care Low vision care Special contact lenses Geriatric care Assessments for children with reading/learning difficulties Other
Demographics – Respondent's patient profile	C1	% respondent's own patients who have low vision	Open answer – respondent enters the percentage
	C3	# patients seen by respondent in a typical week	0-20 21-40 41-60 61-80 81-100 101-120 >120 (please specify)
	C4	% patients with BCVA in the better eye of	Open answer – respondent enters the percentage for the following: % Better than 6/12 % 6/12 to better than 6/21 % 6/21 to better than 6/60 % 6/60 and worse
Low Vision Practice Pattern	C5	Hypothetical question 1: early ARMD with VA 6/12 with a goal of reading	Referral to OD Referral to CNIB Referral to multi-disciplinary low vision clinic Assess for basic magnification and lighting requirements Other
	C6	Hypothetical question 2: advanced AMD with VA 6/60 and goals of reading and writing	Referral to OD Referral to CNIB Referral to multi-disciplinary low vision clinic Assess for basic magnification and lighting requirements and then refer Undertake rehabilitation, including distance and near magnification, lighting and advice re: writing devices Other

	C7	Hypothetical question 3: bilateral homonymous hemianopia and difficulty with reading and mobility	Provide information about reading techniques Provide information about reading techniques and prescribe sector Fresnel or Pelli prism Refer to CNIB Refer to multi-disciplinary low vision clinic Other
	C9	Equipment available in practice	logMAR VA chart Feinbloom chart Paper contrast sensitivity chart Computer contrast sensitivity chart Lighthouse continuous text card for adults or equivalent Range of selective transmission tints/fit-overs Range of full field microscopes Range of prism half eyes Range of hand magnifiers Range of internally illuminated stand magnifiers Range of hand held telescope Other
	C10	Level of LV service provided	A. Recognition of a LV case B. Assessment of visual impairment C. Assessment of disability D. Manage a patient with minimum visual disability and simple goals using high powered additions and lighting E. Manage a patient with minimal visual disability and simple goals using optical devices such as hand and stand magnifiers and filter lenses F. Manage a patient with more than minimum visual disability who requires more than basic devices (ex. Telescopes, electronic low vision aids, custom-designed microscopes, etc) G. Manage a patient with complex goals (ex. Vocational, requiring multiple interventions)
Referral Pattern	C8	BCVA referral criteria	Better than 6/12 6/12 to better than 6/21 6/21 to better than 6/60 6/60 and worse
		VF referral criteria	>50 deg 35-49 deg 20-34 deg <20 deg
	D1	Referral	Do not refer CNIB Local OD or ophthalmologist Multi-disciplinary low vision service Other
	D2	Rating of Availability of other LVS	Outstanding Good Fair Poor None Don't know

		Rating of Quality of other LVS	Outstanding Good Fair Poor None Don't know
	D4	Frequency of receiving a report	Almost never Rarely Sometimes Often Almost always
Exploratory Questions	C11	Reasons for not seeing patients at Levels D and E in Question C10	Lack experience Lack knowledge Inadequate equipment to do reliable examination No devices to do a trial of low vision aids No fee claimable for LV assessment Time consuming Lack of interest Too frustrating Partner(s) or associate(s) sees the LV patient Other
	C12	Reasons for inadequate equipment in Question C11	Lack of interest Not financially viable Not enough foreseeable demand No funding for devices Funding is available but paperwork too time consuming NO time to train staff and/or limited staff resource Other
	C14	What needs to change for respondent to be more willing to manage at Levels D and E in Question C10	More education More equipment A fee for low vision service Funding for low vision devices Nothing would entice me Other
	C13	Does respondent feel he/she would benefit from more education? If so, what type and format?	Open answer
	C15	Comment on provision of LV services in respondent's practice or area	Open answer

4.2 Sampling

This is a cross-sectional survey of practicing optometrists in Canada who were randomly selected according to the province of their primary practice. The complete list of practising optometrists

(n=4608) was obtained from each provincial regulatory body of optometrists (i.e. the provincial college or association of optometrists, whichever was responsible for regulation and registration of optometrists). Excluded from the survey population were optometrists who practice in the Territories. This exclusion was due to the absence of a directory for practising optometrists in the Canadian territories.

Random sampling was used for sampling across different provinces. The optometrists listed in each provincial list were numbered. Using the Rand function in Excel, participants to be included in the final sample were randomly selected. It was impossible to obtain an equal number of anticipated responses in each province because there were markedly more optometrists practicing in some provinces compared with others. For example, in 2010, there were a total of 2012 practicing optometrists in Ontario, compared to 16 in Prince Edward Island. The provinces were grouped with this in mind: the Eastern and Western provinces, Ontario and Quebec, in order to achieve a similar final sample from each region. Hence, the sampling rate was lowered for the more populated provinces (Ontario, Quebec and British Columbia) but was increased for the less populated provinces (Manitoba, Saskatchewan and the Eastern Provinces) to achieve a more balanced number of responses across different geographic regions (Table 4-2). Participants were informed of the purpose of the research as well as assured of anonymity and confidentiality.

Table 4-2: Sampling rate and total number of optometrists surveyed

Province	# All ODs listed in regulating body	Sampling rate (%)	Number sampled	Expected response (25%)	Total expected responses	Geographic Region
NFL	47	100	47	12	70	Eastern Provinces
PEI	16	100	16	4		
NS	105	100	105	26		
NB	112	100	112	28		
QC	1346	30	404	101	101	Quebec
ON	2012	30	603	151	151	Ontario
MN	118	100	118	30	138	Western
SK	126	100	126	32		
AB	194	30	148	37		
BC	532	30	160	40		

4.3 Ethics Clearance

This study was approved and received ethics clearance from the Office of Research Ethics, University of Waterloo.

4.4 Data Collection

A written, self-completion survey was chosen as the method of data collection. In October 2010, selected optometrists were invited to participate either by email (if available) or by regular mail, with a cover letter and a postage-paid return envelope enclosed. Only an English version of the questionnaire was sent due to limited resources. Thus, optometrists who primarily or solely communicate in French may be under-represented. We faxed follow-up letters with the original questionnaire approximately six weeks after initial contact to increase response rate. It was noticed that the email questionnaire generated few responses. Therefore, additional paper questionnaires were mailed to optometrists in provinces where the response rate was below 20% and who had initially received only the email version of the survey. By January 2011, the questionnaire collection had been completed. Data for all returned surveys were entered into Excel by an optometry student (Allison Leung).

4.5 Statistical Analysis

Descriptive statistics were used to examine low vision practice patterns. Most variables used in the statistical analyses were categorical in nature. Therefore non-parametric statistics were used for these. For example, years of practice, population of the area of practice, practice load and patient load were all considered categorical in the analysis.

In Questions C11, C12 and C12, respondents were asked to select only the answers that apply and rank in order of importance of the answers. However, many respondents only selected the applicable answers by checking the box beside the multiple choices instead of ranking them. Therefore, the ranking was discarded. Instead, the frequencies of choices being checked off were counted.

A full qualitative analysis could not be conducted due to the limited scope and depth of open questions (C13 and C15) in a written questionnaire format. Nevertheless, a modification of a qualitative analysis was undertaken as follows. The written comments of Questions C13 and C15 were grouped to represent relevant categories of information emerging from the responses. Commonly occurring themes were developed to reflect the items noted in the material. This was done independently and manually by the author on three separate occasions to ensure comprehensiveness of the coding and accurate representation of written responses in emerging themes. These themes were then compared with the existing literature in the Discussion portion of the thesis.

All subsequent analyses were conducted using the statistical software package SPSS version 21.0. To explore whether there were regional differences, chi-square analysis was used. The study variables for the chi-square analysis can be found in Table 4-3. The categories of the study variables were reflective of the multiple choices in the source questions. The only exceptions were in Question C8, where visual acuities of better than 6/12 and 6/12 to better than 6/21 were combined, and in Question

D2, where “poor” and “none” ratings were combined. These ratings were combined to meet the criterion that at least 80% of the expected frequencies in each cell would exceed 5.

An alpha level of 0.05 was considered statistically significant. For some of the multiple choice questions, the respondent was asked to check off as many answers as they deemed fit (Questions B8, C5, C6, C7 and D1). As a result, the answers were not mutually exclusive or independent. To overcome this, a chi-square test was run for each of the multiple choice answers to test for regional differences. For example, there were four multiple choices in Question C5: refer to another optometrist, refer to local CNIB, refer to a multi-disciplinary low vision clinic and/or assess for basic magnification and lighting requirements. Chi-square test was conducted for the choice of refer to another optometrist (yes or no) across the different regions. Another chi-square test was conducted for the choice of referral to local CNIB (yes or no) across the different regions, etc. In total, four separate chi-square tests were performed on Question C5. To compensate for the increase in Type I error, the alpha value required for significance was lowered using a modified Bonferroni test suggested by Keppel⁹⁹.

Adjusted residual was used to identify the cells that contribute the most to the chi-square statistics. If an adjusted residual was greater than +/-1.96, the particular observed count in a cell would be 2 standard deviations above or below the expected count and therefore deemed significantly different than what would be expected. Cramer’s V was used to measure the effect size. Cramer’s V values are classified as a small effect size if less than 0.20, medium effect if between 0.20 and 0.39 and a large effect size if 0.40 or larger.

Table 4-3: Variables investigated in chi-square analyses

Row Variable (Question Source)	Categories	Column variable (Question Source)	Categories
The presence of an optometric colleague in primary practice offering LV service (B9)	Yes No	Geographic Regions (B1)	Eastern Provinces Quebec Ontario Western Provinces
BCVA for referral to LVS (C8)	Better than 6/21 6/21 to better than 6/60 6/60 and worse		
Total visual field diameter for referral to LVS (C8)	>50° 35° to 49° 20° to 34° <20°		
Rating of the availability of local LV service (D2)	Don't know Poor or None Fair Good Outstanding		
Rating of the quality of local LV service (D2)	Don't know Poor or None Fair Good Outstanding		
Frequency of receiving report (D4)	Almost never (0-5% of the time) Rarely (6-25%) Sometimes (26-74%) Often (75-94%) Almost always (95-100%)		
Case 1: Early ARMD (C5)	Refer to optometrist Refer to CNIB Refer to MLVC Assess for magnification and lighting requirement		
Case 2: Advanced ARMD (C6)	Refer to optometrist Refer to CNIB Refer to MLVC Assess for magnification and lighting requirement and then refer Undertake full rehabilitation		
Case 3: Bilateral homonymous hemianopia (C7)	Provide information about reading techniques Provide information about reading techniques and prescribe prism Refer to CNIB Refer to MLVC		
Level of provision of LV service (C10)	Level A/B/C/D or level E/F/G	Type of low vision service within a Day's Travel (B8)	Local OD/OMD CNIB Multi-disciplinary LVC

Univariate logistic regression analyses were used to determine the individual predictor variables associated with the provision of low vision services from Question C10. The outcome variable was divided into two levels, levels A-D, versus E-G, to discern those optometrists those who would manage patients with only available optometric equipment versus those who would manage patients using low vision devices.

The predictor variables that were found to be potentially statistically associated with the outcome variable ($p < 0.30$) in the univariate analyses were then included as possible predictors in an automated forward stepwise, multiple logistic regression analysis model. The entry criteria was a p-value of less than 0.20 and the exit criteria was a p-value of greater than 0.10. Wald statistics, odds ratios, confidence intervals and p-values were reported to assess the impact of covariates on the results. The p-value considered for final significance was $p = 0.05$.

The goodness of fit was assessed using $-2 \log$ -likelihood and its associated chi-square statistics, Cox and Snell R^2_{cs} and Nagelkerke's R^2_N . This provides the amount of variability in the response accounted for by the explanatory variables included in the model. The results of the descriptive and qualitative analyses will be presented in Chapter 5 and the results of the regional comparisons and regression analyses will be presented in Chapter 6.

Table 4-4: Variables included in logistic regression analyses

Variable	Type of Variable	Categories	Question Number
Level of low vision service provision	Outcome	Level A, B, C, or D Level E, F or G	C10
Years of practice	Predictor	15 years or less 16 years or more	A1
Gender	Predictor	Male Female	A2
Population of the area of practice	Predictor	499,999 or less 500,000 or more	B2
Type of Practice	Predictor	Private Optical Educational institution	B3
# Optometrists at the Office at a time	Predictor	1 2 3 or more	B4
Patient Load of Practice	Predictor	0-40 41-80 81-120 121 or more	B7
Patient Load of Respondent	Predictor	0-40 41-80 81-120 121 or more	C3
Availability of LVS within a day's travel distance	Predictor	Local OD/OMD CNIB MLVC	B8

Chapter 5

Results: General Descriptive Analysis and Written Comments

Descriptive statistics were used to summarize the main features of the quantitative data. Of the 1851 optometrists sampled, 459 (24.8%) responded. Table 5-1 provides an overview of the responses by province and region. Table 5-2 provides the response rate for each questionnaire item.

Table 5-1: Breakdown of responses by regions and provinces

Region	Province	Total sampled	# Respondent (% of total sampled)	Total Actual Responses, Regional
Eastern Provinces	Newfoundland & Labrador	47	12	72
	Prince Edward Island	16	4	
	Nova Scotia	105	26	
	New Brunswick	112	30	
Quebec	Quebec	404	71	71
Ontario	Ontario	603	157	157
Western Provinces	Manitoba	118	19	150
	Saskatchewan	126	21	
	Alberta	148	43	
	British Columbia	160	67	
	TOTAL	1839	450	450

*Note: Nine responses were excluded from this table because these responses did not indicate the province of origin

Table 5-2 Response rate of each multiple choice survey question.

Question	Description	Response rate
A1	Years of practice	98.7% (n=453)
A2	Gender	99.8% (n=448)
B1	Province of primary practice	98.0% (n=450)
B2	Population of primary practice city	98.2% (n=451)
B3	Type of practice	98.9% (n=454)
B4	# OD practicing at the primary practice at one time	98.7% (n=453)
B5	% patients seen that have LV at primary practice	82.4% (n=378)
B6	Appointment booking method	100% (n=459)
B7	# patients seen in practice in a typical week	98.3% (n=451)
C1	% respondent's own patients who have LV	76.9% (n=353)
C3	# patients seen by respondent in a typical week	97.2% (n=446)
C4	% patients with BCVA in the better eye of	83% to 97% *
C5	Hypothetical question 1: early ARMD	99.7% (n=458)
C6	Hypothetical question 2: advanced ARMD	99.6% (n=457)
C7	Hypothetical question 3: hemianopia	98.5% (n=452)
C8	BCVA criteria for referral	95.0% (n=436)
	VF criteria for referral	86.7% (n=398)
C9	Equipment available in practice	78.9% (n=362)
C10	Level of LV service provided	97.8% (n=449)
D1	Referral site	98.3% (n=451)
D2	Rating of availability of other LVS providers	97.2% (n=446)
	Rating of quality of other LVS providers	96.5% (n=443)
D4	Frequency of receiving a report	91.5% (n=420)

*The range of response rates for each level of BCVA was calculated in Question C4

Note: Response rates for questions B8, B9 and C11, C14 could not be calculated because the answers were not mutually exclusive.

The proportion of female respondents was 48.8%. The median years of practice of the respondents were 11-15 years. The frequency distribution of their years of practice is shown in Figure 5-1. When inspecting the distribution of responses by age and years of practice (Table 5-3), more practitioners who were in their advanced years of practice (21+ years) were male and more practitioners who were in their early years of practice (0-5 years) were female.

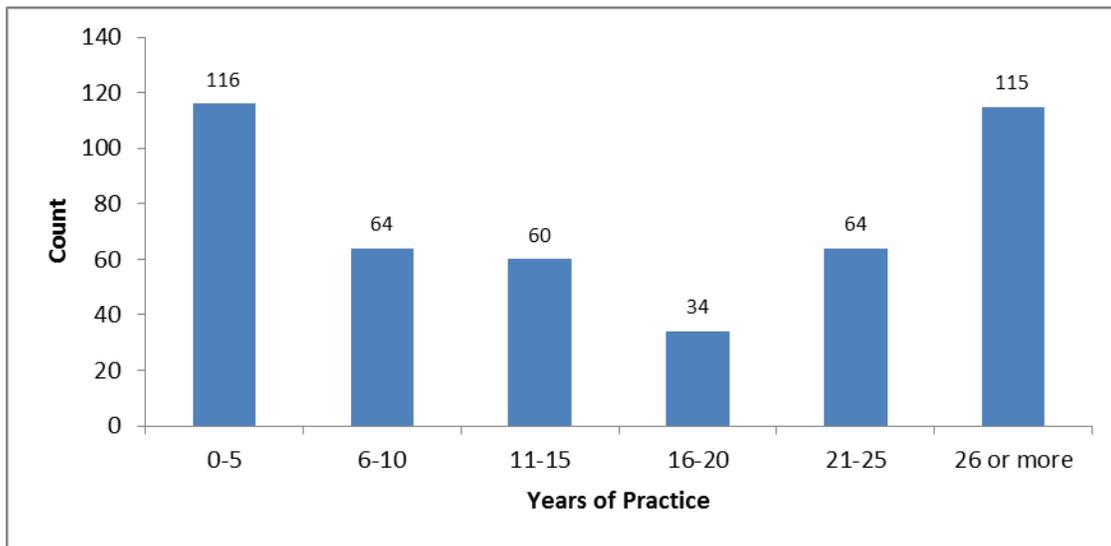


Figure 5-1: Frequency distribution of respondents by years of practice

Table 5-3: Frequency distribution of respondents by sex and years of practice

Years of Practice	% of total	Female	% female within each age group	Male	% male within each age group
0 to 5	25.5%	84	73.7%	30	26.3%
6 to 10	14.3%	35	54.7%	29	45.3%
11 to 15	13.4%	34	56.7%	26	46.7%
16 to 20	7.6%	19	55.9%	15	45.9%
21 to 25	14.1%	23	36.5%	40	63.5%
26 and over	25.1%	27	24.1%	85	75.9%

5.1 Primary Practice Profile

Participants were asked to respond regarding their primary office, defined as the one in which they spend most days. The median city population of their primary practice was 100,000 to 490,000 (Figure 5-2).

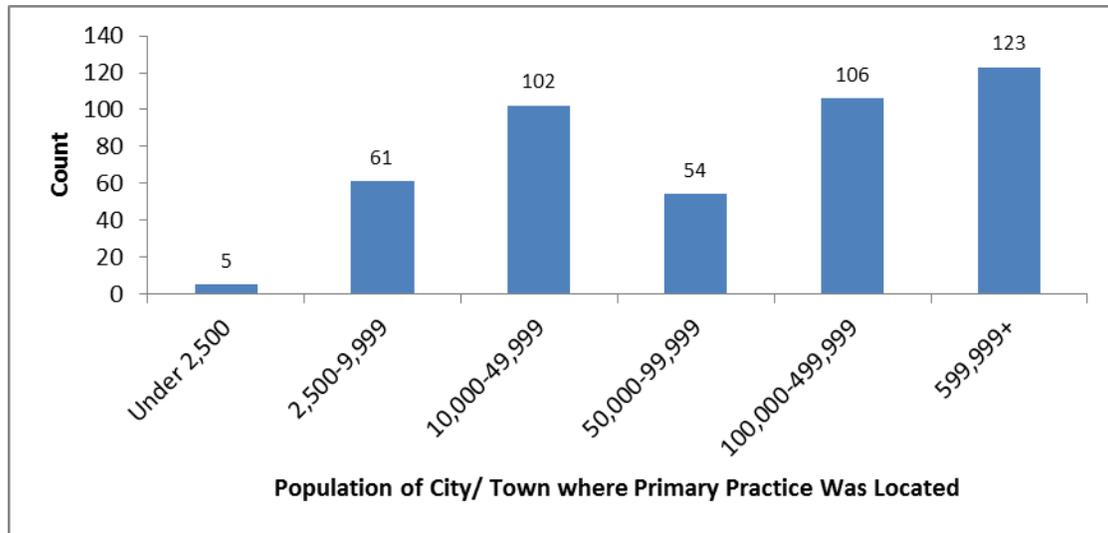


Figure 5-2: Distribution of city/town population in which respondent's primary practice was located

The most frequent type of practice for optometrists was private group practice or a cost-sharing practice. The median number of optometrists practicing in the respondent's primary practice at one time was two. Most respondents indicated that their primary practice would see patients by appointment only (n=320) as opposed to a mix of drop-in/appointment system (n=176). Most of their primary practices would accept emergencies (n=403). Only 2 respondents indicated that their primary practice would not accept emergencies. In a typical week, the respondents estimated that 101-120 patients would be seen in their primary practice. When asked to estimate the percentage of low vision patients seen in their primary practice, the mode and median were 1% (Figure 5-3).

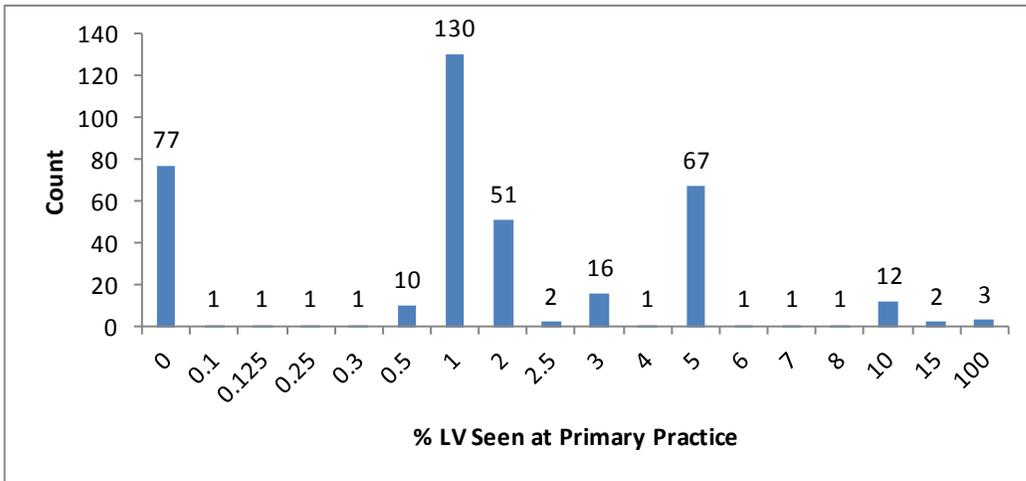


Figure 5-3: Estimated percentage of patients with low vision seen in primary practice

The most common type of low vision service available within a day’s travel (Figure 5-4) for respondent’s patients was CNIB (n=402), followed by local optometrists (n=309) and multi-disciplinary clinics (n=178). In the “Others” option (n=17), respondents indicated that other low vision services included the respondent’s clinic itself offering low vision services (n=4), a hospital (n=4), opticians (n=2), private nurse (n=2), orthoptist (n=1), “low vision clinic close by” (n=1), “independent low vision consultant” (n=1), and vision aid store (n=1).

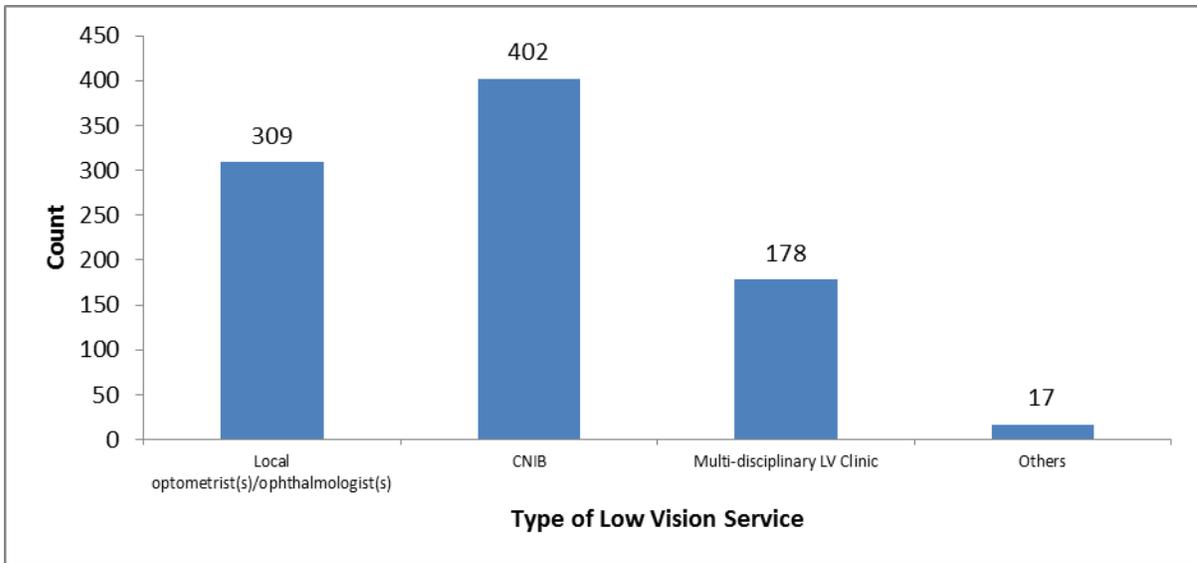


Figure 5-4: Low vision services within one day's travel

Thirty-five percent (161/459) of respondents indicated that there was an optometrist(s) within their primary practice that specifically offered low vision care (Figure 5-5). While 66.5% of respondents' primary practice offered paediatric care, 54.7% offered geriatric care.

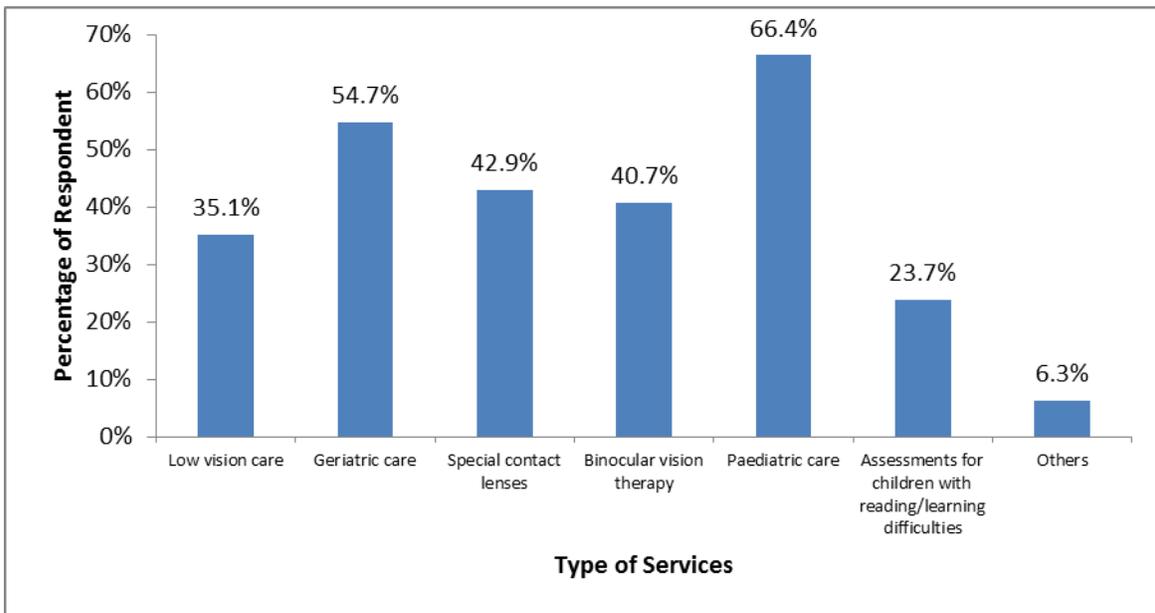


Figure 5-5: Optometric services offered by respondent's primary practice

5.2 Patient Profile

Respondents were asked some general questions about the profile of the patients which they, themselves, see in their office. The modal category for the number of patients examined per week by the respondent was 61-80. Eighty-five percent (n=390) of respondents indicated that their practice involved a co-management system. The most common type of co-management system (Fig. 5-6) was with an ophthalmologist (n=379) or family physician (n=258). Co-management with low vision centres (n=69), long-term care facilities (n=52) and rehabilitation centres (n=31) was less common. Other stated co-management partners included refractive surgery centres (n=20), CNIB (n=4), school (n=1), underprivileged homes (n=1), veterans associations (n=1), third-parties including immigration, Indian health and disability (n=1), hospital (n=1), physiotherapist (n=1), independent low vision consultant (n=1), orthoptist (n=1), senior homes and low vision work for family member by request (n=1).

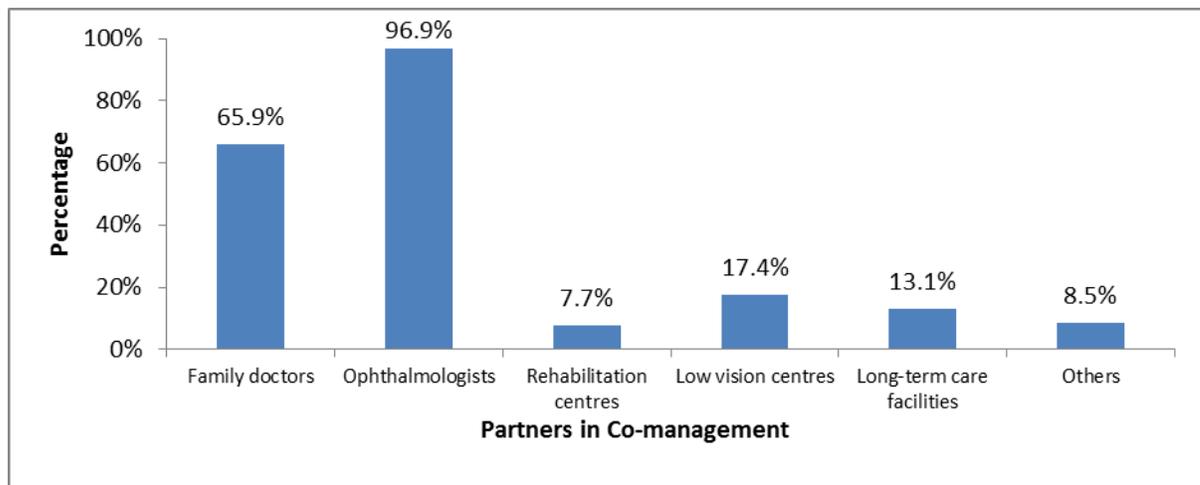


Figure 5-6: Partners in co-management in primary practice

Most respondents estimated that only 1% of their patients in a typical week would fall under the category of low vision (Fig.5-7).

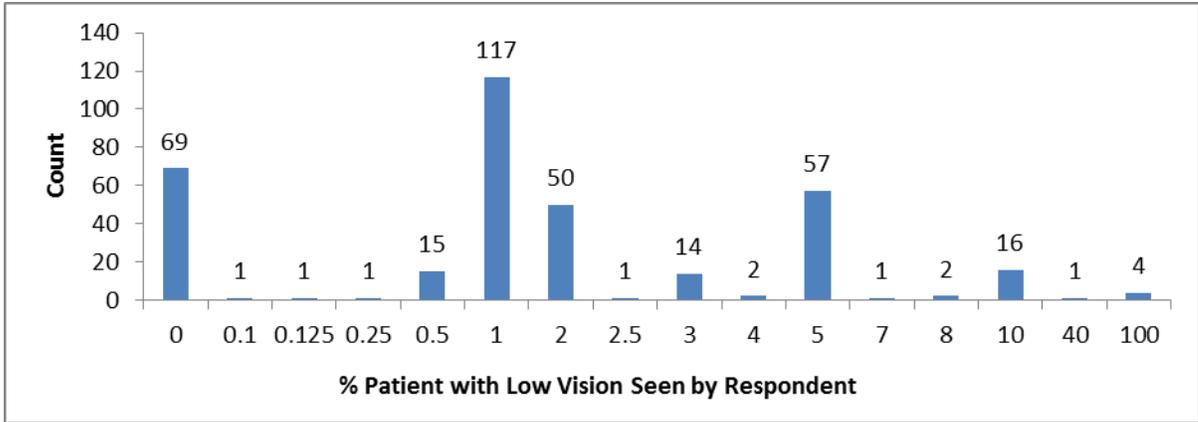


Figure 5-7: Estimated percentages of patients with low vision seen by respondents

In a separate question, Canadian optometrists estimated that a modal value of 90% of their patients had best corrected visual acuity (BCVA) of better than 6/12 (in their better eye) (Fig. 5-8), while the rest had varying degrees of vision impairment (Fig. 5-9 to 5-11). The frequency distributions of percentage of patients at each level of BCVA are illustrated in Figures 5-8 to 5-11.

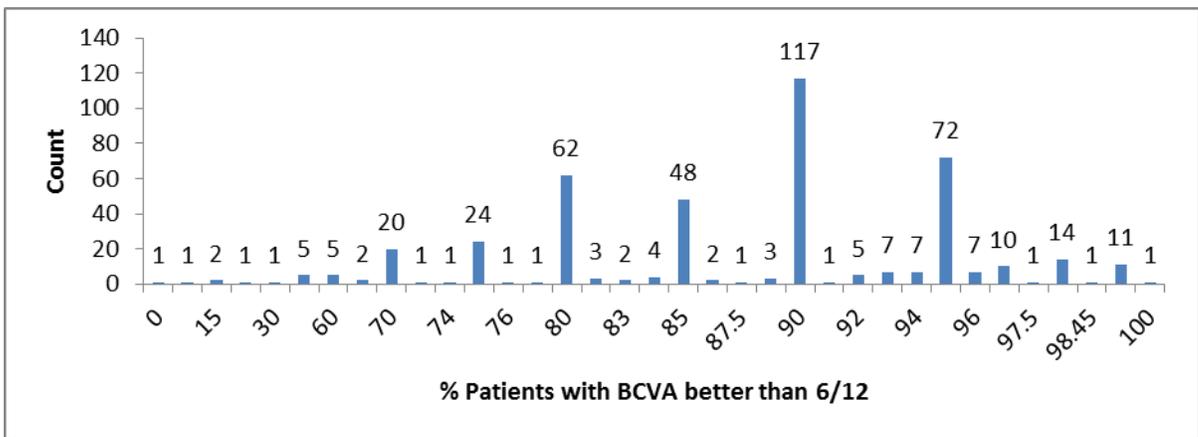


Figure 5-8: Frequency distribution of the estimated % of patients with BCVA of better than 6/12 in the better eye

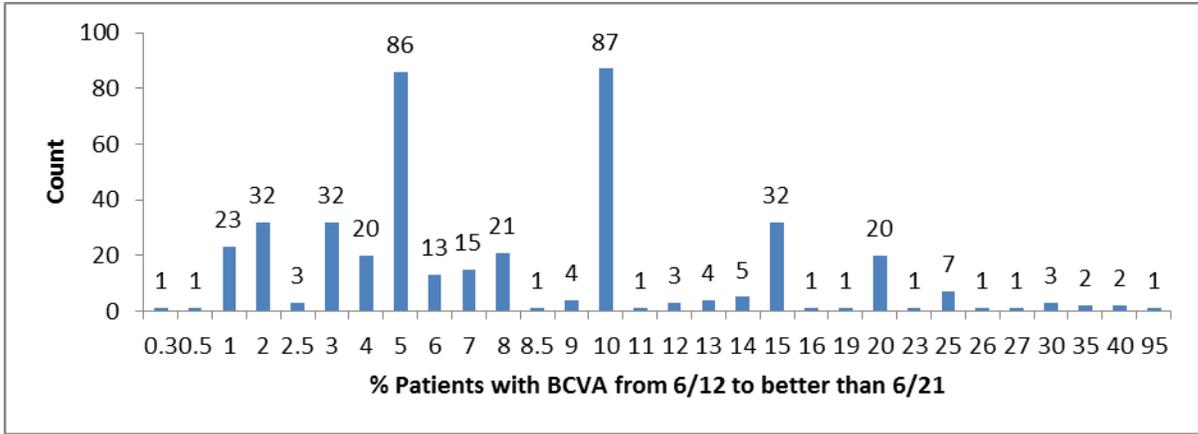


Figure 5-9: Frequency distribution of the estimated % of patients with BCVA of 6/12 to better than 6/21 in the better eye

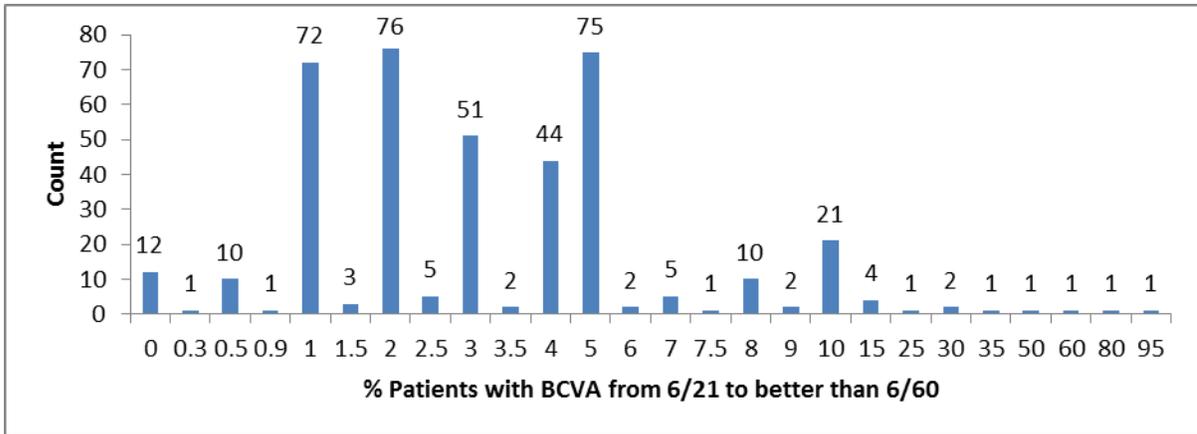


Figure 5-10: Frequency distribution of the estimated % patients with BCVA of 6/21 to better than 6/60 in the better eye

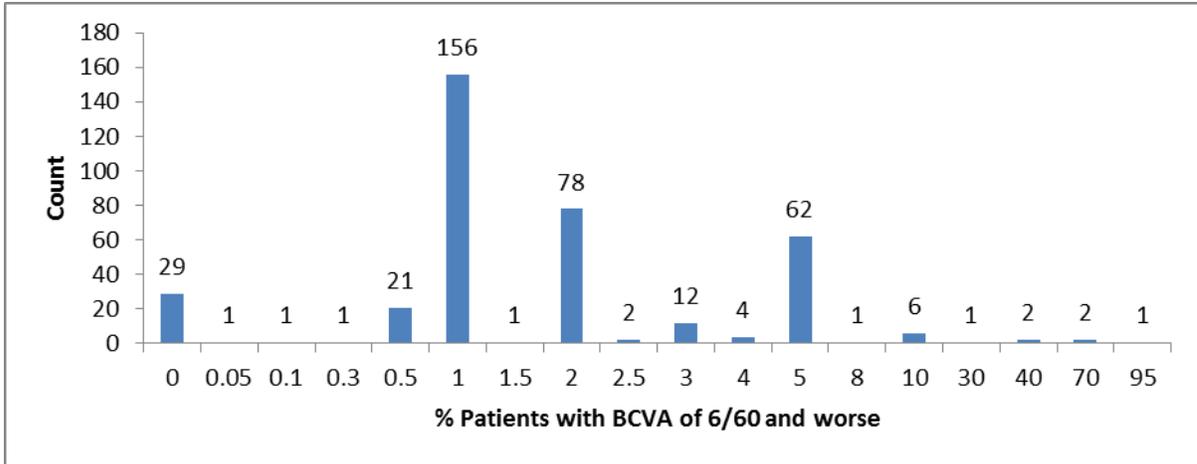


Figure 5-11: Frequency distribution of the estimated % of patients with BCVA of 6/60 and worse in the better eye

These estimates of BCVA are compiled in Figure 5-12 and compared with the Salisbury Eye Evaluation study data¹⁰⁰ using the median percentage of patients with BCVA in each of the categories.

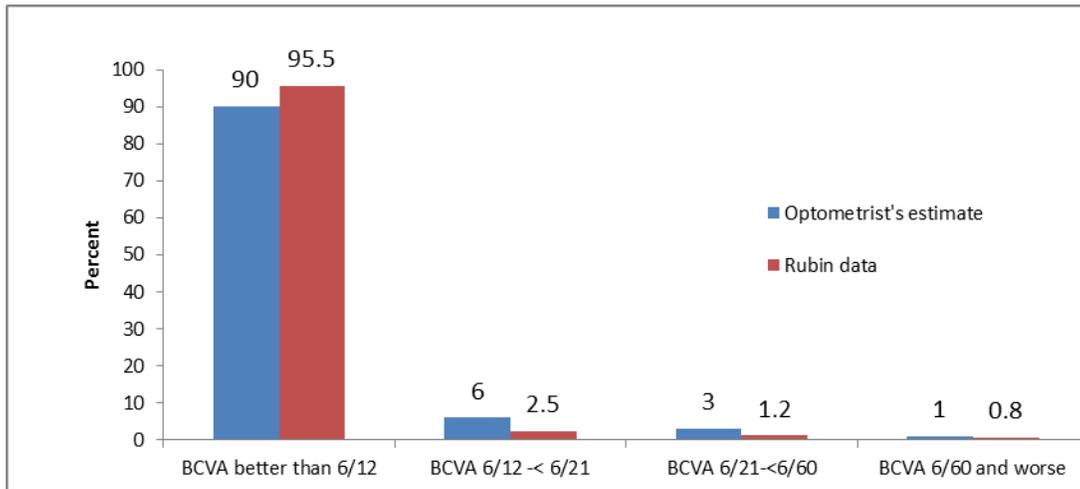


Figure 5-12: Median percentage of patients according to their BCVA in the better eye

5.3 Hypothetical Case Scenarios

A unique aspect of this questionnaire was the use of hypothetical cases. In the three hypothetical case scenarios, we asked how the respondent would manage a hypothetical patient with early macular degeneration (Fig.5-13), advanced macular degeneration (Fig. 5-14) and homonymous hemianopia (Fig.5-15) with specific visual disability(s).

When dealing with a patient with early macular degeneration, a BCVA of 6/12 in the better eye and with the goal of reading, most optometrists (84.3%) stated that they would undertake vision rehabilitation themselves (i.e. assessing for lighting and magnification).

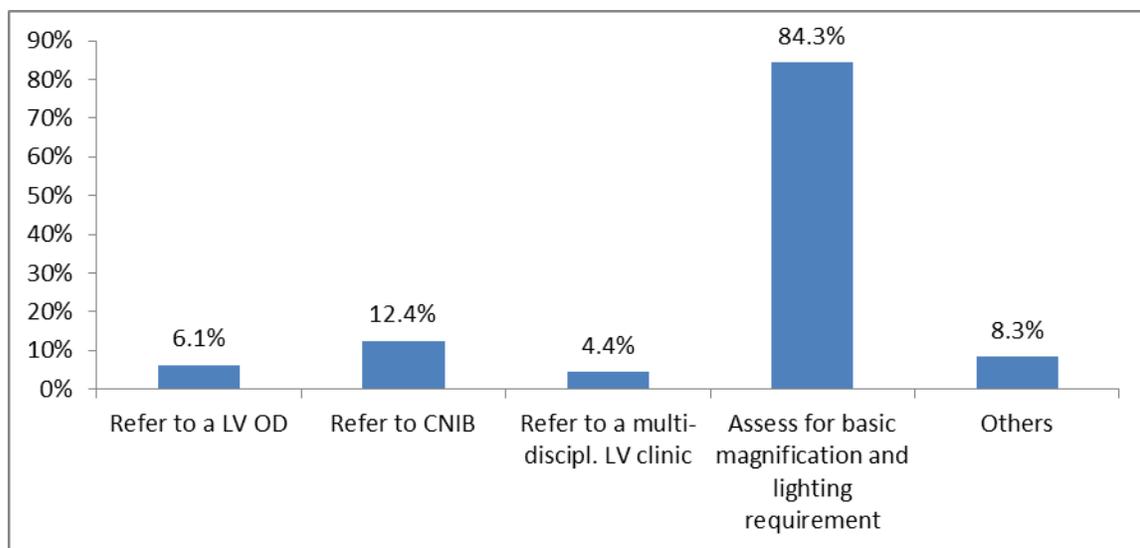


Figure 5-13: Percentage of optometrists indicating each course of action for managing a patient with early ARMD, with a BCVA of 6/12 and a main goal of reading

When dealing with a patient with multiple visual goals and a diagnosis of advanced macular degeneration or hemianopia, the majority of optometrists would refer to CNIB (55.8% in the case of advanced ARMD and 52.5% in the case of hemianopia). However, the distribution of responses became much more diversified. In a patient with advanced macular degeneration, a BCVA of 6/60

and goals of reading, TV and writing, 25.9% of the respondents would assess for basic magnification and lighting requirements and then refer, 20.9% of the respondents would refer the patient to a multi-disciplinary low vision clinic, 15.0% would undertake full vision rehabilitation themselves and 13.9% would refer to another optometrist for a low vision assessment. Similarly, in a patient with hemianopia who was said to have difficulties with reading and mobility, more than one-fifth of the respondents indicated that they would provide information about reading techniques and/or prescribe prism, or they would refer to a multi-disciplinary low vision clinic. What is perhaps disturbing in these responses is that over 25% of optometrists would provide information about reading techniques, seemingly ignoring the mobility difficulties. However, only 5.2% (n=24) of the respondents did not check off another response (i.e. referral to specialized low vision services).

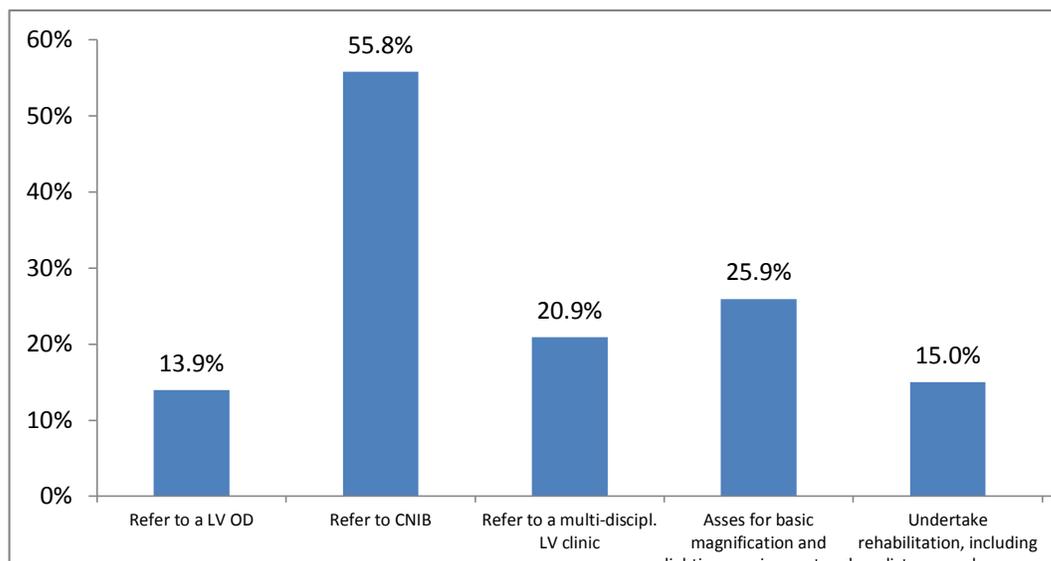


Figure 5-14: Percentage of optometrists indicating each course of action for managing a patient with advanced ARMD, with a BCVA of 6/60 and goals of reading, watching television and writing

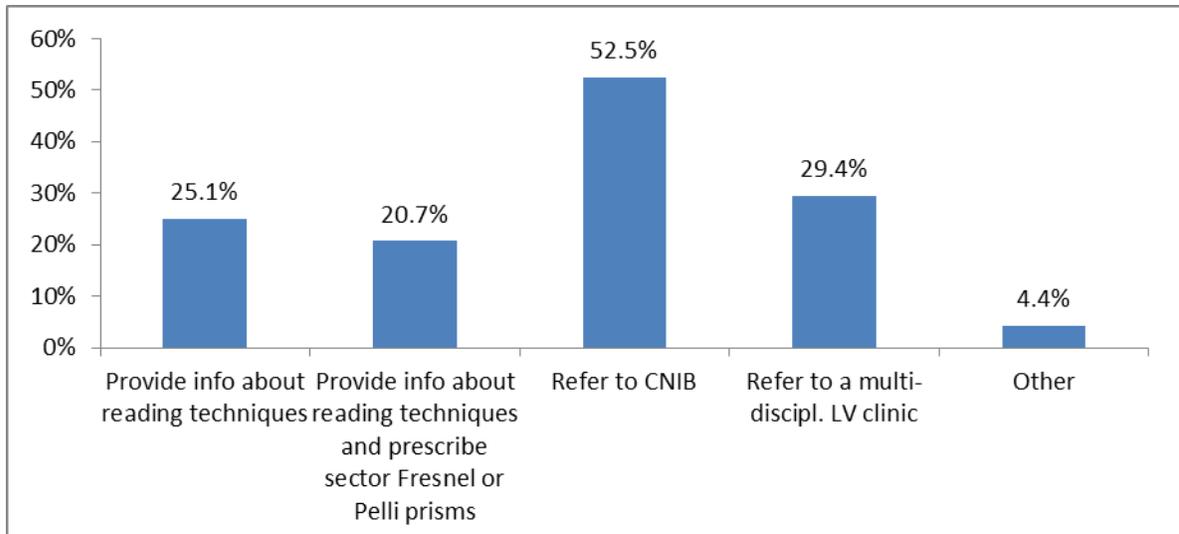


Figure 5-15: Percentage of optometrists indicating each course of action for managing a patient with hemianopia and complex needs (reading and mobility)

5.4 Referral Criteria for Low Vision Services – Visual Acuity and Visual Field

With respect to the level of BCVA that would trigger a referral to specialized services for persons with visual impairment (Fig. 5-16), 77.5 % of respondents would refer at the BCVA of better than 6/60. Still, there were 22.5% of respondents who would not refer a patient until the BCVA was worse than 6/60.

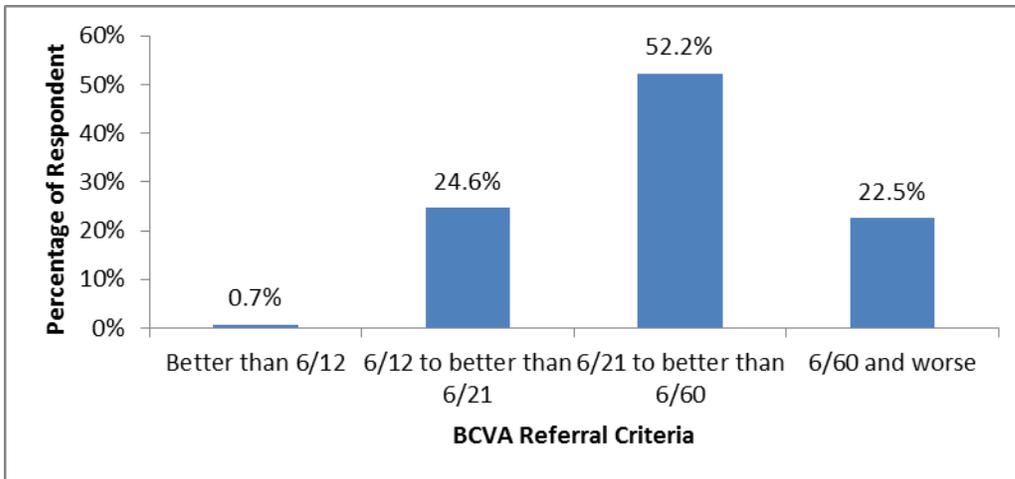


Figure 5-16: BCVA referral criteria for low vision services

Fewer optometrists answered the question regarding referral for visual field loss (n=398) compared with the question regarding referral criteria for VA (n=436). Of those who did answer, the majority of respondents (86.9%) would initiate a referral for low vision services if their patients had a total visual field diameter of more than 20° (Fig. 5-17). Still, 13.1% of respondents chose to wait until the patient's total visual field diameter was worse than 20°.

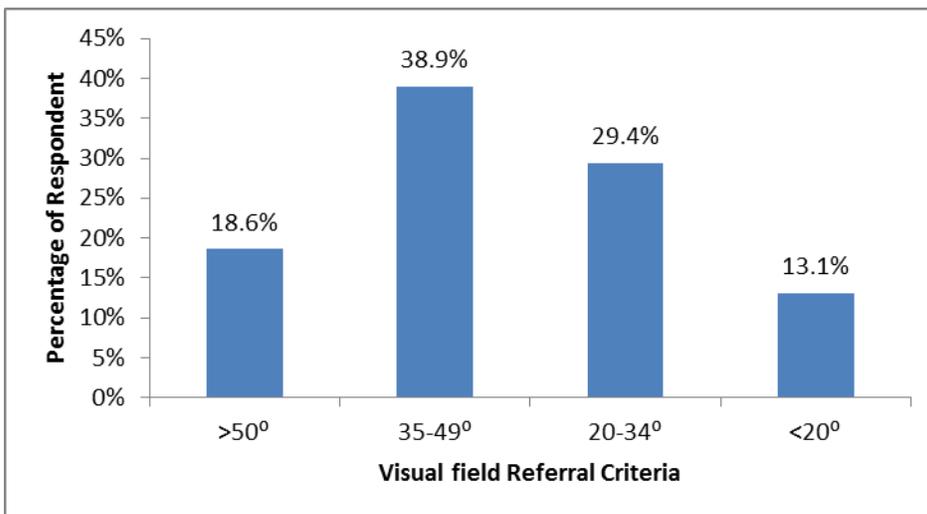


Figure 5-17: Visual field referral criteria for low vision services

5.5 Availability of Low Vision Equipment and Devices in Primary Practice

When asked about the types of diagnostic equipment for low vision assessment in their practice (Fig. 5-18; Question C9), the Lighthouse continuous text near acuity chart was reported most commonly 37.1%, followed by the logMAR distance acuity chart (31.6%), computer contrast sensitivity chart (24.7%), Feinbloom distance acuity chart (23.8%), and paper contrast sensitivity charts (Pelli-Robson or other) (14.0%). The most common types of low vision aids respondents had available in their practice were hand magnifiers (46.9%), stand magnifiers (34.7%), tints (n=23.8%), prism half-eyes (23.1%), telescopes (20.9%) and microscopes (12.9%). Fifty-three respondents (11.8%) checked the option of “other” and they specified the following equipment in their written comment: CCTV (n=16), computer software (n=2), Braille (n=1), electronic magnifier (n=9), electronic low vision aid (n=3), electronic telescope/telemicroscope (n=3), television adaptable magnifier (n=1), Fresnel prism (n=1), “NVR – Brain Injury Rehabilitation System” (n=1), visual field expansion system (n=1). Respondents also cited non-optical aids including iPad (n=2), Kindle (n=1), bookstand (n=1), kitchen equipment (n=1) and Fresnel lens (Fresnel screen magnifier) (n=1).

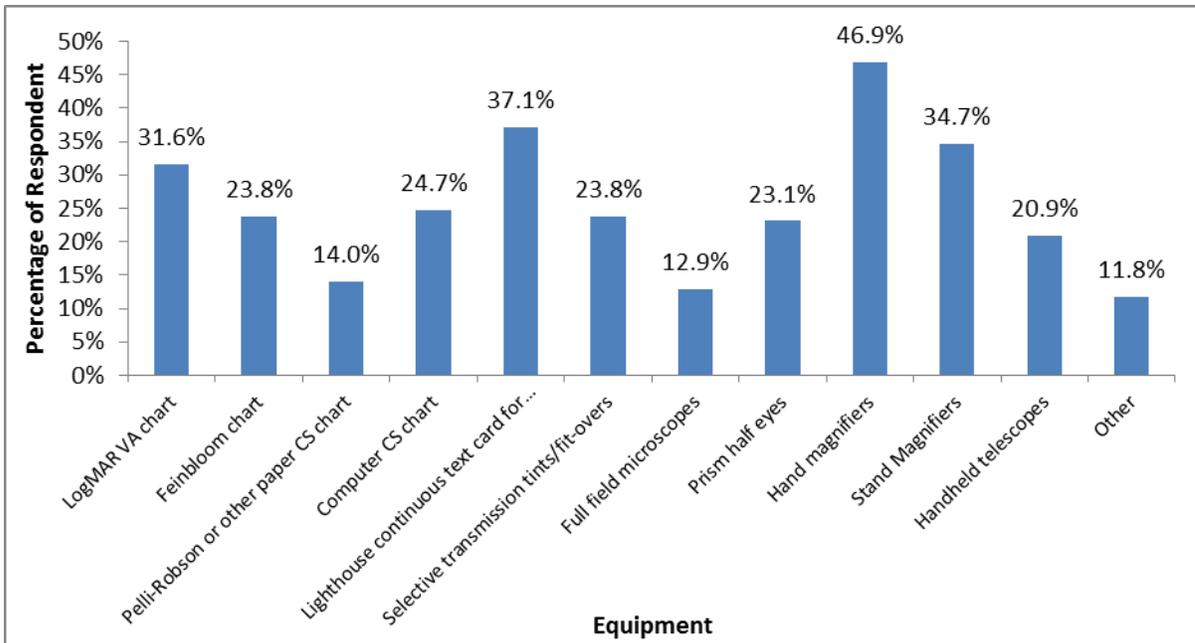


Figure 5-18: Type of equipment respondent has in his/her practice

5.6 Provision of Low Vision Service(s) by Respondents

The level(s) of low vision service respondents would provide is depicted in Fig. 5-19 (Question C10).

While most respondents (90.6%) would recognize a low vision case, assess for visual impairment (75.6%) and/or manage a patient using high powered additions and lighting (73.2%), fewer of the respondents would assess for visual disability (58.2%). The number of optometrists who would manage a patient with more than minimum visual disabilities with more specialized devices (i.e. telescope, electronic low vision aids, and custom-designed microscopes) is fewer still (10.7%). Only 3.5% of the respondents would manage a patient with complex goals (i.e. vocational, requiring multiple interventions).

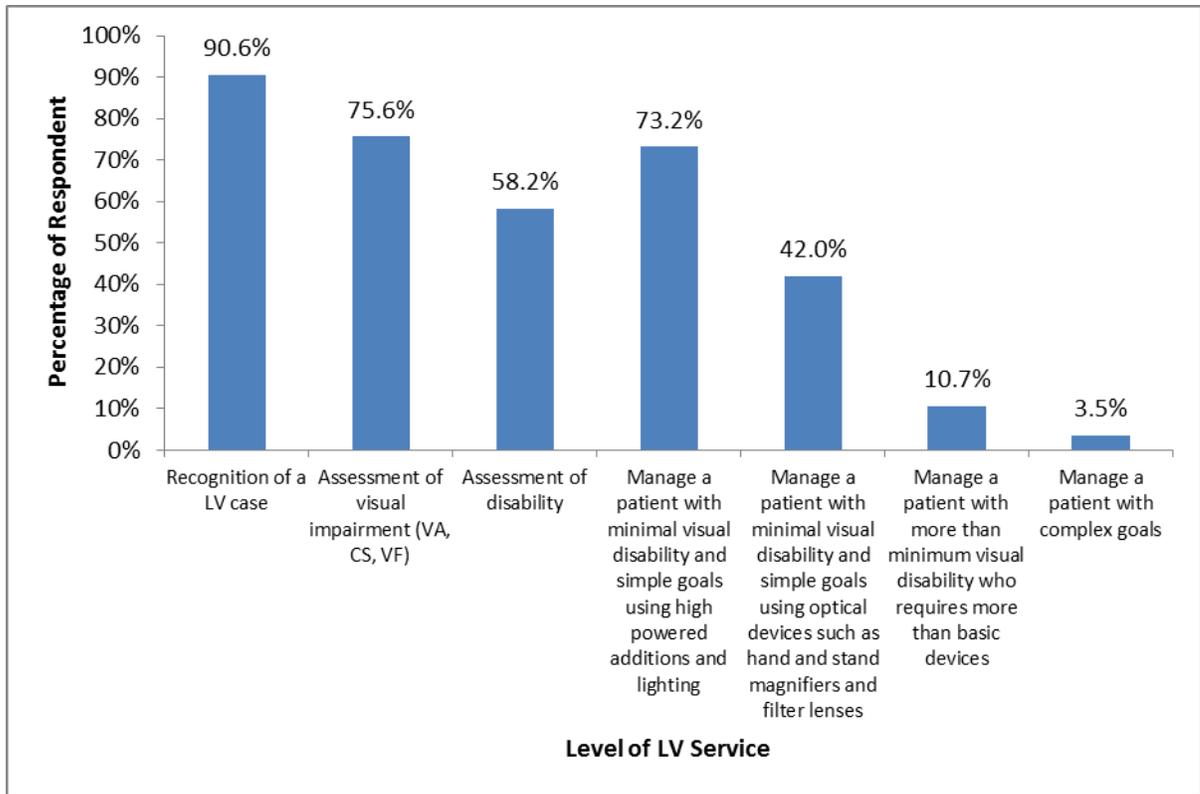


Figure 5-19: Levels of low vision services provided by optometrists

5.7 Barriers to Providing Low Vision Services

If the respondents did not manage many patients with minimal visual disability and simple goals using high powered additions and lighting (Level D) or simple optical devices such as magnifiers and filter lenses (Level E) in Question C10, they were asked to indicate the reasons for not providing this level of management. The readers were prompted not to answer Question C11 if they did manage patients at Levels D and E in Question 10. Despite this instruction, some respondents still answered question C11 when they need not have. Table 5-2 summarizes the number of respondents who answered the question, including both those who were and were not instructed to answer, and those who did not answer the question despite being instructed to respond.

Table 5-4: Classification of correct and incorrect responses for Question C11

Classification of response for Question C11	# Respondents
Did not answer when they should have	36
Correctly answered Question C11	239
Answered Question C11 when they should not have	54

Figure 5-20 illustrates the proportion of respondents who had chosen not to provide LV services at levels D and E according to their reasons. This figure represents the responses of the 239 participants who answered Question C11 correctly. As mentioned above, there were some who answered the question when they should not but their responses followed a similar pattern.

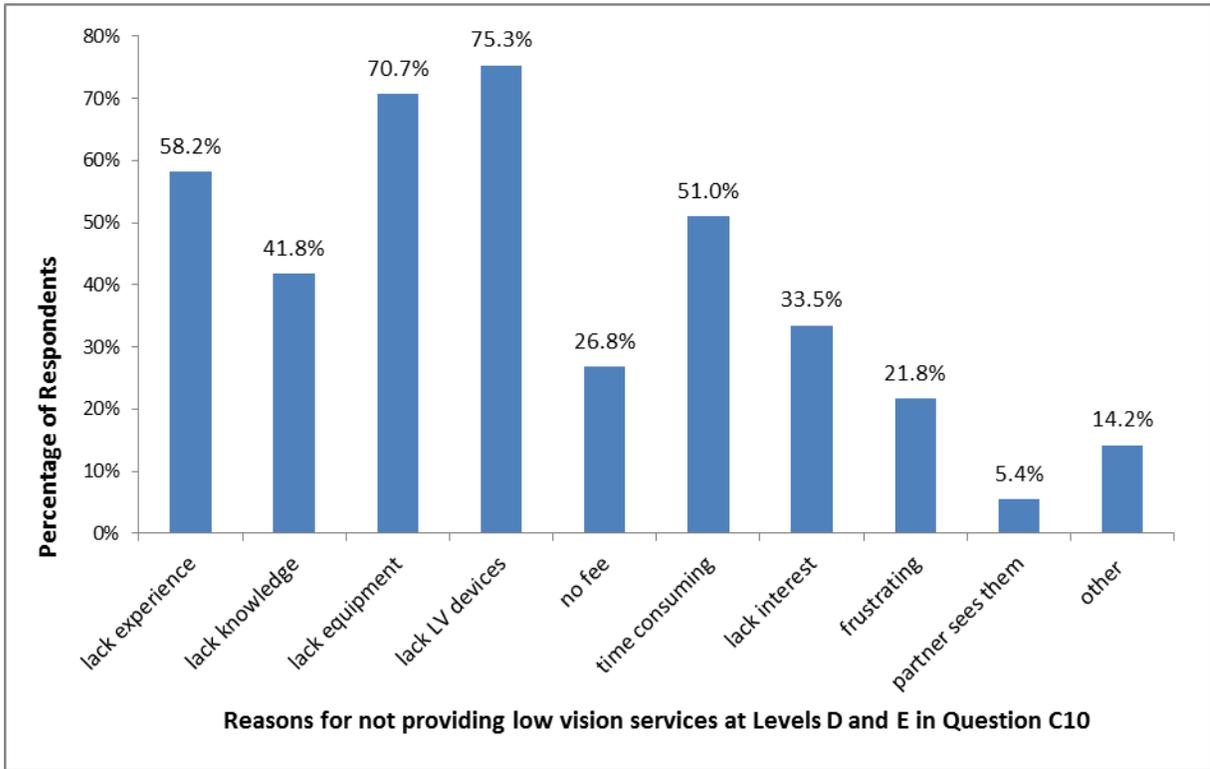


Figure 5-20: Reasons for not providing low vision services at Levels D and E in Question C10

Fifty-eight to seventy-five percent of the respondents who had chosen not to provide LV service at Levels D and E said that they lacked low vision devices, lacked equipment and lacked experience.

Fifty-one percent of the respondents also felt that providing low vision service would be too time consuming. Those who checked “other” in Question C11 stated the following reasons: proximity to other low vision services (n=12), lack of demand (n=10), patients do not wish to pay (n=7), high cost of devices (n=4), better service elsewhere (n=4), “free” service elsewhere (n=3), not the interest of the owner (n=3), frustration or lack interest (n=3), low remuneration (n=2), cannot compete (n=3), patients lack interest/knowledge/commitment (n=2). Question C12 asked respondents who cited inadequate equipment or devices in Question C11, to identify factors that influenced them not to acquire low vision equipment. Again, despite the instruction, some respondents still answered this question incorrectly. Table 5-5 summarizes the number of respondents who answered the question – both those who were and were not instructed to answer – and those who did not answer the question despite being instructed to respond.

Table 5-5: Classification of correct and incorrect responses for Question C12

Classification of response for Question C12	# Respondents
Did not answer when they should have	62
Correctly answered Question C12	220
Answered Question C12 when they should not have	40

Figure 5-21 illustrates the proportion of respondents not having low vision equipment or devices according to their reasons if the respondents do not manage many low vision patients at levels D and E in Question C10. This figure represents the responses of the 220 participants who answered Question C12 correctly. Although there were some who answered the question when they should not have, their responses followed the same pattern. The top three reasons for not having adequate equipment or devices were financial non-viability (60.5%), lack of demand (58.2%) and the respondent’s lack of interest (45.0%).

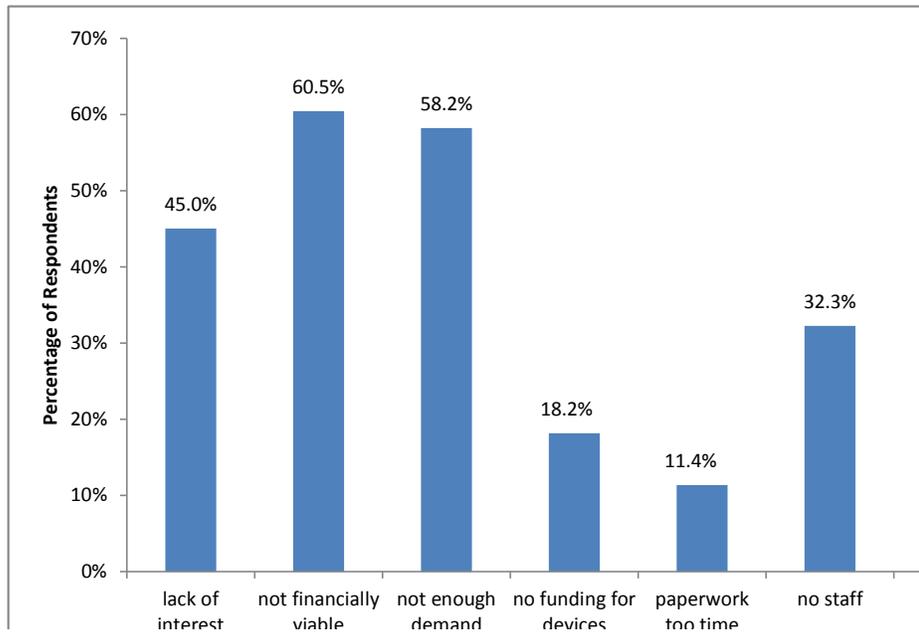


Figure 5-21: Reasons for not acquiring low vision equipment or devices

There were 38 respondents who had written comments in the “other” section of the multiple choice. These other barriers to obtaining equipment included proximity to low vision service (n=8), lack of space (n=5), better service available elsewhere (n=4), time consuming (n=4), lack of demand (n=3), not the decision of respondent (n=2), low vision kit available via provincial association (n=1), no funding for private optometrists (n=1), Ontario Assistive Devices Program’s “artificial requirement” (n=1), lack of experience (n=1), free service elsewhere (n=1), respondent just graduated (n=1), prefers to refer (n=1), not respondent’s specialty (n=1), never pursued (n=1), lack of patience (n=1), patients’ lack of motivation (n=1) and patients not willing to spend (n=1).

Another follow-up question (C14) asked those respondents who did not manage many low vision patients at Levels D or E in Question C10 to indicate what would need to change for them to be willing to manage more of these patients. Again, despite the instruction, some respondents still answered question C14 when they managed patients at Levels D and E. Table 5-6 summarizes the

number of respondents who answered the question – both those who were and were not instructed to answer – and those who did not answer the question despite being instructed to respond.

Table 5-6: Classification of correct and incorrect responses for Question C14

Question C14 response	# Respondents
Did not answer when they should have	27
Correctly answered Question C14	257
Answered Question C14 when they should not have	111

Figure 5-22 illustrates the proportion of respondents not having low vision equipment or devices according to their reasons. This figure represents the response of the 257 participants who answered Question C11 correctly. Although there were some who answered the question when they should not have, their responses followed the same pattern.

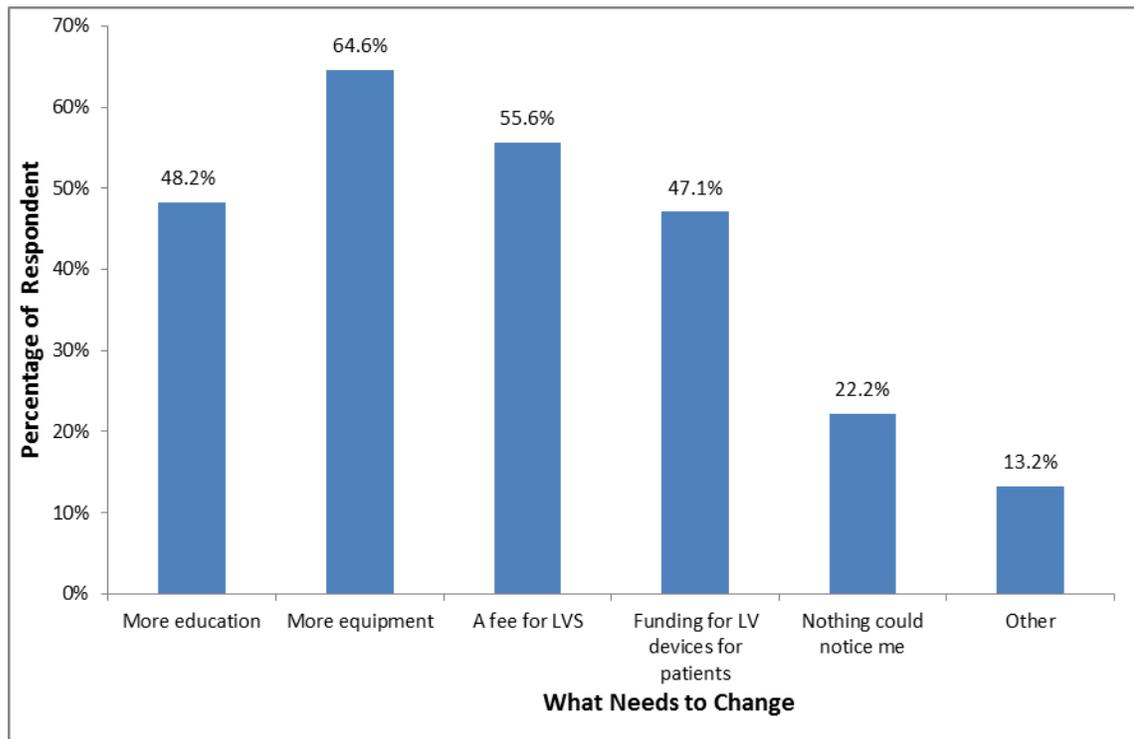


Figure 5-22: Reasons for not seeing many low vision patients at Levels D and E

Almost 65% of respondents felt that if they had more low vision equipment, and almost 56% of respondents believed that if a fee for low vision service could be claimed, they would be willing to become more involved in low vision. Almost half of all respondents would be more willing to provide low vision services if more low vision education was available. There were 46 respondents who had written comments in the “other” section. According to these comments, the most common reasons for not managing more of these patients were as follows: not enough demand (n=16), better service available elsewhere (n=4), too time consuming (n=4), lack of collaboration with other providers (n=4), lack of support from colleague (n=4), respondent not interested (n=2), patient not interested (n=2). free service available elsewhere (n=2), need support from colleague in primary practice (n=2), better co-management/rapport with CNIB needed (n=2), inadequate remuneration to offset cost of equipment and time, limited staff resources (n=2), patients not interested (n=2), no doctor available in primary practice to do low vision (n=1), more space needed (n=1), different type of practice (n=1), patients cannot afford it (n=1), patients not interested (n=1), respondent has no interest (n=1), would do only if respondent is the only help available (n=1), not in position because respondent is not financially independent (n=1), more low vision referral sources needed (n=1), ability to collaborate with ophthalmologist for referral needed (n=1).

5.8 Perception of Low Vision Referrals

The respondents were asked about the organisation(s) or individuals to whom they referred for low vision services (Figure 5-23). Most optometrists referred to CNIB (81.9%). The proportion of respondents referring to local optometrists or ophthalmologists (30.7%) and referring to a multi-disciplinary low vision service (30.1%) were almost equal. A small number of respondents (2.0%) did not refer at all. Twenty-two respondents had checked in the “other” section, and this included private low vision therapist (n=3), respondent did low vision him/herself (n=2), registered nurse (n=2), hospital (n=2), optician (n=2), a rehabilitation centre for different impairment (n=2), low vision

company (n=1), physiotherapist (n=1), family medicine (n=1) and vision enhancement home visit (n=1).

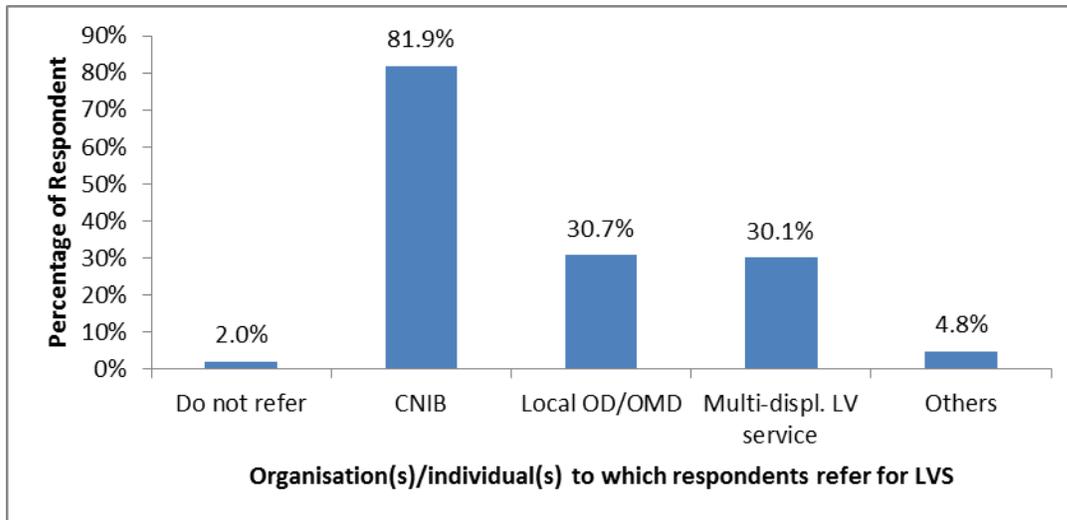


Figure 5-23: Organisation(s)/individual(s) to which respondents refer for low vision service

The respondents were also asked to rate the low vision services provided by others in their local area in terms of availability (Figure 5-24) and quality (Figure 5-25). The availability and quality of low vision service were generally rated as good or fair. However, only 10.7% of respondents almost always received a written report from these agencies/individuals and more than one third of respondents almost never received one (Figure 5-26)

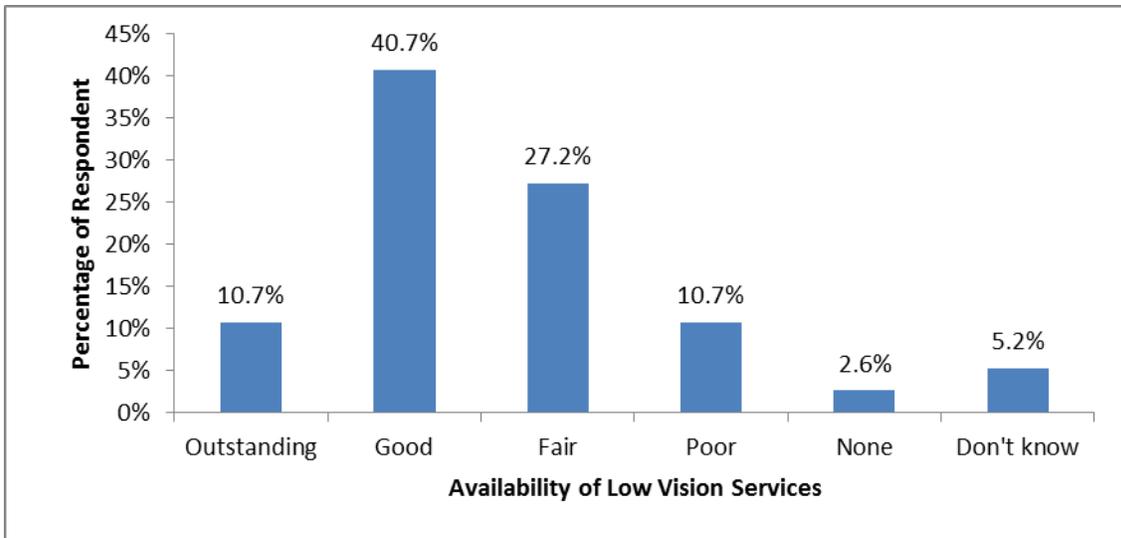


Figure 5-24: Availability of low vision services

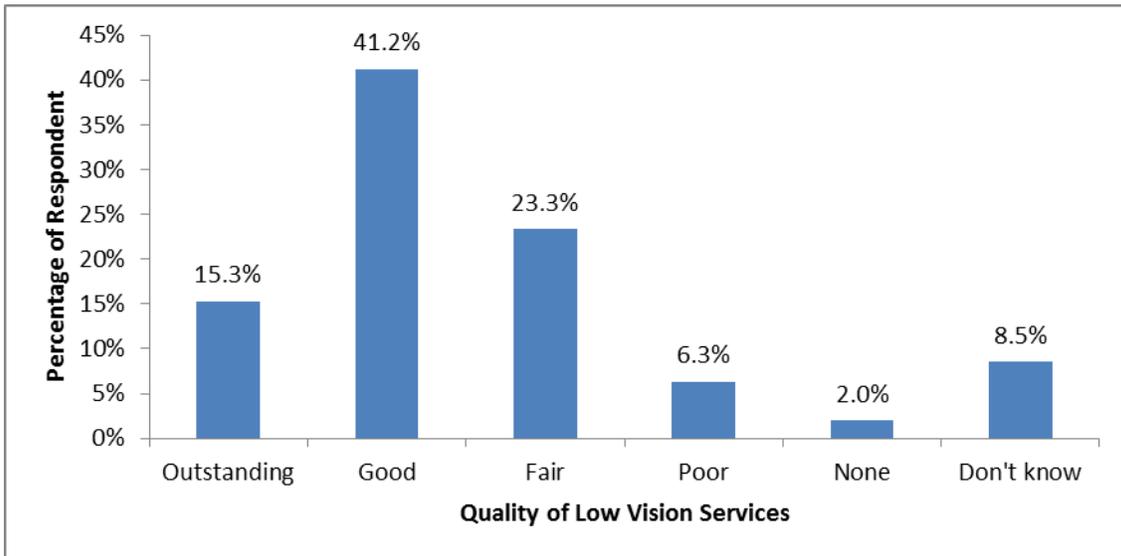


Figure 5-25: Quality of low vision services

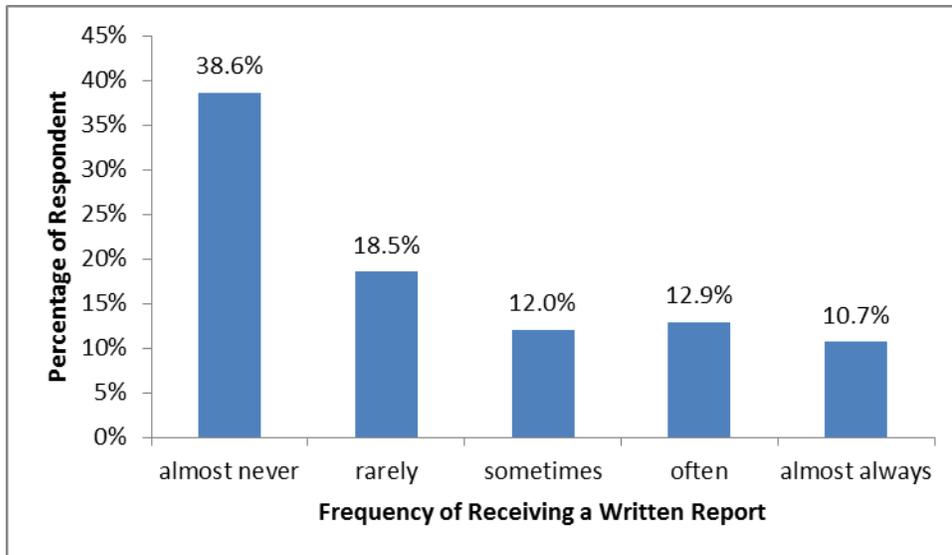


Figure 5-26: Frequency of receiving a report from LV service providers

5.9 Written Responses on Education and Provision of Low Vision Services

Two open-response questions were asked in the questionnaire. The first one (Question C13) asked respondents if they would want to benefit from more education on the subject of low vision. If the respondents agreed, then they were asked what aspects of training or education would be useful and how it might best be achieved. The second question (Question C15) asked respondents to provide any other comments that they have about provision of low vision services in their practice or area.

5.9.1 Comments on Education

Almost forty-two percent (n=192) respondents had written comments on this section. Of these, just over 30% (n=58) simply stated they were not interested.

5.9.1.1 Format of Training

Twenty optometrists who provided written comments simply stated that more continuing education or a “refresher” course would be helpful. A separate group of 22 optometrists commented on the type of training that would be beneficial. Of these optometrists, over half of them (n=16) recommended

hands-on approaches. This would include training/workshops with actual low vision devices, labs about “real cases” and working a day at the local CNIB or at the School of Optometry and Vision Science Low Vision Clinic. In addition to clinical training, optometrists (n=4) also feel that staff training would be helpful, and this may be achieved through the optometric assistant training at the provincial meeting or a 2-3 year programme in community college. While one optometrist thought that there were plenty of continuing education opportunities available (in Quebec), another optometrist (in Ontario) felt otherwise.

Optometrists (n=17) noted that continuing education may be done in the form of recertification at the School of Optometry, conference/seminar, CNIB, webinar or in-office placement. Furthermore, seven optometrists had specific remarks about who in their area did training for them and who should be performing the training. Four disclosed that training has been or can be done through local low vision sales representatives. One remarked that he/she “should need more practical hints on what to provide to low vision patients [and] how to do exam. That should be made in different cities by [a] group of optometrists” (Quebec respondent #52 - QC₅₂). One optometrist mentioned that he and his colleagues “do low vision seminars in our city” (SK₁₀). One recommended training to be done through a seminar by low vision specialists.

5.9.1.2 Content of the Training/Education

It is not known where the respondents undertook their optometry training. However, the overwhelming themes of the training were practicality and feasibility of providing all or part of the low vision optometric service. At the very least, optometrists who were not interested in low vision would need to know where to refer. One optometrist with 26+ years of practice wrote that it would be helpful to know “what is available, what it costs, what coverage is available so I can refer better and know where to refer” (AB₃₀). Six optometrists specifically wanted to know where to access aids and equipment. One wanted to learn more about government coverage in his/her area and two specifically

wanted to learn more about the Assistive Devices Program in Ontario. One wanted to learn about referral criteria for low vision.

Those who would be interested in starting low vision services were interested in how to set-up a low vision clinic (n=5) and how to perform low vision assessment in a timely and cost efficient manner (n=12).

Six optometrists specifically asked about what equipment to obtain to start a low vision practice. Affordability and knowing what kind of devices are good for given situations are important questions to optometrists (n=16). They expressed a need to know the list of equipment that is the most useful and that is available to the patient for reasonable cost. They also wanted to know how to help a patient to evaluate and choose a device in a given situation efficiently. “The low vision exam on a time budget” (MN₁), “CE courses of down-to-earth, useful nature” (QC₄₆), and “practical low vision in a real optometric practice” (ON₃₅) were some of the comments echoed by these optometrists.

Twelve optometrists wanted to learn about the latest devices and high tech devices while one specifically commented on wanting to learn new testing procedures. Seven optometrists wanted to learn about general optical principals and dispensing techniques. Four wanted a review of basic calculations for real life scenarios. Five wanted to learn about telescopes and/or bioptics. Other interventions mentioned included rehabilitation for stroke (n=1), Fresnel prisms for low vision (n=1), aids for distance tasks (n=1), prisms for visual field enhancement (n=1) and “management of early drop of [best corrected] visual acuity and early cases of low vision” (QC₁₂) (n=1).

Four optometrists wanted to learn more about patient counselling. One wrote that he/she wanted to learn “how to convince patients there are devices that will benefit their lives” (ON₁₁₇). He/she added that when he/she “does an evaluation, and show[s] the patient the improvement and then the patient (usually a senior) backs away and says, I’ll think about it.” Managing the psychological aspect of low vision and managing patients’ expectations were also important. Two optometrists mentioned that

they would like to know “how to differentiate between a patient who has accepted low vision as opposed to wanting a cure” (BC₅₄).

5.9.1.3 Comments on Optometry Education

Four optometrists made comments on their low vision training while they were in optometry school. Three were directed towards the impracticality of their learning experience. One respondent felt that s/he “needs practical CE about basic equipment and not every type... A way to START and not just collect lots of data like in school” (BC₂₆). S/he also “want[s] to learn about basic mag calculations for real life scenarios... Not the 1 hour extended version taught in opt. school” (BC₂₆). Another suggested that optometry education should provide a basic method of performing a low vision assessment that “does not take up large quantities of time and does not require a large input of money to get started” (MN₅). The same respondent asserted that “professors continually forget that we practice in reality, not theoretic, where time and money matter” (MN₅). An optometrist from Quebec commented on the lack of internship experience. He/she stated that “in my optometry class (University of Montreal), we had the equivalent of 3 hours internship in LV versus hundreds of hours in regular clinic” (QC₂₇).

5.9.1.4 Comments Not Related to Education

In addition, 14 optometrists commented on other aspects of low vision not related to education. These include lobbying the government to provide coverage for equipment and/or assessment (n=2) and “not knowing the provincial logistics of low vision (i.e. the rule and law with low vision)” (ON₆) (n=1). Comments on communication and inter-professional relationship were also made. This included “more communication needed between CNIB, optometrists and ophthalmologists (which is great)” (AB₆), proximity to low vision service with better service, the optometrists “having great referral relationship with local provider and volunteers with CNIB” (BC₃₃). Others mentioned the low demand for in-office low vision, and comments included that “patients are referred most of the time” (QC₂₈), “demand is low due to CNIB/ophthalmologists” (BC₇) and “population too small for

additional expenses” (AB₃₄). Five optometrists commented on the reason for their lack of motivation. These included “patients do not want to spend money” (BC₆₃), “constant battle with little reward in terms of accomplishment” (UnKnown province - UK₃) and low vision being time consuming. One optometrist wrote, “I used to do low vision... but once CNIB started doing it, I started referring to them as [it is] time consuming [to do low vision]” (NS₁₆).

Finally, there were three optometrists who were not able to do low vision due to limitations in their work environment. Of the three, two were younger optometrists with 0-5 years of practice. Their comments included the following: “I did a low vision residency but unfortunately cannot apply my skills secondary to work environment” (BC₃₂) and “sure, maybe when I’m at a practice where it would fit it. I really enjoyed low vision at school” (BC₃₅). One optometrist with 11-15 years of practice wrote, “more education would be great but we still lack the space, staff, time and money to be serious about it” (BC₅₅).

5.9.2 Comments on the Provision of Low Vision Service in Respondent’s Practice or Area

One hundred thirteen respondents gave comments on Question C15, which was an open-ended question.

5.9.2.1 Comments on Accessibility

Seven optometrists commented on accessibility issues. Three mentioned that there is simply no service. One commented that even when there was a low vision service available within one hour’s travel time, the patient “often cannot drive and has difficulty finding someone to go with them” (QC₁₈). Another, whose practice is situated in a town with a population of 2,500 to 4,999, commented that “transportation is [the] biggest problem for low vision patients in our area to seek help. Long drive over difficult roads, especially in the winter months” (BC₄₂). An Ontario optometrist, whose practice was also situated in a community of 2,500 to 4,999 mentioned that

although CNIB and University of Waterloo Sight Enhancement Centres are both two hours away, these centres are “too far for senior patients” (ON₂₈). He/she added that “some of these patients have access [to low vision services] at their senior home facility.” (ON₂₈) The third respondent commented on a “long wait list at CNIB” (ON₈₅). Another optometrist from British Columbia whose primary practice is in a community of 10,000 wrote “no CNIB in my city anymore so patients have to find a way to drive to a town about an hour away to get help” (BC₅₇).

On the other hand, twenty-four respondents mentioned good accessibility and/or good service provided by local providers and/or him/herself and/or a colleague from the same practice. In Quebec, the comments were overwhelmingly positive. Of the 11 written comments, 7 of them centred on compliments about government-run low vision service being “well-served in Montreal area” (QC₁₆), “good” (QC₅₈), “accessible” (QC₆₁), “free” (QC₁₇) for all eligible and “paid by Medicare” (QC₂₅).

5.9.2.2 Comments on Inter-professional Collaboration

A number of optometrists mentioned collaboration between optometrists and low vision providers in British Columbia. Two optometrists, whose primary practices both resided in a population of 10,000 mentioned that CNIB used their office for “low vision exam and equipment demonstrations” (BC₁₉ and BC₂₄). One mentioned that “CNIB visit area 3-4 times a year doing home visits and uses our offices for visual assessments as required. We offer this service at no charge to CNIB” (BC₂₄). Another BC optometrist commented that the “local CNIB office was closed 5 years ago. One of the consultants from there started offering her services to patients of a number of optometrists office by referral. This has been very effective. She usually visits the patient at their home” (BC₆₁). Two optometrists wrote about companies in BC selling low vision services that would also accept low vision referrals from optometrists. One commented that “we are very fortunate to have independent offers that provide low vision services (i.e. AbleTech and Aroga). They do not have optometrists on site but do accept referrals and have a wide variety of devices available” (BC₁₈). Another optometrist

wrote “on my day off I run a low vision support group for the community” (BC₄₃).

Referrals/collaboration was also seen in Manitoba and Ontario. An optometrist from Manitoba mentioned that “CNIB has a low vision clinic every few months in town” and the optometrist’s office is “used by a low vision nurse who comes with appliances” (MN₆). In Ontario, one optometrist wrote, “basically, all I do is prismatic half eyes on referral from ophthalmologist or CNIB. Our local CNIB is very good and very extensive high tech CNIB centre 3 hours away” (ON₉₁). An optometrist in Ontario who does low vision said that his/her referral source was often the local CNIB. Another one wrote “once a month, I offer specialty low vision assessments at a secondary practice (where I am ADP authorized) in association with an ophthalmologist for OHIP eligibility” (ON₁₄₆).

5.9.2.3 Comments on CNIB

Despite the lack of request for specific comments about CNIB, it was mentioned in 38% (n=43) of all additional written comments on the provision of low vision services. The positive comments were divided into the categories as outlined by Table 5-7 and the negative comments are outlined by Table 5-8. Comments on a common topic were grouped and counted. The point form notes underneath each common topic were direct quotes from the respondents.

Table 5-7: Positive comments on CNIB

Comments	Count
<p>Good availability locally</p> <ul style="list-style-type: none"> • “We have a low vision nurse from CNIB that demonstrates low vision aids” (BC₃₇) • “CNIB has a good presence in our area. If they were not available, I would attempt to have more in office devices” (NB₂₃) • “I feel fortunate that I have easy access to CNIB” (MN₁) • “The CNIB has a LV clinic every few months in town” (MN₆) • “My specialty leaned towards children’s vision so low vision was never my priority – especially with the low vision services available through CNIB in Manitoba” (MN₁₉) • “To me just convenient to send people to CNIB or Centre for Sight Enhancement rather than having devices here” (ON₁₅₃) 	12
<p>Collaboration</p> <ul style="list-style-type: none"> • “CNIB refers patients to me for prism half eyes” (ON₉₁) • “Optometrist allowing CNIB to use their office for LV assessment” (BC₂₄) • “Southern and Northern Saskatchewan Low Vision Clinic have been set up for many years to work with CNIB in providing service to LV patients with significant visual impairment” (SK₇) 	6
<p>“Free” assessment</p> <ul style="list-style-type: none"> • “Patients can get ‘free assessments’ from CNIB, rather than me giving out essentially free services of my own time to do the assessments” (NB₂) • “There is no charge to the patient for the assessment” (NB₁₄) • “In Saskatchewan, patients with BCVA <20/70 can get LVA through SAIL funding through the CNIB but not through an optometrist office → basic for OD to provide service” (SK₁₂) 	4
<p>More equipment available than if respondent were to equip themselves</p> <ul style="list-style-type: none"> • “It’s tough to have everything on site for these few cases, especially since my community there is a CNIB office in town” (NB₄) • “I refer to CNIB locally where they have samples of devices and the time to show these to the patients” (ON₃₅) 	4
<p>Good service</p> <ul style="list-style-type: none"> • “Low vision clinic at Saskatoon extremely qualified for this role. It would be repetitive, time consuming and expensive to duplicate their role” (SK₁₃) • “Patients have been happy with CNIB nearby” (ON₆) 	2
<p>Better price than can be offered if respondent were to equip themselves</p> <ul style="list-style-type: none"> • “Offers devices at lower cost than I can afford to dispense them for” (ON₄₄) • “The cost of sticking LV devices in my practice is too prohibitive. Referral to CNIB low vision services is more logical” (ON₅₉) 	2
<p>An essential service</p> <ul style="list-style-type: none"> • “I wish the government would support the CNIB. They provide an essential service to our seniors but lack of funds means not enough people to service the demand” (BC₃₃) 	1

Note: comments are categorized according to theme. Therefore, it is possible for a respondent to be counted in several themes

There were also a variety of negative comments on CNIB (Table 5.11). Specific comments that were directly quoted from respondents and that provide further insight on these categories are included.

Table 5-8: Negative comments on CNIB

Comments	Count
No CNIB locally or too far	3
Does not support collaboration with low vision optometrist <ul style="list-style-type: none"> • “CNIB have bad attitude and strongly favour the orthoptist/ophthalmologist combination” (NB₈) • “There is little or no cooperation with CNIB to help me prescribe low vision aids and have the patient adapt to them. I believe they could coordinate this if they wanted to” (NB₁₆) • “CNIB is anti-optometry and tell patient to see ophthalmologists and opticians” (MN₁₇) 	3
Stigma associated with the word “blind” <ul style="list-style-type: none"> • “The word ‘blind’ in the CNIB name is scary for many patients” (MN₁) • “Most of my patients do not want to go to the CNIB because they are not ‘blind’” (AB₃₅) 	2
Staff not as knowledgeable as necessary <ul style="list-style-type: none"> • “I am concerned about the expansion of low vision therapists that lack some of the optical knowledge required” (ON₂₀) • “Our CNIB tries very hard but is not as knowledgeable as necessary” (NB₁₅) 	2
Negative or mixed comments from optometrist’s patients after referral <ul style="list-style-type: none"> • “I have heard nothing but disappointed comments about local CNIB” (BC₆₀) • “I find this difficult as I get mixed reactions from the patients I send to CNIB. Most feel they are not helped” (ON₁₀₇) 	2
Expensive aids <ul style="list-style-type: none"> • “CNIB’s aids are extremely expensive” (BC₂₆) • “CNIB over-charge” (NB₈) 	2
Non-specific comments about CNIB not being helpful <ul style="list-style-type: none"> • “CNIB seems only useful for very low vision” (BC₂₆) • “CNIB provide minimal help in terms of LV devices” (ON₂₀) 	2
Lack of funding from government/Resource <ul style="list-style-type: none"> • “CNIB in my local area has no devices to show patients. They are brought up from a major centre every 6 months. Most patients don’t mind waiting” (AB₁₅) 	1
Falsifies records to get funding <ul style="list-style-type: none"> • “The CNIB in our area falsifies records and changes VA to get funding” (MB₁₇) 	1
Long waiting list	1
Dislike filing CNIB form	1
Not sending reports <ul style="list-style-type: none"> • “CNIB usually does not send reports” (BC₅₄) 	1
Competes on an active basis <ul style="list-style-type: none"> • “CNIB ‘competes’ on an active basis (i.e. they advertise LV clinic days and then “sell” the basic devices to our patients” (ON₄₃) 	1

Note: comments are categorised according to theme. Therefore, it is possible for a respondent to be counted in several themes

5.9.2.4 Comments on Fee, Equipment and Coverage

Other aspects that determine the provision of low vision service were (the lack of) provincial coverage and challenges associated with charging a reasonable fee for service. There were 13 respondents who wrote comments about this. Eight commented on the low vision exam fee. They argued that government funding, if any, should be “proportional to chair time” (BC₅₂). One even commented that “low vision takes 3-4 hours of time in which [I] could provide exams for 9-12 other patients. Then there are complicated calculations/letters, etc, that follow. It is not financially possible to provide these services” (AB₂₅). One optometrist from Ontario mentioned that “in BC, there is an additional fee that can be billed for low vision services. This would provide some incentive for me to offer services in my province.” (ON₂₅). Some have mentioned that they are doing less low vision as it is a financial burden for them. A respondent wrote, “now [that there is an] optometrist close to CNIB, I get less referrals. I try not to do more than one LV per week, not profitable” (ON₉₉). Another younger optometrist of 0-5 years of practice commented, “from what I have heard from optometrists who do provide low vision services, there is too little reimbursement to make it worth the exam time” (ON₁₂₂). One respondent who was experienced in low vision said “out of 20 ODs in my area, I am the only one offering intermediate-level services. Usually with elderly patients on limited income, we take a financial hit to perform these services” (ON₁₂₆). Another commented that “OHIP [Ontario Health Insurance Plan] does not cover this service, so people don’t understand why I charge for 1-2 hours of my time” (ON₁₄₅). Finally, an optometrist from Ontario mentioned “I feel that optometrists in Ontario should have an equivalent OHIP billing code for low vision assessments like ophthalmologists” (ON₅₈).

Similarly, optometrists also felt that low vision aids were too costly for them to be equipped with in their office (n=2) and/or too costly for patients to buy without subsidy (n=9). Optometrists commented that low vision aids were too unaffordable for patients with low vision, who were typically on fixed income (n=2). Some have commented on funding for electronic aids (n=2). They

mentioned that “a foundation is needed to defray the costs of electronic visual aids” (BC₁₄) and that “people either want more medical help, always pursuing the latest surgery, or are relying on digital aids, and magnifiers and telescopes are getting left behind” (SK₁₂) In addition, one optometrist found that “newer devices which provide magnification electronically appear more suitable” (BC₄). However, another optometrist said “cost of devices, especially CCTVs are major barrier for many of our patients in Manitoba” (MN₁₄). One optometrist suggested that perhaps “some kind of tax credit (for low vision aids) would really help” (SK₁₀). However, even in Ontario, where the Assistive Devices Program (ADP) may cover up to 75% of the cost of device for eligible patients, an optometrist commented that the ADP is “too cumbersome” (ON₄₃). It was “too much bother for too little money” (ON₄₃).

5.9.2.5 Comments on Patient Motivation

Fourteen respondents have made comments relating to patient motivation. Similar to Tables 5-7 and 5-8 (comments on CNIB), comments on patient motivation were grouped by their common theme and counted. The results are presented in Table 5-9.

Table 5-9: Comments relating to patient's lack of motivation to seek low vision help

Comments	Count
Patients with mild VA loss (6/12 to 6/24 range) but not interested in low vision service <ul style="list-style-type: none"> • “They have no complaints but may not know what’s possible” (AB₃₀) • “They are functioning adequately while waiting for cataract surgery” (BC₂₅) • “Those that visit me have generally a mild affliction. Those with higher degrees of problem seem to go elsewhere in the eye care community.” (NB₄) 	2
Patient satisfied with their own aids and don’t want additional service <ul style="list-style-type: none"> • “Some patients don’t want low vision services. They are happy with their hand magnifier so I don’t refer” (ON₉₈) 	1
Patient not willing to pay for health services and/or device <ul style="list-style-type: none"> • “Prefer to go to stores such as Princes Auto that sells magnifiers. It’s hard to invest into low vision aids where cost is an issue” (MN₉) 	2
Patient expectation <ul style="list-style-type: none"> • “Patients do not want an appliance other than regular spectacle correction” (NFL₇) • “Patients feel too old to try to learn how to use the aids, especially high tech aids. Some of them find magnifiers too cumbersome to use and want the correction in glasses, but do not want to shorten their working distance. I find only a small percentage of low vision patients who are willing to try the aids that could help them. Many of them give up before they even try the aids (NB₁) • Patient wanted medical help, always pursuing the latest surgery (SK₁₂) • If equipment such as telemicroscope is not evolved, they are not interested. Even though it would improve their level of vision and reading capability. It’s frustrating for me to try to teach them, do a demo on my computer and always being turned down, kind of giving up trying (NB₇) • I have been doing low vision and registered with ADP since 1991. However, I have been doing less and less over the years due to my frustration with patients. Despite counselling, their expectations remain too high and willingness to pay for professionals services is too low. I therefore have not promoted that aspect of my practice for more than 10 years. (ON₁₁₀) 	5

Note: comments are categorized according to theme. Therefore, it is possible for a respondent to be counted in several themes

An optometrist who has been actively referring patient to CNIB commented that “my biggest challenge is convince my low vision patient of the benefits that CNIB has to offer. I also mentioned that I have a friend who isn’t too far from me who provides full scope LV assessments, but many patients shy away due to the extra costs of the exams and devices. I look at myself as the middle man and always try to get the patient’s family involved. My main job is to convince the patient to maximize the vision they do have and not dwell on the vision they have lost. Not an easy task for

many” (MN₁). One said, “I seriously did a lot of LV work but now get little satisfaction so now do only selective patients” (NFL₄)

5.9.2.6 Comments on Other Aspects Relating to Provision of Low Vision Services

Other comments included in the provision of low vision service included the need for better communication between different professionals working in low vision (n=1), the need for a list of local providers of low vision service (n=1), and the need for suppliers information (n=1). One respondent wondered if “there [was] a standard fee for low vision service at optometrist’s offices” (MB₈) and if there was a loaner program available. Two optometrists found that providing low vision service would be too time consuming but one would like to have a new associate who is able to do low vision. Another respondent commented that “good suppliers are being substitute with cheaper products due to price” (SK₁₂). There was one respondent who wrote that “many low vision patients have poor reading skills before developing low vision and they have poor saccades and pursuit. Therefore, low vision service therapy involves teaching reading as well as enhancing vision” (BC₅₄). One optometrist felt that “there are only 1-2 optometrists” doing a poor job [of providing low vision services] in local area” (MB₁₆). Therefore he/she is “sending patients to the states for much better exam (costs \$295USD) and better equipment” (MB₁₆).

5.10 Conclusion

This chapter has reviewed the descriptive analysis portion of the current study. The next chapter will present readers with regional comparisons and factors that predict the provision of low vision services.

Chapter 6

Results: Comparisons between Regions and Factors that Predict Provision of Low Vision Services

6.1 Comparisons between Regions

Questions B9, C5 to C8, C10, D2 and D4 were analysed with chi-square statistics to determine the differences in low vision provision between the regions: the Eastern Provinces, Quebec, Ontario and the Western Provinces. The summary of these chi-square analyses can be found in Table 6-1. The factors that showed some significance across regions are described in the sections that follow. No statistically significant regional differences were found in the level(s) of low vision service provided by the respondents, the availability of low vision services locally or whether respondents received a written report from the referred low vision provider.

Table 6-1: Summary of regional differences in low vision practice patterns and services

Source and Description of Variable	Outcome	Counts				χ^2 , Df, 2-sided p	
		Eastern Provinces	Ontario	Quebec	Western Provinces		
Question B9: The presence of an optometric colleague(s) offering LVS within respondent's primary practice	Yes	34	50	26	46	8.89, 3, 0.031	
	No	23	82	37	74		
Question C9: Referral BCVA	Better than 6/21	18	39	11	38	19.29, 6, 0.004	
	6/21 to better than 6/60	31	76	51	61		
	6/60 and worse	20	28	8	40		
Question C9: Referral VF	>50°	14	21	12	25	18.44, 9, 0.030	
	35-49°	22	49	37	41		
	20-34°	22	41	14	35		
	<20°	8	17	2	24		
Question C10: Provision of LVS	Level EFG = 1	47	55	25	68	5.39, 3, 0.146	
	Level EFG = 0	24	101	46	79		
Question D1: Type of LV provider to which respondents refer for LVS	Do not refer	Yes	2	2	1	4	1.14, 3, 0.768*
		No	70	155	70	144	
	CNIB	Yes	66	128	38	139	59.77, 3, <0.0005
		No	6	29	33	9	
	Local OD/OMD	Yes	27	57	12	39	11.61, 3, 0.009
		No	45	100	59	109	
Multi-disciplinary LVC	Yes	3	60	44	29	69.62, 3, <0.0005	
	No	69	97	27	119		
Question D2: Availability of LVS	Don't know	0	9	5	9	16.15, 12, 0.185	
	Fair	24	36	18	43		
	Good	29	62	34	57		
	Outstanding	3	23	7	15		
	Poor	13	19	6	22		
Question D2: Quality of LVS	Don't know	1	16	7	15	40.93, 12, <0.0005	
	Fair	24	33	8	37		
	Good	31	60	37	56		

	Outstanding	3	29	18	18	
	Poor	10	9	0	18	
Question D4: Receive Report	Almost never (0-5%)	33	59	21	59	20.30, 12, 0.062
	Rarely (6-25%)	17	26	10	28	
	Sometimes (26-74%)	10	16	14	15	
	Often (75-94%)	3	20	13	20	
	Almost always (95-100%)	3	22	9	13	

Note: Those in bold are significant

*4 cells or 50% cells have expected count of less than 5

6.1.1 The Presence of an Optometric Colleague(s) Offering Low Vision Service in the Respondent's Primary Practice (Question B9)

The presence or absence of an optometric colleague offering LVS in the respondent's primary practice was significantly different across regions ($\chi^2(3)=8.888$, $p=0.031$). The significance lies in that optometrists in the Eastern Provinces tended to be more likely to have an optometric colleague offering low vision service (adjusted residual=2.9). The effect size measure was small (Cramer's $V=0.118$, $p=0.012$).

6.1.2 Referral Criteria for Low Vision Services: Level of Visual Acuity (Question C9)

The referral criteria for low vision service according to best corrected visual acuity (BCVA) was found to be significantly different across regions ($\chi^2(6)=19.288$, $p=0.004$). Respondents from Quebec tended to be less likely to refer patients to low vision service when the patient's BCVA was better than 6/21 (adjusted residual=-2.0), and more likely to when the patient's BCVA was 6/21 to better than 6/60 (adjusted residual=3.8). They tended to be less likely to refer their patients when the patient's BCVA was 6/60 and worse (adjusted residual=-2.5), perhaps because they have already referred these patients before their BCVA dropped to 6/60. Respondents from the Western Provinces seemed less likely to refer when the patient's BCVA was 6/21 to better than 6/60 (adjusted residual=-

2.3) and seemed more likely to refer when the patient's BCVA was 6/60 and worse (adjusted residual=2.1). The effect size measure was small (Cramer's V=0.151, p=0.004).

6.1.3 Referral Criteria for Low Vision Services: Total Visual Field Diameter (Question B8)

The referral criteria for low vision service according to the total visual field diameter was found to be significantly different across regions ($\chi^2(9)=18.443$, $p=0.030$). Respondents from Quebec tended to be more likely to refer patients to low vision service when the patient's total visual field diameter was between 35⁰ to 49⁰ and tended to be less likely to refer when the patient's total visual field diameter was below 20⁰. Conversely, respondents from the Western Provinces tended to be more likely to refer when the patient's total visual field diameter was below 20⁰. The effect size measure was small (Cramer's V=0.127, $p=0.030$).

6.1.4 Patterns of Referrals to Other Low Vision Providers (Question D1)

In this question, respondents could choose to refer to more than one type of provider depending on the patient's situation. Therefore, the multiple choices to Question D1 were not mutually exclusive and would violate the assumption of the chi-square test. To prevent this violation, the referrals to each type of low vision provider were analysed separately. The alpha level of significance was adjusted using a modified Bonferroni test by Keppel⁹⁹ to reduce Type I error. The patterns of referrals to each type of low vision providers were found to be significantly different across regions as described below. Also, the chi-square analysis for the choice of "do not refer" contained 50% cells which had expected count of less than 5. Therefore, this choice was not included in the analysis.

The pattern of referral was significantly different across regions ($\chi^2(3)=59.772$, $p=0.000$). Respondents from the Western provinces (adjusted residual=2.2) and Eastern provinces (adjusted residual=4.4) tended to be more likely to refer patients to CNIB, whereas respondents from Quebec tended to be less likely to refer patients to CNIB (adjusted residual=-7.1).

The pattern of referral to local optometrists/ophthalmologist was different across regions ($\chi^2(3)=11.607$, $p=0.009$). Respondents from Ontario tended to be more likely to refer patients to local optometrists/ophthalmologist (adjusted residual=2.1) whereas respondents from Quebec tended to be less likely to refer patients to these providers (adjusted residual=-2.6).

The pattern of referral to a multi-disciplinary low vision clinic is different across regions ($\chi^2(3)=69.622$, $p<0.0005$). Whereas respondents from Quebec (adjusted residual=6.3) and Ontario (adjusted residual=2.7) tended to be more likely to refer patients to these clinics, respondents from Eastern Provinces (adjusted residual=-5.3) and Western Provinces (adjusted residual=-3.5) tended to be less likely to refer patients to these clinics.

6.1.5 Quality of Low Vision Services (Question D2)

The quality of low vision service in respondents' local area did differ across regions ($\chi^2(12)=40.933$, $p<0.0005$). Respondents from the Eastern Provinces tended to be less likely to report not knowing the quality of low vision services (adjusted residual=-2.4), less likely to report the quality of low vision services as outstanding (adjusted residual=-2.8) and more likely to report the quality of low vision services as fair (adjusted residual=2.4). Respondents from Quebec tended to be more likely to report the quality of low vision service as outstanding (adjusted residual=2.5) and tended to be less likely to report the quality as fair (adjusted residual=-2.6) and as poor or none (adjusted residual=-2.8). The effect size measure was small (Cramer's $V=0.178$, $p<0.0005$).

6.1.6 Hypothetical Case Questions

For each of the hypothetical questions, regional differences were found to be statistically significant for some of the responses (Table 6-2). Although it was not expected, many respondents had chosen more than one multiple-choice answer (i.e. more than one course of action) in each case scenario. Therefore, these multiple choices were not mutually exclusive and would violate the assumption of

the chi-square test. To prevent this violation, each choice was analysed separately. The alpha level of significance was adjusted using a modified Bonferroni test by Keppel⁹⁹ to reduce Type I error (Table 6-9).

Table 6-2: Summary of regional differences for the hypothetical case questions

Source and Description of Variable	Outcome		Count				χ^2 , Df, 2-sided p	Adjusted Bonferroni (Keppel)
			Eastern Provinces	ON	QC	Western Provinces		
Question C5: Hypothetical case on a patient with early ARMD, BCVA of 6/12 and a goal of reading	Refer to a LV OD	Yes	2	16	2	6	9.10, 3, 0.028	0.0357
		No	67	135	69	140		
	Refer to CNIB	Yes	12	18	8	17	1.74, 3, 0.628	
		No	57	133	63	129		
	Refer to a multi-disciplinary LVC	Yes	1	9	8	1	15.22, 3, 0.002	
		No	68	142	63	145		
Assess for basic magnification and lighting	Yes	62	125	59	135	7.77, 3, 0.051		
	No	7	28	12	11			
Question C6: Hypothetical case on a patient with advanced ARMD, BCVA of 6/60 and goals of reading, television and writing	Refer to a LV OD	Yes	6	34	4	17	15.49, 3, 0.001	0.0285
		No	62	116	67	127		
	Refer to CNIB	Yes	46	80	36	88	6.04, 3, 0.110	
		No	22	70	35	56		
	Refer to multi-disciplinary LVC	Yes	1	34	35	23	51.43, 3, <0.0005	
		No	67	116	36	121		
	Assess for basic magnification and lighting and then refer	Yes	28	37	11	43	12.53, 3, 0.006	
		No	40	113	60	101		
	Undertake rehabilitation, including distance and near magnification, lighting and advice re: writing devices	Yes	14	18	6	31	9.16, 3, 0.027	
		No	54	132	65	113		
Question C7: Hypothetical case on a patient with hemianopia with complex needs (reading and mobility)	Provide information about reading techniques	Yes	19	37	11	45	6.80, 3, 0.079	0.0357
		No	50	109	59	94		
	Provide information about reading techniques and prescribe sector prisms	Yes	22	34	5	33	13.24, 3, 0.004	
		No	47	112	65	106		
	Refer to CNIB	Yes	50	74	34	80	10.97, 3, 0.012	
		No	19	72	36	59		
	Refer to a multi-disciplinary LVC	Yes	7	55	36	35	32.69, 3, <0.0005	
		No	62	91	34	104		

Note: Those in bold are significant

6.1.6.1 Management of a Patient with Early ARMD with a BCVA of 6/12 in the Better Eye and Main Goal of Reading (Question C5)

The choice of referral to another optometrist who does low vision services was found to be statistically significantly different across regions ($\chi^2(3)=9.102$, $p=0.028$). Namely, respondents from Ontario tended to be more likely to refer patient to a local optometrist (adjusted residual=3.0). Cramer's V for referral to another optometrist was 0.144 ($p=0.028$), indicating a small effect size.

The choice of referral to a multi-disciplinary low vision clinic was also found to be significantly different across regions ($\chi^2(3)=15.223$, $p=0.002$). Respondents from Quebec tended to be more likely to refer patients to a multi-disciplinary clinic (adjusted residual=3.1), whereas respondents from the Western Provinces tended to be less likely to refer to a multi-disciplinary clinic (adjusted residual=-2.7). Cramer's V for referral to a multi-disciplinary low vision clinic was 0.187 ($p=0.002$), indicating a small effect size.

6.1.6.2 Management of a Patient with Advanced ARMD with a BCVA of 6/60 and Multiple Visual Goals (Question C6)

The choice of referral to another optometrist for low vision service was significantly different across regions ($\chi^2(3)=15.491$, $p=0.001$). Respondents from Quebec tended to be less likely to refer patients to another optometrist (adjusted residual=-2.2) whereas those from Ontario tended to be more likely to refer their patients to fellow optometrists (adjusted residual=3.7). Cramer's V indicated a small effect size for referral to another optometrist (0.189, $p=0.001$).

The choice of referral to a multi-disciplinary low vision clinic was also significantly different ($\chi^2(3)=51.431$, $p<0.0005$). Respondents from the Eastern and Western Provinces tended to be less likely to refer their patients to a multi-disciplinary low vision clinic (adjusted residuals of -4.4 and -2.0 respectively). In contrast, respondents from Quebec tended to be more likely to refer their patients

to a multi-disciplinary low vision clinic (adjusted residuals of 6.2). The strength of association is a medium (Cramer's $V=0.345$) and highly significant ($p<0.0005$).

The choice of assessment by the respondent for basic magnification and lighting requirements and then refer was significant across regions ($\chi^2(3)=12.525$, $p=0.006$). Respondents from Quebec tended to be less likely to assess and then refer (adjusted residual=-2.5) whereas respondents from the Eastern Provinces tended to be more likely to assess and then refer (adjusted residual=2.8). Cramer's V indicated a small effect size for this choice (0.170, $p=0.008$).

The choice of respondents undertaking rehabilitation also differed between regions ($\chi^2(3)=9.164$, $p=0.027$). Respondents from the Western provinces tended to be more likely to undertake a full rehabilitation by themselves (adjusted residual=2.2). Cramer's V indicated a small effect size for this choice (0.145, $p=0.027$).

6.1.6.3 Management of a Patient with Hemianopia with Complex Needs (Question C7)

Regional differences were found to be significant for each multiple choice response except for providing information about reading techniques only. The choice of providing information about reading techniques and prescribe sector prism was found to be significantly different across regions ($\chi^2(3)=13.239$, $p=0.004$). Respondents from Quebec tended to be less likely to provide information and prescribe prism (adjusted residual=-3.3) whereas respondents from the Eastern Provinces appeared to be the opposite (adjusted residual=2.1). Cramer's V indicated a small effect size for this choice (0.177, $p=0.004$).

The choice of referring to CNIB differed across regions ($\chi^2(3)=10.972$, $p=0.012$). Respondents from the Eastern Provinces tended to be more likely to refer patients to CNIB in this case (adjusted residual=3.0). Cramer's V indicated a small effect size for this choice (0.161, $p=0.012$).

The choice of referring to multi-disciplinary low vision clinic differed across regions ($\chi^2(3)=32.688$, $p<0.0005$). Cramer's V indicated a medium effect size for referral to multi-

disciplinary low vision service (0.278, $p < 0.0005$). Respondents from the Eastern provinces tended to be less likely (adjusted residual = -4.2) to refer patients to a multi-disciplinary low vision clinic, whereas respondents from Ontario and Quebec both tended to be more likely to refer to a multi-disciplinary low vision clinic (adjusted residuals of 2.0 and 4.0 respectively).

6.2 Association between Respondent's Provision of Low Vision Service (Question C10) and the Type of Low Vision Service Available within One-day's Travel (Question B8)

In Question B8, respondents were prompted to indicate the different types of low vision service available within one-day's travel. As such, the choices were not mutually exclusive. To prevent the violation of chi-square test assumption, each multiple choice was analysed separately. The alpha level of significance was adjusted using a modified Bonferroni test by Keppel to reduce Type I error (Table 6-3).

Table 6-3: Summary of chi-square tests for whether the respondents manages a patient at Level E or greater vs. type of LV service available within one day's travel

Source and Description of Variable	Referral Entities		Respondents manage a patient at Level E or greater		χ^2 , Df, 2-sided p	Adjusted Bonferroni (Keppel)
			Yes	No		
Question B10: LVS within 1-Day's Travel	Local OD/OMD	Yes	147	165	6.323, 1, 0.012	0.0325
		No	49	93		
	CNIB	Yes	172	230	0.213, 1, 0.645	
		No	24	28		
	Multi-disciplinary LVC	Yes	63	118	8.585, 1, 0.003	
		No	133	140		

Chi-square test statistics indicated a positive association between the respondent providing low vision service at Levels E, F or G (in Question C10) and the availability of local optometrists within one-day's travel ($\chi^2(1)=6.323$, $p=0.012$) Cramer's V indicated an effect size of 0.118 ($p=0.012$) for this association with local optometrist.

A negative association was found between respondents providing low vision service at Levels E, F or G and the availability of multi-disciplinary low vision service within one-day's travel ($\chi^2(1)=8.585$, $p=0.003$). Cramer's V indicated a small effect size (0.138, $p=0.003$) for this association.

6.3 Predictive Factors for the Provision of Low Vision Service

Table 6-4 shows the results of the univariate logistic regression analysis on potential factor that predict whether optometrists provide higher levels of low vision services (Levels E-G in Question C10). The total number of respondents who answered Question C10 was 441. The predictive factors which were found to be significant were the optometrist being male ($p=0.016$), having practiced for 16 years or more ($p<0.0005$), type of practice, having another local low vision optometrist/ophthalmologist who provides LV services within one day's travel ($p=0.012$), not having a multi-disciplinary low vision clinic within one-day's travel ($p=0.004$), working in a practice located in a city of population of less than 50,000 ($p<0.0005$), and having two or more optometrists in the same practice ($p=0.001$).

Table 6-4: Univariate analysis of potential predictive factors of performing LVS at Levels E, F or G in Question C10

Predictive Factors (Univariate Analysis) (comparison group vs. reference group)	Coefficient	Wald	Odds Ratio	Lower CI	Upper CI	p-value
Gender (male, female)	-0.463	5.789	0.63	0.432	0.918	0.016
Years of Practice (16 years or more vs. less than 16 years)	1.062	29.299	2.893	1.969	4.251	<0.0005
Number of Px Seen by Respondent (41-80 vs. 0-40)	0.316	1.526	1.371	0.831	2.262	0.217
Number of Px Seen by Respondent (81-120 vs. 0-40)	0.379	1.572	1.46	0.808	2.64	0.210
Number of Px Seen by Respondent (120+ vs 0-40)	-1.086	0.944	0.338	0.038	3.019	0.333
Number of Px Seen by All OD (41-80 s. 0-40)	-0.024	0.004	0.976	0.449	2.125	0.952
Number of Px Seen by All OD (81-120 vs. 0-40)	0.262	0.442	13.000	0.6	2.817	0.506
Number of Px Seen by All OD (120+ vs 0-40)	0.491	1.654	1.634	0.773	3.453	0.198
Service within 1-Day – Local optometrist (Yes, No)	0.525	6.267	1.691	1.121	2.551	0.012
Service within 1-Day = CNIB (Yes, No)	-0.136	0.213	0.872	0.489	1.558	0.645
Service within 1-Day = Multi-disciplinary LV clinic (Yes, No)	-0.576	8.513	0.562	0.382	0.828	0.004
Population (50,000 or more vs. less than 50,000)	-0.74	13.956	0.477	0.324	0.704	<0.0005
Type of Practice (Optical vs. Private)	-0.39	1.378	0.677	0.353	1.299	0.240
Type of Practice (Institutional vs. Private)	-1.107	9.548	0.331	0.164	0.667	0.002
Number of optometrist in office (2+ vs. 1)	0.647	10.675	1.909	1.295	2.813	0.001

6.4 Multivariate Analysis of Predictive Factors for the Provision of Low Vision Services at Levels E, F or G (Question C10)

The results of multiple logistic regression analysis are presented in Table 6-5. The factors that were entered into the multiple regression were sex, years of practice, number of patients seen by the respondent, number of patients seen by the primary practice, low vision service available within one day's travel, population, type of practice and number of optometrists in the respondent's primary practice. Table 6-5 shows the final model for providing low vision services at Levels E, F or G 9 and the following factors were included: optometrist having practiced for 16 years or more (OR=3.071, 95% CI 2.024 to 4.659), having a local low vision optometrist/ophthalmologist within one day's travel (OR=1.866, 95% CI 1.179-2.954), not having a multi-disciplinary low vision clinic within one-day's travel (OR=0.443, 95 percent CI 0.287-0.684), working in a practice which resides in a population of less than 50,000 (OR=0.285, 95 percent CI 0.287-0.684), and having two or more optometrists in the same practice (OR=2.330, 95 percent CI=1.510-3.594). Sex and type of practice were not included in the final model. The final Cox and Snell R^2_{CS} was 0.155 and Nagelkerke's R^2_N was 0.208, suggesting a modest relationship between the expected prediction from the model and the actual observation.

Table 6-5: Multivariate analysis of potential predictive factors of performing low vision services at Levels E, F or G in Question C10

Predictive Factors (Multivariate Analysis) (comparison group vs. reference group)	Coefficient	Wald	Odds Ratio	Lower CI	Upper CI	Sig
Years of Practice (16 years or more vs. less than 16 years)	1.122	27.834	3.071	2.024	4.659	<0.0005
Service within 1-D (local LV OD available vs. local LV OD not available)	0.624	7.088	1.866	1.179	2.954	0.008
Service within 1-D MLVC (local MLVC available vs. local MLVC not available)	-0.814	13.473	0.443	0.287	0.684	<0.0005
Population (50,000 or more vs. less than 50,000)	-0.823	13.861	0.439	0.285	0.677	<0.0005
Number of OD in Office (2 or more vs. 1)	0.846	14.628	2.330	1.510	3.594	<0.0005

Chapter 7

Discussion and Conclusion

7.1 Study Population

This is the first survey of low vision practice among optometrists in Canada. It is also one of the most extensive optometric surveys on low vision conducted thus far in any country. While there is no agreed-upon standard for a minimum acceptable response rate for surveys⁹⁸, the total response rate of 25% in this current study is comparable to similar studies done in the past (response rates range from 6.7% to 36%)⁹³⁻⁹⁶.

The current study found that most respondents worked in private practice (Question B2). This result was very similar to other optometric surveys conducted in Australia^{95,96}, Norway¹⁰¹ and the United States⁹³. The higher percentage of female optometrists in earlier years of practice and the higher percentage of male optometrists in more advanced years of practice (Table 5-2) follows the demographic change in optometry within the last few decades. The proportion of respondents with 11-20 years of practice was likely underrepresented.

7.2 Estimate of the Best Corrected Visual Acuity in Respondent's Patients

The estimated proportion of patients with best corrected visual acuities at 6/12 and worse in this current survey (10%) was higher than that found in population-based studies.^{10, 16} In the Salisbury Eye Evaluation study¹⁶, 6.9% of study population (aged 65 to 84) had a binocular presenting visual acuity of worse than 6/12. In the most recent population-based study¹⁰ in the City of Brantford, Ontario, Canada, the weighted prevalence of people with presenting visual acuity of worse than 6/12 in the better eye (aged 40+) was 2.7% (95% CI= 1.8%-4.0%). This difference may have arisen from a combination of two factors: (i) people with poorer vision would be more inclined to seek optometric

care; (ii) different age groups in the study; (iii) different VA ranges included (6/12 and worse versus worse than 6/12; and (iv) inaccurate estimation by the respondents in the present study.

7.3 What is Low Vision and When Are Low Vision Services Offered?

The disparity between the percentage of patients that was considered to have low vision (1%) (Question B5) versus the percentage of patients with an estimated best corrected visual acuities at 6/12 (10%) (Question C4) could be due to several reasons. Firstly, a mild visual acuity loss may not automatically translate to visual disability. Low vision is defined by uncorrectable vision loss affecting a person's ability to performed desired activity. A visual disability would exist only when the individual could not to perform his/her visual goals because of a visual impairment. In the absence of a desired visual goal, a person who suffers from vision loss would be not considered as visually disabled.

Secondly, the percentage of patients that was considered to have low vision may be underestimated by the optometrists. Eighty-six percent of respondents do provide basic low vision intervention (i.e. assessment of basic magnification and lighting requirement) when a disability of reading was explicitly presented in the case study of a patient with early ARMD and a visual acuity of 6/12 (Question C5). Perhaps respondents may not think of visual acuity in the realm of 6/12 as being low vision and therefore may not ask about disabilities and offer LV rehabilitation. However, when they are presented with a case of a patient with an explicit disability, they would provide low vision intervention. Disabilities do start to manifest themselves at a visual acuity of 6/12.⁷ It is well-established in the literature that non-users of low vision service are often not aware of the services available to them.^{81, 82, 85, 88} One way of overcoming a patient's non-awareness would be to have all eye care practitioners initiate a conversation about vision rehabilitation even when the patient's vision impairment is minimal.

The definition of low vision usually includes the assumption that an individual has exhausted all conventional treatment methods. This misinterpretation may lead some eye care providers to postpone offering low vision service/referral and subject patients to an unnecessary sense of helplessness while they are being treated medically. Pollard et al's study on barriers in accessing low vision services in Australia found that many study participants reported that "eye care professionals gave limited information on coping with low vision"⁸² and "were disappointed that their referral to rehabilitation often occurred at the very end of the treatment process"⁸². Again, eye care practitioners could prevent this disappointment if they could introduce patients to the idea of vision rehabilitation in the early stage of the disease process.

Since the definition of low vision service was not specified in the current study (Questions C5 to C7), this may have broadened the spread of responses of provision of LV services. Each hypothetical case study presented a patient with visual impairment (reduced visual acuity) *and* implicitly indicated the patient's disability through his/her visual goal(s), although in the case of the patient with hemianopia, their disability was explicitly stated. In the case of a patient with early ARMD and a visual acuity of 6/12, the patient was said to have disability of reading (Question C5). A high percentage of optometrists (86%) do perform a basic low vision assessment (assess for basic magnification and lighting requirement). In the cases of a patient with advanced ARMD (Question C6) and hemianopia (Question C7) presenting with visual disabilities, respondents tended to refer patients to other low vision providers in their community, rather than managing them on their own. These responses suggested that the respondents would manage patients with low vision within their practice constraints and they would also refer complex cases to other low vision providers.

The current study found that 43% of respondents did manage a patient with minimum visual disability using optical devices such as hand and stand magnifiers. However, the current study did not investigate how respondents dispense low vision aids. Ryan and Culham¹⁰² found in 1999 that of the 1090 optometric respondents surveyed in the UK, 41.1% only sold low vision aids (without

assessment or professional input), 22.6% (n=246) provided low-vision services that included the provision of low vision aids and 35.78% (n=390) did not offer a service at all. Nevertheless, both the current study and the UK study suggested that many optometric clinics did see the need to provide services or products beyond their routine work, for people with vision impairment.

7.4 Low Vision Care Offered by Optometrists in Canada

7.4.1 Percentage of Optometric Practices Offering Low Vision Service

More than one-third of the respondents from the current study indicated there would be an optometrist in their primary practice specifically offering low vision care (Question B9). This percentage, though at first glance may seem high, was comparable to previous studies in other countries. The 2008 American Optometric Association Scope of Practice Survey found that 44.4% of optometrists provided some low vision service to their patients¹⁰³ and a survey by Renaud et al¹⁰⁴ in Quebec found that 39% of optometrists performed low-vision assessments in their office, even though only 2.7% worked in specialized low vision centers. Although more than one-third of the respondents' primary practice offer low vision service, it is likely that only a small proportion of optometrists practice low vision on a regular basis. While there were 13% (n=182) of optometrists in Ontario who practiced vision rehabilitation in 2005¹⁰⁵, only 6.3% (n=88) optometrists in Ontario were considered active Assistive Devices Program (ADP) authorizers of low tech low vision aids.¹⁰⁶ The term "active" was defined by those who authorized at least five or more devices over a two year period (January 1, 2005 to January 1, 2007).¹⁰⁶ Although some optometrists may dispense low vision devices without going through the ADP, it is reasonable to believe that the true proportion of optometrists actively dispensing low vision devices may not be much higher than this percentage. The low percentage of optometric ADP authorizers who actively dispensed ADP aids contrasted with the estimated 10% of optometric patients with a BCVA of 6/12 and worse.

7.4.2 Level of Low Vision Services Offered by Optometrists

Question C10 was the main question which was used to establish the extent to which the respondents provide low vision services. Over 90% of optometrists said they would recognize a case of low vision. However, the majority (32/43) of respondents who did not check off the choice of not recognize a case of low vision did check off the higher levels of low vision service provision, implying that these respondents must be recognizing a low vision case. Alternatively these optometrists may not be required to “recognize” a low vision case if they were providing services for patients who were referred to them by someone else who had already identified the patients. Upon examination of the raw data, it was discovered that only 11 respondents (2.4%) would not do any level of low vision service provision at all. Although a low number, this is worrisome, as patients have no chance of being informed about low vision services if their practitioners could not even recognize a low vision case. However, it is also possible that these optometrists read the stem of the multiple choice question, and thinking that they do not provide low vision services at all, moved onto the next question, without reading the multiple choice options.

Even though most respondents would manage patients with a high reading add and give lighting advice, a dip was evident in the proportion of respondents who assess for visual disability. The responses outlined in the levels of low vision service provision (Question C10) were meant to be in sequence (i.e. assessing for disability comes before managing with high reading add, etc). Some respondents seemed to have misunderstood this intention or understood the wording “disability” differently. This dip may suggest optometrists’ tendency to characterize patients by their disease and by the clinical measurements made during a routine eye examination. More education would be necessary to enable optometrists to be more cognizant of recognizing patients with visual impairment and assessing for visual disability.

7.4.3 Hypothetical Case Questions

When encountering a patient with early macular degeneration and a simple goal of reading (Question C5), most respondents (84%) would assess for basic magnification and lighting requirement themselves. This was consistent with the high proportion of optometrists who would practice low vision at the level of “high add and lighting” (73%) in Question C10.

The respondents’ course of action became much more diverse when they encountered a patient with more advanced impairment and multiple and/or complex needs (Questions C6 and C7). Although referral to CNIB was the most frequent response, it would appear that in the face of a more complex case, many respondents would continue to take charge and do as much low vision as possible within their practice constraints. In a patient with advanced AMD (Question C6), over one-quarter of respondents would still perform basic optical assessment prior to referral. As found in the chi-square analysis, respondents from the Eastern provinces tended to be more likely to assess for magnification and lighting first before referral (likely to CNIB). More respondents from the Eastern Provinces than expected were found to undertake full rehabilitation by themselves in the case of a patient with advanced AMD and to provide information about reading techniques and prescribe prism in a patient with hemianopia. To my knowledge, there is no multi-disciplinary low vision clinic in the Eastern provinces. Thus, these patterns of referral would indicate that respondents would judge a case and manage according to the type of resource available locally.

Similarly, in a patient with hemianopia (Question C7), over one-quarter of respondents would provide information about reading techniques and over one-fifth would provide information about reading techniques and prescribe prism. It would be important to note that in both cases, multiple answers were allowed. These patterns of referral indicate that respondents may choose to provide some low vision intervention *and* refer to other low vision providers.

The findings from the advanced AMD case show that the course of action taken by the respondents corresponded with the level of low vision services they would provide (Question C10). The

proportion of respondents who would undertake full vision rehabilitation (15.0%) was similar to the proportions of respondents who would manage patients with more than basic low vision devices (10.7%) and those who would manage complex needs (3.5%) combined. However, it was not clear how over one-fifth of the respondents would manage patient with hemianopia by providing information about reading techniques *and* prescribing prism, considering that this proportion was greater than those who indicated they would manage more than basic devices and/or complex needs combined (14.2%). Perhaps these respondents did not consider prescribing prism and providing reading techniques as being complex. Perhaps some respondents shared their practice with colleagues who provided such advance level of LV service, and these respondents would be inclined to at least attempt using prism when the equipment was readily available.

CNIB, being the most accessible low vision service provider and being one who can offer services “free-of-charge”, was logically the most popular choice among all types of LV service providers. No regional difference in the referral to CNIB was found in any of the hypothetical cases, except in the case of a patient with hemianopia, when respondents from the Eastern provinces seemed more likely to refer to CNIB. Perhaps the wording “difficulty with mobility” in Question C7 cued optometrists that intervention beyond vision aids would be needed for such a patient. Because there is no multi-disciplinary low vision clinic available in the Eastern provinces (to my knowledge), referral to CNIB would be the only choice.

Some ambiguity exists in selecting the choices between multi-disciplinary clinic and CNIB in the hypothetical questions because some multi-disciplinary clinics partner CNIB in service delivery. For example, the SAIL program in Saskatchewan and the STEP program in Alberta are administered by CNIB. CNIB handles the referral and booking of low vision assessment while the Royal Alexandra Hospital Department of Ophthalmology in Edmonton provide clients with the low vision assessment.⁵⁸ It is not clear whether this ambiguity caused confusion in answering the hypothetical questions.

7.4.4 Equipment and Devices Available in Optometric Practices

Contrast sensitivity is integral to visual performance and closely related to the ability to perform activities of daily living including reading, driving and navigation.¹⁰⁷ It is also important in predicting or understanding success with optical magnification. Yet, it is not considered a part of a routine optometric examination. In the current study (Question C9), there were almost twice as many respondents who possessed a computer contrast sensitivity chart (24.7%) compared to a paper version (14.0%). Because a computer contrast sensitivity chart would typically be included as a part of computer visual acuity programs, the greater prevalence of these charts would likely be attributable to the increasing popularity of these visual acuity programs in primary care settings. However, accurate contrast levels rely on the proper calibration of monitor's luminance.^{107, 108} Moreover, the liquid crystal display (LCD) monitor, which these programs use and which is a more prevalent form of monitor than the cathode ray tube (CRT) display, has been shown to be less suitable for psychophysical measurement of contrast than the CRT.¹⁰⁷ Perhaps encouraging the testing of contrast sensitivity as part of the work-up for people with an ocular condition(s) would enable optometrists to become more attuned to their patient's deficits in visual function.

The type of low vision devices available in the practice can be compared to that of Lim et al's⁹⁶ study in Victoria, Australia (Table 7-1). The percentages for all the low vision devices were higher in the Australian study⁹⁶ likely because optometrists in Australia were able to bill the government health care program, for low vision assessment.

Table 7-1: Type of LV devices available in optometric practices

	Lim et al ⁹⁶ (2007) n _{total} = 97	Current study n _{total} =459
Hand magnifier	61 (62.9%)	207 (45.1%)
Stand magnifier	51 (52.6%)	151 (32.9%)
Telescope	30 (30.9%)	89 (19.4%)
Head-borne magnifier device	47 (50.5%)*	159 (34.6%)**
CCTV	12 (12.4%)	25 (5.4%)

*“magnifying glasses” in Lim et al’s study were considered to be head-borne magnifier devices

**prism half eyes (22.2%) and microscopes (12.4%) were considered to be in our current study as head-borne magnifier device

Hand magnifiers and stand magnifiers were found to be the most useful among patients with macular degeneration.¹⁰⁹ They were also the most commonly dispensed low vision aid for patients with vision impairment.^{43, 47, 109-112} Horowitz et al¹¹³ conducted a study which included an investigation on the use of assistive devices in new applicants for community-based low vision services six months after service utilization. At the six-month follow-up, the proportions of participants who used special sunglasses (80.6%, n=353) and magnifiers (69.9%, n=306) were greater than those who used other optical aids (19.4%, n=85).¹¹³ DeCarlo et al¹⁰⁹ found that greater than 80% of patients with macular degeneration, who used hand magnifiers (n=144) and stand magnifiers (n=117), found them to be moderately to extremely useful at three-months after the prescription of these devices, whereas only 59.3% (n=16) of the near-spectacle users found their devices to be moderately to extremely useful at the three-month time point.

In our current study, the availability of prism half eyes (22.2%) was almost twice as much as microscopes (12.4%). Spectacle-mounted low vision aids have been shown to have a higher prevalence of nonuse for reading among those patients with relatively good visual acuity (6/24 or better) and those with relatively low visual acuity (worse than 6/60)¹¹⁴. However, those who could use them successfully were also most likely to be using them daily for a longer duration than other non-

high tech low vision aids.^{109, 114} The use of spectacle-mounted aids requires a reduction in working distance. Consequently, high powered microscopes may be prescribed with the least amount of magnification that a patient requires in order to maximize the working distance.¹⁰⁹ In doing so, the patient may not have sufficient acuity reserve to read fluently and thus abandon the device.

Conversely, if the power of the spectacle-mounted device is prescribed with sufficient acuity deserve, the patient would need to accept and learn to adapt to the shorter working distance. Learning to do so may require more time and training, which are resources more likely to be afforded by tertiary care rather than primary care eye providers. Indeed, it has been shown that spectacle-mounted low vision aids were more commonly dispensed in hospital-based low vision service than in community-based low vision services (29% vs. 7%; Fisher's exact, $p < .001$).¹¹⁰ While over 20% of respondents in the current study indicated that their primary practice was equipped with telescopic devices, the question did not distinguish between how many have custom telescopic trial kits versus the ready-made, entry-level devices such as the MaxTV and MaxDetail.

Only 7.0% (n=32) of respondents' primary practices were equipped with some form of high-tech magnifying aids. The features of high-tech devices offer more utility value compared with conventional low vision aids. For one, the contrast value in a computer display can be higher than that of laser print.¹¹⁵ Therefore, reading a certain type of computer display such as Apple Cinema display may require a lower contrast sensitivity to achieve the same reading fluency than print.¹¹⁵ Also, high tech devices can do the work of multiple systems. For example, a handheld electronic magnifier can offer multiple magnification levels. Due to the variable magnification levels, it can be used for multiple tasks. It can also prevent the need of changing the power of a conventional optical aid if vision continues to deteriorate.

Indeed, a systematic review of assistive devices revealed that there was moderately strong evidence that electronic stand-mounted or handheld CCTVs were generally preferred by people with low vision over standard non-electronic optical devices.¹¹⁶ There is also evidence that high-tech aids are useful

especially for people with reduced contrast sensitivity and severely reduced visual acuity. In Watson et al's study¹¹⁴, patients within the lowest visual acuity (6/60 to 6/240) tended to use the prescribed low vision devices for reading either highly successfully, or not at all. The larger number of successful users was accounted for primarily by video magnifiers whereas the larger number of non-users was accounted for primarily by spectacle-mounted magnifiers.¹¹⁴ The difficulty in prescribing conventional, non-high tech visual aids in patients in the lowest acuity group was also evident in DeCarlo's study¹⁰⁹. Of all the patients who had undergone a low vision assessment, 18 did not receive any conventional optical aids because they were unable to use them "for meaningful purposes primarily because of profoundly impaired vision (meaning BCVA in the better eye that was 6/60 and mean BCVA in the poorer seeing eye that was 6/150). Because electronic devices may offer so many advantages compared to conventional aids, they were indeed advocated by a number of respondents.

The current disadvantage of high-tech assistive devices is their relatively high cost and lack of coverage by provincial health care plans (except for Quebec and Ontario). Even in Ontario, where financial subsidy for visual aids is available, the program "has fallen far behind with respect to coverage of new device technologies".¹⁰⁶ The program "has also been criticised for failing to keep abreast of real market pricing of eligible devices".¹⁰⁶ Although electronic assistive devices may be more preferable by patients, the high cost likely deters many optometrists from supplying them.

The current study suggests that the types of low vision optical aids available in Canadian optometric practice do correspond to what previous studies have found to be the most frequently prescribed and most useful optical aids. High tech devices are particularly beneficial for patients with more reduced BCVA (6/60 or worse) because of the enhanced contrast, multiple magnification levels and increased field of view in some circumstances. In order for the patients to access these high tech devices, there must be a way to help patients defray the cost.

7.5 Referral to Low Vision Providers

7.5.1 Best Corrected Visual Acuity and Total Visual Field Diameter as Referral Criteria

The distribution of referrals according to best corrected visual acuity and total visual field diameter (Question C8) are very similar to that found in Lovie-Kitchin et al's⁹⁵ survey. Lovie-Kitchin et al's⁹⁵ survey was conducted prior to the implementation of government coverage for optometric LV services in Australia.

Table 7-2: Best corrected visual acuity referral criterion for low vision services

BCVA	Current study (%)	Lovie-Kitchin (1996) ⁹⁵ (%)
Better than 6/12	0.7	0.0
6/12 to 6/21	24.6	29.6
6/21 to better than 6/60	52.2	52.7
6/60 or worse	22.5	17.8

Table 7-3: Total visual field diameter referral criterion for low vision services

Total VF diameter	Current study (%)	Lovie-Kitchin (1996) ⁹⁵ *
>50°	18.6	>15° = 81.5%
35°-49°	38.9	
20°-34°	29.4	
<20°	13.1	<15° = 15.0%

*The total percentage did not add up to 100% because 3.5% of participants gave a description of visual field only

Both visual acuity and visual field are important predictors of performance in activities of daily living. Bergman and Sjostrand¹¹⁷ found that there was a statistically significant relationship between distance visual acuity and the probability of being able to live independently. Van Nispen et al¹¹⁸ found that decline in visual acuity, along with other co-morbidities, predicted a relatively rapid decline in health-related QoL in older adults who were visually impaired compared with younger

patients who were visually impaired and with older patients who were not visually impaired. Furthermore, Tabraett et al¹¹⁹ demonstrated that visual field loss in all areas of the binocular visual field was significantly associated with self-reported vision related activity limitation when tested with a Humphrey 30-2 SITA Fast program. Lovie-Kitchin et al⁸ showed that people with a binocular visual field of between 31 and 52° diameter solid angle should be considered for referral for mobility assessment. This finding was based on the experimental subject's walking speed, number of errors while walking through the experimental obstacle course and weighing the cost of referral relative to the cost of failure to refer.⁸

From the regional comparisons, it was found that optometrists tended to refer their patients to specialized low vision services according to the eligibility criteria that would get the patients covered by government-sponsored programs. One outstanding example of this tendency was found in respondents from Quebec. The eligibility criteria for government-sponsored rehabilitation centres in Quebec are a BCVA of less than 6/21 in each eye or a visual field of less than 60° in the horizontal and vertical meridians.⁵⁶ The finding from the current study reflected these eligibility criteria closely. Indeed, optometrists in Quebec seemed less likely to refer when a patient had a BCVA of better than 6/21 and more than those in other provinces when a patient had a BCVA between 6/21 to better than 6/60. Not many optometrists in Quebec would wait until their patient had a BCVA of 6/60 and worse to refer. The optometrists in Quebec appeared to use the eligibility criteria for government-sponsored rehabilitation centres as their referral criteria.

Their referral pattern for visual field demonstrated this trend as well. Respondents from Quebec referred more patients than those in other provinces when the patient's total visual field diameter was between 35-49 degrees. The visual acuity and visual field criteria correspond to the findings of Renaud et al, in which 70% of optometrists from Quebec "considered a person visually impaired when corrected visual acuity in the best eye is less than 6/21"^{104 (p285)} and 74% "considered a person to be visually impaired when the visual field in the best eye is less than 60 degrees"^{104 (p285)}. The strong

tendency to refer to their regional rehabilitation centers was also evidenced by the course of action they take in the three hypothetical LV cases. In each of the cases, the respondents from Quebec more often chose to refer to multi-disciplinary clinic than the average across other provinces. This is true even in the first hypothetical case where the patient only had mild vision loss (6/12) and a simple reading goal.

This tendency was also found in respondents from the Western Provinces. Alberta and Saskatchewan are the only Western provinces in which government-funded subsidy programmes are available for people with vision impairment. The Specialized Technical Equipment Program (STEP) in Alberta is administered through CNIB service centres.⁵⁸ People with vision impairment may receive coverage of up to 75% of the cost of their assistive devices and 100% of the cost (to up to \$500) if they have low or subsidized income.⁵⁸ To be eligible for this program, the applicant must be CNIB-registered.¹²⁰ To be CNIB-registered, one must be identified as being legally blind.

In Saskatchewan, funding for non-high tech vision aids is available through the Saskatchewan Aids to Independent Living (SAIL) Program.¹²¹ In order to be eligible, one must have a BCVA of 6/45 or worse or fields of less than 20 degrees.¹²¹ CNIB is responsible for registering eligible clients for the SAIL Program, but registration with CNIB is voluntary.¹²¹ These vision aids must be requisitioned by the Low Vision Clinic at either the Pasqua Hospital in Regina or the Saskatoon City Hospital in Saskatoon.¹²¹

It would be likely that the eligibility criteria for STEP and SAIL program played a role in influencing the referral criteria for optometrists practicing in the Western optometrists. Indeed, they referred more than expected when the patient's BCVA was 6/60 and worse and when the patient's total VF diameter is below 20⁰ (i.e., they tended to wait until these levels of vision were reached). This illustrates the importance of functionally relevant criteria of low vision services).

Definitive clinical criteria, rather than a functional-based definition, appear to cue optometrists to refer their patients to specialized low vision services. A fully sponsored government low vision

programme through publicly funded health care, such as that of Quebec, appeared to entice optometrists to refer earlier across different hypothetical case scenarios.

7.5.2 Perception of Referrals to Other Low Vision Service Providers

CNIB offers low vision services to Canadians, free-of-charge. According to the current study, it was also the most accessible low vision service provider within a day's travel for respondent's patients (Question B8). Therefore, it was not surprising to observe that referral to CNIB would be a popular choice. To my knowledge, there are no multi-disciplinary low vision clinics available in the Eastern and Western provinces. Therefore, referral to CNIB would be the only choice. Compared to other provinces, there were more respondents from Quebec who would refer to multi-disciplinary low vision clinics rather than other low vision service providers, presumably because respondents from Quebec referred their patients to the government-sponsored low vision clinics. Renaud et al's¹⁰⁴ survey on optometrists in Quebec supported this finding: 75% of optometrist referred "often" or "always" to government-sponsored low vision centres when the respondents were the first to detect a low vision problem.

In Ontario, there were more optometrists who referred to local optometrists/ophthalmologists and to multi-disciplinary clinics for low vision service. There might be several reasons for this. First, Ontario houses the University of Waterloo Centre for Sight Enhancement Low Vision Clinic, the University of Toronto Vision Rehabilitation Program, the Vision Institute of Canada and the Ivey Eye Institute Low Vision Clinic in London and Ottawa Hospital Low Vision Clinic. These clinics are staffed by optometrists/ophthalmologists, which may imply a level of quality to referrers. Secondly, the Ontario Health Insurance Program covers low vision examination by ophthalmologists. Thirdly, the Assistive Devices Program provides funding for visual aids for any person with long-standing vision impairment. The above factors may increase the number of referrals to these low vision service providers.

The fact that the perceived availability of LV service (Question D2) did not vary across regions may suggest that when one type of low vision service provider was not available in a region (i.e. the absence of multi-disciplinary low vision clinic in Eastern and Western provinces), other types of low vision service providers may develop to fulfill the role. However, the perceived quality of low vision service being delivered (Question D2) was not homogeneous across the regions. More respondents from the Eastern provinces tended to rate the perceived quality of low vision services in their local area to be fair, and this may be due to the absence of multi-disciplinary clinics in the region (to my knowledge). In the absence of multi-disciplinary clinics, respondents from Eastern provinces tended to refer to CNIB more than in other regions. More respondents from Quebec than other provinces found the quality of low vision services to be outstanding. This was not surprising due the calibre and accountability of government-sponsored low vision clinics in Quebec.

Most of the respondents (57%) rarely (less than 25% of the time) received a written report from the low vision service providers to which they had referred their patient (Question D4). This proportion was higher compared to Lovie-Kitchin et al's⁹⁵ survey in 1996 in Australia (39.4%). Conversely, less than one-quarter of our respondents received a written report more than 75% of the time. This proportion is compatible with that of Lovie-Kitchin et al's⁹⁵ study. These responses suggest that optometrists often do not receive feedback from these low vision providers. Receiving reliable feedback from the low vision service provider has been reported to encourage the referral of other patients by health care providers.⁸⁶ Without feedback, it would be difficult for optometrists to appreciate the value of low vision services. Without feedback, it would also be difficult for optometrists to learn whether their referrals were appropriate and they would not be able to gain insight into the scope and depth of low vision services provided by the referred entity. Finally, without feedback, it would be difficult to judge the quality of low vision services provided other than from the feedback from returning patients.

7.6 Predictive Factors Associated with Providing Low Vision Services at and Beyond a Level of Managing Patients with Magnifiers and Filter Lenses

The multivariate logistic regression analysis showed that the provision of low vision services at and beyond a level of managing patients with magnifiers and filter lenses was associated with the following independent predictors: advance years of practice, having local low vision optometrists/ophthalmologist within one-day's travel, not having a multi-disciplinary low vision clinic within one-day's travel, working in a practice within a population of less than 50,000 and working in a non-solo practice.

It was found that optometrists with 16 years or more of practice (Question A1) were more likely to provide more advanced levels of low vision service. Low vision is considered a traditional field of optometry. There has been an increasing concern about the scarcity of optometry students who are expressing interest in low vision as a clinical subspecialty.¹²² Even if younger optometrists had an interest in low vision or had residency training in low vision, the current study revealed that some felt unable to provide low vision services due to financial constraints. Perhaps optometrists in more advanced years of practice would have more financial means to set-up and equip their office with specialized low vision equipment. Perhaps older optometrists empathise more with older adults who suffer from vision loss.

Working in a community of than 50,000 residents (Question B2) was also found to be a predictive factor for providing more optometric low vision services. Specialised low vision services tend to be situated in urban centres. Perhaps when no specialised low vision centre was nearby, more optometrists in the community would perform low vision examinations. This finding was also consistent with the higher than expected counts of respondents from the Eastern provinces who had optometric colleagues in their primary practice who offer low vision services. This “fill-in” phenomenon by optometrists may be what was taking place in order for optometrists to serve the needs of their community when necessary. One might also expect the respondents from the Western

provinces to have more fellow colleagues practicing low vision within their primary clinic. Like the Eastern provinces, the population of most communities in the Western provinces is smaller and more spread out. Thus, it might be more difficult to find centralized multi-disciplinary low vision centres to serve patients with low vision. However, optometrists in Alberta and Saskatchewan can refer patients to centralized government-subsidized low vision programs. Also, we learned that CNIB visited some of the more remote areas in the Western provinces several times a year.

Respondents who worked in a group practice (Question B3) were found to be more likely to provide a higher level of low vision service. First and foremost, working in a group practice would allow the individual optometrist to have more time and freedom to accommodate patients with vision impairment, rather than focusing on primary care. Moreover, adding a subspecialty to the practice may be more appealing as it would create a niche market for the practice. Finally, it may be easier to establish a patient-base for low vision as fellow colleagues in the same practice may conveniently become the referral sources.

It was not clear why having local optometrists/ophthalmologist within a day's travel (Question B8) was related positively to the provision of higher levels of low vision service. Perhaps respondents who have colleagues who provide LV within their primary practice checked this off as "an optometrist/ophthalmologist within a day's travel" and may be more inclined to at least attempt to provide a higher level of low vision services themselves because equipment would be readily available. However, only 5.4% of respondents indicated that their partner saw patients with low vision. Also, it is possible that our term "within a day's travel" may be too inexact. A day's travel by car, if taken literally, could be as long as twenty-four hours. Even if one was to travel for 10 hours by car at the speed of 60km/h, he/she would have travelled 600 kilometers. At a distance of 600 kilometers, it would be likely to find an optometrist or ophthalmologist who would perform a higher level of low vision service (although that could hardly be considered "local"). Therefore, the positive

relationship between having a local optometrist/ophthalmologist within a day's travel and the provision of higher levels of LV services was not expected and cannot be fully explained.

7.7 Reasons for Not Managing Patients at a Higher Level

The questionnaire inquired on factors that would encourage or discourage respondents to provide low vision services beyond prescribing for high adds and giving lighting advice. Specifically, questions C11, C12 and C14 were designed to serve as different ways of investigating the relationship between these factors and so that these barriers could be identified and then removed or lessened in future. Many respondents completed these questions differently than intended, perhaps because these follow-up questions were positioned in a page subsequent to Question C10. It was also possible that the wording "many" in the sentence, "if you do not manage *many* low vision patients at levels D and E in question 10", in Questions C11 and C14 was too vague.

In an optometric practice, a visual acuity chart, trial frame and trial lenses and/or a phoropter would typically be available for performing a routine eye exam. If respondents only had this equipment, they would only be able to provide low vision services up to the level of prescribing for high additions and giving lighting advice (level D in Q10). Therefore, having the proper devices and equipment would be essential to provide a higher level of low vision service. The most frequent reason for not providing low vision examination beyond Level D was the lack of equipment and devices. Question C12 then asked respondents what factors influence them not to acquire equipment and devices.

The number one reason for not acquiring more equipment and devices was because it was considered not financially viable to do so. Other common reasons were not having experience and that LVS is too time consuming. These reasons are interrelated. In the current study, respondents considered only 1% of their patients as having low vision. In a typical week, they indicated that they see 101-120 patients in their primary practice. It can be deduced that, on average, respondents see

only one patient who they would considered to be visually impaired per week. Hence, the demand would not be adequate for them to consider acquiring more equipment and/or devices if they were to accommodate only their own patients with low vision, or to attain experience. Assuming that respondents work seven hours a day, five days a week and they see 101-120 patients per week, the chair time per patient would be approximately 20 minutes. As some respondents have mentioned, the chair time for low vision should be much longer compared with a routine eye examination. Similarly, Lim et al's Australian study found that most optometrists (36/53) in private practice were seeing fewer than 20 patients for low vision services per year.⁹⁶ For the assessment to be financially viable, the remuneration for providing low vision services should compensate for the chair time, staff training and the associated administrative work. Although some patients may be able to pay such fees, unfortunately, many patients with low vision are particularly vulnerable to private-pay services due to their limited income. Patient's ability to afford access to optometric low vision service is thus, a cause for concern.

Indeed, respondents in the current study indicated that patients with low vision would often have a limited income and could not afford the cost of a low vision assessment and/or devices. The respondents' concern is well-founded. Gold et al's study found that primary source of income for the working age group of people with low vision (n=200) was provincial disability benefits (42%) and federal pension (26%).⁸⁴ In addition, Statistics Canada's 2004 Health report revealed that only 30% of Canadians aged 80 or older have insurance to cover all or part of the cost of spectacles or contact lenses.²¹

Because optometrists felt that they could not provide low vision service with a fee that would be reasonable for the patient and for themselves, it would be understandable that they would be inclined to refer to other providers that could offer low vision services without a charge to the patient. These providers include CNIB and ophthalmologists (in provinces where they can bill the provincial health plan). Alternatively, optometrists may overcome this limitation by working "under" ophthalmologists

in provinces where ophthalmology billing of low vision services is available. To alleviate this situation, a fee for optometric low vision services is needed.

The proportions of respondents who cited no interest as a response range from 21.8% (frustration) to 45.0% (no interest in acquiring more equipment). The true proportion of those who were simply not interested likely lied somewhere in between. Approximately half of the respondents indicated lack of experience (58.0%) and lack of knowledge (41.8%) as reasons for not providing a higher level of low vision service. These findings were consistent with the proportion of respondents who felt that more education (48.2%) would be needed for them to manage more of their patients with low vision.

7.8 Optometric Education

The comments on education showed that many optometrists would like to learn more about low vision but did not believe they had access to the right content or format of continuing education. Optometrists were eager to learn about practical aspects of low vision provision and how they could incorporate low vision into their private practice (only 30% said that they were not interested in more education about low vision). The few (n=5) who did comment on their experience in optometry school felt that their education did not prepare them adequately for providing low vision service in a private optometry setting, where time and money would be a practical concern.

Suttle et al¹²³ in 2012 investigated the forms of knowledge that were used by optometrists in Australia and New Zealand as a basis for their clinical decisions. Optometrists in their study weighted undergraduate education second only to patient's presenting signs and symptoms in clinical decision-making.¹²⁴ Postgraduate education, including continuing education, came in third, with "more than 75% of respondents in their study, who had made change to their practice in the previous two years, basing this change on knowledge gained at a continuing education seminar or postgraduate course."¹²³ Because optometrists highly value knowledge obtained from educators in their field, it is important that educators address this gap of knowledge between theory and application appropriately.

The lack of continuing education courses in low vision was brought up by respondents in our current study. It appeared that respondents primarily obtained their continuing education through attending courses outside Canada and/or through their local low vision sales representatives. In addition to these resources, CNIB in Toronto has organized 1-day low vision continuing education for optometrists since 2009 and an International Low Vision Conference was hosted by University of Montreal School of Optometry in 2008. To the author's knowledge, there were no other low vision continuing education venues in a Canadian setting.

Although sales representative can be seen as an invaluable source of information for optometrists, there could be negative implications for obtaining knowledge solely from a vendor of low vision devices/equipment. The optometrist may only learn about the devices sold by that particular vendor. This acquisition of low vision knowledge would likely bias toward the dispensing of equipment provided by that vendor.

Optometrists would like to see a “refresher course” on low vision, and many favoured a hands-on approach through workshops, lab and shadowing in a low vision clinic. The hands-on approach would be particularly important, as respondents may lack confidence in working with low vision patients, often because of the relative rarity and complexity of low vision patients who present in most optometric practices.¹²⁴

Respondents would like to learn how to choose “the best intervention” for a given patient. Unfortunately, there is no clear answer to this. Patients' satisfaction did not appear to be solely driven by the ability of the low vision device in assisting the patient with functional vision goals. In investigating the effectiveness of a community-based Welsh low vision service, it was found that patient's satisfaction with low vision intervention mainly stemmed from good practitioner attributes and good overall service. Conversely, patients' dissatisfaction was mainly related to the limitation of low vision aids design and the inability to improve vision.¹¹⁰ There is a paucity of evidence in

choosing an optimal intervention that would result in improvement in patients' perceived functional ability.

While improvement in communication between practitioner and patients may increase the effectiveness of low vision services, there were still factors beyond the control of practitioners in identifying patients who could and would be willing to benefit from low vision services. Optometrists in the current study responded in concert about the challenges posed by the patient: lack of transportation, living alone/no accompanying persons to low vision appointment, patient's attitude and societal attitude towards low vision.

Affordability of equipment should be explicitly discussed in a continuing education course. A number of respondents pointed to the fact that patients who have low vision often could not afford low vision devices. Results from research consistently show a negative correlation between income and risk of visual problems.¹²⁵ In Canada, the lack of government-funded annual eye examination was found to be associated with increased levels of non-refractive problems among low-income elderly adults.¹²⁶ Because people in the lower income group would be at a higher risk of visual problems, the fee associated with a low vision assessment and equipment would be a real problem for them.

7.9 Limitations of the Study

7.9.1 Survey Approach, Response and Non-response Bias

The response rate of the current study is not high, but it is typical of postal questionnaires (approximately 20%).¹²⁷ An attempt was made to improve the response rate by sending out reminder faxes to the primary practice of all the selected optometrists 4-6 weeks after the survey was mailed out. Due to budget and time constraint, it was not possible to individualise the follow-up letter with the name of each recipient. Therefore, it would be possible that an unintended recipient (i.e. a colleague of the intended individual) may have been sampled and responded to the questionnaire. In addition, it is not possible to eliminate volunteer bias, as participation was strictly voluntary (e.g.,

those optometrists who are more interested in low vision may have been more likely to respond). Thus, the results of the study are likely biased towards the characteristics of those who have an interest or feel strongly about low vision.

The research protocol did not use a method of coding to track the demographics characteristics of respondents versus non-respondents. As such, it would not be possible to determine the external validity of the study. Although the results of the study offer valuable insights in the provision of low vision care by optometrists and the current landscape of vision rehabilitation in Canada, the study should be considered exploratory in nature. In examining the potential for non-response bias, it is important to note that a French version of our questionnaire was not available, resulting in a lower than expected response rate in Quebec and also a possible difference if the English-speaking optometrists practice in a different way than those who speak French. This is a limitation in the survey design that likely results in bias towards optometrists who are able and/or are willing to communicate in English.

The proportion of missing values for all closed-ended questions except for B5 (estimate of percent of LV patients seen in the practice, C1 (percentage of LV patients seen by optometrists) and C8 (regarding visual field referral criteria) and D4 (frequency of receiving a report from LV provider) was less than 5%. Therefore, it is not expected that the deletion of missing values would impose a significant shift in the survey results. It is likely that respondents may have been unsure how respond to these questions. For example, it is unlikely that they would perform a visual field test on their patients unless there was a medical indication. Even then, the most common type of visual field test would be a Humphrey 24-2 or 30-2. These tests would not allow the measurement of total visual field diameter and so they may be unfamiliar with interpreting total field.

7.9.2 Confounding Factors in Self-reported Surveys

The accuracy of self-reported data depends on the ability of optometrists to recall information from memory or perception. Therefore, it is questionable whether respondents were able to accurately respond to some of the items on the questionnaires, especially questions that requested for percentages (e.g., Questions B5, C1 and C4). As mentioned above, it may also have been difficult for respondents to answer Question C8 regarding total visual field diameter. Finally, Question D3 asked respondents to indicate the frequency of patients refusing or accepting their recommendation for low vision referral. Patients who decline referral may not necessarily tell their optometrists their reasons, especially because reasons such as cost, inability to travel and lack of motivation are often too personal. Therefore, this question was discarded from the analysis of the study.

7.9.3 Wording and Multiple Interpretations of the Term “Low Vision”

In the response of Question C10 (regarding the provision of low vision care), respondents may not have understood the meaning of “assessment for disability”. This may have resulted in a lower response rate for this multiple choice answer.

The term “low vision” was not explicitly defined in the questionnaire. Therefore, the manner in which respondents chose to answer Questions B5 (% patients seen in primary practice that have LV), B9 (the presence of optometric colleague in primary practice offering LVS) and C1 (% respondent’s own patient who have LV) would depend entirely how these respondents define the term “low vision”. In retrospect, an open answer of how respondents define the term “low vision” would have been enlightening, but would have changed the nature of the questionnaire. However, if this term was defined explicitly, it would also inadvertently influence respondents’ answers to other questions including all the hypothetical cases and their referral criteria (visual acuity and visual field) for low vision services. Considering that these other questions are important elements in achieving the objectives of this study, the level of uncertainty regarding “low vision” may be acceptable.

7.10 Recommendations on Current Landscape of Low Vision in Canada

The current study provides a glimpse of how optometrists in our country viewed the current landscape of low vision. Recommendations based on their viewpoints are outlined below.

7.10.1 The Need for the Establishment of a Referral Network

The establishment of a referral network is urgently needed. At the minimum, anyone who would like to access or refer someone to access low vision service should have the means to find out what is available, who is offering services and the cost associated with the service. Therefore, this network should include the contact information of all types of low vision service providers, not just one profession in isolation. In addition, information about whether coverage is available and/or fees associated with low vision assessment, the provider's scope of practice and qualification should also be included. This would allow all those involved to make an informed decision on a low vision referral.

7.10.2 Recommendations on the Basis of Initiating Low Vision Service and Referral

While a disability-based definition of low vision would be more appropriate, the current study suggests that not all optometrists may be prepared to recognize/assess a low vision case based on this disability definition. Perhaps it would be more practical to ask optometrists (and eye care practitioners in general) to initiate a conversation about low vision service whenever their patient's best corrected visual acuity, contrast sensitivity and/or visual field fall below a certain level. The "certain" level of visual impairment can be established based on current available evidence. In 1999, Leat et al⁶⁶ proposed a definition of visual disability as best corrected visual acuity of <6/12 or contrast sensitivity of <1.05 by considering the level of visual measures which result in measurable or reportable disability. Lovie-Kitchin et al⁸ recommended referral for mobility assessment when a patient's binocular visual field diameter was reduced to between 31 to 52 degrees. In 2003, Jackson et

al⁷³ initiated the SmartSight Initiative that outlined a model of graduated low vision interventions. It is time we, as eye care practitioners, become more united and act upon the current research findings/initiatives more consistently so that more patients with low vision can be identified and benefit from vision rehabilitation services.

7.10.3 The Need for Collaboration and Communication among All Low Vision Providers

This study suggested that much work is needed in building collaboration and communication between all low vision providers. A patient who visits a low vision provider (e.g. a low vision optometrist) may subsequently be referred to see another type of low vision provider for different services (e.g. CNIB). A mechanism needs to be developed to improve the communication between the low vision provider and other low vision providers outside their immediate team, and to learn about each other's roles and range of services and equipment available. This would greatly reduce service inefficiency and confusion for all parties involved. As a start, low vision service providers should begin offering a written report to the referring practitioner.

7.10.4 The Need for Provincial Health Plans to Cover for Optometric Low Vision Services

Although optometrists are the primary healthcare providers of low vision service, there is a lack of fee coverage from provincial health care plan in many provinces. A fee for low vision service would be necessary for more optometrists to provide low vision services in their community. For example, ophthalmologists in Ontario can currently claim \$240 for an initial low vision assessment and \$120 for each follow-up assessment.¹²⁸ In contrast, there is no coverage for optometric low vision service in Ontario. Optometric coverage is available in Alberta, but a fee of only \$55.21 can be claimed for an examination for low vision aid.¹²⁹ This fee is equivalent to the fee that can be claimed for a complete

oculo-visual assessment in Alberta.¹²⁹ Coverage for optometric low vision services should compensate for the amount of chair time and administrative cost for providing low vision care.

7.10.5 The Need for More Education

The definition of low vision is based on visual disability. The current study found a discrepancy between the estimated percentage of patients with reduced BCVA and the estimated percentage of patients considered “low vision”. In order to raise awareness on low vision, more education on how to assess for visual impairment and disability would be needed. There is a need for continuing education courses on low vision and these courses should be hands-on and address the needs of optometrists in private practice settings.

7.10.6 Time Trade-off with Other Optometric Service

Optometrists are the primary eye care providers for Canadians. In addition to routine eye exams, they may also provide specialized services including contact lens therapy, binocular vision therapy, pediatric and geriatric care just to name a few. Although, they are, in many ways, the ideal profession to be involved in low vision rehabilitation, it is not clear whether optometrists, if they become the primary provider of clinical low vision service, would be able to accommodate both the demand from the core services they offer and the potential demand for low vision. Optometrists who choose to provide low vision service would likely need to consider it as an area of special interest (i.e. devoting more clinic hours and education on low vision).

7.11 Conclusion

We found that more than one-third of respondent’s primary practice offers low vision services in their primary office. While almost three-quarters of respondents would manage a patient with minimal visual disability and simple goals using high powered additions and lighting, 43% of respondents would manage the same type of patient with magnifiers and filters lenses and 10% of respondents

would manage a patient with a higher level of visual disability. Through the hypothetical case studies, we found that optometrists did attempt to do as much low vision intervention as possible within their practice constraints. While CNIB was the most popular referral site, respondents' referral pattern suggested that their criteria for referral to specialty low vision services were dependent on the eligibility criteria for government sponsored programmes. Most optometrists rarely receive a written report from the low vision service providers, highlighting the need for better communication within the low vision community. Chi-square analysis revealed that optometrists in Quebec generally prefer to refer their eligible patients to government-sponsored low vision clinics, rather than managing these patients on their own. In contrast, more optometrists than expected in the Eastern provinces tended to provide low vision intervention by themselves in the case of a patient with advanced macular degeneration and hemianopia. The types of low vision optical aids available in Canadian optometric practices were found to reflect what past research found to be the most frequently dispensed by low vision providers and the most useful among patients. The predictive factors associated with the extent of optometric low vision care were advanced years of practice, having local low vision optometrists/ ophthalmologists within one-day's travel, working in a practice within a population of less than 50,000 and working in a group practice. The reasons identified by respondents as barriers to managing patients at a more comprehensive level of low vision care were related to financial non-viability (and hence, lack of motivation to acquire equipment and devices), patient unaffordability, and the time-consuming nature of a low vision assessment. Approximately 21.8% to 45% of respondents cited no interest in low vision. Many optometrists indicated that they would like to see more continuing education on low vision, preferably through a hands-on approach.

As mentioned by Strong¹³⁰, it is neither practical nor economically feasible to expect an independent practitioner to provide the full range of necessary services. Ideally, an individual optometrist would be responsible for patient evaluation and “outsource” to other professionals in the network to provide the full range of rehabilitation services.¹³⁰ However, this requires the collaboration

of low vision providers and their commitment to coordinate low vision care collectively. Moving forward, more studies are needed to evaluate how this collaboration can be achieved to eliminate service redundancy and maximize human resource utilization.

Appendix A
Cover Letter for the Questionnaire



**Investigating Optometric Vision Care for
People with Visual Impairment**

Principal Investigators:

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Susan J. Leat, BSc, PhD, FCOptom,

FAAO

University of Waterloo, School of Optometry

(519) 888-4567 Ext. 32040

Dear Doctor:

As a current member of the Canadian Association of Optometrists, your name has been randomly selected to receive an invitation to participate in the first national study of provision of low vision service by optometrist in Canada.

Recent journals have shown that there is an increasing need for additional low vision rehabilitation services. Although overall estimates of low vision patients receiving rehabilitation services are low, we are interested in whether but is this a homogenous phenomenon across urban and suburban areas. Also, we are interested to determine how many optometrists in practice are offering low vision services, to what level and some of the considerations that affect optometrists' decision to provide or not provide low vision care. Furthermore, we are interested to determine if there are barriers against patients receiving low vision services in some areas. The purpose of this study is an attempt to identify factors that may influence the amount and extent of low vision care in Canada.

As a participant in this study, you will be asked to complete a questionnaire regarding patients with visual impairment seen in your practice. More specifically, questions pertaining to your preferred low vision practice management will be asked. In addition, professional background and practice profile questions are included to help us understand the data received from all participants.

Participation in this study is voluntary, anonymous, and will take approximately ten to fifteen minutes of your time. By volunteering for this study, you will allow us to explore optometric care provided to patients with visual impairment. The result from this study is intended to provide statistically sound results so that opportunities in improving the vision rehabilitation system can be identified. There are no personal benefits to participation. You may decline to answer any questions if you so wish. All information you provide is considered completely confidential; indeed, your name will not be included and therefore cannot be associated with the data collected in the study. Furthermore, because the interest of this study is in the average responses of the entire group of participants, no individual practice data will be described in any written reports of this research. A stamped addressed return envelope is included.

Data collected during this study will be retained for five years. Paper records will be kept in at the office of Norris Lam. There are no known or anticipated risks associated with participation in this study. Once the study has been completed, we plan to publish the findings in an optometric journal.

We would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes at this office at (519) 888-4567 Ext. 36005.

We would be grateful if you would take the time for this study, however, the final decision to participate is yours, Thank you in anticipation for your assistance in this project.

Yours faithfully,

Norris Lam and Susan J. Leat

Appendix B

Content of Questionnaire



Investigating Optometric Vision Care for People with Visual Impairment

Please answer the following questions in relation to your primary practice address:

Please be reminded that this survey is anonymous and the answers you provide are completely confidential. For the multiple choice questions, please select your answer by checking one box for each question, unless otherwise stated.

Section A: Personal Profile

1. How many years have you been practicing optometry?
 - 0 – 5 years
 - 6 – 10 years
 - 11 – 15 years
 - 16 – 20 years
 - 21 – 25 years
 - 26 or more years
2. Your Gender:
 - Male
 - Female

Section B: Primary Practice Profile

This section refers to your primary practice; the primary practice being the one where you spend most days.

1. In which province is your primary practice situated? _____
2. Please estimate the population of the city/town where your primary practice is located?
 - Under 2500
 - 2,500 – 9,999
 - 10,000 – 49,999
 - 50,000 – 99,999
 - 100,000 – 499,999
 - 500,000+
3. In what type of practice do you work (regarding your primary practice)?
 - Private single practice
 - Private group practice or Cost-sharing practice
 - Practice beside an optical store
 - Practice within an optical store
 - Educational institution

4. How many optometrists are practicing at this office at one time (i.e. are physically working at the office simultaneously)?
- 1
 - 2
 - 3
 - 4
 - More than 4
5. In a typical week, please estimate the percentage of patients seen in each of the following categories at your primary practice (i.e. by all practitioners):
- ____% Primary Care Paediatrics (≤ 6 yrs)
 - ____% Primary Care General (7 – 64 yrs)
 - ____% Primary Care Geriatric (≥ 65 yrs)
 - ____% Contact Lens
 - ____% Ocular Disease – Emergency, follow-up or co-management
 - ____% Binocular Vision
 - ____% Low Vision
6. How does this practice see patients? (check all that apply)
- By appointment only
 - By a mixed drop-in/appointment system
 - Accepts emergencies
 - Does not accept emergencies
 - Other (please specify): _____
7. In a typical week, please estimate how many patients are seen in your primary practice (including all optometrists)?
- 0 – 20
 - 21 – 40
 - 41 – 60
 - 61 – 80
 - 81 – 100
 - 101 – 120
 - >120 (please specify): _____
8. Which of the following low vision services are within one day's travelling distance for your patients? (check all that apply)
- Local optometrist or ophthalmologist who performs LV assessments
 - CNIB
 - Multi-disciplinary low vision clinic
 - Others (please specify): _____
9. Does any optometrist in your primary practice specifically offer the following services (check all that apply)
- Binocular vision therapy
 - Paediatric care
 - Low vision care
 - Special contact lenses (anything beyond soft or hard toric lenses)
 - Geriatric care (i.e. working with complex/frail elderly)
 - Assessments for children with reading/learning difficulties
 - Other (please specify): _____

Section C: Your Own Treatment and Management of Patients

Please answer the following questions regarding patients YOU examine in your **overall** practice:

1. In a typical week, please estimate the percentage of patients seen in each of the following categories by you:
 - ____% Primary Care Paediatrics (\leq 6 yrs)
 - ____% Primary Care General (7 – 64 yrs)
 - ____% Primary Care Geriatric (\geq 65 yrs)
 - ____% Contact Lens
 - ____% Ocular Disease – Emergency, follow-up or co-management
 - ____% Binocular Vision
 - ____% Low Vision
 - ____% Other (please specify): _____

2. Does your practice involve a co-management system? Yes No
If yes, please check all that apply. If not, please leave blank.
 - Family doctors
 - Ophthalmologists
 - Rehabilitation centres
 - Low vision centres
 - Long-term care facilities
 - Other (please specify): _____

3. In a typical week, please estimate how many patients are seen by you?
 - 0 – 20
 - 21 – 40
 - 41 – 60
 - 61 – 80
 - 81 – 100
 - 101 – 120
 - >120 (please specify): _____

4. On average, please estimate what percentage of your patients have best corrected visual acuity in the better eye of:
 - ____% Better than 6/12 (20/40)
 - ____% From 6/12 (20/40) to better than 6/21 (20/70)
 - ____% From 6/21 (20/70) to better than 6/60 (20/200)
 - ____% 6/60 (20/200) and worse

The following 3 questions are based on hypothetical patients.

5. For a patient with early ARMD with VA = 6/12 in the better eye and with a main goal of reading, would you:
 - Refer to another optometrist who does low vision services
 - Refer to the local CNIB
 - Refer to a multi-disciplinary low vision clinic
 - Assess for basic magnification and lighting requirements
 - Other (please specify): _____

6. For a patient with more advanced ARMD, with best VA = 6/60, and goals of reading, TV and writing, would you:
- Refer to another optometrist who does low vision services
 - Refer to the local CNIB
 - Refer to a multi-disciplinary low vision clinic
 - Assess for basic magnification and lighting requirements and then refer
 - Undertake rehabilitation, including distance and near magnification, lighting and advice re: writing devices
 - Other (please specify): _____
7. For a patient with bilateral homonymous hemianopia who is having difficulty with reading and mobility, would you:
- Provide information about reading techniques
 - Provide information about reading techniques and prescribe sector Fresnel or Pelli prisms
 - Refer to the local CNIB
 - Refer to a multi-disciplinary low vision clinic
 - Other (please specify): _____
8. At what level of vision loss would you refer to specialized services for persons with visual impairment? Check one answer for VA and one for fields
- | | |
|---|----------------------------------|
| Best Corrected Visual Acuity: | Total Visual Field Diameter: |
| <input type="checkbox"/> Better than 6/12 | <input type="checkbox"/> >50° |
| <input type="checkbox"/> 6/12 to better than 6/21 | <input type="checkbox"/> 35°-49° |
| <input type="checkbox"/> 6/21 to better than 6/60 | <input type="checkbox"/> 20°-34° |
| <input type="checkbox"/> 6/60 and worse | <input type="checkbox"/> <20° |
9. Which of the following equipment do you have in your practice (check as many as apply)?
- logMAR VA chart
 - Feinbloom chart
 - Pelli-Robson contrast sensitivity chart or other paper CS chart
 - LCD or other computer contrast sensitivity chart
 - Lighthouse continuous text card for adults or equivalent
 - Range of selective transmission tints/fit-overs
 - Range of full field microscopes
 - Range of prism half eyes
 - Range of hand magnifiers
 - Range of internally illuminated stand magnifiers
 - Range of hand held telescopes
 - Other LV equipment (please specify): _____
10. What level(s) of LV service do you provide? (check all that apply)
- A. Recognition of a LV case
 - B. Assessment of visual impairment (VA, CS, visual fields)
 - C. Assessment of disability (difficulty with tasks that the patient would like to perform)
 - D. Manage a patient with minimum visual disability and simple goals using high powered additions and lighting
 - E. Manage a patient with minimal visual disability and simple goals using optical devices such as hand and stand magnifiers and filter lenses
 - F. Manage a patient with more than minimum visual disability who requires more than basic devices (e.g. telescopes, electronic low vision aids, custom-designed microscopes, etc.)
 - G. Manage a patient with complex goals (e.g. vocational, requiring multiple intervention)

11. If you do not manage many low vision patients at levels D and E in question 10 above, please indicate your reasons for not seeing these patients (select only those that apply and rank in order of importance; where 1 = most important reason. If you do manage patients at levels D and E, skip to question 14.

- I feel that I lack experience in working with low vision patients
- I feel that I lack knowledge in low vision
- I feel that I do not have adequate equipment to do reliable examination
- I do not have devices to do a trial of low vision aids
- There is no fee that can be claimed for LV assessment
- Too time consuming
- Lack of interest
- Too frustrating
- My partner(s)/associate(s) sees the LV patients
- Other (please explain): _____

12. If your answer to #11 was that you do not have adequate equipment or devices, then please let us know what factors might influence the decision not to acquire LV equipment. (select only those that apply and rank in order of importance; where 1 = most important reason)

- Lack of interest
- Not financially viable
- Not enough foreseeable demand
- No funding for devices in my province
- Funding is available in my province but paper work is too time consuming
- No time to train staff and/or limited staff resource
- Other (please specify): _____

13. Do you feel that you would want to benefit from more education on the subject of low vision? If so, please give information about what aspects of training/education of low vision would be useful and how this might best be achieved?

14. If you do not manage many low vision patients at levels D or E in question 10, please indicate what would need to change for you to be willing to manage more of these patients (check all that apply and number in order of importance; where 1 = most important reason).

- More education
- More equipment
- A fee for low vision service
- Funding for low vision devices for patients
- There is nothing that would encourage me to be more involved in low vision services
- Other (please specify): _____

15. Please let us know any other comments that you have about provision of LV services in your practice or area.

Section D: Perception of Low Vision Service Referrals

Please answer these questions in reference to your **overall** practice.

1. Who or which organization(s) do you refer to, if any, for low vision service? (check all that apply)

- Do not refer
- CNIB
- Local optometrist or ophthalmologist
- Multi-disciplinary low vision service
- Others (please specify): _____

2. Rate the low vision services in your local area, other than any low vision services provided by you, in terms of availability or quality. Please check the box that applies.

Availability

<input type="checkbox"/> Outstanding	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor	<input type="checkbox"/> None	<input type="checkbox"/> Don't know
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Quality

<input type="checkbox"/> Outstanding	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor	<input type="checkbox"/> None	<input type="checkbox"/> Don't know
--------------------------------------	-------------------------------	-------------------------------	-------------------------------	-------------------------------	-------------------------------------

3. Of the referrals you recommend for low vision services, on average, how often would your patients do the following (please check in the appropriate box):

4.

		Almost never 0-5%	Rarely 6-25%	Sometimes 26-74%	Often 75-94%	Almost always 95-100%
Refuse referral because of...	Cost	<input type="checkbox"/>				
	Travel distance	<input type="checkbox"/>				
	Lack of motivation/did not believe anything could be done	<input type="checkbox"/>				
	General health issues	<input type="checkbox"/>				
	Real or perceived language barrier	<input type="checkbox"/>				
Agree on referral	But did not proceed due to financial constraint	<input type="checkbox"/>				
	And followed through to a low vision assessment	<input type="checkbox"/>				

5. Of the referrals you make for low vision services, how often do you receive a written report of the results? Please check the box that applies.

<input type="checkbox"/>				
Almost Never 0-5%	Rarely 6-25%	Sometimes 26-74%	Often 75-94%	Almost Always 95-100%

Thank you for your time.

Please return to Dr. Norris Lam, Suite 204, 500 Sheppard Ave East, North York, ON M2N 6H7

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