The Enhancement of Optometric Practice through Occupational Optometry

Kathy Keehne
Shannon MacNab

The National Society for the Prevention of Blindness estimates that 90% of eye injuries are preventable.[1] As occupational optometrist's we can have a significant role in providing primary preventive vision care. "The direct cost of a single employee losing one eye ranges from about $40,000 to $115,000. Workers' compensation laws have the loss of one eye ranging from $5,699 to $157,685, depending on the state."[2]

In the industrial setting there are a variety of health care issues. Each of these issues must be addressed individually to provide the optimal working environment for the employee. Ocular health is one of these concerns. The role of the optometrist in industry is an important one. The knowledge the practitioner can provide concerning eyecare is highly beneficial to the employer. The expertise in the area of ocular health serves to maintain a safe and efficient work environment in order to prevent such tragedy to both the employee and employer.

The preservation of ocualr health within the work environment is the primary goal of the occupational optometrist. In order to achieve this goal, a variety of variables must be examined within the workplace. This can be accomplished through establishing a complete industrial eye health program. The components of such a program include:

1) Survey of eye hazards and standards
2) Analysis of lighting and visual tasks
3) Setting vision standards for specific jobs
4) Vision screening before, during, and at the end of employment
5) Consultation with management on ocular risk avoidance
6) Refractive/vision analysis service
7) Prescribing/providing/servicing protective eyewear
8) Initiating eye safety programs for supervisors and workers[3]

Within each of these components lie opportunities for an optometric practitioner. The optometrist can decide how extensively they would like to be involved in an occupational optometry program. This allows a large amount of flexibility when electing to incorporate an industrial vision program into a practice. In many of the larger industries there is a safety officer or another individual on staff responsible for task analysis.[3] They may determine the visual requirements and standards for each occupation. In this case, the optometrist may only provide the refraction and servicing or dispensing of the safety devices. Many of the smaller companies may require outside assistance for establishing standards and health care programs. This may provide the opportunity for the optometrist to serve as a consultant for the company. The role of the practitioner within an industrial eyecare program may include:

1) Prescribing protective eyewear
2) Setting vision standards
3) Consultation on lighting and work area design
4) Providing educational services
5) Treating industrial accidents
6) Determining the nature of injuries for workmans compensation[3]

When initiating an industrial vision program, the practitioner should familarize themselves in each of these areas. Because each industry is unique it is impossible to have an all-inclusive knowledge base concerning each aspect. The purpose of the following text is to provide an outline and some basic principles to establish an industrial vision program. From these, the individual practitioner can further incorporate the knowledge necessary to individualize the services provided.

Prescribing Protective Eyewear

Programs Available for Prescribing Protective Eyewear

Among all of the areas included in occupational optometry, prescribing protective eyewear tends to be the most emphasized. This is due to the fact that all parties involved are aware of the importance of this issue. These parties include the employer, the employee, the insurance company, as well as the optometrist. Because of this, it is imperative that the practitioner be knowledgeable of the guidelines and options available in prescribing protective eyewear.

The first step in prescribing safety glasses is coordinating a program with the employer. This optimizes the quality of eyecare received by the employee. It also assures a cohesive relationship between the employer and the optometrist. There are three basic types of programs for the off-site practitioner. These include:

1) Dispensing on-site:
   The employee obtains an authorized prescription form and takes it to an optometrist of their choice for the refraction. They select the frame and other accessory items at this office. They return to the place of employment with the completed form. The prescription is ordered and paid for by the employer. The safety glasses are returned to the in-plant dispensary staffed by either an optician or employee where they are verified and adjusted.
2) Approved supplier:
   The employer establishes a panel of preferred optometrists. The practitioner provides the refraction, the frame selection, fitting, verification, and the adjustment for the employee. The employee may

choose an optometrist not on the panel for the refraction only, but must obtain the safety glasses through a panel doctor.

3) Employee responsibility:
The employee takes an authorized letter to an optometrist of their choice for both the refraction and frame selection. The optometrist provides the refraction, selection, verification, and adjustments and invoices the employer for the charges. The letter may limit the frame selection or may make further specifications.[1]

Although there are many variations to these programs, they provide a basic structure to formulate the optimal relationship between the industry and the optometrist. Each demonstrates advantages and disadvantages for all parties involved. The on-site dispensing program provides optimal accessibility for the employee. The employer maintains control over the quality of the protective eyewear dispensed; however, this is dependant upon the quality of dispensing. The optometrist retains minimal responsibility and has less paperwork. The approved supplier program allows the panel optometrist to provide all the necessary services. This is advantageous to the employer since they do not have to provide the space or staff for the on-site dispensary. They also maintain some quality control through the criteria involved in establishing the panel. The optometrist receives an increase in traffic flow through the office but has a higher level of liability. The employee will receive optimal eyecare, but will have a limited choice of optometrists. Finally, the employee responsibility program also has both advantages and disadvantages. This plan requires less time to formulate the program; however, there is little control over the quality of eyecare the employee receives. The optometrist benefits from an increase in traffic flow, but this is not a guaranteed percentage of the patient base. The employee has a freedom of choice as to which practitioner they receive care from, but may have

difficulties in a practice unfamiliar with their requirements. Since each has pros and cons, the relationship established must be individualized to meet the needs of the employer, the employee, as well as the optometrist.

Programs established for providing plano safety eyewear are generally much different. The industry will usually establish a committee to decide which type or style of safety glasses are necessary to meet their requirements.[4] This committee may or may not include an optometrist. The chosen safety glasses are distributed in mass, possibly with other industrial tools or accessories. Employees desiring other styles must purchase them independantly.

Requirements of Personal Protective Equipment

One of the challenges in prescribing personal protective equipment is to understand the guidelines required for different industries. The Occupational Safety and Health Administration(OSHA) has divided visual hazards into five basic categories: 1)impact 2)heat 3)chemical 4)dust 5)optical radiation.[4] Each occupation is investigated for hazards inclusive of these five areas. The equipment required may need to protect against a combination of any of these. The regulations for proper protection must be investigated by both the safety officer and the optometrist prior to prescribing the safety glasses. There are three primary references in which this information can be found. These are:

1) Occupational Safety and Health Act - sections outlined in the Federal Register Document 29 CFR1910, sections 132 and 133, available from a regional U.S. Department of Labor/OSHA office.
2) State OSHA regulations - available from the U.S. Department of Labor/OSHA office.
3) Current "American National Standard-Practice for

Occupational and Educational Eye and Face Protection" (American National Standards Institute (ANSI) Z87.1-1989) - available at: ANSI 11 West 42nd Street, New York, NY 10036.[5]

The requirements of industrial personal protective equipment include head, face, and eye protection.[6] This is required by title 29 of the Code of Federal Regulations part 1910, "Personal Protective Equipment for General Industry" which sites the American National Standard Practice for Occupational and Educational Eye and Face Protection, ANSI Z87.1-1989 and Protective Headwear for the Industrial Worker, ANSI Z87.1-1986.

Within the text to follow, some of the basic eyewear requirements are stated. This is to provide the optometrist with a functional knowledge base. As an individualized program is established, further education will be necessary.

According to ANSI Z87.1-1989, protectors are divided into two basic categories, primary and secondary.[6] Primary protectors provide adequate protection for the visual hazard alone. Secondary protectors are designed to be used in conjunction with primary protectors in order to provide adequate protection. These may not be used alone since they will not meet ANSI regulations. There are five general types of eye and face protectors:[6]

1) Spectacles-
   - -commonly used to provide primary protection for impact and optical radiation
   - -may have sideshields either solid or ventilated
2) Faceshields-
   - -secondary protectors which shall be used only with a primary protector
   - -intended to shield the wearers eyes and all or a portion of their face

3) Goggles-
   -primary protective devices
   -two basic styles: 1) eyecups- enclose the eye sockets completely
   2) cover- worn over spectacles
   -usually vented to prevent fogging
4) Welding helmets-
   -secondary protectors which shall be used only in conjunction with primary protectors
   -protective device intended to shield the eyes and face from optical radiation and impact
5) Special purpose lenses-
   -provide eye protection while performing visual tasks that require unusual filtering of light
   -many of these offer inadequate ultraviolet and/or infrared protection
   -caution shall be exercised in their use
   -for each application the responsible individual shall ensure that proper UV, IR, and visible protection is provided
   -lenses with low luminous transmittance should not be worn indoors except in need of protection against optical radiation

The determination of the type of personal protective device required involves many variables. These include the type of occupation, the work environment, the visual requirements, and the visual hazards encountered while performing the task. To facilitate the selection process, ANSI has developed the ANSI Z87.1-1989 Selection Chart.[6] (Refer to Appendix A-1) This groups protective devices by visual hazards and also by the types of protectors available. This is used to determine which device will satisfy the task-specific requirements. Reference to this chart enables the practitioner to match the protective device to the particular visual hazards encountered by the patient. ANSI Z87.1-1989 has also stated a few guidelines to assist in the

selection process. They include:

1) Become familiar with the selection chart and type of protective equipment available
2) Compare estimated hazards associated with the environment with available protective equipment
3) Make a judgement in selection of appropriate protective equipment so that protection is greater than the estimated hazard
4) Fit user with protective device and give instruction on care[6]

Once the appropriate protective device is decided upon, the ordering process must be accurate. Specific measurements including pupil diameter, bifocal segment height, and any other specifications must be obtained as with any order. Generally, a specific safety material order form is utilized and is sent to a laboratory that specializes in the manufacturing of such devices. One example is AO Safety Laboratories.

Each variable of a pair of safety spectacles is subject to certain manufacturing requirements. The knowledge of these is essential for accurate verification of the glasses when the manufacturing process is complete. These requirements are as follows:[6,7]

1) Lenses-
   - -3mm center thickness for minus lenses and plano lenses (not polycarbonate).
   - -2mm center thickness for non-prescription polycarbonate lenses.
   - -2.5mm minimum edge thickness for high plus lenses or in the most plus meridian.
   - -impact resistance tested with a 1" steel ball dropped 50".
   - -Penetration test for non-prescription lenses
   - -Have manufacturer monogram
   - -Specialty lenses marked with shade number "S" or "V"

for photochromic lenses

2) Frames-
   -Have a posterior retaining lip and withstand the lens retention test
   -No rimless mounting
   -Side-shields which are non-removable, if required
   -Marked with Z87.1 and manufacturer monogram on both temple and front
3) Optical requirements-
   -Rx tolerances same as from Z80.1 used for other spectacle criteria
4) Special purpose lenses - marked with "S"
   A) Light tints - exempt from shade number
   B) Transmissions
      1) Clear - >85% transmission
      2) Absorptive - shade number between 1.5 and 3.0
      3) Filter - shade number greater than 3.0
   C) Photochromic lenses - marked with "V" - used with care in operations requiring critical acuity or fast reaction time to visual stimuli especially passing from indoor to outdoor.
      -not as a substitute for proper protection in hazardous optical radiation environments.

-Note: 1) Safety spectacles require safety frames and safety lenses together to meet the requirements, no other combinations are allowable.
2) All end users (wearers) shall be made aware of all warning labels and their content.

After the verification of the protective device has been completed, the proper adjustment of the device is essential. The importance of this final step is crucial to the success of providing protection for the consumer. "The key factors that help ensure worker compliance and establish a successful program are a good comfortable fit, stylish designs and a wide selection."[8] Another part of the dispensing process should

include patient education concerning the device. Reinforcement as to why the device is necessary, how to properly care for the device and the warnings included with the device are essential. The actions necessary if there is a problem with the device is another component of the educational process.

Setting Vision Standards

Another role of the optometrist in the industrial setting is the determination of vision standards for the employee. The establishment of these standards is important for many reasons. It creates a criteria for hiring a new employee, it allows eligibilty determination for workman's compensation if an accident would incur while performing the task, it also establishes a basis for which an employee with a deteriorating ocular condition must be concerned with. For many industrial occupations vision standards are pre-determined through state or federal agencies. For example, the interstate commercial drivers must have distant visual acuity of 20/40 in each eye as well as distance binocular acuity of 20/40 in both eyes with or without correction.[7] They must have at least 120 degrees of visual field in the horizontal meridian in each eye and be able to recognize the colors of traffic signals of red, green and amber.[7] In other cases, the employer may need to standardize task-specific positions for safety reasons. The role of the practitioner is to act as a consultant and assist in the proper establishment of these criteria.

The development of vision standards involves the determination of the task-specific criteria. There are two primary approaches to setting these standards, the analytical approach and the worker performance approach.[7] The analytical approach seperates the task into specific parts and determines the minimum visual requirement for each component.[7] It also incorporates a safety cushion to assure that the worker is not performing at the level of limitation. This approach is most

commonly used.[7] The worker performance approach compares the worker's performance to the known visual characteristics of the worker and uses such factors as supervisor ratings, productivity, quality of performance and accident frequency records to establish the visual criteria. This approach tends to be more costly and therefore not as popular. Independant of which approach is chosen, it is important for the optometrist to familarize themselves with each occupation and consider the safety ramifications involved in setting up the criteria.

When establishing vision standards, the determination of visual efficiency becomes an important part of the analysis. The visual efficiency relates to how well the employee can perform their daily activities. Although many factors are involved, three main considerations are essential. These include corrected visual acuity for distance and near, visual fields, and ocular motility in the absence of diplopia.[7] An equation has been developed which correlates these variables in order to quantify this value for statistical purposes. The equation is as follows:[7] $VE=(3CP+C'P'M')/4$
where: C=central visual efficiency rating of better eye
C'=central visual acuity efficiency rating of poorer eye
P=visual field of better eye P'=visual field of poorer eye
M=motility factor. While establishing criteria through statistical data is important, it is also crucial to relate this information to the actual performance while performing the task. Realistic standards for safety and job performance is expected from the employer. The criteria from their aspect includes many other variables such as employee availability, productivity and cost maintenance. Unreasonable vision standards may make hiring or maintaining employees difficult.

Consultation on Lighting and Work Area Design

Video Display Terminals

The introduction of video display terminals(VDT's) into the workplace has become widespread within the industrial setting. Their increased presence has caused a higher number of visual complaints. "Studies have shown that vision problems and symptoms associated with the use of the eyes are the most frequently occuring health problem amoung VDT workers."[1] The most prevalent eye and vision complaints are eyestrain, headaches, blurred vision and dry or irritated eyes. The factors that may influence these symptoms are visual disorders, a poor work environment or a combination of both factors.[9]

Common vision conditions such as poor eye focusing or deficient eye coordination can be one of the reasons for the visual complaints associated with VDT use.[10] Presbyopia, hyperopia and astigmatism are a number of focusing problems that may become apparent when using a VDT. These conditions result in eyestrain and fatigue because of the increased effort exerted to maintain a clear focus. The problems of hyperopia and/or astigmatism can manifest only during VDT usage. Many of these conditions can be simply corrected with prescription eyeglasses. Eye coordination problems such as convergence insufficiencies may also cause visual symptoms for VDT users due to the increased visual demands. The above visual conditions can be treated by a doctor of optometry with a spectacle prescription or vision therapy. This allows work at the VDT to be more comfortable. In order to obtain optimum visual comfort and work efficiency it is recommended by both the American Optometric Association and the National Institute of Occupational Safety and Health that VDT users receive yearly eye examinations.

The presbyopic individual has additional challenges in order to work comfortably at the VDT. This is because the components of the VDT, including the screen, keyboard and work material is often at any different planes. There are several options available to help decrease their complaints and allow maximum efficiency and clarity of vision. One cause of their symptoms is due to the fact that they must look through the bottom part of

the lens to see up close and they must also position their head at the proper distance from the screen for the power of the bifocal. To make bifocals more comfortable the bifocal needs to be set a little higher than usual and the bifocal width should be larger, at least 28mm. This allows for less head tilt while viewing the screen. If the VDT user is still having difficulty clearly seeing the keyboard, screen and work material at the same time then the use of a trifocal may be necessary. The trifocal segment should be extra deep and wide, however, care should be taken not to set the segment too low. The option of progressive add lenses also assist broadening the range of clear vision. You can also order these made especially for occupational problems such as these. A third option may be to have one set of glasses for general use and another set of glasses just for working at the VDT. This allows maximum visual efficiency providing customized glasses for those who spend a majority of their time at the VDT. While the proper spectacle prescription is essential for VDT use, other components must also be analyzed to optimize employee performance.

The work environment has many contributing factors that can lead to visual complaints from VDT workers. A survey conducted by Dr. James Sheedy revealed that "the biggest environmental causes of vision problems were screen glare, poor arrangement of the office/workstation, poor lighting and poor screen resolution."[9] Glare is light that is reflected off the computer screen surface. It is a contributing factor to visual discomfort. Several methods may be used to minimize glare on VDT screens. First, if the VDT is near a window the monitor should be positioned at a right angle to the window to reduce glare. Blinds, shades or drapes may also be used to decrease glare from windows.[2,10,11,12] Another method to reduce glare is to use anti-glare computer filters. There are three basic filter types; mesh, glass or plastic.[13] When choosing a filter it is important to ensure that it does not reduce screen contrast and resolution. The American Optometric Association has established a Seal of

Certification and Acceptance program to judge the effectiveness of filters for computer screens.

Poor workstation design is another area which contributes to the vision complaints of VDT users. The ergonomics and design of the VDT workstation greatly influences the productivity and comfort of its users. The key to a proper workstation is that all of the furniture and equipment is flexible and adjustable. The chair, table, computer screen and keyboard all need to be adjustable in order to arrange the workstation to meet the established norms for maximum comfort.[2,11] An adjustable chair allows the worker to sit comfortably with feet flat on the floor or on a footrest. The keyboard should be detachable from the VDT screen to allow the wrists to be kept straight. It is also important that the VDT swivels or tilts so that it may be positioned at the most comfortable position. Some recommendations for VDT positioning are:

1) Placement of VDT straight in front of worker.
2) Viewing distance to screen from 50 to 70cm.
3) Positioning top of VDT screen 10 to 15 degrees below the horizon.[2,11]

Another factor that can improve visual comfort at the workstation is to use an adjustable document holder. This allows the work material to be placed at the same height and plane as the computer screen.[2] The combination of all of these recommendations will improve the workstation design and consequently decrease visual complaints.

A final area which may contribute to visual complaints from VDT workers is poor lighting and screen resolution. There is a difference in the recommended general lighting levels for non-VDT vs VDT work areas. For non-VDT work areas the general lighting level should be between 500-1000cd/m^2 vs a recommended 200-500cd/m^2 in a room for VDT use.[2] The recommended brightness for

the VDT screen is between 75cd/m^2 and 150cd/m^2.[2] "Generally the screen brightness should be three to four times brighter than overall room lighting and the characters on the screen should be five to ten times brighter than the background."[11] Improper lighting of the room and/or VDT screen can lead to visual complaints. By adjusting the lighting to the proper levels the number of visual complaints can be reduced.

Providing Educational Services

The role of the optometrist in providing educational services for the industry is important in developing a successful occupational optometry program. Many of the aspects involved in the educational process is included in the marketing plan established by the practitioner. Enhancing the knowledge base of the employer allows the opportunity to promote your services. When providing the educational services it does not only mean to the employee, but also the employer and the surrounding community. The following section is designed to give the optometrist a baseline and offer a few ideas to include in the educational process.

Marketing

Having a solid marketing plan is essential to the development of a successful occupational optometry program. Many optometrists place little emphasis in this area; however, the potential subscribers to the plan are highly influenced by the quality of marketing technique utilized.

Marketing is defined as a planned, systematic process of identifying needs of your community, planning ways to meet those needs, and then telling your practice community about your services.[14] This definition states the basic steps necessary to establish a marketing plan. The practitioner must also keep in

mind that due to the diversity of industries found within a community, multiple plans or variations may be necessary to target each specific patient base. Below is a general outline for which the practitioner may utilize. The individualization of the plan must incorporate the needs of the optometrist as well as the industry.

Identifying the needs of the community is required to determine the services rendered by the optometrist. There are numerous sources for obtaining area demographics. These include the local Chamber of Commerce and the Small Business Administration. These can give objective statistical information of services offered in the community. Also, community involvment and memberships in groups such as the Lions Club provide an excellent way to increase contact with business owners or managers. This type of association may give a subjective sense of the optometric requirements in the surrounding area. An alternative way to collect data is through a survey of local businesses such as in the example provided in Appendix A-2. According to Pathways in Optometry, optometrists report that 50% of patients referred to them are friends or a patient's family member.[14] This principal could also relate to the formulation of an occupational optometry program due to pre-existing relationships involving patients within the industrial setting.

After determining the needs of the community, the practitioner must decide which areas they would like to assist in meeting these needs. This relates back to the different roles of the optometrist within the industrial setting. The optometrist must now make a marketing plan and incorporate it into the pre-existing practice. A marketing plan consists of:

1) Mission Statement- describes the purpose of the program
2) Marketing Goals- divides the mission statement into smaller areas of achievement
3) Marketing Strategy- describes methods of obtaining the

goals. This variable is concurrent with the marketing mix which contains four variables: 1)services and products offered 2)locations served 3)fees charged 4)communications sent and received.[14]

The formulation of the marketing plan is primarily maintained within the practice. The next step is to determine how to advertise the expansion of the practice. This process is highly individualized to the practitioner. The main emphasis is to target the business community. A short informational article stating the goals of the program in the local newspaper is one option. Brochures or pamphlets is another way to provide both community awareness and education regarding occupational optometry. These brochures can be individualized to the practice. An example of this can be found in Appendix A-3. Another resource for this type of pamphlet is through the American Optometric Association (AOA). The literature specific to occupational optometry include:

1) VDT User's Guide To Better Vision
2) Your Vision...Your Job Depends On It!
3) Using Your Eyes and Your VDT- AOA Fact Sheet Series
4) Protecting Your Eyes From UV Radiation- AOA Fact Sheet Series[15]

Speaking engagements or educational seminars sponsored by the practice and targeted toward local businesses are also excellent ways to promote the program. The American Optometric Association also has a book entitled "Optometric Speaker's Guidebook" to assist the practitioner.[15] All of these methods are economical and optimize communication between the optometrist and the employer.

The outline presented above can be incorporated into many different aspects of practice enhancement. There are some

specific entities to include when developing a marketing plan for an industrial optometry program. They include:

- -Small businesses are the best opportunities since they have fewer resources[3]
- -The primary contact may be the safety officer in larger corporations or the business owner in smaller companies therefore target the marketing strategy to fit their needs[3]

The determination of fees for the industrial vision program offers many challenges. The key to fee determination is perceived value.[14] The business community is not only concerned with the cost of the program but also the quality of service. These factors correlate with the perceived value of the program. Other variables involved in fee determination include the cost of materials, delivering the service, the competition and the third party payment programs involved.

Most industries are aware of the costs of materials; therefore, maintain low profits on materials and use separate dispensing or professional fees.[3] When structuring the professional fees, incorporation of time spent to consult the industry and/or employee as well as additional efforts of paperwork and initiation of the program must also be considered. Competition will also influence the fees charged by the practice. This is especially apparent if the practitioner becomes a member of a panel as described earlier in the approved supplier program. The industry may have pre-established criteria with other optometrists and may wish to maintain them. The involvement of third party payment programs may also influence pricing. Vision insurance in the industrial setting often correlates with the optometrist who provides these services. One of the leading insurance programs is Vision Service Plan (VSP) in the occupational optometry setting. The optometrist must agree to

accept the reimbursement of materials and services and regulate the fee determination according to these guidelines. With these factors in mind, the proposal of the occupational optometry program can be complete.

After considering these areas of the marketing plan, the practitioner can implicate them to assist in the initiation of the occupational optometry program. Further education of the community or specific industry may be necessary. Also, the final determinate of a successful industrial vision program is the compliance of the end user, namely the employee. Education emphasizing the importance of any eyecare assistance supplied by the optometrist is essential. Much of this is done through personal communication and counseling during the eye examination. The practitioner should take the time to stress the importance of the protective device as well as it's proper use and care.

Treating Industrial Accidents

The prevention of ocular accidents in the industrial setting is the primary goal of any occupational optometry program. Unfortunately, the occurance of an eye injury is inevitable. Within this area, ocular injury can take on many forms. These include abrasions, lacerations, flash burns, thermal burns or chemical burns.[2] Another aspect of an industrial vision program is to treat these accidents.

The optometrist plays a vital role in treating industrial ocular injuries. The practitioner must be prepared with both an in-office treatment plan as well as an on-site emergency response plan. The implementation of an emergency response plan within the industrial setting includes:

1) Developing procedures and training programs to identify those events that are true emergencies, urgencies and less urgent conditions.
2) Identify the areas within the industry that are the most

hazardous and place emergency eyewash or eyecare stations in each areas.

3) Training personnel in the identification and response to ocular injuries.
4) Development of posters and procedures for the immediate management of the employee with an eye injury.
5) Development of an accident reporting process.[2]

Although the actual treatment of each type of ocular accident is beyond the scope of this paper, a pre-established reference should be readily available to the optometrist at their office. The industrial optometrist will most likely be one of the first to be contacted if an ocular accident were to occur at an associated place of business. Prompt response is essential for all involved, especially the employee in question.

Contact Lenses

Contact lens use for industrial workers has been controversial since they became available for general use. It is a common misbelief that if an individual is injuried while wearing contact lenses, the lens will contribute to the extent of the injury. This misconception has been proven false in many cases. It has been shown that some types of contact lenses actually give added protection in instances of chemical splash, dust, flying particles and nonionizing radiation.[2] "The evidence also refutes claims that contact lenses negate the protection provided by safety equipment or make the cornea more susceptible to damage by nonionizing radiation, in particular arc flashes."[2] In the case of an industrial worker, the optometrist needs to expand their case history to investigate the advisability of wearing lenses in a given environment. The optometrist should ask questions about:

-Toxic chemicals and physical agents that may be encountered
-Raw materials and by-products involved

-Potential for exposure
-Protective equipment available and used
-Other protective measures available
-Presence or absence of health personnel
-Hygiene facilities available
-Factors that may influence compliance with cleaning and wearing schedules.[2]

Determining the Nature of Injuries for Workman's Compensation

The final role of the optometrist in the area of industrial vision is the determination of the nature of injuries for workmans compensation. Should an ocular injury occur while on the job, the employee must be evaluated by a licensed practitioner to determine eligibility for compensation through their employer. The employer must file a claim with both the state and their insurance company. This claim must include a report of the incident. The optometrist may have a specific form in which to fill out or they may need to submit a report on the office letterhead summarizing their findings. This normally includes a date, the chief complaints, diagnosis treatment plan and prognosis. The practitioner usually includes whether the employee can return to work, the duration expected to be away from the job and the necessity of any follow-up visits required. The employer may ask for additional information as the follow-up care is provided.

Conclusion

Ocular health is an important issue within the industrial setting. Imput from an authority in eyecare allows maximal safety and visual efficiency in the workplace. The incorporation of an occupational optometry program into a practice can be very rewarding. This type of addition provides an expansion of the practice while maintaining flexibility to the practitioner. The extent of involvement is dependant upon the needs of the

community, the industry, as well as the optometrist. The basic outline provided in this paper is meant to establish a baseline of knowledge to which a practitioner may expand to create an asset to their pre-existing practice. The individuality of such a program creates a unique practice opportunity to those wanting to enhance their current patient base.

End Notes

1. Sheedy, James. "Vision problems at video display terminals: a survey of optometrists." Journal of the American Optometric Association Oct. 1992, Vol.63, No.10:687-692.

2. Kleinstein, Robert N. and Donald G. Pitts. Environmental Vision. Stoneham, MA: Butterworth-Heinemann, 1993.

3. "Occupational Opportunity." Optometric Economics Nov. 1993:11.

4. Steinle, M. "Comprehensive Eyewear Programs Maintain Worker Vision Protection." Occupational Health and Safety Oct. 1992, sec.61(10):72-76.

5. Eisma, T.L. "Positive Plans Promotes Consistent Use of Safeguards for Head, Face and Eyes." Occupational Health and Safety July 1991, sec.60(7):54-56.

6. American National Standards Institute, Inc. Occupational and Educational Eye and Face Protection - Z87.1-1989. New York:1989.

7. King, Vincent. Lecture notes: Environmental Vision-Spring 1993.

8. Warnke, W.C. "Prescription for Safety." Occupational Health and Safety Oct. 1993, sec.62(10):62-66.

9. VonStroh, Rolland. "Computer Vision Syndrome." Occupational Health and Safety Oct 1993, sec.62(10):62-66.

10. VDT User's Guide to Better Vision. St. Louis: American Optometric Association, n.d.

11. "Sheedy: VDT-related eye problems cost US $2 billion annually." AOA News 1 Jan. 1995, Vol.34:16.

12. "Working Ergonomically." PC Computing Dec. 1991:326.

13. Furger, Roberta. "In Search of Relief for Tired Aching Eyes." PC World Feb. 1993:29-34.

14. Pathways in Optometry. Allergan Inc., Winter 1993.

15. American Optometric Association.

APPENDIX A-1

Table 1. Selection Chart—American National Standard Z87.1–1989*

Hazard Type	Example Activities	Risk Assessment**	Recommended Protectors†	Non-recommended Protectors
Impact	Grinding Chipping Machining Polishing Sanding	Propelled objects and fragments; Flying chips and particles; Dirt, sand, dust, etc.	Spectacles with sideshields; Goggles; Faceshields§	Protectors that do not provide side protection‡
Heat	Casting; Soldering; Furnace	Sparks; Molten or very hot metals/ ceramics: Hot air blasts	Spectacles with sideshields; Goggles; Faceshields: screen or reflective§	Protectors that do not provide side protection
Chemical	Acids; Bases; Others	Splashes; Irritations	Goggles; Faceshields§	Spectacles; Handshields
Dust	Polishing; Grinding; Buffing; Blasting	Nuisance; Distraction; Allergy	Goggles	

Table 2. Comparison of Eye Protection Devices*

Type	Front Splash Protection	Side Splash Protection	Front Impact Protection	Side Impact Protection	Neck and Face Protection
Goggles	Excellent	Excellent	Excellent	Excellent	Poor
Glasses (no shields)	Good	Poor	Excellent	Poor	Poor
Glasses (with shields)	Good	Good	Good	Fair	Poor
Face Shield**	Excellent	Good to Excellent	Variable (depends on thickness	Variable (depends on thickness	Variable (depends on type/length)

* modified from reference 3
** shields should include both side and top types

AMERICAN NATIONAL STANDARD Z87.1-1989 SELECTION CHART

PROTECTIVE DEVICES

A.

Spectacle, No Sideshield

B.

Spectacle, Half Sideshield

C.

Spectacle, Full Sideshield

D.

Spectacle, Detachable Sideshield

E.

Spectacle, Non-Removable Lens

F.

Spectacle, Lift Front

G.

Cover Goggle, No Ventilation

H.

Cover Goggle, Indirect Ventilation

I.

Cover Goggle, Direct Ventilation

J.

Cup Goggle, Direct Ventilation

K.

Cup Goggle, Indirect Ventilation

L.

Spectacle, Headband Temple

M.

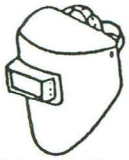
Cover Welding Goggle, Indirect Ventilation

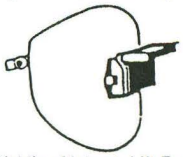
N.

Faceshield

O.

Welding Helmet, Hand Held

P.

Welding Helmet, Stationary Window

Q.

Welding Helmet, Lift Front

*The illustrations shown are only representative of protective devices commonly available at the time of the writing of this standard. Protective devices do not need to take the forms shown, but must meet the requirements of the standard.

NOTES:

(1) Care shall be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards must be provided.

(2) Operations involving heat may also involve optical radiation. Protection from both hazards shall be provided.

(3) Faceshields shall only be worn over primary eye protection.

(4) Filter lenses shall meet the requirements for shade designations in Table 1.

(5) Persons whose vision requires the use of prescription (Rx) lenses shall wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.

(6) Wearers of contact lenses shall also be required to wear appropriate covering eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.

(7) Caution should be exercised in the use of metal frame protective devices in electrical hazard areas.

(8) Refer to Section 6.5, Special Purpose Lenses.

(9) Welding helmets or handshields shall be used only over primary eye protection.

(10) Non-sideshield spectacles are available for frontal protection only.

SELECTION CHART — PROTECTORS

		ASSESSMENT SEE NOTE (1)	PROTECTOR TYPE	PROTECTORS	LIMITATIONS	NOT RECOMMENDED
IMPACT	Chipping, grinding, machining, masonry work, riveting, and sanding.	Flying fragments, objects, large chips, particles, sand, dirt, etc.	B,C,D, E,F,G, H,I,J, K,L,N	Spectacles, goggles faceshields SEE NOTES (1) (3) (5) (6) (10) For severe exposure add N	Protective devices do not provide unlimited protection. SEE NOTE (7)	Protectors that do not provide protection from side exposure. SEE NOTE (10) Filter or tinted lenses that restrict light transmittance, unless it is determined that a glare hazard exists. Refer to OPTICAL RADIATION.
HEAT	Furnace operations, pouring, casting, hot dipping, gas cutting, and welding.	Hot sparks	B,C,D, E,F,G, H,I,J, K,L,*N	Faceshields, goggles, spectacles *For severe exposure add N SEE NOTE (2) (3)	Spectacles, cup and cover type goggles do not provide unlimited facial protection. SEE NOTE (2)	Protectors that do not provide protection from side exposure.
		Splash from molten metals	*N	*Faceshields worn over goggles H,K SEE NOTE (2) (3)		
		High temperature exposure	N	Screen faceshields, Reflective faceshields. SEE NOTE (2) (3)	SEE NOTE (3)	
CHEMICAL	Acid and chemicals handling, degreasing, plating	Splash	G,H,K *N	Goggles, eyecup and cover types. *For severe exposure, add N	Ventilation should be adequate but well protected from splash entry	Spectacles, welding helmets, handshields
		Irritating mists	G	Special purpose goggles	SEE NOTE (3)	
DUST	Woodworking, buffing, general dusty conditions.	Nuisance dust	G,H,K	Goggles, eyecup and cover types	Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleaning may be required.	
OPTICAL RADIATION	WELDING: Electric Arc		*O,P,Q	TYPICAL FILTER LENS SHADE — PROTECTORS SEE NOTE (9) 10-14 — Welding Helmets or Welding Shields	Protection from optical radiation is directly related to filter lens density. SEE NOTE (4). Select the darkest shade that allows adequate task performance.	Protectors that do not provide protection from optical radiation. SEE NOTE (4)
	WELDING: Gas CUTTING TORCH BRAZING		J,K,L, M,N,O, P,Q	SEE NOTE (9) 4-8 — Welding Goggles or Welding Faceshield 3-6 3-4	SEE NOTE (3)	
	TORCH SOLDERING		B,C,D, E,F,N	1.5-3 — Spectacles or Welding Faceshield		
	GLARE		A,B	Spectacle SEE NOTE (9) (10)	Shaded or Special Purpose lenses, as suitable. SEE NOTE (8)	

APPENDIX A-2

September 30, 1995

Dear Doctor of Optometry:

The following is a questionnaire designed to investigate the role of optometry in the industrial setting. As a student optometrist, I am conducting a survey on how a practitioner can enhance their practice through establishing relationships with companies in the community.

There are many opportunities available in the area of occupational optometry. The practitioner can provide safety glasses, specialty bifocals, and low vision devices. They can also assist in computer ergonomics and workstation design. Educational seminars and consultation concerning the eyecare needs of the company may also be included in this area. Focusing on the occupational needs of your patients can enhance the growth of your practice.

Please fill out the attached questionnaire and return it by November 15, 1995. We greatly appreciate your cooperation. If you have any questions concerning this survey or would like any additional information please contact me at (810) 548-6337.

Sincerely,

Shannon MacNab
4th Year Optometry Student
Ferris State University
College of Optometry

Occupational Optometry Questionnaire

Name:_____ Date:_____
Address:_____
_____
Phone: _____

Mode of Practice: _____
Specialty Areas: _____
Number of O.D.'s in Practice: _____

Does your dispensary include safety frames? _____
if yes, which company supplies them? _____
Do you have the ability to order specialized safety equipment?
_____

Does your case history include task-specific analysis? ____
Does your practice include Occupational Optometry? _____
if no,
would you consider establishing an Occupational Optometry program into your practice? _____
if yes,
what percentage of your practice does it include? ____
how was this relationship established? _____
_____
_____
what type of special arrangements have been made to accommodate this program? _____
_____
_____
what type of services do you provide?
____ safety glasses ____ VDT issues
____ contact lenses ____ low vision aides
____ consultation ____ other _____
do you feel this has increased your patient base? ____
how much? _____
how has this enhanced your practice? _____
_____
_____

Additional Comments: _____
_____
_____

Thank you for your cooperation. Please return by November 15, 1995.

September 25, 1995

Dear Employer:

The following is a questionnaire designed to investigate the eyecare needs of your company. As a student optometrist, I am conducting a survey on how eyecare services can enhance the productivity of employees.

Studies have proven that job performance can be increased through vision enhancement. Eyeglasses specifically designed for individualized tasks allow for optimal productivity. An optometric practitioner can provide a variety of services to assist an individual with their assigned job. These services include task-specific safety glasses, computer workstation design, magnifying devices, and specialty bifocals. The optometrist can also serve as a consultant for your company concerning the visual requirements of your employees. Please fill out the attached questionnaire and return it to me by November 15, 1995.

I greatly appreciate your cooperation. If you have any questions concerning the survey or would like additional information in this area, please contact me at (810) 548-6337.

Sincerely,

Shannon MacNab
Senior Optometry Student
Ferris State University
College of Optometry

Occupational Optometry Survey

Company Name: _____ Date: _____
Contact Person: _____ Title: _____
Address: _____
_____
Phone: _____

Number of Employees: _____

Do you provide vision insurance for your employees? _____
if no, would you consider this as a benefit? _____
if yes, what type? _____
does it include safety glasses? _____
does your company have an established relationship with an optometrist to provide this service? _____
if yes, who? _____
is the optometrist on-site or off-site? _____
how was this relationship established? _____
_____
_____

In what areas would your employees benefit from optometry:

____ safety glasses
____ magnifiers
____ special bifocals
____ consultation
____ computer terminal design
____ sunglasses
____ education in safety
____ other _____

Would you be interested in additional information concerning these issues? _____

Additional comments: _____
_____
_____

Thank you for your cooperation! Please return form by Nov. 15, 1995.

APPENDIX A-3

How Can You Help Assure Your Getting The Best Eyecare For Your Occupation?

Ask your optometrist. Before your next eye examination take special note of your work environment. Consider the work hazards around you. Notice which areas give you the most difficulty. Describe distance from which you do the majority of your work. Consult the optometrist on the areas in question and together you can decide on the best type of eyewear to suit your specific needs.

How Optometry Can Help Improve Your Job Performance: Facts You Should Know.

There are many ways in which your optometrist can help maximize your performance while at work. the comfort and clarity of vision correlates with how well a job can be carried out. We have listed just a few of the areas which you may work with on a daily basis.

Eye Safety

Proper eye protection is a primary concern for both you and your optometrist. Many types of jobs require special equipment to protect the eyes from the work environment. The proper pair of safety glasses is essential to both the safety of the eye and the quality of work performed. The key to a successful pair of safety glasses is a good, comfortable fit. Your optometrist can provide a large selection of safety frames and options for both prescription and non-prescription eye wear.

Computer Use

The use of computers in the work environment has been associated with increased visual complaints the employees. By controlling factors such as, screen glare, workstation design and room lighting the visual complaints of computer users can be decreased. Glare can be cut down by using blinds or shades on the windows. The key to proper workstation design is that all of the furniture and equipment is flexible and adjustable. Your optometrist can help to provide information and suggestions to decrease the visual complaints of computer users.

Presbyopia

Presbyopia is a normal aging process which affects the ability of the eye to focus up close. This happens usually after age 40. There is a large selection of bifocal styles available to help you focus at any distance. Many jobs require fine detailed work is required. Consult your optometrist about which type would suit your needs the best both at work and for your hobbies at home. How comfortable your eyes are while doing these activities is a key factor in improving your job performance.