

MACULAR DEGENERATION, GLAUCOMA, AND DIABETIC RETINOPATHY:

A CONTINUING EDUCATION PROGRAM

by

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of the requirements for the degree

of

Master of Nursing

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ABSTRACT

Three prevalent eye diseases affect millions of Americans: age-related macular degeneration, glaucoma, and diabetic retinopathy. Unfortunately, these diseases often result in some form of vision loss. While ophthalmologists provide the definitive diagnosis and treatment for these diseases, the nurse practitioner as a primary care provider also plays a crucial role in eye care. Through the early identification of problems and the judicious use of screening guidelines, some of the devastating effects of these diseases may be limited or even prevented.

The purpose of this project was to develop a continuing education program for rural nurse practitioners that would enable them to recognize these eye diseases and thus participate in the management of an important component in the health care needs of the patient. This program focuses on early identification of disease, appropriate prevention, and tertiary management.

Since the nurse practitioner is the target audience of this program, the principles of adult learning theory guided the overall program development and provided the framework for this project. This continuing education program was designed to be informative while interactive. The program utilizes lecture, discussion questions, role play, case studies and hands on experience with the eye exam in an attempt to provide optimal learning opportunities.

Since the program has yet to be field-tested there has been no feedback which would act as an evaluation of its effectiveness. However, when the program is implemented the participants will be asked to provide a thorough evaluation of the topics, their contents and the methods used to present the material. The responses provided by the participants will identify strengths and weaknesses and guide future changes or adaptations in the material presented. Based upon the theoretical perspectives of adult learning utilized in this project, it is expected that this educational program will be effective in improving the skills nurse practitioners need to provide better eye care for their patients.

CHAPTER 1

INTRODUCTION

Purpose

The purpose of this project was to develop a continuing education program for rural nurse practitioners which may enable them to recognize the most prevalent eye diseases and participate in the management of these chronic eye problems. The program will focus on early identification of disease, appropriate prevention, and current tertiary management.

Background and Significance

A blind friend once asked the author of this project to describe a neighbor's flower garden. At first glance this would seem to be an easy task. It proved, however, to be a challenge to describe a lush beautiful garden without using words like bright or colorful. Brief encounters like this remind us of the privilege of sight. Vision loss impacts every aspect of life. Not only does it rob the individual of the pleasure of color, light, and visible facial expressions, it restricts mobility, limits job opportunities, and forces dependence on others. Because sight is so important, the ability of the health care provider to identify eye problems in the early stages becomes imperative.

Clearly the most devastating consequence of eye injury or eye disease is the loss of vision. While ophthalmologists provide definitive diagnosis and treatment of eye diseases, the primary care provider is also instrumental in eye care. In recent years managed care has emerged as a form of health care intended to provide cost effective services. One particular feature of managed care is to place the primary care provider in the role of gatekeeper to health care. This means that the primary care provider screens and assesses patient need then makes an appropriate referral for additional evaluation or treatment. The primary care provider essentially provides entrée into the health care system.

Routinely, the primary care provider treats minor injuries and eye problems such as corneal abrasions and conjunctivitis. Individuals with eye diseases like glaucoma, macular degeneration and diabetic retinopathy are referred to ophthalmologists for comprehensive eye exams, diagnosis and treatment. In order to identify eye disease and related complications in the primary care setting, the health care giver must have a repertoire of quality skills. These skills must involve the ability to seek answers to key questions about eye health or changes in vision during routine visits. The practitioner must also identify risk factors for eye disease, utilize vision-screening tests, and adhere to current screening standards. As discussed in the following chapter, Strahlman, Ford, Whelton, and Sommer (1990) regard the use of screening tests and questionnaires as an important means to identify undetected eye disease in the primary care setting. Finally, primary care providers must understand current treatment regimes including the systemic effects, drug interactions, and side effects of ophthalmic medications.

Nurse Practitioners as Primary Care Providers

Nurse practitioners, in the primary care setting, function as primary care providers but they are unique since they also bring nursing care to primary care medicine.

According to Phillips (1995), “health care is shifting from a focus on medicine and cure to one that is concerned with health and care, which is the primary domain of nursing” (p. 4). Courtney (1996) states that nurses “are known for their comprehensive approach to patient care that involves highly developed clinical skills, an emphasis on patient education and counseling, and a focus on promoting health and preventing disease” (p. 45). As primary care providers, nurse practitioners manage acute and chronic illness across the age spectrum in many different types of settings. As a result, the nurse practitioner must develop well-rounded clinical skills, which must correspond with the varied patient needs.

Nurse Practitioners in Rural Settings

Nurse practitioners are an important part of the health care delivery system as they meet rural needs by providing primary care in solo and collaborative practice settings throughout Montana. This results in practitioner autonomy and limited role support. According to the Montana Department of Commerce, 249 Nurse Practitioners are licensed to practice in Montana (Montana Department of Commerce Professional and Occupational Licensing, 1998). Because many rural communities have limited or no local access to specialty medical care, the nurse practitioner must be knowledgeable in current screening practices and must become skilled in exam techniques which will identify the onset of eye disease.

A number of barriers or access issues may limit health care for the rural dweller. The most obvious barrier is a lack of services especially in remote areas. Rural communities may not have any local health care providers. This causes them to drive long distances to access health care which upon arrival may not include the specialized services they need (Bushy, 1991). In short, the individual seeking care for an eye problem may experience delayed treatment due to the lack of access to ophthalmologists.

Not only is health care affected by geographical location, access may be limited by “difficult terrain, inadequate or nonexistent public transportation systems, inability to finance a vehicle or obtain a driver’s license, and poor roads” (Bushy, 1991, p. 4). All of these factors affect the ability of the rural dweller to seek health care.

Another barrier to accessing health care involves financial considerations. As stated by Bushy (1991) the economic base of rural communities often relies on agriculture, mining, logging and ranching. These resources are in a state of flux and affect the overall economy of the local communities. This is especially visible with farm economic crises (Bushy). Another financial issue involves affordability since individuals without health insurance may delay or even avoid treatment based on the ability to pay.

In short, rural dwellers may experience limited access to eye care due to lack of services, travel considerations and financial affordability. The understanding of these realities enables the nurse practitioner to communicate more effectively with clients, understand limitations to access, and provide some insight into possible health care needs for rural dwellers.

Need for Continuing Education for Prevalent Eye Problems

It is impossible to overestimate the collective impact of the following three eye diseases as causes for vision loss in the general public: age-related macular degeneration, glaucoma and diabetic retinopathy. According to Wang, Ford, Tielsch, Quigley, and Whelton (1994), “the major causes of legal blindness are cataract, diabetic retinopathy, glaucoma, and age-related macular degeneration. Together they account for more than 50% of all blindness in US adults” (p. 1821). These diseases are devastating and early diagnosis and treatment help prevent complications and reduce vision loss. The disastrous effect of these diseases on public health resources has caused the Healthy People 2000 agenda to include objectives to reduce visual impairment and diabetes-related complications. (Healthy People 2000, National Health Promotion and Disease Prevention Objectives, 1990)

To determine the educational needs of rural nurse practitioners, information about their experiences in caring for clients with eye problems was gathered through an informal needs assessment done by the author. Five Montana family nurse practitioners were contacted by telephone and asked to respond to four questions (see Appendix A for needs assessment questions). These four questions covered the clinical experiences with eye problems, adequacy of formal training and interest in continuing education.

Responding to the first question about the types of eye problems encountered in the individual clinic settings, each nurse practitioner said that they primarily see clients with conjunctivitis and foreign bodies. One practitioner reported seeing some unusual eye problems including a patient with an optic tumor. Each respondent indicated they had no

trouble referring patients to an ophthalmologist although the distance the patient had to travel ranged from 50 to 200 miles. One stated, “the ophthalmologists always see the patients I call them about. They are very helpful.”

When asked about adequacy of formal education to evaluate eye complaints, only one respondent indicated she had felt prepared. Interestingly she also indicated she would like to learn how to do a better eye exam and “see the disc better.” This is a telling response because the ophthalmoscopic exam only really begins by identifying the optic disc. This structural landmark enables the examiner to evaluate the vascular and nonvascular areas of the retina and the macula. Clearly this response indicates the need for continuing education. The remaining respondents stated they received a marginal amount of information about eyes and with the exception of conjunctivitis each stated they did not feel prepared to evaluate eye complaints.

All five of the respondents stated they would be interested in attending a continuing education course related to the evaluation of eye complaints as planned for this project. Each indicated they would benefit by additional information related to the assessment, diagnosis and treatment of eye complaints. Some of the specific information they would like to receive in continuing education programs includes the typical steps involved in performing an eye exam, ophthalmologic medicines, and the effects of neurologic diseases such as strokes on vision.

“I am leery of all eye complaints and I refer them as fast as I can,” stated one nurse practitioner. It is this very uneasiness about understanding the intricacy of the eye that supports the development of this continuing education program. Since the eye is very

complex the consequence of misdiagnosed complaints or delayed treatment can be devastating.

According to Scharff (1998), “the burden for self-responsibility of education is greater in the rural setting than in the urban setting, and most rural nurses accept this burden in stride” (p. 28). Continuing education is a requirement for nurse practitioner certification; it is also sought as a means to gain important information about practice related topics.

The continuing education program proposed in this project will disseminate information to nurse practitioners about glaucoma, macular degeneration and diabetic retinopathy. In addition it will provide information about quality of life issues and vision loss resources. As stated earlier, the ophthalmologist is essential in the diagnosis and treatment of these diseases. For the nurse practitioner providing comprehensive care to patients with eye disease, an overview of these diseases, risk factors, screening recommendations, a review of the basic ophthalmic exam, treatment regimes, and vision resources will provide the practitioner with the necessary tools to manage patients with eye disease. This provides the foundation for quality and comprehensive care and will enable the health care provider to appropriately manage an important component in the health care needs of the patient.

CHAPTER 2

LITERATURE REVIEW

The literature reviewed for this project focuses on the most prevalent eye diseases, which are age-related macular degeneration, glaucoma and diabetic retinopathy. For each of these diseases the description and epidemiology, current research, clinical manifestations, and current treatment will be covered. It should be noted that treatment of these eye diseases would be determined by an ophthalmologist. Following the review of each of the eye diseases, current screening recommendations, the role of the primary care provider and long-term sequelae related to quality of life will be addressed. The chapter concludes by explaining the role of the nurse practitioner in identifying and managing these primary eye diseases. This literature review does not include a comprehensive review of pathophysiology and cellular eye research.

Age-Related Macular Degeneration

Epidemiology and Description

Age-related macular degeneration (ARMD) is the leading cause of legal blindness among individuals older than 60 (Trobe, 1993; Weber & Eichenbaum, 1998). According to Weber and Eichenbaum, “early diagnosis, especially by primary care physicians, may

help stem the devastating consequences of this disorder” (p. 113). Trobe (1993) defined ARMD as, “a slowly progressive, binocular loss of central vision owing to deterioration of the retinal pigment epithelium in the macula” (p. 129). Olsen (1997) adds that the most common abnormality seen in ARMD is the presence yellow deposits in the macula called drusen, which are waste products. “Drusen limit the nutritional and metabolic support available to the outer retina” (Olsen, p. 123). Measures to prevent this disease have not been identified since there is no known cause of ARMD. Several possible risk factors include individuals age 65 and older, women, persons with lighter skin pigmentation, hyperopia (farsightedness), and smoking (Elfervig, 1998; Olsen).

Two types of ARMD have been recognized and they include the more common dry or atrophic form that results in a mild and gradual loss of vision and a wet or exudative form that is more sudden with severe loss of vision (Elfervig, 1998). The atrophic form involves atrophy of the retinal pigment epithelium. Exudative macular degeneration occurs as new vessels from the choroidal vasculature grow under the retina. These vessels leak fluid and lipids and at times bleed. The end-stage of this process is a scarring process that results in a destruction of the overlying retina (Olsen, 1997). According to Starr, Guyer, and Yannuzzi (1998), 200,000 new cases of exudative ARMD occur each year and ARMD currently affects about 8.5 million Americans over the age of 40. The exact cause of this disease is unknown and the focus of many recent studies revolves around potential causes or contributing factors that may influence the development of disease and disease progression.

Current Research

In a landmark population-based study called the Beaver Dam Eye Study, a population of 3684 adults in Beaver Dam, Wisconsin were evaluated at base-line in 1988 and then again five years later in 1993 (Klein, Klein, Jensen & Cruickshanks, 1998). This study has provided data that is being used for multiple studies to evaluate possible associations or risks for developing eye diseases. Many of the studies related to ARMD identify potential factors involved in the development or progression of ARMD. While the Beaver Dam Eye Study evaluated a primarily white community in Wisconsin identifies potential factors for the whole population that may related to ARMD progression and provides groundwork for additional studies.

One facet of the Beaver Dam Eye Study examined the relationship of cataracts and other ocular factors such as absence of a crystalline lens (aphakia), and farsightedness to the incidence and progression of ARMD (Klein et al., 1998). The researchers concluded that individuals who have had cataract surgery are more likely to experience a progression in age-related maculopathy. They add that this may be the result of inflammatory changes that occur in the eye after cataract surgery. In addition they state that more studies need to be conducted to evaluate this association.

Another component of the Beaver Dam Eye Study investigated the association between cardiovascular disease and ARMD (Klein, Klein & Jensen, 1997). The researchers concluded that a possible association might exist between a higher pulse pressure, an indication of atherosclerotic disease, and the progression of ARMD. They discuss several other studies that have found a relationship between uncontrolled

hypertension, hyperlipidemia, and atherosclerotic disease in the progression of ARMD. Klein et al. (1997) state, “data from this prospective study in Beaver Dam show neither consistent nor strong relations between cardiovascular disease and most of its risk factors and the incidence of lesions associated with age related maculopathy” (p. 1810). While important this study in no case gives exhaustive answers. Further studies are recommended to evaluate cardiovascular disease and risk factors as related to ARMD.

The relationship of dietary fat to the progression of ARMD was also studied in the Beaver Dam Eye Study. Mares-Perlman et al. (1995) evaluated the amount of saturated fat and cholesterol consumed by participants in their study. They concluded that a diet high in saturated fats, particularly items like butter and lard, is associated with the development of early age-related maculopathy. The researchers stressed that this association needs to be tested in other studies since other potential factors may have been overlooked or may influence these results.

A study by Wang et al. (1996), drawing upon data from the Beaver Dam Eye study, investigated the pattern of lesions associated with ARMD. They found that a specific pattern of lesions is associated with early ARMD. The researchers described these lesions in the following manner.

Soft indistinct drusen were more prevalent in the temporal and superior quadrants than in the nasal and inferior quadrants, where as pigmentary abnormalities associated with age-related maculopathy were more prevalent in the superior or nasal quadrants than the inferior or temporal quadrants. (p. 2239-2240)

Although this pattern of lesions has been identified it is unknown whether the pattern is influenced by anatomic, physiologic or environmental factors.

In one of the studies not drawing on the Beaver Dam research, Seddon, Ajani, and Mitchel (1997) evaluated family tendencies toward the development of ARMD. First degree relatives of patients with ARMD were evaluated for the presence of age related maculopathy. Of the first-degree relatives of patients with exudative ARMD, 28% were diagnosed with ARMD. Only 14% of the first-degree relatives of non-exudative ARMD were diagnosed with ARMD. While the study only evaluated Caucasian subjects it does indicate that a genetic component may exist. An historical perspective twin study by Meyers (1994) evaluated twins to determine if a genetic predisposition existed. Findings revealed 23 of 23 identical or monozygotic twin pairs had age-related maculopathy. A smaller number of fraternal or dizygotic twin pairs, 2 of 8, had age-related maculopathy. The summative results of this study clearly indicate a genetic predisposition to ARMD. A recognized limitation of this study is lack of information about ethnic backgrounds since the focus of the research is on genetic relationships.

Clinical Manifestation

According to Olsen (1997), the symptoms of ARMD may include a gradual or acute onset of blurred vision, intermittent shimmering lights, vision distortion, or a blind spot in the center of vision. Clinical signs of ARMD may include a decreased visual acuity or a distortion or blind spots noted when looking at the grid lines of an Amsler chart. The ophthalmoscope exam may reveal a change in the pigmentation color (atrophic

ARMD), the presence of drusen, and the presence of serous fluid or blood in the retinal or subretinal areas (Olsen).

Treatment

Any acute changes in vision or vision loss should be referred to an ophthalmologist immediately. Laser photocoagulation according to Olsen (1997) is beneficial in treating some cases of exudative ARMD. The downside to this treatment is the possibility of laser injury to the macula and a high rate of return of disease. The use of low vision aids assists patients by enabling the patient to maximally use their remaining vision.

Glaucoma

Epidemiology and Description

Glaucoma is the second leading cause of blindness in the United States and the leading cause of blindness in individuals of African descent (Whitaker, Whitaker, & Dill, 1998). It is estimated that approximately 15 million people in the United States have glaucoma and that half of those people are not aware they have this disease (Chaudhry & Wong, 1996). Other sources indicate that approximately 2 million Americans suffer from glaucoma resulting in 80,000 cases of blindness (Sherwood et al., 1998).

Glaucoma is a group of diseases characterized by optic nerve damage and visual field loss. As the nerve damage progresses it results in loss of vision which may advance to total blindness if not appropriately treated (Chaudhry & Wong, 1996; Whitaker et al., 1998). Importantly, the vision loss is irreversible.

The term glaucoma is generally associated with elevated intraocular pressure. It should be noted, however, that increased pressure is not essential for the diagnosis since glaucoma may exist in patients with normal pressures (Trobe 1993). This disease involves the production and drainage of aqueous humor from the anterior portion of the eye. The ciliary body produces the aqueous humor which “flows past the lens, around the iris, into Schlemm’s canal via the trabecular meshwork, and then into aqueous and episcleral veins” (Beck, 1997, p. 135). Beck further adds that, “the entire volume of aqueous is turned over approximately every 100 minutes” (p. 135). The ratio of aqueous production to outflow determines the intraocular pressure. Normal ranges lie between 10 and 21mm Hg and measurements greater than 22 mm Hg are considered abnormal or high. These measurements are obtained with the use of tonometry instruments.

The two primary types of glaucoma include open-angle and closed-angle glaucoma. These terms reflect the anatomy of the anterior chamber angle. A third type of glaucoma is a congenital form. It is identified during infancy and can be recognized by a bluish appearance of the cornea with a penlight exam. This form of glaucoma will not be addressed in this project.

In open-angle glaucoma “the angle appears anatomically normal to the naked eye, but the underlying trabecular meshwork, on a microscopic level, is abnormal, thus affecting its ability to drain the aqueous humor” (Wu, 1997, p. 79). In contrast, closed-angle glaucoma occurs when a “blockage of aqueous flow between the lens and iris causes a forward shifting of the iris and closure of the anterior chamber angle” (Beck, 1997, p. 137). This blockage causes a sudden, rapidly increasing intraocular pressure that

develops over several hours. The end result of both forms of glaucoma is an increase in intraocular pressure that damages the optic nerve. “Glaucoma is further differentiated as primary (not related to other conditions) or secondary (associated with an ocular condition, systemic condition, or both)” (Podolsky, 1998, p. 131). Some examples of secondary glaucoma include glaucoma associated with trauma, tumors, inflammation, retinal disorders, and steroid use. These forms of glaucoma will not be specifically reviewed in this project. It is important to note that like other forms of glaucoma the optic nerve is damaged resulting in vision loss.

Primary open-angle glaucoma is the most common type of glaucoma and it accounts for approximately 70% of all cases in the United States (Chaudhry & Wong, 1996). Unfortunately this type of glaucoma is generally asymptomatic until damage to the optic nerve is advanced and irreversible (Podolsky, 1998). Risk factors for developing open angle closure glaucoma include a positive family history, increasing age, African-American descent, myopia, and diabetes (Noble, 1996; Trobe, 1993).

Angle-closure glaucoma, a condition that results in a rapid increase in intraocular pressure, is an ophthalmic emergency requiring immediate treatment by an ophthalmologist (Podolsky, 1998). This form of glaucoma affects women three to four times more often than men, normally occurs between 55 and 70 years of age, and generally occurs in “shorter, smaller, far-sighted eyes with narrow chamber angles” (Beck, 1997, p. 141).

Current Research

Current research related to glaucoma focuses on aspects of the disease that influence cost, health care decisions, and treatment effectiveness. A study by Quigley and Vitale (1997) used a meta-analysis of glaucoma incidence and prevalence to gain information related to length of disease. They determined that black Americans have open-angle glaucoma 27% longer than in white counterparts. In a study about utilization of care, Javitt (1995) found that black Americans are less likely to seek eye care but when they do they are treated for eye disease in the same manner as others. He also stated that blindness resulting from glaucoma in black Americans is two times more likely than blindness in whites. Javitt concluded that eye health education resulting in increased utilization of ophthalmologists might be the most important factor in the prevention of blindness. Education leading to early identification of eye disease would reduce the suffering involved with vision loss and save federal dollars used to treat the disease in its advanced stages.

Another side of glaucoma research involves the evaluation of drugs used to treat the disease. Beta-blockers are the most commonly used drugs in the treatment of glaucoma unless a contraindication exists (Di Piro et al., 1998). Timolol is a non-specific beta-blocker that was compared to a new prostaglandin called Latanoprost in a study by Camras (1996). This was a double-blind study with 268 subjects in which the researcher compared the use of Latanoprost to Timolol to treat glaucoma. The study concluded that Latanoprost has the potential to become a new first-line treatment for glaucoma. Its benefits are that it affects aqueous humor outflow, is dosed once a day with reduced intraocular pressures consistent throughout the day and night, and results in fewer

systemic side-effects. On the down side, Latanoprost was shown to produce more hyperemia than the Timolol and to cause an unusual side effect involving the pigmentation of the iris. It should be noted that the pool of subjects was small and included three times as many whites as black participants. Further studies are indicated in order to evaluate this drug and determine the safety and efficacy of its use.

Clinical Manifestations and Treatment

The clinical manifestations and treatment for glaucoma differ between the two primary types, open and closed-angle glaucoma. The first type is painless and the latter is painful and considered an ocular emergency. Because the clinical manifestations and treatment are different for these two forms of glaucoma, they will be addressed separately.

Open-Angle Glaucoma. Open-angle glaucoma is painless and unrecognized by the patient until late in the disease when vision loss occurs. According to Wu (1997), occasionally the patient may note reduced vision in the dark or in twilight which suggests a loss of contrast sensitivity, one of the earliest signs of glaucoma. It is important to note that “visual acuity and the central visual fields usually remain normal until late in the disease process” (Beck, 1997, p. 136). In the advanced stage severe visual field changes occur.

Ophthalmologists can detect this form of glaucoma with the use of specialized equipment to evaluate intraocular pressure and visual fields, and through the use of ophthalmoscopy. Direct ophthalmoscopy provides important information about the optic

disk or optic nerve. Damage caused by glaucoma is manifested by optic nerve cupping and a measurement of the cup-disc ratio of 0.6 or greater is one sign of glaucoma (Beck, 1997). In addition, a 0.2 or greater asymmetry in the cup-disc ratio is also suggestive of glaucoma. The optic nerve evaluation during the ophthalmoscope exam is greatly aided by the use of medications like tropicamide 1% and phenylephrine 2.5% ophthalmic solutions that dilate the pupil. It is important to note that drugs that dilate the eye may in fact precipitate an angle-closure glaucoma.

The treatment for open-angle glaucoma usually begins with the use of medications. "The two rationales behind the drug treatments used for this disease are to reduce the production of aqueous humor or to increase its drainage," (Page et al., 1997, p. 376). If the glaucoma is not responsive to medications, several surgical options are possible. One option is called a laser trabeculoplasty. This procedure involves "placement of multiple, low-energy burns to the trabecular meshwork, decreasing the intraocular pressure significantly in approximately 80% of cases," (Beck, 1997, p. 141). Another option is a surgical procedure called a trabeculectomy which "bypasses the normal outflow pathway by the creation of a surgical fistula" (Beck, p. 141). A successful trabeculectomy results in an elevation of the conjunctiva called a filtering bleb. Due to the risk of infection, Beck stresses that conjunctivitis occurring in individuals with a filtering bleb needs immediate referral to an ophthalmologist.

Ophthalmologists initiate and manage treatment. Additionally, they monitor open-angle glaucoma by "obtaining regular measurements of the patient's intraocular pressure and photographing the optic nerve and visual fields" (Wu, 1997, p. 83).

Closed-Angle Glaucoma. The sudden rise in intraocular pressure associated with closed-angle glaucoma often causes severe eye pain. This pain may be associated with nausea and vomiting, headache, and blurred vision. As stated earlier, this is an ocular emergency requiring immediate referral. If the very high intraocular pressure is not relieved permanent blindness may ensue.

Treatment for angle closure glaucoma initially involves “emergent lowering of intraocular pressure with medications, followed by iridectomy performed with the laser or with incisional surgery” (Trobe, 1993, p. 141). The iridectomy restores the flow of aqueous fluid to the trabecular meshwork by bypassing the structural blockage that occurs in angle-closure glaucoma. Closed-angle glaucoma is managed and closely followed by ophthalmologists.

Diabetic Retinopathy

Epidemiology and Description

In persons ages 20 to 74, diabetes is the leading cause of blindness. According to the Morbidity and Mortality Weekly Report (1993) as many as 40,000 new cases of blindness occur in diabetes each year. Primary care physicians commonly manage Type 1 and 2 diabetics and one of the complications is diabetic retinopathy, a microvascular disease of the retina (Smith, 1998). In this disease the capillaries in the retina become thickened, hardened, fibrous and diseased. These changes result in the loss of the retina’s ability to adequately transport red blood cells, which then affects the oxygenation and nutrient supply (Smith). The end result is tissue hypoxia and ischemia.

The early stage of diabetic retinopathy is called nonproliferative retinopathy. During this stage microaneurysms occur due to the sclerotic retinal capillaries. Other characteristic features include small retinal hemorrhages, lipid exudates and nerve fiber infarcts called cotton-wool spots. Changes occurring in the capillary membrane result in a loss of ability to regulate fluid transport and the capillary beds become leaky and edematous. Ophthalmologic findings at this stage reveal “microaneurysms, hard exudates, intraretinal hemorrhages, and macular edema” (Trobe, 1993, p. 136). Over time the disease progresses from the non-proliferative to a proliferative retinopathy stage. During this stage, new vessels develop above the retinal surface to try to compensate for the resultant hypoxia. Again, these vessels are weak and often hemorrhage and “as these new vessels bleed into the retinal or vitreous cavity, they stimulate proliferation of the fibrous scaffold that supports them. This scaffold eventually contracts and tugs on the retina, causing it to split or detach” (Trobe, p. 137). Vision loss often occurs late in the disease as a result of the injury to the retinal vasculature.

Current Research

The focus of the Healthy People 2000 objective to reduce complications of diabetes has generated extensive research on diabetic retinopathy (Healthy People 2000, National Health Promotion and Disease Prevention Objectives, 1990). Current practices related to glycemic control and blood sugar levels are related to a major research study entitled the Diabetes Control and Complications Trial (DCCT), (Diabetes Control and Complications Trial Research Group, 1993). This research identified the effects of glycemic control by evaluating macrovascular or cardiac and peripheral vascular disease

and microvascular diseases such as nephropathy, neuropathy, and retinopathy. During the process of the study, the benefit of tightly controlled blood glucose in reducing complications became so clear that the project was cancelled one year early.

Recommendations from this study now guide practice. According to the DCCT early-improved control of blood glucose in the insulin dependent diabetic reduced the risk of retinopathy (Diabetes Control and Complications Trial Research Group, 1993). In addition, the DCCT found that an analysis of Hemoglobin A1c (HbA1c) provides an indication of glucose control while predicting risk of complications.

Several studies evaluating primary care of this disease have been conducted. A study by Konen, Curtis, and Summerson (1996) reviewed common symptoms in non-insulin-dependent diabetics in the primary care setting. These researchers concluded that half of the patients tested positive for microalbuminuria, an early sign of nephropathy. They further observed common symptoms of depression, anxiety, panic, and forgetfulness, and determined that a lack of compliance with treatment regimes may be related to these factors. Another study by Kraft et al. (1997) evaluated screening and detection patterns of diabetic retinopathy in the primary care setting. Findings revealed that 52% of the primary care physicians performed “in-office” ophthalmoscopic exams and that 90% of those exams were performed with undilated pupils. These researchers also found that only 58% of insulin dependent diabetics were referred for ophthalmic exams and only 42% of the non-insulin dependent diabetics were referred for ophthalmic exams. Recommendations from this study include a need for the development of

strategies to improve adherence of primary care physicians to recommended guidelines for diabetic retinopathy screening (Kraft et al.).

In a study completed by Legorreta, Pelletier, Hasan, Leung, and Peters (1997) a “reminder” intervention in a large health maintenance organization (HMO) was evaluated. This intervention was in the form of written letter from the HMO explaining the screening recommendations to the physicians. In addition, the HMO sent to the physician a list of patients needing retinal exams and educational information to be used by the physician. The purpose of the study was to determine the percentage of diabetics receiving retinal examinations after the reminder intervention. Based on the number of ophthalmology referrals, these researchers concluded that referrals increased with this “reminder” but that the referral rate remained low compared to the published guidelines. Primary care provider’s compliance with screening recommendations will help to identify early retinal changes observed in diabetic retinopathy. Without good screening practices, undetected retinal disease may result in permanent loss of vision.

Clinical Manifestations

According to Olsen (1997), “Some patients with severe proliferative retinopathy may have 20/20 visual acuity and be unaware of any symptoms” (p. 106). Patients may, however, experience gradual or acute vision changes. Some of these changes include “floaters” which are a possible sign of a vitreous hemorrhage, commonly described as a “shower”, or blind spots known as scotomata. Patient’s descriptions of symptoms vary and may include sudden loss of vision, wavy or distorted vision especially with reading, and changes in light perception (Wu, 1997).

The clinical signs of retinopathy may include decreased visual acuity or noted distortion or blind spots when looking at an Amsler grid. Upon examination a reddish appearing iris may indicate neovascularization or the development of additional blood vessels. The inability to obtain a red reflex may indicate a vitreous hemorrhage. The ophthalmoscope evaluation is the most effective with a dilated exam. In this way microvascular changes associated with diabetic retinopathy can be detected. This exam may reveal neovascularization of the optic nerve or retina. Additionally, hemorrhages, cotton-wool spots which are whitish areas of optic nerve infarcts, or hard exudates, often appearing as yellow substances, may be visualized.

Treatment

The treatment according to Smith (1998) falls into three categories, which include medical control, laser photocoagulation and surgical options. The medical control involves tight management of blood glucose, which was demonstrated by the Diabetes Control and Complications Trial. Therefore, the primary care provider can help diminish worsening retinopathy by helping the patient control blood sugar.

Laser surgery or photocoagulation is used to control bleeding areas and to control the growth of new vessels (Wu, 1997). Olsen (1997) best describes retinal laser photocoagulation therapy in the following manner. "Retinal laser photocoagulation destroys the peripheral retina and decreases the release of vasoproliferative growth factors from the ischemic retinal tissue" (p. 108). This photocoagulation limits the traction on the retina that causes detachment by creating multiple adhesions between the choroid and retina.

Surgical interventions include vitrectomy and retinal reattachment. The vitrectomy, according to Smith (1998), “usually includes the removal of blood and scar tissue from the vitreous cavity, reattachment of the retina with a scleral buckle, and the introduction of gas into the eye to hold the retina in place until normal healing processes maintain its proper position” (p. 17).

The goal of retinopathy treatment is to slow or halt progression of the disease. Once the retinal tissues are injured they are unable to regenerate and vision cannot be restored. Once vision has been lost, the use of remaining vision may be enhanced by the use of low vision aids and by visual rehabilitation.

Screening Recommendations for Eye Disease

The impact of these diseases on vision is so severe that adherence to screening recommendations is of utmost importance. General primary care recommendations for vision screening include performing a visual acuity at routine exams. According to Noble (1996) a referral for further evaluation should be made if the best corrected vision is less than 20/40 or if a decline in vision occurs between examinations. In patients 40 years of age and older, an exam by an ophthalmologist is recommended every two to four years (Trobe, 1993).

Since age-related macular degeneration is so poorly understood, no generally accepted screening recommendations exist. In glaucoma, the validity of various screening tests, especially tests to detect intraocular pressure and optic disc cupping have been challenged (Wormald & Rauf, 1995). Glaucoma is not always associated with elevated

intraocular pressures and the cost of routine screening with tests having poor validity would be expensive and often ineffective.

By contrast screening recommendations for diabetic patients are well established. The American Academy of Ophthalmology, the American College of Physicians, and the American Diabetes Association have embraced a single screening criteria (American Diabetes Association, 1998). This criteria states that diabetic patients ages 10 to 29 with Type 1 diabetes should undergo a dilated ophthalmologic exam within 3-5 years after developing diabetes. Type 1 diabetics age 30 and older and Type 2 diabetics should be referred for an ophthalmic exam shortly after diagnosis with annual ophthalmic exams thereafter. Diabetic women planning to get pregnant should have a comprehensive eye exam prior to pregnancy, a repeated exam during the first trimester and subsequent visits as determined by the ophthalmologist.

Screening recommendations for an exam by an ophthalmologist every one to two years have been established for adults with high risk. These identified high risks include a history of detached retina, a family history of glaucoma, African-Americans, individuals over the age of 65, a history of severe eye trauma, hypertension, sickle cell disease, and persistent vision loss in one or both eyes (Trobe, 1993).

Primary Care Provider Issues

As managed care has evolved, the primary care provider has become the gatekeeper who determines the need for diagnostic tests and referrals. Does this work? Is it cost effective? Are there long term consequences reflected by vision loss or blindness

for the patient? These are questions that need to be addressed by the research community. The answers to these questions will provide the foundation for evidence based medicine as it relates to eye care and the primary care provider. Literature is sparse addressing these issues and the effectiveness of the primary care provider's ophthalmologic exam, diagnosis and referral practices.

According to Podolsky (1998), "definitive diagnosis and treatment are the domain of ophthalmologists, but primary care physicians play an essential role in screening patients through careful history taking and physical examination and in identifying those at high risk" (p. 131). One study by Lazaridis, Kraft, Qiu, and Marrero (1997) analyzed primary care physician referral patterns for diabetic retinopathy screening in Type I and Type II diabetics. These researchers reported that physicians screened Type I diabetics more aggressively by referring more patients to ophthalmologists than to optometrists. In the case of Type II diabetics, patients are more likely to be referred to optometrists for screening. When comparing rural and metropolitan practices, the findings indicate that rural practices refer Type II diabetic patients to optometrists two times more often than their urban counterparts. The discussion ensuing from these findings reveals that annual screening guidelines do not specify referral to an ophthalmologist or optometrist. Moreover, the role of the optometrist in detecting diabetic eye disease is not well defined. The researchers add that it is unclear whether optometrists are able to provide retinal disease screening comparable to the screening provided by ophthalmologists. This study provides a brief glimpse into physician referral patterns while at the same time it encourages primary care providers to carefully evaluate their referral practices.

On the subject of referrals a study by Ettinger, Schwartz, and Kalet (1993) concluded that primary care referrals for eye care are often generated by acute or symptomatic problems rather than by routine screening. There are implications from this for the primary care provider. Since early identification of eye disease is imperative for treatment, it is essential for the primary care provider to recognize high-risk patients and refer them for screening before acute or symptomatic problems arise.

Eye specialists like Strahlman, Ford, Whelton, and Sommer (1990) who recognize the primary care provider as a valuable ally in identifying eye disease, evaluated the effectiveness of a questionnaire and vision test that could be used as a screening tool in a primary care setting. Of the 541 participants in this study, 267 individuals met referral criteria for ophthalmic evaluation as identified by the questionnaire and vision test. The authors conclude that primary care screening is an efficient means to identify individuals with undetected eye disease that need follow up. This study took place in a large internal medicine clinic with patients known to have chronic diseases at high risk for eye disease. The benefits of a questionnaire and vision chart used to identify risk factors and possible eye disease would be transferable to other primary care and internal medicine settings. This would promote early identification and initiation of treatment for eye disease.

Quality of Life and Vision Loss

The full impact of vision loss on quality of life may be unfathomable for the causal on-looker. Certainly one might understand that reduced vision may impair someone from reading or driving but each impairment in itself requires huge lifestyle

changes on the part of the one with vision loss. The loss of the ability to drive forces dependence on others. Visual changes that limit reading ability make even simple tasks difficult. For instance, reading a recipe, adjusting a furnace thermostat, writing a check, or balancing a checkbook may be impossible. For this reason, the nurse practitioner must ask insightful questions and talk with patients and family members about their experience with vision changes and the personal impact felt. Only then can the nurse practitioner assist with issues that may help both the patient and family.

Several studies have evaluated the impact of vision loss on quality of life. One such study by Williams, Brody, Thomas, Kaplan, and Brown (1998) studied the effects of ARMD. This study evaluated 86 elderly individuals with ARMD using a variety of measures to evaluate quality of life, emotional well being, and functionality. They found that these subjects with legal blindness in one or both eyes experienced emotional distress, a reduced quality of life, and difficulty in managing daily activities. The researchers determined that the decreased visual acuity had a domino effect. The decreased vision resulted in difficulty carrying out activities of daily living, which in turn caused emotional distress and a sense of reduced quality of life. These findings indicate that interventions focused on activities of daily life may actually reduce the emotional distress experienced in these individuals and may improve a sense of quality of life.

In a related study, Sherwood et al. (1998) examined the impact of glaucoma on quality of life. As background information the researchers reviewed common clinical indicators used to evaluate glaucoma treatment effectiveness. One indicator, the use of visual acuity, was identified as one of the most important measures of day to day

function. The researchers proposed that patient's perceptions of visual limitations would be a better indication of visual functioning than the visual acuity alone. During this study, 56 subjects with similar demographic characteristics answered questionnaires intended to measure general well being, day to day functioning, and the impact of glaucoma symptoms, treatment, and side effects on daily life. In addition to answering the questionnaire, each subject received a visual acuity and visual field assessment. The findings revealed that quality of life decreased with loss of vision and complex treatment therapy reduced daily activities (Sherwood et al.). Although further research is indicated to validate these findings, this study holds implications for the primary care provider. Since visual function affects quality of life, the primary care provider must engage the patient in a discussion of day to day activities and perceived limitations resulting from vision loss. Only then can the provider address patient concerns.

For the individual experiencing vision loss the use of vision loss aids may be helpful. Some of the vision loss aids available include magnifiers, telescopes, special lights, and large-print materials (Trobe, 1993). It is important to note that vision loss aids only assist by enhancing remaining vision. These aids require trained specialists in order to achieve optimal benefits. These specialists help evaluate patient needs and assess goals and expectations for the use of remaining vision. Through the use of various low vision aids, the specialists enable patients to retain as much quality of life as possible. Even the patient's domestic space needs to be assessed for improved access and utility. Low vision specialists or rehabilitation services provide needed resources for patients with vision loss.

The Nurse Practitioner

After all of the previous discussion one might ask, “what is the nurse practitioner’s special contribution in providing care for those with the eye problems discussed above?”

The role of the nurse practitioner (NP) as it relates to eye care requires the NP to understand the anatomy and physiology of the eye. To effectively manage patients with known eye disease or to provide quality comprehensive primary care, the NP must bear in mind the information provided throughout this chapter. This includes knowing the epidemiology, the description of the disease or the pathophysiology, clinical manifestations, and treatment options as described above. An understanding of these factors assists the NP in evaluating eye problems, since differential diagnoses need to be considered. The NP must also read current literature and research related to these topics to remain informed.

In the clinic setting, the NP must routinely incorporate questions about vision change and eye disease during patient exams. Information must also be obtained about family history the occurrence of eye disease. This assists in recognizing some of the risk factors indicating a need for an ophthalmic exam. Careful attention to published screening recommendations is also a must to recognize eye disease early in its course.

The process of evaluating eye function can be easily obtained through routine evaluation of visual acuity and the use of an Amsler grid. In this way, the NP can better identify patients who need referral to ophthalmologists. By incorporating the components of a basic exam the NP may be able to identify some problems early and will be better

able to detect general eye problems. The documentation of the eye exam should use correct ophthalmologic terms and the nurse practitioner should be familiar with standard abbreviations used by ophthalmologists to communicate patient exams.

Finally, the nurse practitioner, as a primary care provider, can provide valuable assistance to patients experiencing vision loss by utilizing vision loss resources. This includes the possibility of coordinating vision loss rehabilitation services for the patient.

The nurse practitioner that incorporates these essential items into practice is armed with the necessary tools to manage patients with age-related macular degeneration, glaucoma and diabetic retinopathy. This provides the groundwork for skilled and comprehensive care, which can only benefit the patient and provide holistic care.

CHAPTER 3

METHODOLOGY

Project Design

The purpose of this project was to develop a continuing education program for rural nurse practitioners which may enable them to recognize the most prevalent eye diseases and participate in the management of these chronic eye problems. The program will focus on early identification of disease, appropriate prevention, and current tertiary management.

Conceptual Framework

This continuing education program is designed to be informative while interactive. Since the nurse practitioner is the target audience of this program, the principles of adult learning theory guide the overall course development. The conceptual framework is adult learning theory, specifically the five assumptions developed by learning theorist, Malcolm Knowles (1990). These basic assumptions provide the underpinnings to guide the project by aiding in understanding the adult learner, in this case, the nurse practitioner.

The first assumption states that the adult learner knows what he or she needs to know and comes prepared to learn when there is a perceived need. As this applies to the

nurse practitioner, there is a body of nursing and medical knowledge that is assumed. The nurse practitioner is educated, licensed, and actively engaged in the profession. This is not however to overlook the fact that additional information is necessary to remain well versed and current in aspects of patient care. The information provided in this continuing education program builds on the participants' foundation of knowledge. It is designed to provide needed information about age-related macular degeneration, glaucoma and diabetic retinopathy in order to provide optimal care through early diagnosis, prevention and tertiary treatment.

Secondly, the adult learner is generally self-directed and independent. The success of every continuing education program is predicated from the learner's perspective, on this. It is assumed that the reason one does continuing education is that one takes the initiative to learn. This program on eye diseases is intended to be like bait for hungry fish. Nurse practitioners, like achieving adult learners, want to improve their skills and thus gain higher levels of service and personal satisfaction.

Thirdly, adults bring to education past experiences. These experiences vary from individual to individual and encompass a wide variety of learning styles, backgrounds, skills, interests, and goals. A continuing education course like the one proposed here is rich because the learners are rich: in environments in which they work, rich in stories of past experiences, rich in problems they have encountered for which they are seeking help. The kinds and varieties of learning styles places a burden on the author of this continuing education program so as to be sensitive to those individual needs consistent with the brevity and focus of the sessions.

The fourth assumption states that the adult learner is mature and ready to learn information that enables one to contend with real-life circumstances. The final assumption states that the learner is motivated to expend energy to learn new skills or deal with problems encountered in life situations. This learning is most effective when information can be applied practically (Knowles, 1990). The fourth and fifth assumptions both deal in some sense with the realization that the knowledge needed is applied knowledge. It is fairly clear that the need in continuing education is to provide information and experiences that meet the practical needs of the participants. I am confident that this program does just that. It attends to issues that will enable the nurse practitioner to contend more ably than before with real-life circumstances.

Based upon these assumptions, the following strategies have been incorporated into this program to enhance learning. According to Van Hoozer (1994) adults prefer to learn through active involvement. With this in mind, this program utilizes discussion questions, case studies, role-play, simulation through “vision loss experiences” and hands-on experience with the eye exam. A portion of the information presented in this program occurs through a lecture type format. To encourage group participation in learning, notes will be provided in an information booklet, PowerPoint or overheads will be utilized to convey visual information and discussion or feed back questions will be woven into the content (Van Hoozer).

The Continuing Education Program

This continuing education offering is intended to be a full day program. Ideally the number of participants would no more than 30 to encourage active participation

through hands-on experiences and discussion. This program will be held in an environment that is comfortable with adequate seating space, appropriate lighting and good acoustics. Each attendee will receive a program packet entitled, “Eyes on the Prize: The Nurse Practitioner Guide to Age-Related Macular Degeneration, Glaucoma and Diabetic Retinopathy” (see Appendix B for program packet). This packet includes the purpose, course objectives and program schedule. Additionally, it contains a review of eye anatomy, an overview of each of the eye diseases identified in the program, and a discussion list to be used with a simulated vision loss experience. Also to be included are the components of the eye exam, screening recommendations, vision loss resources, a role playing vignette, several case studies, a recommended reference list of books and Internet sites, and a course evaluation.

The Program Outline

The day begins with opening remarks that include a welcome, the purpose of the program and an introduction of facilitators and participants (see Appendix B for program outline). During the participant introduction each individual is asked to share their name and briefly indicate their clinical experience and interest in the topic. This sets the stage for open discussion and group participation.

Following the opening remarks, a brief review of eye anatomy establishes a foundation to present and discuss the course material. Next, participants undergo a “vision loss experience” which imitates the effects of age-related macular degeneration. In this activity, each participant receives non-prescription glasses that limit central vision and are directed to thread a needle and pay a bill by writing a check. Upon completion of

the activity, individuals are encouraged to share their feelings and experience (see Appendix B).

After the vision loss experience, age-related macular degeneration is presented. This presentation includes the description, prevalence, brief pathophysiology, risk factors, clinical manifestations and current treatment. Participation is encouraged through the use of a case study (see Appendix B).

Following a break, a second vision loss experience offers an opportunity for participants to consider the affects of glaucoma. In this activity, Vaseline is applied to non-prescription glasses and the participants are asked to dial a telephone number and set the time on a watch. As in the previous vision loss experience, a discussion time follows the activity to provide an opportunity to explore the meaning of the experience.

Next, information about glaucoma is presented (see Appendix B). An overview including the prevalence, a brief review of pathophysiology, risk factors, clinical manifestations and current treatment communicates important information about this disease. A case study utilizing this information provides an opportunity for group participation.

A third and final vision loss experience enables participants to consider total vision loss. During this activity participants are asked to pair up and are given a blindfold. Once blindfolded, the participant is directed to take a “trust walk” utilizing his or her partner as a resource. After completing the walk, the participant is given a large piece of paper and a pen and asked to write his or her name correctly, completely, and as orderly as possible. When the first participant has completed the exercise the partner

repeats the activity. Upon completion of this experience, the significance of the experience to the participant is solicited through discussion questions.

The final morning topic to be covered is diabetic retinopathy (see Appendix B). The content consists of an overview of prevalence, a brief review of pathophysiology, risk factors, clinical manifestations and current treatment. A case study assists in the application of this information to the clinical setting.

Following a one-hour lunch break, the components of the eye exam are presented. This session is intended to be interactive. Using guided group discussion various aspects of the patient history, the review of systems and screening recommendations are reviewed (see Appendix B). Next, the specific vision, visual field, pupillary and ophthalmoscopic exam components are presented. A hands-on practice session follows which enables participants to perform these skills.

After a break, vision loss resources are presented. During this time, important information about vision rehabilitation and the use of vision loss assistive devices is provided (see Appendix B). A role-play experience offers an opportunity to discuss what assistance the client may need (see Appendix B).

A “putting it all together” group activity using a case study incorporates the entire information previously presented during the day (see Appendix B for case study). The concluding remarks provide an opportunity to briefly review the content of the day and thank participants for their involvement and interest in this topic. The participants will be asked to complete course evaluation prior to leaving the facility (see Appendix B).

CHAPTER 4

PROJECT OUTCOME

Evaluation of Results

Since this professional project has not been implemented, results are not available to evaluate. The project entailed the development of a continuing education program that has yet to be field-tested and accordingly there has been no feedback which would act as an evaluation of its effectiveness. When the program is implemented as part of a continuing education program, the participants will be asked to provide a thorough evaluation of the topics, their contents and the methods used to present the material. The evaluation plan was described in chapter 3 and the evaluation instrument can be found in Appendix B. The responses provided by the participants will identify strengths and weaknesses of the program and will guide future changes or adaptations in the material presented.

Limitations

The primary limitation of this project is the fact that the continuing education program has not been presented. Without the feedback offered by participants the value

of this work cannot be adequately determined. Based on a theoretical perspective, the principles of adult learning, it is expected that the educational program will be effective.

Summary

The purpose of this project was to develop a continuing education program for rural nurse practitioners which may enable them to recognize the most prevalent eye diseases and participate in the management of these chronic eye problems. The program will focus on early identification of disease, appropriate prevention, and current tertiary management.

The target audience for this program is nurse practitioners. In Montana, nurse practitioners work in solo and collaborative settings as primary care providers. In this autonomous role they must properly screen and evaluate patient need for ophthalmologic examinations and treatment. By utilizing good interview techniques, following established screening guidelines, identifying risk factors, and incorporating quality eye exam techniques the nurse practitioner can appropriately manage an important component in the health care needs of the patient. This is of utmost importance as the early identification and treatment of these eye diseases may reduce or prevent devastating vision loss.

An informal needs assessment substantiates a need for this type of continuing education program. Importantly, the majority of the respondents queried about their educational needs indicated the amount of information about eyes in their formal

education is lacking. Additionally, each respondent indicated an interest in a continuing education course such as the one described in this project.

This proposed continuing education program would disseminate information to nurse practitioners about glaucoma, age-related macular degeneration, and diabetic retinopathy. The ophthalmologist diagnoses and treats these diseases but the nurse practitioner plays an important role through risk assessment and early identification of problems. Because the nurse practitioner manages the primary health concerns of these patients, an understanding of these diseases and their treatment assists the practitioner in caring for the overall health care needs of the patient. One key health care issue involves the impact of these diseases on quality of life. The nurse practitioner that is aware of quality of life issues and is able to identify vision loss resources provides an invaluable service to patients and their families.

A review of the literature provided the salient details about the epidemiology, current research, clinical manifestations, and current treatment of age-related macular degeneration, glaucoma, and diabetic retinopathy. Additionally, the current screening recommendations, the role of the primary care provider and long-term sequela related to quality of life are addressed in the literature.

This continuing education program is designed to be informative while interactive. Since the nurse practitioner is the target audience of this program, the principles of adult learning theory guide the overall course development and provide the framework for this project. Five key assumptions regarding adult learners developed by one adult learning theorist, Malcolm Knowles (1990), help to understand the adult learner

and adult learning needs. These assumptions state that the adult learner is self-directed and independent. The adult learner comes prepared to learn when there is a perceived need and brings life experience to the educational process. Additionally, the adult learner is mature and ready to learn information that enables one to contend with real-life circumstances and is prepared to expend energy to learn new skills to deal with problems encountered in life situations.

Based upon these assumptions, the program incorporates numerous strategies to enhance the learning experience. The program utilizes lecture, discussion questions, case studies, role-play, simulated vision loss experiences, and hands-on experience with the eye exam. Through these strategies the participants gain additional knowledge and clinical skill in order to participate in the care of patients with age-related macular degeneration, glaucoma, and diabetic retinopathy. They are also led into a new understanding of how disease affects vision through several dramatic examples of diminished vision. Each participant's experience of simulated but real-to life vision loss makes the day by day trials of patients with vision loss an unforgettable educational experience while helping the participant to consider quality of life issues the patient may face. An awareness of screening guidelines, crucial elements of the eye history, and interviewing techniques is also learned through this program. Additionally, the participants gain skills in performing the eye exam and learn about vision loss resources so they can provide vision loss information to patients and their families.

As stated earlier, this program has not yet been presented. However, the continuing education program developed for this professional paper provides the

necessary framework for the author to serve the profession by presenting this material at a later date.

Implications and Recommendations for Further Study

This continuing education program provides necessary information about three of the most prevalent eye diseases. This information is essential to the practitioner providing care for patients with risk factors for the development of these diseases or patients who already have macular degeneration, glaucoma, or diabetic retinopathy. While the effectiveness of this program can only be determined by actually presenting the program, one would expect that nurse practitioners would recognize a need to understand these diseases and would seek to attend such an offering.

Additional studies are needed related to the effectiveness of the primary care provider, specifically the nurse practitioner, in the use of screening guidelines and the efficacy of the eye exam and ophthalmoscopy. In general there is little literature published about the nurse practitioner and their role in eye care. This type of literature is necessary to provide information and guidance to the practitioner caring for patients with age-related macular degeneration, glaucoma, and macular degeneration.

Specific recommendations for the presentation of this continuing education program include the use of multiple disciplines to present the information and to dialog with the participants. Ophthalmologists bring a wealth of experience and knowledge and could assist in teaching the components of the eye exam especially the use of the ophthalmoscope. Nurse practitioners who currently provide primary care to patients with

age-related macular degeneration, glaucoma, or diabetic retinopathy also provide the perspective only a peer can offer. Finally, vision loss counselors provide another valuable perspective in the care of the patient through vision loss aids, which contribute to improved quality of life.

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APPENDICES

APPENDIX A

INFORMAL NEEDS ASSESSMENT QUESTIONS

Informal Needs Assessment Questions:

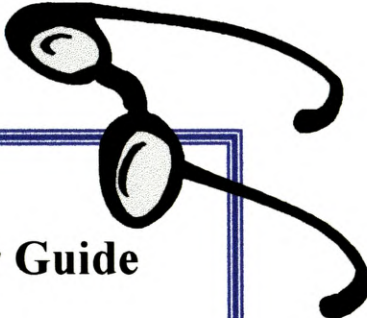
1. What kind of eye problems or complaints do you see in your office?
2. Do you feel that your schooling prepared you to evaluate eye complaints?
3. What additional eye information would be of interest to you?
4. Would you be interested in attending a continuing education program about the evaluation of eye complaints?

APPENDIX B

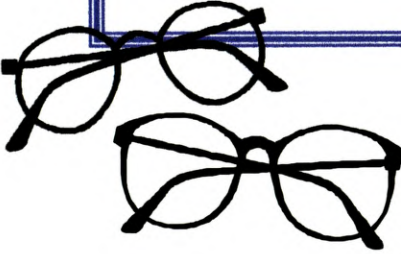
PROGRAM PACKET

**Eyes on the Prize: The Nurse Practitioner Guide to Age-Related Macular Degeneration,
Glaucoma, and Diabetic Retinopathy**

Eyes on the Prize



**The Nurse Practitioner Guide
to Age-Related Macular
Degeneration, Glaucoma, and
Diabetic Retinopathy**



Continuing Education Program Description

The purpose of this continuing education program is to enable rural nurse practitioners to recognize the most prevalent eye diseases and participate in the management of these chronic eye problems. The program focus will be on early identification of disease, appropriate prevention, and current tertiary management.

Objectives

At the completion of this course the nurse practitioner will meet the following learning objectives:

1. Identify essential eye anatomy.
2. Describe the risk factors, clinical manifestations and treatment of age-related macular degeneration, glaucoma and diabetic retinopathy.
3. Discuss the effects of these diseases on vision.
4. Integrates the elements of a good eye history interview and review of systems.
5. Discuss the screening guidelines.
6. Demonstrate the components of the eye exam.
7. Identify vision loss resources.
8. Demonstrate interviewing techniques that assist in the identification of client needs.
9. Explain the role of the nurse practitioner in the care and management of the client with these chronic eye diseases.

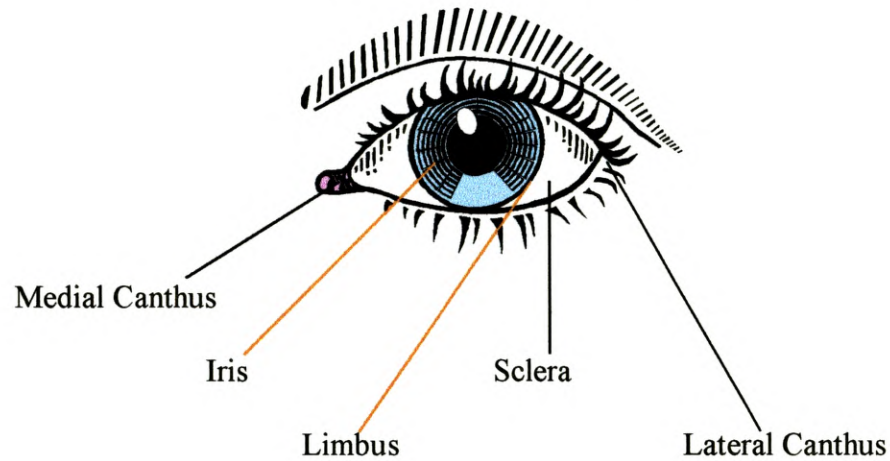
Schedule and Outline of Program

8:00-8:15 a.m.	Opening Remarks ❖ Welcome ❖ Purpose of the Program ❖ Introduction of Facilitators ❖ Introduction of Participants
8:15-8:30	Review of Eye Anatomy
8:30-8:40	Vision Loss Experience and Discussion
8:40-9:30	Age-Related Macular Degeneration ❖ Prevalence & Description ❖ Risk Factors ❖ Research ❖ Clinical Manifestations ❖ Treatment ❖ Case Study
9:30-9:45	BREAK
9:45-10:00	Vision Loss Experience and Discussion
10:00-10:40	Glaucoma ❖ Description & Prevalence ❖ Risk Factors ❖ Research ❖ Clinical Manifestations ❖ Treatment ❖ Case Study
10:40-11:00	Vision Loss Experience and Discussion
11:00-12:00	Diabetic Retinopathy ❖ Description & Prevalence ❖ Risk Factors ❖ Research ❖ Clinical Manifestations ❖ Treatment ❖ Case Study

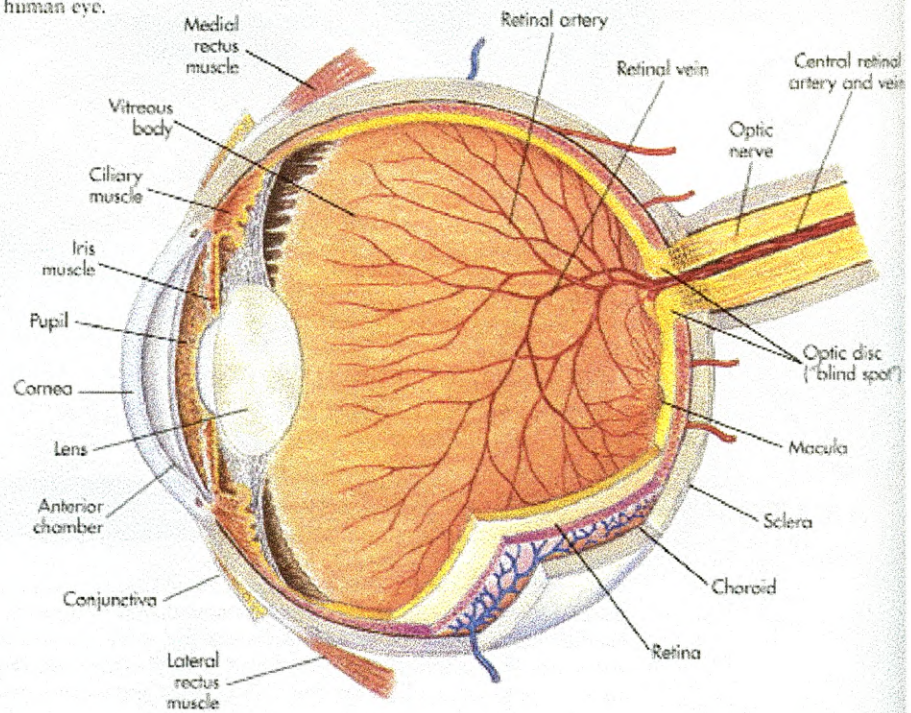
Schedule and Outline of Program (Continued)

12:00-1:00	LUNCH
1:00-1:40	The Eye Exam ❖ History... Medical History, Family History ❖ Review of Systems ❖ Screening Recommendations ❖ Exam
1:40-2:15	Practice Session
2:15-2:30	BREAK
2:30-3:00	Vision Loss Resources & Role Play
3:00-3:30	Putting it all Together – Case Study
3:30-3:40	Concluding Remarks
3:40-4:00	Course Evaluation

Review of Eye Anatomy



Anatomy of the human eye.



From

Mosby's Guide to Physical Examination (4th ed.) (p. 273), By H. M. Seidel, J. W. Ball, J.E. Dains, and G.W. Benedict, 1999, St. Louis: Mosby.

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Vision Loss Simulation Discussion Questions

Purpose of these experiences: To consider how life might change with these limitations; not to “know” what life would be like to live with these vision losses.

Discussion questions to be used after vision loss simulation

1. What was your experience?
2. How might you experience life differently?
3. How would it be different to live?

Age-Related Macular Degeneration (ARMD)

❖ Prevalence

- Leading cause of legal blindness in individuals > 60 years.
- No known cause.
- Affects about 8.5 million Americans over the age of 40
- 200,000 new cases of exudative ARMD each year

❖ Description

- Loss of central vision due to the deterioration of the macula (retinal pigment epithelium).
- A common abnormality seen: Drusen, yellow waste products that are deposited in the macula. They limit the nutritional and metabolic support for the retina.

Two Types of ARMD:

1. *Dry or atrophic* –
 - a) Results in a mild, gradual loss of vision
 - b) Involves atrophy of the retinal pigment epithelium
2. *Wet or exudative*—
 - a) More sudden & severe loss of vision
 - b) New vessels from the choroidal vasculature grown under the retina. These vessels leak fluid and lipids and at times bleed. The end-stage of this process results in a destruction of the overlying retina.

❖ Risk Factors

- Age 65 or older
- Women
- Individuals with light skin pigmentation
- Hyperopia (farsightedness)
- Smoking

❖ Research

- Beaver Dam Eye Study – Landmark population-based study has provided data to evaluate possible associations or risks for the development of ARMD
 - Cataracts? Researchers concluded that individuals who have had cataract surgery are more likely to experience progression of ARMD. This may be related to inflammatory changes that occur due to surgery.
 - Cardiovascular disease? May be an association between a higher pulse pressure and progression of ARMD. Found no consistent or strong relationships between the incidence of ARMD lesions and cardiovascular disease.

- Dietary fat? Seems to be an association between diets high in saturated fats and the development of early ARMD.
- One study found a specific pattern of lesions that are associated with early ARMD.
- Research about family tendencies toward the development of ARMD – does seem to indicate a genetic predisposition to ARMD.

❖ Clinical Manifestations

- Symptoms: may include
 - Gradual or acute onset of blurred vision
 - Intermittent shimmering lights
 - Vision distortion
 - Blind spot in the center of vision
- Clinical signs – May include
 - Decreased visual acuity
 - Distortion or blind spots noted when looking at an Amsler grid
 - Ophthalmoscope exam
 - May see a change in the pigmentation color (dry ARMD)
 - Presence of drusen
 - Presence of serous fluid or blood in the retinal or subretinal areas

❖ Treatment

- Refer to ophthalmologist immediately if any acute vision changes or loss of vision
- Laser photocoagulation may be beneficial in treating some cases of exudative ARMD. There is a high rate in the return of disease and a risk of laser injury to the macula.
- Use of low vision aids to help patients maximally use their remaining vision.

❖ Case Study

A 72 yr old white female comes to the clinic for routine follow up of her hypertension and hyperlipidemia. While she is in the office she tells you about her friend who was recently diagnosed with an eye problem called macular degeneration. She's concerned she might be developing this problem but tells you she really doesn't know what macular degeneration is. What do you tell her? What questions might you ask? What clinical assessment may be needed? Any treatment?

Glaucoma

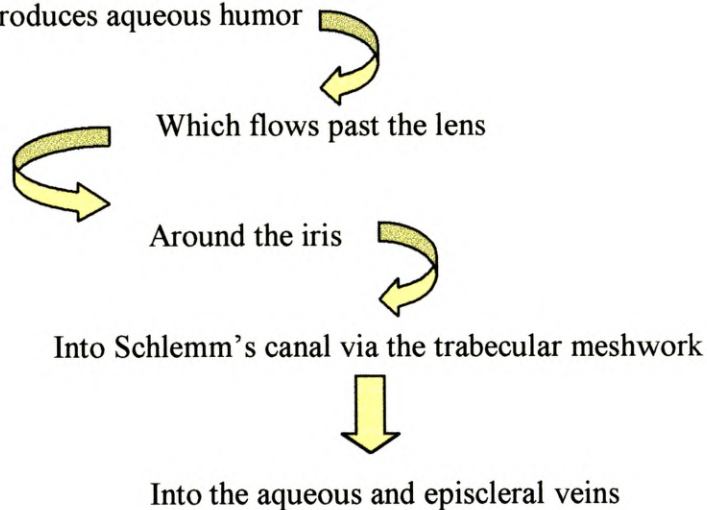
❖ Prevalence

- Second leading cause of blindness in the USA
- Leading cause of blindness in African-Americans
- 2 – 15 million individuals are affected.

❖ Description

- A group of diseases characterized by optic nerve damage and visual field loss. Nerve damage results in vision loss and if not appropriately treated may advance to total blindness. The vision loss is irreversible.
- Glaucoma is generally associated with elevated intraocular pressures. Importantly, elevated intraocular pressures are not essential for the diagnosis as some individuals with glaucoma have normal intraocular pressures.
- This disease involves the production and drainage of aqueous humor from the anterior portion of the eye.

The ciliary body produces aqueous humor



The ratio of aqueous production to outflow determines the intraocular pressure

****Any structural blockage which prevents the drainage of aqueous fluid results in increased intraocular pressures. (Entire volume of aqueous is turned over approximately every 100 minutes.)**

- Normal pressures between 10 – 21 mmHg (using tonometry)

Two primary types of glaucoma:

1. Open-Angle – the anterior chamber angle appears normal but the underlying trabecular meshwork is abnormal and this affects the drainage of aqueous fluid.
2. Closed-Angle – blockage in the aqueous flow between the lens and iris shifts the iris and closes the anterior chamber angle. This results in a sudden, rapid rise in intraocular pressure that develops over several hours. This is an ophthalmic emergency!

Glaucoma is further differentiated as:

Primary – not associated with other conditions

Secondary – associated with trauma, tumors, inflammation, retinal disorders, and steroid use

- Primary open-angle glaucoma is the most common; it accounts for 70% of all cases
- Generally asymptomatic until damage to the optic nerve is advanced and irreversible!

❖ Risk Factors

- Open-angle glaucoma
 - Family history of glaucoma
 - Increasing age
 - African-American descent
 - Myopia
 - Diabetes
- Closed-angle glaucoma
 - Women (affected 3 times more than men)
 - 55 and 70 years of age
 - Farsighted eyes with narrow chamber angles

❖ Research

- ❖ Related to incidence and prevalence – African Americans develop glaucoma but are less likely to seek eye care. They are two times more likely than whites to go blind. Recommend increased utilization of ophthalmologists and education leading to early identification of disease.
- ❖ Drugs: Timolol is a commonly used drug in the treatment of glaucoma. It was compared to a new prostaglandin, Latanoprost, with the potential to become a new first-line treatment for glaucoma. Latanoprost affects aqueous outflow, is dosed once a day and results in fewer systemic side effects than Timolol. It does seem to cause more hyperemia and causes an unusual side effect involving the iris pigmentation. Further studies are indicated to determine safety & efficacy.

❖ Clinical Manifestations & Treatment

▪ **Open-Angle Glaucoma**

- Symptoms: May include
 - Reduced vision in the dark or twilight (loss of contrast sensitivity)
 - Visual acuity & central vision remains normal until late in the disease process
- Ophthalmologists: Use specialized equipment to evaluate intraocular pressure and visual fields. They also use direct ophthalmoscopy to check the optic disc or nerve.
 - Damage caused by glaucoma is demonstrated by optic nerve cupping.
 - A measurement of the cup-disc ratio of 0.6 or greater
 - A 0.2 or greater asymmetry in the cup-disc ratio

**** A dilated exam is the preferred exam. Importantly, drugs that dilate the eye may precipitate an angle-closure glaucoma**

- Treatment
 - Begins with medications to either increase aqueous humor drainage or decrease aqueous humor production.
 - If medications do not work, several surgical options are available
 - Laser trabeculoplasty: places multiple, low-energy burns to the trabecular meshwork. This decreases the intraocular pressure significantly in 80% of cases.
 - Laser Trabeculectomy: Creates a surgical fistula which bypasses the normal outflow pathway for aqueous humor. This fistula results in an elevation of the conjunctiva called a filtering bleb

**** If a patient with a filtering bleb develops conjunctivitis, immediate referral to an ophthalmologist is necessary**

- **Closed-Angle Glaucoma**

- **** NEEDS EMERGENT REFERRAL ****

- Symptoms:
 - Severe eye pain – may be associated with nausea, vomiting, and headache.
 - Blurred vision
- Treatment: Lower intraocular pressure
 - Medications
 - Iridectomy or Incisional surgery: bypass the structural blockage to restore the flow of aqueous fluid to the trabecular meshwork.

- ❖ **Case Study**

You are on call to cover the emergency department at a small rural community hospital. The nurses call you to let you know that a 50-year-old white male just arrived with a chief complaint of a migraine. You arrive in the emergency department to find the patient vomiting.

Vital Signs: T 98.7 P 92 R 24 BP 148/96

Past Medical History: No Chronic illness, no surgeries, no hospitalizations

Family History: Mother had diabetes died at age 70, Father has CHF, AF

Social History: Married, works as a manager for a local business

Medications: Centrum qd, ASA qd

Allergies: NKDA

What information would you want to know? What differential diagnoses? Treatment plan?

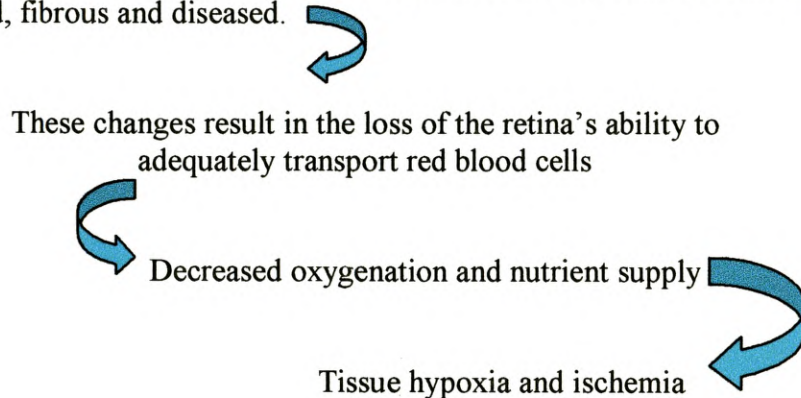
Diabetic Retinopathy

❖ Prevalence

- Leading cause of blindness in persons ages 20-74

❖ Description

- A microvascular disease, in which the capillaries in the retina become thickened, hardened, fibrous and diseased.



Stages of disease:

1. Nonproliferative retinopathy: Sclerotic retinal capillaries cause microaneurisms. Small retinal hemorrhages, lipid exudates and nerve fiber infarcts (cotton-wool spots) develop. Changes in the capillary membrane cause a loss of ability to regulate fluid transport and the capillary beds become leaky and edematous.

Over time, the disease progresses to...

2. Proliferative retinopathy: New vessels develop above the retinal surface to try to compensate for the resulting hypoxia. Because the vessels are weak and often hemorrhage they create a fibrous scaffold that supports the new vessels. This scaffold eventually contracts and pulls on the retina which causes it to split or detach. Vision loss occurs as a result of the injury to the retinal vasculature.

❖ Risk Factor

- Diabetes

❖ Research

- Healthy People 2000 objectives focus on the reduction of complications due to diabetes.
- Diabetes Control and Complications Trial – determined that glycemic control reduces the microvascular complications.

- Screening patterns have been evaluated: 58% of Type 1 diabetics were referred for ophthalmic exams & 42% of Type 2 diabetics were referred for ophthalmic exams.
- Even with interventions trying to draw attention to physicians about the need for ophthalmology referrals, the rate of referral was still low compared to published guidelines.
- Need improved compliance with screening recommendations.

❖ Clinical Manifestations

- Symptoms:
 - Some patients may have 20/20 vision and no symptoms even though they have severe proliferative retinopathy
 - May experience gradual or acute vision changes
 - May see “floaters” – a possible sign of a vitreous hemorrhage. (May be described as a “shower”)
 - May have blind spots or scotomata
 - May have sudden vision loss
 - May have wavy or distorted vision with reading
 - May experience changes in light perception.
- Clinical Signs: May include
 - Decreased visual acuity
 - Noted distortion or blind spots when looking at an Amsler grid
 - A reddish appearing iris may indicate neovascularization
 - If unable to obtain a red reflex, may have a vitreous hemorrhage
 - Dilated ophthalmic exam: May see
 - Neovascularization of the optic nerve or retina
 - Hemorrhages
 - Cotton-wool spots (optic nerve infarcts)
 - Hard exudates – appear as yellow substances

❖ Treatment

- Medical Control: Tight management of blood glucose
- Laser surgery or photocoagulation: Used to control bleeding areas and the growth of new vessels. Photocoagulation limits the traction on the retina that causes detachment by creating multiple adhesions between the choroid and retina.
- Surgical interventions:
 - Vitrectomy / Retinal reattachment: involves the removal of blood and scar tissue from the vitreous area and reattachment of the retina through the use of a scleral buckle.

Treatment Goal: Slow or halt progression of disease. Once retinal tissues are injured they are unable to regenerate and vision cannot be restored.

❖ Case Study

A 42 year old woman with a 5 year history of type 2 diabetes comes to the clinic with a chief complaint of cold symptoms including rhinitis, cough and sore throat. While she is in your office she mentions that she is having increasing trouble seeing with night driving. She asks you if there's anything that would help her to be able to drive easier at night.

What questions do you want to ask? What do you want to assess? What do you tell her?

The Eye History and Review of Systems

- ❖ History
 - ❖ Medical History
 - ❖ History of eye disease, trauma, hypertension, thyroid disease, diabetes, glaucoma, macular degeneration, cataract, any other past medical problems
 - ❖ Family History
 - ❖ Especially for Glaucoma
 - ❖ Current Medications
 - ❖ Allergies: to medicines, seasonal, other allergies
 - ❖ Social History: Living situation, work, hobbies, smoking, alcohol use
- ❖ Review of Systems
 - ❖ Glasses/Contacts
 - ❖ Last eye exam
 - ❖ Any vision changes
 - ❖ Blurred vision
 - ❖ Double vision (diplopia)
 - ❖ Any visual field loss
 - ❖ Eye pain or redness
 - ❖ Difficult night vision
 - ❖ Dry eyes

Screening Recommendations

❖ General Primary Care Recommendations:

- ❖ Visual acuity with routine exams
 - Refer for evaluation:
 - If best corrected vision is less than 20/40
 - If a decline in vision between exams
- ❖ Patients age 40 to 65: Ophthalmology exam every 2 to 4 years
- ❖ Patient age 65 and older: Ophthalmology exam every 1 to 2 years
- ❖ Patients with high risk – Ophthalmology exam every 1 to 2 years
 - History of detached retina
 - Family history of glaucoma
 - African-Americans
 - History of severe eye trauma
 - Hypertension
 - Sickle cell disease
 - Persistent vision loss in one or both eyes

- ❖ Age-Related Macular Degeneration: No generally accepted screening recommendations exist. An Amsler grid may be used to detect signs of macular degeneration. Follow general primary care recommendations.

- ❖ Glaucoma: No specific recommendations. Follow general primary care recommendations.

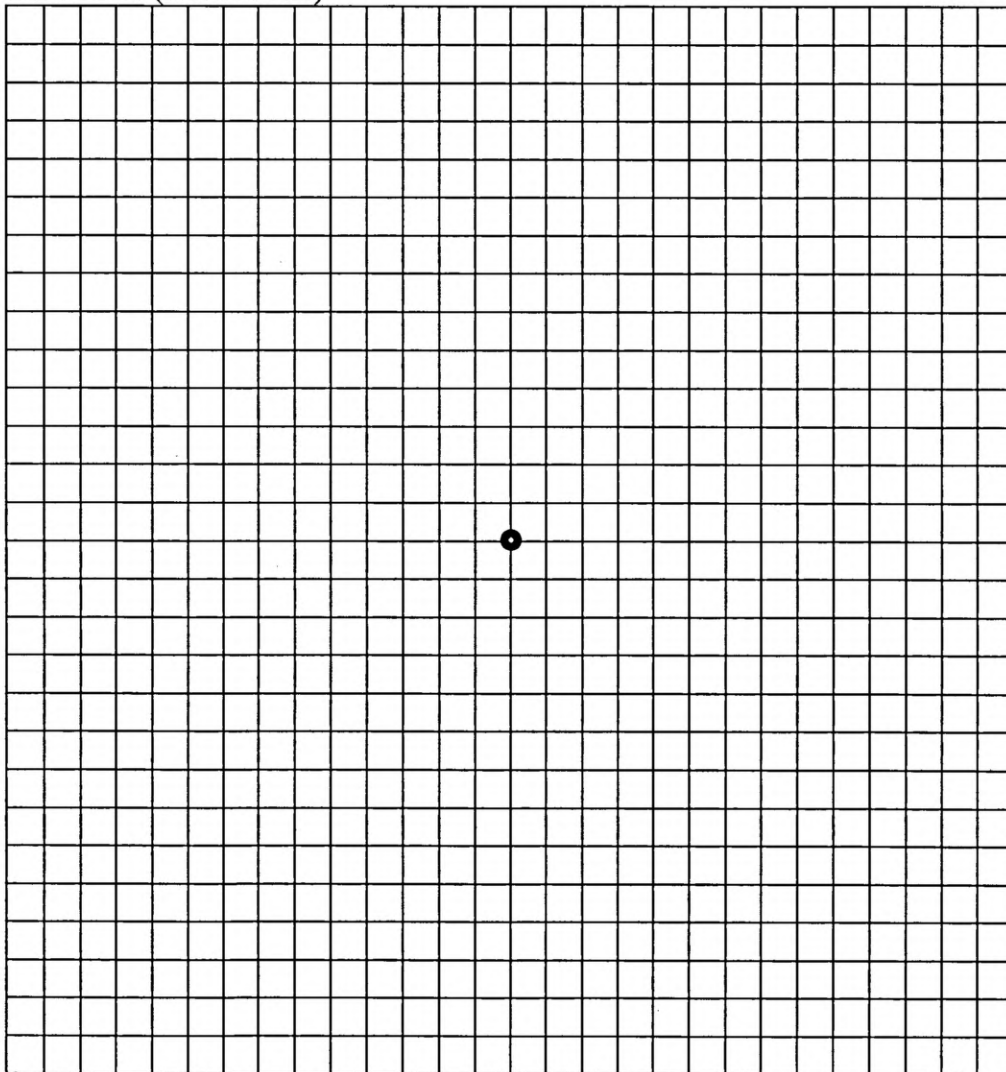
❖ Diabetic Retinopathy:

- Type 1 Diabetes
 - Age 10-29 years: Need a dilated ophthalmologic exam within 3-5 years of diagnosis.
 - Age 30 and older: Annual ophthalmic exams.
- Type 2 Diabetes
 - Annual ophthalmic exams shortly after diagnosis
- Diabetic Women:
 - If planning to get pregnant: Should have a comprehensive eye exam prior to pregnancy & a repeated exam during the first trimester. Any further exams determined by the ophthalmologist.

Equipment Commonly Used in the Primary Care Setting

- ❖ Snellen Visual Acuity Chart: Wall Chart and Near Vision Card
- ❖ Fluorescein strips and woods lamp (Used to evaluate corneal abrasions)
- ❖ Pinhole Device: Useful to check visual acuity if a patient needs glasses or if a patient does not have glasses with them .
- ❖ Penlight – To check pupils and to look at external structures.
- ❖ Ophthalmoscope
- ❖ Amsler Grid

Amsler Grid (Not to scale)



(Sight & Hearing Association, 1995)

The Eye Exam

Acuity

- Check Vision with Snellen Test: Distance and Near vision
- If unable to see Snellen chart, check low vision acuity
 - Counting-fingers: Patient counts fingers at a distance of 1-5 feet. Specify distance for chart.
 - Hand-Movements: Patient able to recognize horizontal or vertical movements at one foot.
 - Light perception: Is the patient able to see a bright light when it is directed toward their eyes.

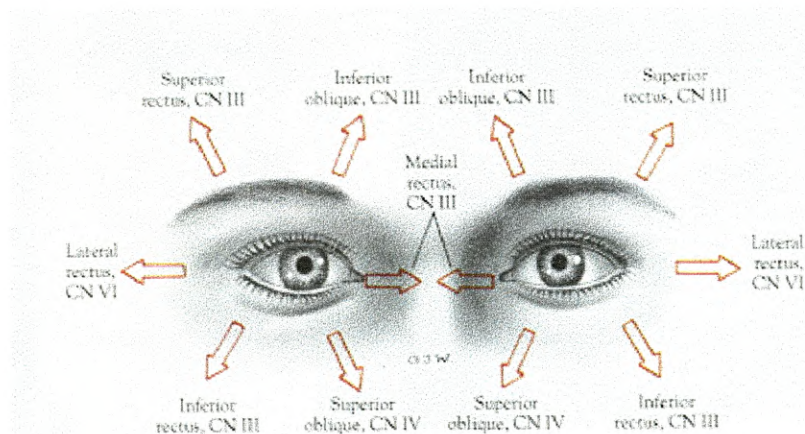
Amsler Grid – Used to test central vision. Patient asked to focus on the black dot in the center of the grid and to note any wavy lines (metamorphopsia) or blind spots. (Check eyes separately)

Check Visual Fields – Confrontational test

- Stand or sit 2 to 3 feet from the client. Have the patient cover right eye and you cover or close your left eye. With the patient looking directly at you eye, bring your fingers from the outside into the peripheral area until the patient can identify your fingers. Check the nasal, superior, and inferior fields. Repeat with the right eye.

Ocular Movements

Keep both eyes open, follow your finger.



From

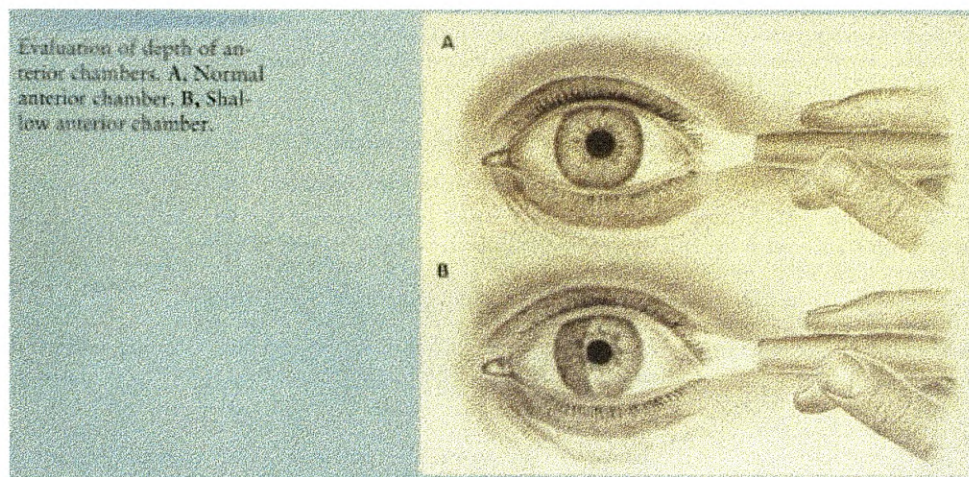
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Penlight exam

- Check external structures: eye lids, conjunctiva, cornea, surrounding tissues.
- Check pupil size, shape, reactivity and accommodation.
- Swinging-light test:
In a darkened room, have the patient look at a distant target. Shine the light directly into the right eye and observe for constriction. Quickly swing the light across the nasal bridge to the left eye and observe for the response. Normally the eye will slightly constrict or remain the same size. An abnormal response is dilation. (Repeat starting in the left eye...)
- Look at anterior chamber depth:



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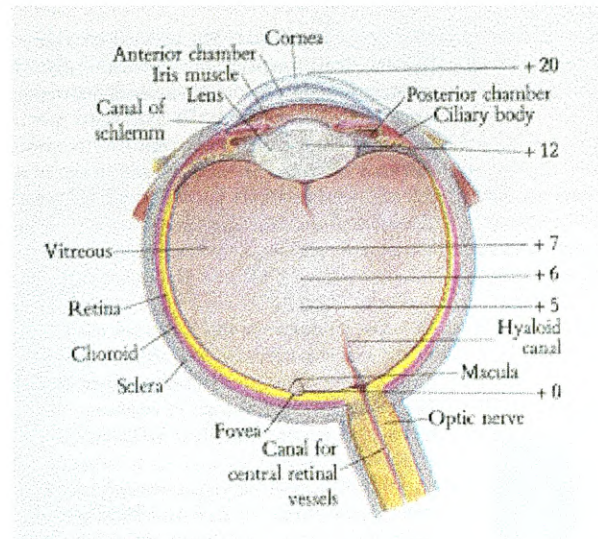
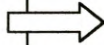
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➤ Ophthalmoscope Exam

- Check for red reflex
- Retinal and optic nerve exam

Lens diopter settings
to focus on eye
structures



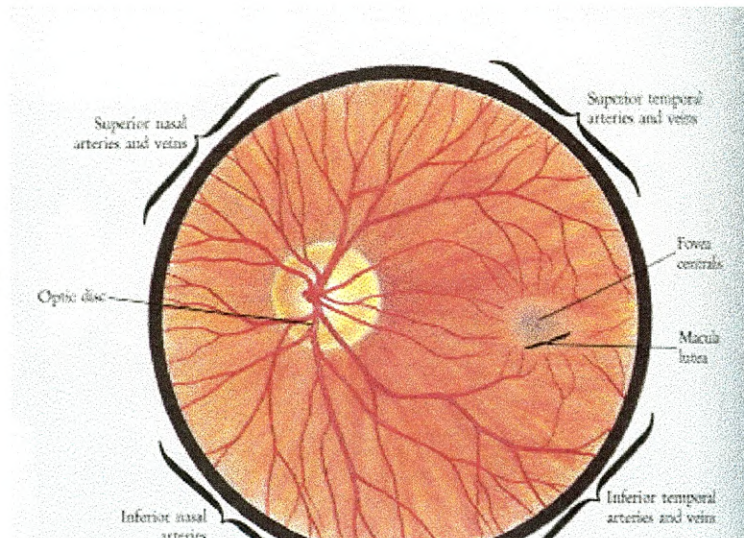
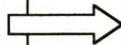
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Retinal
Structures of
Left Eye



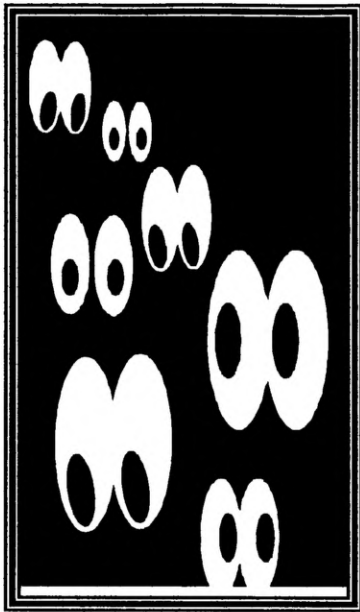
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- Retinal and Optic Nerve Exam
 - Ask the patient to focus on a distant object.
 - Approach the patient as close as possible to the eyelashes. Focus the beam about 15 degrees nasally toward the optic disc.
 - Look at the optic disc retinal vessels and posterior retina.



Role Play

One client / One nurse practitioner

Purpose: To identify client needs

The client: The 65 year old client has experienced significant vision loss in the past three months due to one of the three eye diseases presented in this program. (Role to answer questions that allow the client to be in control.)

The Practitioner Role: To provide information and determine the needs of the patient.

The Client Role: To answer questions that allow you to have control.

Discussion: What questions were helpful in gathering information?

Some possible questions:

1. Who are you? How would you like me to address you?
2. What information do you need?
3. How may I assist you?
4. How does this work for you? How did you do this in the past? How has this changed?

Case Study

A 56 year old woman recently moved into your community from out of state. She states she needs to become established with a new health care provider and she is in need of her annual physical exam.

What do you want to know?

You obtain the following history:

Past Medical History: Diagnosed with type 2 diabetes three years ago. Chronic bronchitis. No surgeries or hospitalizations.

Family History: Mother died at age 80 with CVA, Father has CHF and macular degeneration. Uncle has glaucoma, Sister has glaucoma.

Social History: Married. Smokes ½ ppd for 40 years. Drinks 1-2 glasses of wine each week. Works as a legal secretary.

Medications: Glyburide 5mg BID, Metformin 500mg qd, ASA 325mg qd

Allergies: None

What else do you need to know? What needs to be assessed? What screening recommendations need to be considered?

Resources**Low Vision Resources & Information About Eye Diseases****American Academy of Ophthalmology**

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PO Box 7424
San Francisco, CA 94120-7424
(415) 561-8533
<http://www.eyenet.org/>

National Eye Institute

National Institutes of Health
2020 Vision Place
Bethesda, MD 20892-3655
(301) 496-5248
<http://www.nei.nih.gov>

American Optometric Association

243 N. Lindbergh Blvd
St. Louis, MO 63141
(314) 991-4101
<http://www.aoanet.org>

The Lighthouse Inc.

Information and Resource Center
111 E. 59th Street
New York, NY 10022
1-800-829-0500
<http://www.lighthouse.org>

Sight and Hearing Association

674 Transfer Road,
St. Paul, MN 55114-1402
1-800-992-0424
<http://www.sightandhearing.org>

Montana Resources

Blind and Low Vision Services

Montana Department of Public Health and Human Services

PO Box 4210

Helena, MT 59604-4210

(406)444-2590

Montana Low Vision Service, Inc

Billings Clinic 1-800-228-1941 or (406) 248-1941

Helena Clinic 1-800-451-3226 or (406) 442-0668

Montana Talking Book Library (provides books on tapes): 1-800-332-3400

LIFTT Radio Reading Service (Reading service-newspapers, etc): (406)259-5181

Eye Web Sites:

AMDF American Macular Degeneration Foundation

<http://www.macular.org/welcome.html>

American Academy of Ophthalmology: <http://www.eyenet.org/>

American Academy of Optometry: <http://www.aaopt.org/>

Ask Noah About Eyes: <http://www.noah.cuny.edu/illness/eye/eye.html>

Blindness Resource Center: <http://www.nyise.org/blind.htm>

Current Eye Research: <http://www.oup.co.uk/cureye/>

Digital Journal of Ophthalmology: <http://www.djo.harvard.edu/>

Eye Diseases: <http://www.mic.ki.se/Diseases/c11.html>

Eye News Online Homepage: <http://www.eye-news.com/>

Eye Resources on the Internet: <http://webeye.ophth.uiowa.edu/dept/websites/eyeres.htm>

S.U.N.Y. Health Science Center at Syracuse Ophthalmology

<http://www.hscsy.edu/~CONNERTS/TABLE.HTM>

Course Evaluation

Scale 5 Strongly Agree
 4 Agree
 3 Neutral
 2 Disagree
 1 Strongly Disagree

Program met course Objectives 5 4 3 2 1

Your personal objectives were met 5 4 3 2 1

Speaker was:

Knowledgeable 5 4 3 2 1

Organized 5 4 3 2 1

Gave an effective presentation 5 4 3 2 1

Stimulated interest 5 4 3 2 1

The teaching methods were appropriate and effective 5 4 3 2 1

Visual aids were appropriately & effectively used 5 4 3 2 1

Physical Environment

Room – adequate space, seating 5 4 3 2 1

Adequate lighting 5 4 3 2 1

Temperature comfortable 5 4 3 2 1

Most helpful information: _____

Least helpful information _____

Comments and suggestions _____

APPENDIX C

LETTERS REQUESTING/GRANTING PERMISSION TO REPRINT INFORMATION

1134 Patriot Street
Billings, MT 59105
Phone (406)238-0251

RECEIVED

MAR 1 1999

PERMISSIONS

February 23, 1999

Julie Lawly
W.B. Saunders
The Curtis Center, Suite 300
Independence Square West
Philadelphia, PA 19106-3399

Dear Ms. Lawly,

I am a graduate student at Montana State University and I would like to request permission to use several images from a Mosby book. These images will be used to complete a professional paper I am writing as a requirement for a Master's degree. Copies of this paper will be placed in the university library and in the nursing student resource centers on the Montana State University College of Nursing campuses. I will not be publishing this paper or using the images for any other purposes.

The images I am interested in using are from Mosby's Guide to Physical Examination (3rd ed) by H. M. Seidel, J. W. Ball, J. E. Dains, & G.W. Benedict, (1995). Specifically, I would like to use the following:

Fig. 3-11, page 72, Longitudinal cross section of eye showing lens diopters to focus eye structures. p 65 Fig 3-14

Fig. 8-1, page 236, Anatomy of the human eye. p 273 Fig 10-1

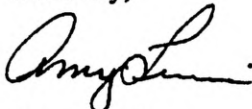
Fig. 8-19, page 247, The six cardinal fields of gaze. p. 286 Fig 10-19

Fig. 8-21, page 248, Evaluation of depth of anterior chambers. p 287 Fig 10-21

Fig. 8-24, page 250, Retinal structures of the left eye. p 289 Fig 10-24

I look forward to hearing from you.

Sincerely,



Amy Lewis
Family Nurse Practitioner Student

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Nicole O'Malley 3/24/99
Mosby Date

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(see notations & attached copies)