



Complete Summary

GUIDELINE TITLE

Eye.

BIBLIOGRAPHIC SOURCE(S)

Eye. Elk Grove Village: American College of Occupational and Environmental Medicine (ACOEM); 2004. 77 p. [149 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Harris, J, ed. Occupational Medicine Practice Guidelines: American College of Occupational and Environmental Medicine. Beverly Farms, MA: OEM Press; 1997.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory information has been released.

- [June 15, 2005, Non-Steroidal Anti-Inflammatory Drugs \(NSAIDs\)](#): U.S. Food and Drug Administration (FDA) recommended proposed labeling for both the prescription and over the counter (OTC) NSAIDs and a medication guide for the entire class of prescription products.
- [April 7, 2005, Non-steroidal anti-inflammatory drugs \(NSAIDs\) \(prescription and OTC, including ibuprofen and naproxen\)](#): FDA asked manufacturers of prescription and non-prescription (OTC) non-steroidal anti-inflammatory drugs (NSAIDs) to revise their labeling to include more specific information about potential gastrointestinal (GI) and cardiovascular (CV) risks.

COMPLETE SUMMARY CONTENT

** REGULATORY ALERT **

SCOPE

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SCOPE

DISEASE/CONDITION(S)

Occupational eye injuries and complaints

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Ophthalmology
Optometry
Physical Medicine and Rehabilitation
Preventive Medicine

INTENDED USERS

Advanced Practice Nurses
Physician Assistants
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

- To provide information and guidance on generally accepted elements of quality care in occupational and environmental medicine
- To improve the efficiency with which the diagnostic process is conducted, the specificity of each diagnostic test performed, and the effectiveness of each treatment in relieving symptoms and achieving cure
- To provide comprehensive guidelines and practical recommendations for treating the three major eye complaints seen most frequently in workers: red eye, blurred vision, and visual fatigue

TARGET POPULATION

Adults with potentially work-related acute eye complaints seen in primary care settings

INTERVENTIONS AND PRACTICES CONSIDERED

1. History
2. Observation of the patient
3. Examination
 - Visual acuity chart
 - Penlight (slit lamp preferred)
 - Tonometer
 - Sterile fluorescein dye strip
 - Topical anesthetic drops
 - Ophthalmoscope
4. Diagnosis via signs and symptoms and special testing, if necessary
5. Prevention and control of occupational eye infections
6. Classification with the Birmingham Eye Trauma Terminology (BETT)
7. Referral to ophthalmologist or optometrist, as appropriate
8. Initiate an eye and face safety program
9. Red eye differential diagnosis
10. Specific treatment for red flag conditions
11. Specific treatment for non-red flag conditions
12. Patient comfort including anesthetic agents, analgesics, pressure patching, mydriatics and cycloplegics, antimicrobials, and anti-inflammatory agents (steroidal and nonsteroidal)
13. Management of blurred vision and visual fatigue

MAJOR OUTCOMES CONSIDERED

Missed work days

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Note from the National Guideline Clearinghouse (NGC): The American College of Occupational and Environmental Medicine contracted the Work Loss Data Institute to provide medical library research services.

Disability-Duration Data

This edition includes disability-duration data that have been extracted from National Health Interview Survey data. Only data from interviews with individuals without workers' compensation claims has been included.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Contributors reviewed at least one chapter each and reviewed the relevant medical literature that had been published since the creation of the original Guidelines in 1997.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Following the chapter and literature review, participants provided written or verbal comments to the American College of Occupational and Environmental Medicine's Practice Guidelines Committee.

Verbal comments were in the form of participation in multi-specialty conference calls, during which the issues raised in each chapter were extensively discussed. Draft chapters were prepared and distributed by the American College of

Occupational and Environmental Medicine to all chapter reviewers. Follow-up multi-specialty teleconferences were then held as appropriate, during which time the draft was again reviewed.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

General Approach and Basic Principles

The principal recommendations for assessing and treating patients with eye complaints are as follows:

- Initial assessment should focus on detecting indications of potentially serious ocular pathology, termed red flags, and determining an accurate diagnosis. For these purposes, red flags are defined as a sign or symptom of a potentially serious condition indicating that further consultation, support, or specialized treatment may be necessary.
- In the absence of red flags, occupational or primary care providers can safely and effectively handle work-related eye complaints. Conservative treatment can proceed for 48 to 72 hours for superficial foreign bodies, corneal abrasions, conjunctivitis, and ultraviolet radiation damage. Normally, tissues of the eye heal rapidly. If eye damage is not well on the way to resolution within 48 to 72 hours, referral to a specialist is indicated. Nonspecific eye complaints may be monitored for a longer period of time while ergonomic and other adjustments are made. The focus is on monitoring for complications, facilitating the healing process, and determining fitness for return to work in a modified- or full-duty capacity.
- Corneal discomfort can be relieved safely with a topically applied ophthalmic nonsteroidal anti-inflammatory drug (NSAID), a systemic nonprescription analgesic, or an intramuscular or intravenous narcotic in severe ocular/face injuries when symptoms or physical findings mandate. Patients requiring narcotic analgesics generally should be referred for ophthalmologic care. Avoid using topical anesthetics for purposes other than diagnosis or treatment because they may obscure worsening pathology and thus inadvertently cause further injury.
- Visual acuity should be assessed and documented carefully at each examination prior to other examinations or treatment, except for cases of chemical burns.
- Patients recovering from acute eye injury or infection should be encouraged to return to modified work as their condition permits.
- Nonphysical factors, such as psychosocial, workplace, or socioeconomic problems, should be addressed in an effort to resolve delayed recovery.

Management of Red Eye

Primary care physicians commonly see patients who complain of a red eye. This condition may result from a simple disorder such as a subconjunctival hemorrhage that will resolve spontaneously. The general physician may treat numerous other causes. Vision threatening disorders that cause a red eye require early recognition

and prompt referral to an ophthalmologist for optimal management based on the results of the initial examination.

History

Information obtained from a careful history and examination directs the approach to management. The onset of a red eye, duration of the redness, and clinical course should be noted to help to distinguish the causative agents (see Table 16-1, Master Algorithm, and Algorithms 16-1, 16-2, and 16-3 in the original guideline document.)

Asking the patient open-ended questions such as those listed in the original guideline document allows the clinician to judge the need for further discussion or specific inquiries to obtain more detailed information.

Observation of the Patient

When the patient enters the examination area, the physician can observe his or her ability to see the way in and to gauge depth. Photophobia or pain can be inferred if the affected eye is held shut. Tearing or discharge can be observed as well. A history of chemical splash is an emergency, and examination may be delayed until after the eye is flushed to dilute the chemical.

Examination

The primary care physician should evaluate the red eye with a visual acuity chart, a penlight (slit lamp preferred), a tonometer, a sterile fluorescein dye strip, topical anesthetic drops, and an ophthalmoscope. Most clinics today have a Titmus or Stereo Optical visual screener or an Armed Forces Tester, a noncontact "puff" tonometer (Reichert Optical Company), and a slit lamp. A systematic approach to the examination should then be conducted, beginning by examining the face, orbital area, and lids and ending with a close view of the eyeball. The preferred method for examining the eyeball includes using the slit-lamp biomicroscope and the ophthalmoscope.

The American Academy of Ophthalmology specifies nine diagnostic steps to use when evaluating a patient with a red eye (Bradford):

1. Determine whether the visual acuity is normal or decreased using a Snellen chart or (preferred) Early Treatment Diabetic Retinopathy Study (ETDRS) chart at 20 feet or six meters, or the 1 meter ETDRS chart if required.
2. Decide by inspection what pattern of redness is present and whether it is due to subconjunctival hemorrhage, conjunctival hyperemia, ciliary flush, or a combination of these.
3. Detect the presence of conjunctival discharge and categorize it as to amount—profuse or scant—and character—purulent, mucopurulent, serous, or hemorrhagic.
4. Detect opacities of the cornea, including large keratic precipitates, or irregularities of the corneal surface, such as corneal edema, corneal leukoma (a white opacity caused by scar tissue), and irregular corneal reflection.

- Conduct the examination using a biomicroscope, or penlight and transilluminator, at least. Biomicroscopy is the practice standard.
5. Search for disruption of the full thickness of the corneal epithelium by staining the cornea with fluorescein and lack of corneal epithelium vitality by staining with rose bengal.
 6. Use of a slit lamp (biomicroscope) allows one to estimate the depth of the anterior chamber as normal or shallow and to detect any microscopic blood or white blood cells, which would indicate either hyphema or hypopyon, respectively. (A hypopyon is indicated by the presence of protein and white blood cells in the anterior chamber, e.g., when a corneal ulcer is present, and a hyphema is indicated by protein and red blood cells in the anterior chamber.)
 7. Detect irregularity of the pupils and determine whether one pupil is larger than the other. Observe the reactivity of the pupils to light to determine whether one pupil is more sluggish than the other or is nonreactive.
 8. Determine whether the intraocular pressure is high, normal, or low by performing tonometry if indicated clinically (e.g., if acute angleclosure glaucoma is suspected). (Tonometry is contraindicated when external infection or lack of globe integrity is obvious.)
 9. Detect the presence of proptosis, lid malfunction, or any limitations of eye movement.

Signs of Red Eye

Symptom	Referral Advisable if present	Acute Glaucoma	Acute Iridocyclitis	Keratitis	Bacterial Conjunctivitis	Viral Conjunctivitis	Allergic Conjunctivitis
Ciliary flush	Yes	1	2	3	0	0	0
Conjunctival hyperemia	No	2	2	2	3	2	1
Corneal opacification	Yes	3	0	1-3	0	0-1	0
Corneal epithelial disruption	Yes	0	0	1-3	0	0-1	0
Pupillary abnormalities	Yes	Mid-dilated, nonreactive	Small; may be irregular	Normal or small	0	0	0
Shallow anterior chamber depth	Yes	3	0	0	0	0	0
Elevated intraocular pressure	Yes	3	-2 to +1	0	0	0	0
Proptosis	Yes	0	0	0	0	0	0
Discharge	No	0	0	Sometimes	2-3	2	1
Preauricular lymph-node enlargement	No	0	0	0	0	1	0

Note: The range of severity of the symptoms is indicated by 0 (absent) to 3 (severe).

Source: Table modified from Bradford CA, ed. *Basic Ophthalmology*. 7th ed. San Francisco, Calif: American Academy of Ophthalmology; 1999.

Refer to the original guideline for information on methods of testing, how to interpret findings of red eye, diagnostic criteria, special studies and diagnostic treatment considerations, type of red eye, and prevention and control of occupational eye infections.

Ocular Trauma

Elements of the History of Ocular Injury

While a detailed, accurate history is essential in all injuries, it is especially important to obtain a detailed history of an ocular injury because incorrect or misleading information may lead to blindness. Such information may be obtained from a variety of sources, including the patient, the first responder(s), and others involved in or associated with the accident (see Master Algorithm and Algorithms 16-1, 16-2, and 16-3 in the original guideline document).

Information for acute trauma should include the four *Ws*:

- *Where*: Location of the accident
- *When*: Time and date
- *Who*: Other individuals involved
- *What*: A detailed description of the accident circumstances, including force and load

If chemical exposure was involved, seek available Material Safety Data Sheets (MSDSs) information.

Ocular Examination for Eye Injury

The examination of the injured eye should include:

- Visual acuity (each eye separately) with best correction or pinhole
- Inspection of the ocular structure. (If an open globe is suspected, no pressure should be exerted on the globe.)
- Position of the eyes and eye movements (six cardinal positions) if globe is intact
- Examination of the pupils for size and reaction to light
- Gross visual fields by confrontation
- Ophthalmoscopy
- Intraocular pressure (IOP) determination if acute glaucoma is suspected and the globe is intact

It is important for primary care physicians to make immediate referrals to the closest ophthalmologist or eye institute when eye injuries exceed their capability. Make the patient comfortable (with intravenous analgesics, if necessary), and

protect the injured eye from further injury by applying a rigid Fox shield or equivalent. Depending on the type of injury, transport the patient on a stretcher.

Yardsticks that can be used to evaluate standard emergency care include:

1. The detail and accuracy of the history obtained at the time of or after admission
2. The thoroughness of the admission examination
3. The correlation of critical results with medication and/or other treatment provided to the patient

Refer to the original guideline document for information on initializing an eye and face safety program and personal protective equipment.

Assessing Red Flags and Indications for Immediate Referral

Physical examination evidence of severe ocular compromise that correlates with the medical history and test results may indicate a need for immediate consultation. The examination may further reinforce or reduce suspicions of infection or major trauma (e.g., open globe, chemical exposure, or radiation damage). A medical history suggestive of pathology in an area other than the eye may warrant examination of the head, neck, or other areas.

Refer to the original guideline for information on timing of referrals or special studies and red eye differential diagnosis.

Red Flags for Potentially Serious Eye Conditions Requiring Immediate Ophthalmologic Examination

Disorder	Medical History	Physical Examination
Ocular injury; open globe	Trauma due to high velocity foreign-body injury	Visible foreign body in globe; deformity of the globe
	Visual loss	Loss of globe pressure
	Bleeding	Distorted pupil and/or iris
	Local pain	Subconjunctival hemorrhage
Ocular injury, closed globe	Direct blow	Eyelid ecchymosis
	Visual loss	Subconjunctival hemorrhage
	Diplopia	Vitreous hemorrhage
		Lens dislocation
		Retinal edema and/or tear
		Decreased visual acuity
		Hyphema

Disorder	Medical History	Physical Examination
		Retrobulbar hemorrhage Extraocular motion deviation
Thermal burns	Exposure of eye to hot material/extreme heat Superficial eye pain Photophobia	Burns of lids and/or surrounding structures Damage to cornea, conjunctiva, and/or sclera Decreased visual acuity
Radiation injury	Exposure of eyes to ultraviolet, laser, or bright light Delayed severe superficial eye pain (4-6 hours) Tearing Photophobia	Blepharospasm Tearing Corneal punctate staining and/or sloughing of epithelium Retinal damage
Chemical burns	Alkali, acid, solvent splash Painless visual loss	Corneal erosion Conjunctival chemosis Necrosis of anterior segment of tissues and vessels Decreased visual acuity Circumcorneal vascular ischemia Necrosis of cornea and/or conjunctiva Glaucoma
Hydrofluoric (HF) acid burns	HF acid splash Delayed damage	Necrosis of cornea and/or conjunctiva Decreased visual acuity
Corneal ulcer	Abrasion or infection Superficial pain Foreign-body sensation Photophobia Visual loss	Corneal infiltrates and ulcers Decreased visual acuity Ulceration on slit-lamp exam and fluorescein staining

Diagnostic Criteria for Non-Red Flag Eye Conditions That Can Be Managed by Primary Care Physicians

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Corneal abrasion, conjunctival abrasion	Direct contact Contact lens Aerosol chemicals	Superficial pain Foreign-body sensation	Possibly visible abrasion on magnification	Fluorescein staining reveals abrasion with use of cobalt blue light Visual acuity test results abnormal
Nonionizing radiation exposure	Ultraviolet (welding) light Bright light (sun) Laser	Severe photophobia Tearing Sandy sensation Possibly reduced visual acuity	Injection Blepharospasm Corneal erosion or sloughing Decreased visual acuity Central scotoma	Fluorescein staining reveals punctate lesions under cobalt blue light Amsler grid abnormality
Chemical splash	Chemical splash (nonacid, nonalkali; acid; alkali)	Chemical exposure Painful Visual loss	Corneal erosion Possibly diffuse inflammation of periorbital, lids and anterior segment Eye burn	Fluorescein staining reveals punctate lesions or abrasion under cobalt blue light
Foreign body	Projectile material	Foreign-body sensation	Visible foreign body Possible corneal abrasion Possible rust ring	Fluorescein staining may reveal abrasion under cobalt blue light
Blepharitis	Infectious or eyelid gland dysfunction	Burning, itching of lids Wake up with eyelids stuck together	Dry or greasy scales of lid Loss of eyelashes in chronic state	None
Stye	Acute <i>Staphylococcus</i> infection of glands of Moll, Zeis, and Meibomian	Acute localized infection of eyelid in area of cilia or meibomian glands	Localized acute infection or abscess	None

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Chalazion	Chronic granulomatous inflammation of either of the gland Zeis, Moll, or Meibomian	Generally painless lid thickening, frequently following hordeolum	Palpable nodule associated with cilia of eyelid or meibomian glands	None
Conjunctivitis	Microbial infection Viral infection Parasitic infection	Blurred vision or eye stuck shut Discharge	Purulent, watery mucous discharge	Culture positive for bacteria
Visual fatigue	Ergonomic factor Refractive error Work habits Workplace illumination	Headache Colored afterimages Eye fatigue Diplopia Blurred vision, especially near vision	Possibly refractive error for working distance	Evaluate worksite for the visual ergonomic status
Subconjunctival hemorrhage	May develop from rubbing the eyes, sneezing, Valsalva May be associated with bleeding disorders and hypertension	Asymptomatic	Generally a light amount of subconjunctiva blood	None Rule out foreign body

Management or Referral

The conditions that a primary care physician may appropriately treat include blepharitis, stye and chalazion, and conjunctivitis. Patients requiring prolonged treatment or those in whom the expected response to treatment does not occur promptly may be referred to an ophthalmologist.

Red-Flag Conditions and Preferred Specific Treatment

Blunt Trauma

Ocular contusions are caused by blunt trauma to the eye or periorbital structures that may cause contusion of the globe and/or periorbital. There may be no symptoms; however, some patients complain of local pain, visual loss, diplopia, or a red eye. The clinician may observe any of the following—ecchymosis of the eyelid; corneal edema; subconjunctival hemorrhage; microscopic or gross

hyphema; reduced visual acuity or abnormal visual fields; dislocation or subluxation of the lens; retinal tears, edema, or detachment; or restriction of ocular motion if extraocular muscles are trapped in a blowout fracture.

Retrobulbar Hemorrhage

A relaxing incision at the lateral canthus must be completed within 10 minutes of the rise in IOP or the eye may be irreversibly damaged secondary to the high IOP.

Orbital Floor Fractures

Treatment indications for orbital floor fractures are evolving. Nonresolving oculocardiac reflex, the "white-eyed" blowout fracture, and early enophthalmos or hypoglobus are indications for immediate surgical repair. Surgery within 2 weeks is recommended in cases of symptomatic diplopia with positive forced ductions and evidence of orbital soft tissue entrapment on computed tomographic (CT) scan or large orbital floor fractures that may cause latent enophthalmos or hypophthalmos.

Hyphema

It is important to identify and treat ocular injuries that often accompany traumatic hyphema. Consider each of these management issues and refer to the pertinent literature in formulating the following recommendations:

- Advise routine use of topical cycloplegics and corticosteroids, consider systemic antifibrinolytic agents or corticosteroids, and always use a rigid shield.
- Recommend activity restriction (quiet ambulation). If compliance (with medication use or activity restrictions), follow-up, or increased risk for complications (e.g., history of sickle cell disease or hemophilia) is a concern, inpatient management can be offered.
- Indications for surgical intervention include the presence of corneal blood staining or dangerously increased IOP despite maximum tolerated medical therapy, among others.

Burns

Thermal Burns of the Eye

If damage exceeds superficial burns of the lids and surrounding structures, prompt intervention by a specialist is imperative.

Electromagnetic Radiation Injury to the Eye

Patients with electromagnetic radiation injury to the eye may have no initial symptoms. Severe cases may show a marked decrease in central visual acuity, but there may be severe delayed consequences. Depending on the exact electromagnetic spectrum, the symptoms or signs may be localized to the external segment, lens, retina, and choroid. This type of injury can cause scarring of the cornea or retina or cataracts. Visual field disorders also may result from

damage to the retina or choroid. Burns from the blue end of the visible spectrum and ultraviolet A are discussed under nonionizing radiation exposure.

Chemical Burns

When they make contact with ultrasensitive eye tissues, toxic substances immediately begin to cause damage. Studies show that after the first 10 seconds of chemical contact, chances of full recovery become fleeting. Aside from general tissue damage, acids and alkalis can change the pH in the eye itself. From this detrimental change, severe eye damage, including blindness, may result. A history of chemical exposure is an emergency, and examination should be delayed until after the eye is flushed to dilute the chemical. It is imperative that emergency flushing begin immediately. To ensure the best chances for a minimal amount of eye damage, correct emergency equipment, proper placement, and knowledge of its use are necessary in the workplace. The requirements governing medical services and first aid is covered in OSHA 1910.151(a)(b), whereas ANSI Z-358.1, Emergency Eyewash and Shower Equipment, provides guidance. At the site, water is the initial dilution agent to flush the eye or body. Subsequently, an isotonic saline or balanced Ringer's solution is preferred and should be used, if available (otherwise, use sterile intravenous fluids), until a tear pH of about 7 is obtained after ceasing irrigation for 10 minutes. Proper flushing usually takes at least 15 minutes, but can take as long as 24 hours.

Refer to the original guideline document for information on irrigation technique, alkali burns, acid burns, and hydrofluoric acid burns.

Corneal Ulceration

Corneal ulcers, which can permanently damage vision, are an ophthalmologic emergency. They may be bacterial, viral, fungal, or parasitic in origin and may occur following corneal lacerations, abrasions, and intrusion of foreign bodies. Patients with corneal ulcers present with complaints of changes in visual acuity, photophobia and/or eye pain, tearing, and a sensation that a foreign body is in the eye. The presence of corneal ulcers can be determined by direct visualization, but magnified viewing with fluorescein staining is needed to completely rule out their presence.

Open Globe Eye Injury

Direct trauma to the eye from high-velocity objects can cause laceration or perforation of the globe. The trauma can be perforating or penetrating. Patients with damage to the integrity of the globe can present with decreased visual acuity, local pain, and bleeding. The cardinal sign is distortion of the globe with loss of tension or IOP; the pupil is not round, but rather is distorted and/or nonreactive. In addition, ecchymosis or other signs of damage to periorbital structures are evident. The clinician may observe subconjunctival hemorrhage, distortion of the iris or pupil, or herniation of the iris through the cornea. There also may be retinal damage. The injured eye should be protected with a metallic or plastic shield. Transfer by stretcher is recommended.

Non-red-flag Conditions

Occupational health or other primary care physicians could treat the conditions listed above in the table entitled "Diagnostic Criteria for Non-Red Flag Eye Conditions That Can Be Managed by Primary Care Physicians" after thorough evaluation and be within their scope of practice.

Abrasion of the Cornea or Conjunctiva

A corneal abrasion involves denuding of the five layers of corneal epithelium. Corneal abrasions may be divided into three classes based on healing time, degree of iridocyclitis, and potential infection complications. The three types are as follows:

- *Simple*. Generally less than 3 mm in greatest diameter. Usually heals in 24 hours without treatment.
- *Complex*. Secondary to fingernails, thorns, tree branches, or oyster shells. These have a delayed and variable healing time, ocular pain and ciliary spasm, and a high rate of recurrent erosion. Use nonsteroidal anti-inflammatory drugs (NSAIDs) with ophthalmic antibiotics and, frequently, cycloplegics.
- *Potentially contaminated with bacteria*. Secondary to contact lenses, dirt, barnyard, or other traumatic materials. These have a higher potential rate of corneal infection or corneal ulcers from *Pseudomonas aeruginosa*. No patching is the rule because it encourages bacterial growth. Applying cycloplegics and ophthalmic antibiotics topically is indicated.

Recurrent Corneal Erosion

The diagnosis is confirmed by a history of recent trauma, previous corneal abrasions, ocular surgery, family history (corneal dystrophy), and slit-lamp examination with fluorescein staining.

Treatment for an acute episode may be performed by a primary care physician, but subsequent episodes that do not resolve in 36 to 48 hours should be referred to an ophthalmologist. Apply a cycloplegic drop (e.g., cyclopentolate or homatropine) and use antibiotic ointment. If the defect is large, a pressure patch may be applied. After epithelial healing is complete, apply artificial tears (e.g., Refresh Plus, TheraTears, or Celluvisc) and artificial tear ointment (e.g., Refresh P.M.) or 5% sodium chloride drops four to eight times per day and 5% sodium chloride ointment at bedtime for at least 3 months.

If the corneal epithelium is loose and heaped and not healing, the ophthalmologist will consider debridement of the abnormal epithelium. The following treatments may be considered for erosions that are not responsive to the preceding treatment:

- An extended-wear bandage soft contact lens for several months
- Anterior stromal puncture (generally used in extremely symptomatic, refractory cases with erosions outside the visual axis)
- Epithelial debridement with diamond burr polishing of Bowman's membrane (effective for large areas of epithelial irregularity and lesions in the visual axis)

- Phototherapeutic keratectomy (PTK). Excimer laser ablation of the superficial stroma is successful in up to 90% of patients with recurrent erosions from corneal dystrophies. Follow-up may be required every 1 to 2 days until the epithelium has healed and then every 1 to 6 months depending on the severity and frequency of the episodes.

Nonionizing Radiation Exposure from Ultraviolet and Bright Visible Spectrum

This energy may arise from welders' torches, mercury vapor lamps, and the sun. The onset of symptoms, including photophobia, corneal pain, lacrimation, and blepharospasm, usually occurs 5 to 12 hours after exposure; healing usually occurs within 24 hours (see Tables 16-9 and 16-10 in the original guideline document).

Foreign Bodies of the Cornea or Conjunctiva

These may be superficial and may be removed less than 6 hours after the injury. Superficial foreign bodies generally may be removed with a moist swab soon after injury and should be handled like a simple abrasion (see Table 16-8 in the original guideline document). Foreign bodies can be divided into two types (Table 16-10 in the original guideline document presents details for treating various types of foreign bodies):

- *Simple.* A superficial foreign body removed within hours generally will heal within 24 hours and have a low rate of inflammation of the cornea or conjunctiva and no iritis.
- *Complex.* A foreign body of the cornea and conjunctiva in which the trauma has taken place generally will heal in 24 to 48 hours. A metallic foreign body may be surrounded by swollen necrotic tissue and metallic pigmentation.

Chemical Splashes

Chemical splashes from a solvent, acid, or alkali agent generally are red flag conditions, but preliminary treatment by a primary care physician can be provided before referring the patient to an ophthalmologist. Primary treatment is irrigation of the eye with water and/or isotonic saline until the pH returns to approximately 7, measured by pH paper, 10 minutes after stopping irrigation.

Subconjunctival Hemorrhage

In the absence of blunt trauma, hemorrhage beneath the subconjunctiva (the potential space between the conjunctiva and the sclera) requires no treatment and, unless recurrent, no evaluation. Causes may include a sudden increase in ocular venous pressure, such as occurs with coughing, sneezing, vomiting, or vigorous rubbing of the eye. Many subconjunctival hemorrhages occur during sleep when no prodromal conditions exist. If recurrent, an underlying bleeding disorder should be ruled out.

Blepharitis

Response to the treatment of blepharitis, or inflammation of the eyelid, is often frustratingly slow, and relapses are common. The mainstays of treatment are as follows:

- Apply a warm compress over the closed eyelids for 10 to 15 minutes with the cloth rewarmed (by running through hot water) as it cools. The compress helps to increase the fluidity of the meibomian glands and loosen the debris from the bases of the lashes.
- To remove the secretions, follow compresses with lid scrubs, such as baby shampoo diluted with water (one drop of shampoo in cup of water) on a cotton ball or clean cloth, which is preferable to a cotton-tipped applicator. These measures may be performed two to four times daily.
- Apply a topical antibiotic (erythromycin or bacitracin) following lid scrubs twice daily. Tetracycline (orally, daily) or doxycycline (orally, daily) is added for patients with rosacea or chronic blepharitis who are not responding to conservative measures. For pregnant or breastfeeding women and children younger than 12 years of age, substitute erythromycin.
- Give patients with punctate epithelial keratitis (PEK) artificial tears five to six times daily.

Chalazion

Chalazion is a chronic granulomatous inflammation of a meibomian gland that may develop spontaneously or may follow a hordeolum, acute meibomitis, or sty. Chalazia are chronic granulomata of fat bodies and they may require excision. Because most chalazia are sterile, antibiotic therapy is of no value, but hot compresses may be useful for early lesions. Incision with curettage is indicated when lesions do not resolve spontaneously or with other medical therapy. A persistent or recurring lid mass should undergo biopsy because it may be a rare meibomian gland carcinoma or a squamous cell carcinoma of the conjunctiva rather than a benign chalazion.

Bacterial Conjunctivitis

Bacterial conjunctivitis is treated with frequent antibiotic eye drops as well as antibiotic ointment applied at bedtime. Cool compresses may give some relief. There is no specific medical treatment for viral conjunctivitis, but patients should be instructed in proper precautions to prevent contagion. Corticosteroids have no place in treating infectious conjunctivitis. Eye drops containing a combination of antibiotics and corticosteroids are not indicated for the treatment of ocular inflammation by the primary care or occupational medicine physician.

Stye or Hordeolum

A sty or hordeolum is an acute inflammation of the eyelid that may be characterized as an external swelling (involving the hair follicle or associated glands of Zeis or Moll) or an internal swelling (involving the meibomian glands). An external hordeolum occurs on the surface of the skin at the edge of the lid. An internal hordeolum presents on the conjunctival surface of the lid. Styes, generally localized abscess, are treated initially with hot compresses and topical antibiotics. An internal or external hordeolum (stye) may be a sequela of acute blepharitis (meibomitis) and require incision and drainage of the abscess. Incision

with curettage is indicated when lesions do not resolve spontaneously or with medical therapy.

Initial and Definitive Care of Red Flag and Non-red-flag Conditions

Patient Comfort

Comfort is often a patient's first concern. Nonprescription analgesics provide sufficient pain relief for most patients with acute eye symptoms. Persistence of eye pain is a red flag. If treatment response is inadequate (i.e., symptoms and limitations continue), prescription pharmaceuticals can be tried, but only briefly, before referring the patient to an ophthalmologist. Comorbid conditions, side effects, cost, and provider and patient preferences guide the clinician's choice of recommended agents. Table 16-11 in the original guideline document summarizes comfort options.

Generally, three sources of pain are secondary to a red eye:

- Periorbital pain
- Cornea, conjunctival, or eyelid pain
- Ciliary and iris spasm

Conditions that require referral must be diagnosed and treated initially, and the patient must be stabilized while making preparations for transfer. A series of general and diagnostic treatment modalities for red flag and non-red flag conditions are provided.

Anesthetic Agents

Topical anesthetics of short onset and duration with a low potential for causing hypersensitivity (e.g., proparacaine hydrochloride 0.5%) are used commonly during the eye examination and treatment only to facilitate removal of superficial foreign bodies or rust rings or to facilitate the examination when blepharospasm or severe local pain prevents adequate visualization of the eye (e.g., in patients with flash burns or severe corneal abrasions). The agents listed below (see also Table 16-11 of the original guideline document) allow the clinician to perform ocular procedures such as tonometry, removing foreign bodies from the surface of the eye, and lacrimal canalicular manipulation and irrigation. Refer to the original guideline document for further details.

- Cocaine hydrochloride
- Proparacaine hydrochloride
- Tetracaine hydrochloride

Analgesics

Systemic

The safest and most effective analgesic medication for acute eye problems appears to be acetaminophen. Opioids may be no more effective than acetaminophen but should be avoided if possible or used only until an emergent

referral to an ophthalmologist is made. Details regarding major orbital or periorbital trauma appear in Chapter 3 of the original guideline document.

Ophthalmic Topical

Four topical nonsteroidal anti-inflammatory drugs (NSAIDs) are available for ophthalmic application that function as local anesthetics and analgesics. They are diclofenac, flurbiprofen, ketorolac, and suprofen (see Table 16-14 in the original guideline document).

Pressure Patching

Antibiotic ointment, with or without a topical mydriatic and a pressure patch, has been the traditional treatment of traumatic, non-contact lens-related corneal abrasions. Unfortunately, using a pressure patch is not a benign treatment because it removes binocular vision, can be uncomfortable for the patient, and may retard healing.

Potential disadvantages of patching can be noted. Pseudomonas ulcers have been documented after eye patching of corneal abrasions caused by contact lenses. Also, patching has been noted to decrease the natural irrigation effect of tears and to decrease corneal oxygen tension while increasing corneal temperature. Adverse effects on depth perception and visual fields are well known.

In cases of open globe and/or major injury to the orbit, the injured eye should be covered with a metallic or plastic shield for protection.

Mydriatics and Cycloplegics (see Table 16-12 in the original guideline document for full listing)

The autonomic drugs that produce mydriasis (pupillary dilatation) and cycloplegia (paralysis of accommodation and iris constriction muscles) are among the most frequently used topical medications in ophthalmic practice. The most commonly used mydriatic is the direct-acting adrenergic agent phenylephrine hydrochloride, usually in a 2.5% concentration.

Phenylephrine is used alone or, more commonly, in combination with a cycloplegic agent for refraction or for pupillary dilatation.

Antimicrobial Therapy (see Table 16-13 in the original guideline document for full listing)

Antibiotics are used routinely in ophthalmology for both treatment and prophylaxis. They are used prophylactically to manage foreign bodies and corneal abrasions and in pre- and postoperative care, where they are administered as an ophthalmic solution or ointment. Because these antibiotics are prescription drugs, no known over-the-counter antibiotics are available to be used.

Corneal abrasions associated with contact lens wear are commonly evaluated and treated in acute care clinics and emergency departments by nonophthalmologists. The risk of progression to suppurative keratitis in this setting requires

management distinct from that of other mechanical (e.g., fingernail scratch) corneal abrasions. The antibiotic chosen should reflect the need for prophylaxis against *Pseudomonas*. Conditions favoring bacterial growth, specifically occlusive patching and/or use of steroid-containing compounds, must be avoided, and a 24-hour follow-up examination is recommended.

Again, ensure that the patient is not allergic to the proposed antibiotic prior to its use. Patients with more serious conditions, such as bacterial corneal ulcers (red flag), or those whose foreign-body abrasion is not healed in 24 hours or is showing no evidence of healing should be referred to an ophthalmologist for further treatment. Patients with potentially contaminated corneal abrasions or foreign bodies may have their tetanus immunization evaluated and may be treated in accordance with the tetanus immunization protocol.

Ocular Anti-inflammatory Agents (Steroids)

The wide variety of medications available to treat ocular inflammation are listed in Table 16-14 of the original guideline document. Corticosteroids (steroids) are used most commonly, and many are available in combination with antibiotics and/or other medications. Ocular anti-inflammatory drugs (steroids) should not be initiated by the primary care physician but may be followed after initiation by an ophthalmologist. Herpes simplex keratitis may be difficult to diagnose by a nonophthalmologist and can be extremely progressive when steroids are used without the presence of an appropriate antiviral agent.

Corticosteroids once were thought to be contraindicated in infectious disease states. However, it is now appreciated that steroids, when used in conjunction with appropriate antimicrobial, antifungal, or antiviral agents, may help to prevent more serious ocular damage. The correct diagnosis and appropriate agent are critical. Steroids may be administered by four different routes when treating ocular inflammation. Table 16-15 in the original guideline document lists the preferred route for various conditions.

Topical corticosteroids can elevate IOP and, in susceptible individuals, can induce glaucoma. Some corticosteroids, such as fluorometholone acetate, medrysone, and loteprednol, cause less elevation of IOP than others. Corticosteroids also may cause cataract formation, a complication more likely with high systemic use.

Management of Blurred Vision

Blurred vision is a symptom of a decrease in visual acuity that may be central or peripheral. The patient presenting with symptoms or signs of blurred vision may be referred to an ophthalmologist or, based on results of visual (ocular) screening, an optometrist (see Algorithm 16-8 in the original guideline document). Refer to the original guideline document for definitions of central and peripheral visual acuity loss.

Management of Visual Fatigue

Visual fatigue is a term used to describe phenomena related to intensive use of the eyes. It can include complaints of eye or periocular pain, itching or burning,

tearing, oculomotor changes, focal problems, performance degradation, after-colors, and other phenomena. Patients presenting with signs or symptoms of visual fatigue may be referred to an ophthalmologist or optometrist (see Algorithm 16-9 in the original guideline document).

Refer to the original guideline for additional information on factors influencing the visibility of tasks and ergonomic findings regarding video display terminals.

Vision Screening for the Worker

In order to determine the exact loss of function in patients with blurred vision and visual fatigue, a visual (ocular) function screening should be completed (see Algorithms 16-7, 16-8, and 16-9 in the original guideline document).

Work-Relatedness

A thorough work history is crucial to establishing work-relatedness. Determining whether an eye complaint is related to work requires careful analysis and weighing of all associated or apparently causal factors operative at the time. In most traumatic eye complaints, the etiology is relatively clear. However, identifying the source of cataracts, for example, may be more difficult. In cases of nonspecific eye complaints, such as "eye strain" or headache, a predominance of work factors suggests that worksite intervention to prevent recurrences and hasten recovery is appropriate. A cluster of cases in a work group suggests a greater probability of associated work-design or management factors.

Refer to the original guideline for additional discussion of work activities, preventive medicine guidelines, and American with Disabilities Act (ADA) issues.

CLINICAL ALGORITHM(S)

The following clinical algorithms are provided in the original guideline document:

- American College of Occupational and Environmental Medicine Guidelines for care of eye complaints
- Care of red eye complaints
- Initial evaluation of occupational red eye complaints
- Initial and follow-up management of non-red flag occupational eye complaints
- Evaluation of slow-to-recover patients with occupational eye complaints (symptoms >7 days)
- Surgical considerations for patients with persistent visual symptoms
- Further management of occupational eye complaints
- Visual screening (fitness-for-duty evaluation)
- Care of eye complaints – blurred vision
- Care of eye complaints – visual fatigue

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Improved efficiency of the diagnostic process
- Effective treatment resulting in symptom alleviation and cure

POTENTIAL HARMS

- Avoid using topical anesthetics for purposes other than diagnosis or treatment because they may obscure worsening pathology and thus inadvertently cause further injury.
- Allergic reactions to topical and systemic medications
- Side effects of topical and systemic medications
- Topical corticosteroids can elevate intraocular pressure (IOP) and, in susceptible individuals, can induce glaucoma. Some corticosteroids, such as fluorometholone acetate, medrysone, and loteprednol, cause less elevation of IOP than others. Corticosteroids also may cause cataract formation, a complication more likely with high systemic use.

CONTRAINDICATIONS

CONTRAINDICATIONS

Tonometry is contraindicated when external infection or lack of globe integrity is obvious.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- The American College of Occupational and Environmental Medicine (ACOEM) provides this segment of guidelines for practitioners and notes that decisions to adopt particular courses of actions must be made by trained practitioners on the basis of the available resources and the particular circumstances presented by the individual patient. Accordingly, the ACOEM disclaims responsibility for any injury or damage resulting from actions taken by practitioners after considering these guidelines.
- The guidelines for modification of work activities and disability duration (see original guideline document) are general guidelines based on consensus or population sources and are never meant to be applied to an individual case without consideration of workplace factors, concurrent disease, and other social or medical factors that can affect recovery.
- The parameters for disability duration are "consensus optimal" targets as determined by a panel of ACOEM members in 1996 and reaffirmed by a panel of ACOEM members in 2002. In most cases, persons with one nonsevere injury can return to modified duty immediately.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Chart Documentation/Checklists/Forms
Clinical Algorithm

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Eye. Elk Grove Village: American College of Occupational and Environmental Medicine (ACOEM); 2004. 77 p. [149 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

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2004

GUIDELINE DEVELOPER(S)

American College of Occupational and Environmental Medicine - Medical Specialty Society

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GUIDELINE COMMITTEE

American College of Occupational and Environmental Medicine Practice Guidelines Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Harris, J, ed. Occupational Medicine Practice Guidelines: American College of Occupational and Environmental Medicine. Beverly Farms, MA: OEM Press; 1997.

GUIDELINE AVAILABILITY

Print copies are available from ACOEM, 25 Northwest Point Boulevard, Suite 700, Elk Grove Village, IL 60007; Phone: 847-818-1800 x399. To order a subscription to the online version, call 800-441-9674 or visit <http://www.acoempracguides.org/>.

AVAILABILITY OF COMPANION DOCUMENTS

The following implementation tool is available in the original guideline document:

- Visual history questionnaire. Table 16-16

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on May 31, 2006. The information was verified by the guideline developer on November 3, 2006.

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