Managing the Red Eye in Primary Care
Part 1 - Infectious Conjunctivitis

Learning Objectives
After participating in this educational activity, participants should be better able to

1. Differentiate and recognize red eye including infectious conjunctivitis based on a patient’s history and signs and symptoms
2. Treat with appropriate medications while educating patients about ways to minimize recurrence and cross-infection
3. Recognize which patients with infectious conjunctivitis, and other ocular issues, should be referred to an ophthalmologist

Overview of Infectious Conjunctivitis
Primary care clinicians are often the first to encounter patients with eye problems such as the red eye. Conjunctivitis is the most common cause of red eye. It is of paramount importance for clinicians to properly identify and treat infectious conjunctivitis patients in order to prevent epidemic spread. This program will update you on the most important diagnostic and therapeutic advances in managing infectious conjunctivitis. This program will also review some important aspects of the eye exam and how primary care clinicians can confidently care for the red eye patient.
Background

Primary care clinicians (PCPs) are often at the frontline of caring for a myriad of acute care issues including eye disease. Representing 1% to 2% of all patient visits, conjunctivitis is the most common ocular disorder in primary care.\[1,2,3\] A survey showed considerable variability in how PCPs manage the red eye.\[4\] This is not surprising considering the minimal time devoted to ophthalmic education in medical schools and post-graduate training programs.\[5\] To complicate matters, eye diseases are difficult to diagnose because of the complexities involved in performing a proper eye exam. Fortunately, the past few years have become an exciting period in ophthalmology because of new diagnostic modalities and novel medications with increased efficacy and safety.

Providing state-of-the-art ophthalmic care requires PCPs to address the following questions:

- What type of conjunctivitis is present?
- Is the patient contagious?
- When can the patient return to work / school?
- Can the patient be safely treated or be referred to an ophthalmologist?
- What ophthalmic medication(s) can be used to safely and effectively treat conjunctivitis?

Initial History and Workup

To make the correct diagnosis in ophthalmology, the physical eye exam is usually the most important part of the workup. However, asking some key questions during the initial patient history can help narrow the differential diagnosis for the red eye. These questions include:

- How long has the eye(s) been red?
- Is this the first episode or a recurrent problem?
- Is this unilateral or bilateral involvement?
- Has there been contact with another person with a red eye?
- Is the vision affected?
- Is there pain or light sensitivity? These symptoms are not usually seen with infectious conjunctivitis.
- Does the eye(s) itch?
- Is there any ocular discharge?

Important questions to ask to rule out vision and eye threatening emergencies include:

- Does the patient use contact lenses? (rule out corneal ulcer)
- Has the patient undergone previous eye surgery? (rule out endophthalmitis)
- Has there been any associated ocular trauma? (rule out ruptured eye / globe)

Eye Exam

Primary care clinicians (PCPs) should develop a routine checklist for the eye exam in order to recognize the key signs of a dangerous red eye (Tables 1 and 2). Before the eye is examined with a bright light, the visual acuity should be checked in each eye with the best distance glasses worn to correct any refractive error. Any unexplained decreased vision or asymmetrical acuity between the two eyes requires a comprehensive workup to determine the cause.
Table 1

Eye Exam Checklist for Primary Care

- Visual acuity (measure each eye with patient wearing glasses if available)
- Confrontational visual fields
- Pupils (size, symmetry, reactivity, afferent pupillary defect (i.e. Marcus Gunn Pupil noted on swinging flashlight test of pupils)
- Eye motility
- External exam (for proptosis especially)
- Magnifying glass with penlight and cobalt filter to examine the
  - Lids
  - Conjunctiva
  - Cornea (fluorescein staining)
  - Anterior chamber
  - Iris
  - Lens
- Eye pressure
  - Digital palpation
- Direct ophthalmoscope
  - Optic nerve
  - Central retina (fovea)

Table 2

Features of a Dangerous Red Eye

- Severe ocular pain or photophobia (light sensitivity)
- Diminished visual acuity
- Unreactive or irregularly shaped pupil
- Proptosis
- Reduced ocular motility
- Firm eye on palpation
- Corneal epithelial defect with an underlying opacity
- Cornea or scleral perforation
- Cells or fluid seen in the anterior chamber (hypopyon or hyphema)
- Eye remains red after instillation of topical 2.5% phenylephrine (perform this test only if scleritis is suspected)
- Worsening red eye after 3 days of topical therapy

If the patient’s glasses (or contact lenses) are not available, a pinhole cover can be used to approximate the best possible visual acuity (Figure 1). Test the patient’s peripheral vision in each eye by confrontation using your fingers or a small red object. The presence of a scotoma or field defect could suggest underlying neurological disease. The pupils should then be examined for their reactivity, symmetry, and size. Inspect the motility of the extraocular muscles in all directions to rule out muscle restriction or paralysis. Because a slit lamp is not always available in many primary care clinics, a magnifying glass or a Wood’s lamp can be used to examine the eye (Figure 2). Both eyelids should be everted to look for foreign bodies embedded in the conjunctiva. A topical anesthetic drop can be used to facilitate the examination of those patients with severe eye pain.
Repeated use of topical anesthetics can be toxic to the cornea[6] and should never be dispensed for corneal pain management. Topical anesthetics should be locked away because they are prone to abuse theft by patients with chronic eye pain. The cornea is normally transparent and small opacities or foreign bodies can easily be missed if a slit lamp is not used. Fluorescein paper strips help stain the cornea for epithelial defects and perforations when used with a cobalt blue filter on a penlight or a Wood’s lamp. However, they will cause significant discomfort to the conjunctiva if the eye is not first anesthetized. Fluorescein dye premixed with a topical anesthetic (fluorescein sodium 0.25% / benoxinate hydrochloride 0.4%) is typically used by ophthalmologists to examine the red eye. This special fluorescein eye drop (Fluress) provides immediate pain relief while allowing the clinician to simultaneously examine the stained cornea (Figure 3). The anterior chamber (the space between the cornea and the iris) is normally clear and devoid of any blood or inflammatory cells. The presence of any cells, fluid, blood, or debris in the anterior chamber requires further investigation and an ophthalmologist should be consulted (Figure 4).

Finally, inspect both optic nerves and the central retina (fovea) with a direct ophthalmoscope in a dark room. This will help dilate the pupils and improve visualization. The PanOptic ophthalmoscope is a useful alternative for examining the optic nerve, especially in patients with small pupils. The examiner should wear his or her corrective lenses (or contact lenses) and set the direct ophthalmoscope dial to zero before examining the patient. As you approach the patient’s eye, focus on the pupil and turn the dial in the direction that offers the clearest view of the optic nerve.

Figure 1. Pinhole occlusion used to estimate best possible visual acuity
Figure 2. Magnifying glass used to examine the anterior structures of the eye

Figure 3. Fluorescein dye used to stain and examine the cornea

Figure 4. Hyphema: Prolonged blood within the anterior chamber can potentially cause permanent damage to the cornea
Case Study 1: “Pink eye”

A 44-year-old female elementary school teacher presents with 4 days of bilateral red eyes. (Figure 5). She suspects that one of her students came to school with “pink eye” and that she was inadvertantly infected. Initially, her right eye was red, tearing and filled with “stringy” discharge. Now, both eyes have become infected and the eyelids are swollen. She denies any itching symptoms but complains of severe light sensitivity in both eyes. She does not use any contact lenses, has not undergone any previous eye surgery, and there is no history of associated ocular trauma. She has not used any eye drop medications other than over the counter ocular decongestants. She is not sexually active. The visual acuity is 20/50 in each eye.

Figure 5. Bilateral conjunctivitis

1. What is the patient's diagnosis?
   A. Allergic conjunctivitis
   B. Bacterial conjunctivitis
   C. Adenovirus conjunctivitis
   D. Chlamydia conjunctivitis
   E. Unsure – more diagnostic testing required

2. What is the next step in the management of this patient?
   A. Obtain swab of conjunctival discharge and send for adenovirus culture
   B. Prescribe broad-spectrum topical antibiotic
   C. Perform ELISA testing of tear film for adenovirus
   D. Prescribe topical antihistamine-mast cell stabilizer
   E. Isolate the patient from other humans
Discussion - Adenovirus vs. Bacterial Conjunctivitis

Primary care clinicians (PCPs) are often at the frontline of caring for patients who have adenovirus, the most common cause of viral conjunctivitis. The peak season for this virus is during fall. Numerous epidemics have been reported in schools, communities, and hospitals due to failure to recognize and contain this contagious disease.[7] Primary care personnel should practice universal precautions in any patient with acute conjunctivitis to prevent outbreaks within the clinic. Disposable gloves should be used to examine the patient’s eyes. Clinicians must recognize the signs and symptoms of infectious conjunctivitis from noninfectious etiologies. Tearing, redness, and ocular discharge are the hallmark symptoms of infectious conjunctivitis. Itching is usually a symptom of allergic conjunctivitis. Unfortunately, the symptoms of bacterial conjunctivitis and viral conjunctivitis can overlap and a systematic review of the literature revealed that there are no hallmark signs that can help clinicians differentiate the two entities.[8] This diagnostic challenge has caused many clinicians to empirically treat all cases of conjunctivitis with topical antibiotics, regardless of the etiology. This leads to unnecessary antibiotic use, increased resistance and unintended antibiotic complications for patients who really do not need to be treated.

How can PCPs identify adenovirus conjunctivitis? Laboratory diagnosis by viral culture or PCR is timely, costly, and impractical. Previous outpatient screening tests have also lacked sufficient sensitivity and specificity. An ELISA immunochromatographic test (RPS AdenoDetector) approved by the FDA is now available to help clinicians rapidly detect adenovirus particles in the tear film of conjunctivitis patients (Figure 6). This inexpensive test has a reimbursable CPT code and is CLIA waived.

Figure 6. ELISA test for adenovirus from human tear fluid (RPS AdenoDetector)
A result can be obtained in minutes to help identify contagious patients and prevent unnecessary use of topical antibiotics. (Figure 7) A multicenter, prospective study showed that this test had high sensitivity and specificity for rapidly detecting adenovirus in tear fluid from patients with viral conjunctivitis. [9] This inexpensive test has been especially useful for ophthalmologists in reducing adenovirus conjunctivitis epidemics. The American Academy of Ophthalmology’s preferred practice guidelines now lists this test as one possible tool to aid clinicians in screening for adenovirus conjunctivitis. [10]

Upon diagnosis, patients must be isolated and the examination room disinfected. The duration of the infectious period of adenovirus varies from patient to patient depending on the viral strain and the immune system’s ability to clear the virus. The contagious period of adenovirus can vary from as low as one week to as high as five weeks from the initial onset of symptoms. [11] Thus, primary care clinicians must isolate infected patients from others. If the clinician cannot convince the patient to stay home from work or school for a sufficient duration, viral epidemics can occur. Most patients can clear the adenovirus from the eyes without any ocular damage. However, depending on the viral strain and the patient’s immune system, some patients can develop long-term complications such as immune related keratitis (corneal opacities), conjunctival membranes, and corneal scarring – all of which can contribute to vision loss. (Figures 8 and 9) These immune-related complications can persist for years in some patients.

Figure 7. Positive ELISA test for adenovirus conjunctivitis. Two red lines imply the patient is infected and contagious.
Figure 8. Removal of conjunctival membrane with bleeding from a patient with adenovirus conjunctivitis and a severe inflammatory response.

Figure 9. Corneal opacities known as corneal subepithelial infiltrates. These lesions represent an immune-related response to either active or past adenovirus conjunctivitis episode. The lesions can result in reduction in visual acuity.
This is why it is important for clinicians to limit the spread of adenovirus. Advise against direct contact with people and recommend good hygiene practices. Infected patients should have absolutely no physical contact with people, including hand-shaking. Avoid sharing towels, pillows, and utensils. Discourage the infected patient from rubbing their eyes and touching objects such as door knobs or table countertops. Adenovirus particles have been reported to remain viable on non-porous surfaces for weeks.[12] The patient exam room should be thoroughly disinfected after an encounter with an adenovirus patient. There is currently no effective treatment for adenovirus conjunctivitis. Supportive care consists of artificial tears and topical antihistamines. Topical corticosteroids prolong adenovirus shedding. They should only be used if there is an immune-related keratitis and under the guidance of an ophthalmologist. An ophthalmology consultation is required if there is no clinical improvement after 1 week or if the patient develops immune-related ocular complications.

There are no established guidelines on isolation time. Our practice typically recommends patients to remain at home for at least 7 days from the onset of symptoms, avoiding contact with any people. After one week, the patient is re-examined in the office and a repeat ELISA adenovirus tear film test is performed. If the test is negative and there are no ocular symptoms, the patient is can return to work or school. There have been numerous reported outbreaks of adenovirus conjunctivitis within the community. The PCPs play the key role in preventing these epidemics. Patients (and parents) need to be informed how contagious the disease is and the important responsibility they have in not infecting others.

Case Study 2: “Glued-shut eye”
A 19-year-old male college fraternity student presents with a 2 day history of a right red eye (Figure 10). He suspects that he may have developed “pink eye” and was inadvertently infected after a recent college party. He denies any history of sexually transmitted disease. The right eye is red, tearing, and filled with purulent discharge. The discharge has caused his right eye to be “glued-shut” upon awakening. The discharge is not copious and does not drip onto his cheek. He denies any ocular itching or contact lens use. The visual acuity is 20/20 in each eye. Fluorescein staining of the cornea is unremarkable for any pathology. An ELISA test for adenovirus is performed in the right eye and the result is shown (Figure 11).
3. What is the patient’s diagnosis, based on the photos in Figure 10 and 11?
   
   A. Allergic conjunctivitis  
   B. Bacterial conjunctivitis  
   C. Adenovirus conjunctivitis  
   D. Chlamydia conjunctivitis  
   E. Herpes simplex keratoconjunctivitis

4. What topical antibiotic can potentially cause hypersensitivity contact dermatitis and worsening red eye?
   
   A. Macrolide (erythromycin, azithromycin)  
   B. Aminoglycoside (tobramycin, gentamicin, neomycin)  
   C. Polymyxin – trimethoprim B  
   D. Sulfacetamide  
   E. Fluoroquinolone
Discussion – Bacterial Conjunctivitis and Proper Ophthalmic Antibiotic Use

A small cohort study showed that presenting signs of bacterial conjunctivitis may include early-morning “glued” eye, absence of itching, and no history of conjunctivitis.[13] However, it is important to remember that as clinicians, it is still impossible for us to accurately differentiate adenovirus from bacterial conjunctivitis. The ELISA adenovirus tear film detector should be used to rule out adenovirus. It is important to obtain an adequate sample of tear fluid and to use the test properly in order to avoid false negatives. If the test is negative, the diagnosis is assumed to be bacterial conjunctivitis. Bacterial conjunctivitis commonly occurs during the winter season. Both gram-positive and gram-negative organisms cause bacterial conjunctivitis with Haemophilus influenzae and Streptococcus pneumoniae comprising the majority of pediatric conjunctivitis cases.[14] Staphylococcal organisms are the chief cause in adults. Large epidemics of conjunctivitis caused by a nonencapsulated serotype of S. pneumoniae have occurred at a college campus, military facility, and an urban community.[15,16] Because of the availability of topical ophthalmic antibiotics, cultures are usually not performed except in cases of recurrent conjunctivitis or suspected gonorrheal infection.

Broad-spectrum topical antibiotics should be used as first-line therapy because of the diverse pathogens affecting adults and children. A large meta-analysis of five well-controlled clinical trials of topical antibiotics versus placebo showed that bacterial conjunctivitis is a self-limiting disease in both children and adults.[17] No adverse systemic or ocular events (e.g., corneal ulcers) were reported if topical antibiotics were withheld; however, if used early in the course of disease (day 2 through 5), higher clinical and microbial remission rates could be achieved.[16] The American Academy of Ophthalmology currently recommends using a topical broad-spectrum antibiotic for 5 to 7 days which leads to faster clinical recovery and reduces the risk of contagious spread.[9]

Primary care clinicians have many choices when prescribing topical antibiotics. Antibiotics such as aminoglycosides and sulfacetamides should be avoided because of their limited spectrum, corneal toxicity, idiosyncratic hypersensitivity reactions, and increased resistance.[18] Topical aminoglycosides, in particular, are notorious for causing a persistent red eye because of toxicity. They can also cause contact dermatitis in patients (Figure 12). Clinicians should never prescribe aminoglycoside-steroid combinations (tobramycin-dexamethasone, neomycin-dexamethasone, tobramycin-loteprednol) - the dangers of topical steroids are combined with the toxic potential of aminoglycosides.[19,20]

Figure 12 – Contact dermatitis with left red eye caused by topical aminoglycoside exposure.
Topical fourth-generation fluoroquinolones (moxifloxacin, gatifloxacin, besifloxacin) offer broad-spectrum coverage and are very effective in the treatment of bacterial conjunctivitis.[21] They were developed in light of increasing resistance to third-generation fluoroquinolones.[22] Topical fluoroquinolones are often used by ophthalmologists for infection prophylaxis in cataract surgery patients because of their ability to achieve high concentrations in aqueous fluid.[23] They are also popular because of their tolerability and their ability to rapidly clear eye infections especially in contact lens patients.[24] However, there is some evidence that patients exposed to previous fluoroquinolone therapy may develop bacterial flora resistant to future fluoroquinolone use.[25]

Trimethoprim-polymyxin B sulfate is a topical antibiotic with broad-spectrum activity that has been used safely in children.[26] However, this antibiotic requires dosing every 3 hours to achieve therapeutic levels. This frequency could reduce compliance especially for busy patients (or parents). As a result, delayed recovery and slower clearance of the bacterial infection can occur.[27]

Oral azithromycin is a broad-spectrum antibiotic that has been used to treat trachoma and adult inclusion chlamydia conjunctivitis throughout the world. Topical azithromycin has been combined with a bioadhesive polymer that prolongs the bioavailability in tear fluid, making it useful for topical ophthalmic use.[28] The increase in bioavailability permits less frequent dosing, possibly resulting in better compliance and lowering the chance of developing resistance because of skipped doses. This antibiotic may be practical for busy adults and children with working parents; however, its cost may be prohibitive for those without adequate formulary coverage.

It is important to remember that clinicians have many choices for topical antibiotics. Because bacterial conjunctivitis is self-limiting, topical antibiotics should only be used to prevent outbreaks and accelerate clinical recovery. Earlier recovery allows patients to return to work or school much earlier. If the conjunctivitis has persisted for several days or weeks, antibiotics should not be used and other causes sought out (see Case Study 4). Antibiotic costs vary. Antibiotics that have broad-spectrum properties, faster kill rates, and favorable dosing schedules are often more expensive. Regardless of the choice, PCPs must ensure that patients follow the dosing schedule to completion to prevent incomplete therapy and antibiotic resistance. Clinicians should also not indiscriminately dispense topical antibiotics without clinical justification.

Case Study 3: “Recurrent Unilateral Conjunctivitis”

An 8-year-old female presents with a history of a left red eye for the past 3 days. Her eye is tearing and the eye appears red. Mom reports that the patient does not have any itching symptoms and is not rubbing her eyes. Upon awakening the patient is reported to have some crusting and discharge of the eyelids. There is no history of eye trauma and the patient does not use any contact lenses. When you inquire about past episodes of conjunctivitis, the mother states, “It’s funny, she always gets pink eye once or twice a year – and it’s always the left eye!” The patient does not wear any corrective glasses or contact lenses. The visual acuity is 20/20 in the right eye and 20/50 in the left eye. When you examine the child’s left eye with a penlight, she abruptly pulls away because of light sensitivity. The eyelids appear normal without any skin lesions.
5. At this point, the most important part of the eye exam is:
   A. Examining the pupils
   B. Staining the cornea with fluorescein
   C. Measuring the intraocular pressure
   D. Assessing ocular motility and the presence of strabismus / amblyopia
   E. Examining the optic nerve

6. After you apply fluorescein dye to the left eye, what is the patient’s diagnosis (Figure 13)?
   A. Herpes simplex keratitis
   B. Herpes zoster keratitis
   C. Adenovirus conjunctivitis
   D. Corneal abrasion
   E. Corneal ulcer

Figure 13. Fluorescein staining of the left cornea reveals an unusual staining pattern

7. Which of the following medications can exacerbate and worsen the patient’s left red eye?
   A. Topical vasoconstrictor
   B. Topical aminoglycoside
   C. Topical aminoglycoside-steroid combo (drops or ointment)
   D. Topical fluroquinolone
   E. Topical macrolide
Discussion - Herpes Simplex Keratitis and the Dangers of Topical Steroids

Primary herpes simplex infections manifest as vesicular lesions on the eyelids whereas recurrent episodes present with corneal involvement. Patients often have a recurrent, unilateral red eye and may have a history of cold sores or fever blisters. The virus is transmitted by direct contact via saliva and can remain dormant for years in the nerve fibers supplying the cornea and eye. Stress, sunlight, illness, or an immunocompromised condition may cause the virus to reactivate and to scar the cornea resulting in blindness. When the virus is reactivated on the cornea, a tree-like branch called a dendrite can be seen on fluorescein staining (Figure 14). When a dendrite is noted on the corneal surface, topical corticosteroids should never be prescribed as they can accelerate viral replication. Cases of herpes simplex corneal ulceration caused by inappropriate use of topical steroids have been documented.[29] Upon diagnosis of herpes simplex eye disease, the patient should be promptly referred to an ophthalmologist for further management. Topical trifluridine is typically used to treat active herpes simplex cornea epithelial disease. Topical ganciclovir ointment, recently approved by the FDA, has emerged as a new treatment alternative for primary and recurrent herpes simplex keratitis. Long-term use of oral acyclovir is used to prevent future flare-ups of ocular herpes simplex infections.[30]

Ophthalmologists routinely use topical corticosteroids to treat a multitude of inflammatory eye conditions such as anterior uveitis. However, PCPs should never dispense topical corticosteroids. These medications can cause cataracts and glaucoma without proper slit lamp and eye pressure monitoring by an ophthalmologist.[31] Topical corticosteroids can also exacerbate viral and fungal eye infections that can masquerade as conjunctivitis in the primary care setting.[18] Also avoid using topical combination corticosteroid-antibiotics because they contain aminoglycosides that can cause further ocular toxicity with prolonged use.[19]
Case Study 4: “Persistent red eyes”

A 50-year-old male presents with a six-week history of bilateral red eyes, discharge, and eyelids sticking in the morning (Figure 15). His eyes feel gritty and he has tried a multitude of eyedrops including topical vasoconstrictors, artificial tears, antibiotics, and antihistamine drops prescribed by several primary and urgent care clinicians and optometrists, all of which do not offer relief. He does not work contact lenses and denies having any history of systemic allergies. The patient is sexually active and has multiple partners. He has never traveled outside the United States. Prior to this six-week history, he never had eye problems. Visual acuity is 20/20 in each eye, and on exam, he noticed that both eyes were red but the corneas appeared normal on fluorescein staining. There is scant, nonpurulent discharge noted in each eye.
Figure 15. Bilateral chronic conjunctivitis greater than 6 weeks

8. The most reasonable course of action for this patient is to
   A. Prescribe a broad-spectrum, non-toxic antibiotic
   B. Prescribe a short course of topical steroid
   C. Obtained a conjunctival swab and test for Chlamydia (Immunofluorescence test, DNA probe, or culture)
   D. Initiate oral antibiotic therapy appropriate for the suspected organism
   E. Refer the patient to an ophthalmologist

Discussion - Chronic Conjunctivitis
When a patient presents to your office with chronic conjunctivitis, it is most important to eliminate any external factors that could be contributing to the red eyes. Prolonged contact lens wearing time, chronic use of topical vasoconstrictors or aminoglycosides, and external chemical agents can all contribute to chronic conjunctivitis. Once these causes have been eliminated, the diagnosis of chlamydial inclusion conjunctivitis should be considered. This condition can masquerade as a persistent red eye(s) that lasts for weeks and fails to respond to any topical antibiotic therapy. This should be suspected in any patient who is sexually active and exposed to partners who may be infected. Ancillary testing such as conjunctival culture or direct immunofluorescence is required to rule out chlamydial conjunctivitis. It would also not be unreasonable to refer this patient to an ophthalmologist. In general, any patient with chronic conjunctivitis that does not resolve should be referred to an ophthalmologist. The patient can be treated with either a single dose of azithromycin or a seven-day course of oral doxycycline or erythromycin. Topical erythromycin ointment or azithromycin drops are also used for approximately 2-3 weeks as well to help eradicate the infection. It is most important that the patient's sexual partners be evaluated and treated as reinfection can occur.

Case Study 5 – "Burning, tearing, crusty red eyes"
A 72-year-old male presents to your office with a long chronic history of bilateral red eyes, crusting around the eyelids upon awakening, foreign body sensation, tearing, and burning. The
symptoms are worse especially upon awakening. He states he has had these symptoms for years and is seen a multitude of doctors who cannot help him. He denies any contact lens use and any topical vasoconstrictor use. He has tried numerous topical antibiotics and antihistamines which offer no relief. When you examine his eyes he noticed the patient has a lot of debris (dander) on his eyelashes and both conjunctiva are injected (Figure 16).

**Figure 16. Bilateral red, crusty eyelids**

9. **What is the patient's most likely diagnosis?**
   A. Allergic conjunctivitis
   B. Bacterial conjunctivitis
   C. Chlamydial conjunctivitis
   D. Blepharitis
   E. Chemical conjunctivitis

**Discussion – Blepharitis**

Ocular blepharitis is a common, chronic affliction that is seen particularly in seniors. The condition is multifactorial and can be associated with rosacea. Patients may also have over-colonization of bacteria on the eyelids. The underlying problem involves the production and composition of the meibomian gland secretions within the eyelids. The meibomian gland secretions in a younger patient are usually liquid and easily expressed out of the meibomian
In patients with long-standing blepharitis, the meibomian gland secretions from the eyelids have an altered chemical composition in which the secretions behave like molasses (Figure 17). The secretions cannot be expressed and can clog the glands within the eyelids. This can cause in styes. When the secretions leak from the glands into the surrounding eyelid connective tissue, this results in a chalazion. A chalzaion is a granulomatous reaction that occurs in response to the leaked meibomian gland secretions into the eyelids. Meibomian gland secretions also produce a lipid layer that stabilizes the tear film. The absence of the secretions leads to evaporative tear loss - all of which contribute to dry eye symptoms. As a result many patients with blepharitis also suffer from dry eye syndrome.

Figure 17. Meibomian gland dysfunction – a common finding in blepharitis patients

The mainstay of blepharitis therapy involves daily lid hygiene and warm compresses. This helps prevent the meibomian glands from being clogged and allows the secretions within the glands to be expressed. The patient should also use frequent preservative free artificial tears which lubricates the corneas and prevents damage. Patients may also need to take long-term tetracycline or doxycycline therapy. These antibiotics are used not for their antimicrobial properties but more so for their ability to stabilize the meibomian gland secretions and allow them to be easily expressed from the eyelids. Some patients may benefit from the short-term use of a topical, non-toxic antibiotic ointment to help treat any bacteria over-colonization on the eyelids. Because blepharitis is chronic and difficult to treat, patients are often referred to an ophthalmologist for specialty care. Nevertheless, it is important for PCPs to be aware of the different clinical presentations between blepharitis and infectious conjunctivitis. Blepharitis affects many senior patients and many of them have been mistakenly treated for infectious conjunctivitis.
One final but important point about blepharitis is that it is almost always a bilateral condition. CPs should be aware of sebaceous cell carcinoma of the eyelid that can occasionally masquerade as unilateral blepharitis in a senior patient. (Figure 18) These patients should be identified and referred promptly to an ophthalmologist.

Figure 18. Sebaceous cell carcinoma – this can masquerade as a unilateral blepharitis or chalazion

Case Study 6: Hyperacute purulent conjunctivitis

A 21-year-old male presents to your office with significant, purulent ocular discharge that drips to his cheeks for the past 24 hours. (Figure 19). He does not wear contact lenses and has not suffered any ocular trauma. The visual acuity is 20/100 in each eye. The eyelids and conjunctiva are swollen with yellow, purulent discharge. The cornea appears normal in both eyes by fluorescein staining. The preauricular lymph nodes appear very tender and enlarged. The patient admits to having a history of sexually transmitted disease. The patient is very agitated and would like to leave the office immediately after your treatment.
10. What is the most important step in the management of this patient?
   A. Obtain a STAT gram stain of the ocular discharge
   B. Check for concomitant chlamydial infection
   C. Hospitalize the patient and begin intravenous antibiotics for presumed organisms
   D. Urgent ophthalmology consultation
   E. Prescribe hourly topical antibiotics appropriate for presumed organisms on an outpatient basis

Gonococcal Conjunctivitis

When a patient presents with sudden, hyperacute purulent conjunctivitis, the diagnosis of gonococcal conjunctivitis must be ruled out. This should be suspected especially if the discharge is purulent and literally dripping on the patient’s cheek (Figure 19). The ocular discharge of nongonococcal conjunctivitis is usually not this severe and copious and can be managed with topical antibiotics as an outpatient. A past history of sexually transmitted disease exposure should also tip the clinician for the possibility of gonococcal conjunctivitis. Outpatient management, however, would not be appropriate in this patient as this condition is a medical ophthalmic emergency. A gram stain of the discharge would reveal Gram-negative intracellular diplococci indicative of Neisseria gonorrhoeae. The most important thing the clinician can do for this patient is to educate him on the risk of corneal perforation if he is not hospitalized. Neisseria species can rapidly penetrate an intact cornea, infect the internal eye, and cause a corneal perforation if left untreated within 24 hours.[33] These complications can lead to blindness and even loss of the patient’s eye.

The treatment of this gonococcal conjunctivitis is different from other causes such as Streptococci and Haemophilus species. Systemic intravenous antibiotics are required rapidly.
achieve therapeutic levels in the eye. This patient must be hospitalized and monitored to prevent the development of a corneal perforation. The patient should also be treated with frequent broad-spectrum topical antibiotics and saline irrigation to reduce the bacterial load in the conjunctiva.

Finally, the patient should be tested for HIV and be treated for chlamydia because of the high rate of coinfection. Any sexual partners should receive medical attention. Good clinician-patient communication is absolutely essential in educating this patient and preventing him from going blind.

**Case Study 7: Painful red eye in a soft contact lens wearer**

A 19-year-old college student presents to your office complaining of eye pain upon awakening. The patient admits to regularly wearing her soft contact lens while sleeping against the advice of her ophthalmologist. The right eye reveals significant conjunctival injection and some mild discharge. Fluorescein staining reveals a large defect in the central cornea with an underlying white haze (Figure 20). The visual acuity is only “counting fingers” at 1 foot.

**Figure 20. Painful red eye in a soft contact lens wearer.**

11. **What is the patient’s diagnosis?**
   - A. Herpes simplex keratitis
   - B. Corneal abrasion
   - C. Bacterial keratitis (corneal ulcer)
   - D. Giant papillary conjunctivitis
   - E. Acute uveitis
Discussion - Contact Lens Related Eye Complications

Any corneal epithelial defect with an underlying white “opacity” is considered to be a corneal ulcer (infectious keratitis) until proven otherwise. There is a high incidence of *Pseudomonas aeruginosa* and *Acanthamoeba* corneal ulcers in patients who sleep in contact lenses.[34,35,36] The American Academy of Ophthalmology discourages the use of extended-wear, overnight contact lenses because of the risk of bacterial keratitis.[37] The treatment of a corneal ulcer includes discontinuing the use of contact lenses and starting hourly topical fortified broad-spectrum antibiotics. The risk of developing a scar or perforation is high because the microbial enzymes can rapidly melt the cornea if the ulcer is left untreated. Topical corticosteroids are contraindicated in the presence of infectious corneal ulcers as they may accelerate further melting of the cornea. The cornea should be stained with fluorescein, and a cobalt blue light should be used. If there is an underlying white opacity within the corneal epithelial defect, the patient has a corneal ulcer and should be promptly referred. If the cornea is transparent within the fluorescein defect, the patient has a minor abrasion that can be safely treated with a topical fluoroquinolone (Figures 21A and 21B). PCPs should also inquire about the patient’s contact lens hygiene. Certain contact lens cleaning solutions have recently been withdrawn because of reported cases of *Fusarium*[38] and *Acanthamoeba*[39] keratitis. The contact lens, case, and cleaning solution must be saved for potential laboratory culture when the patient is referred to the ophthalmologist.

*Figure 21A. Corneal abrasion. Fluorescein dye shows the extent of the corneal defect*
Figure 21B. Corneal abrasion – same patient as Figure 21A. Note that the area within the defect is relatively transparent and not opaque. This abrasion has not yet developed into an infectious ulcer.

Case Study 8: The Infected Child and the Defiant Mom

A 6-year-old child is seen in your office with a two-day history of right eye conjunctivitis (Figure 22). The visual acuity is 20/40 in the right eye and 20/20 in the left eye. ELISA testing (RPS Adenodetector) of the patient’s tears is positive for adenovirus. You recommend to the mother and that the patient use artificial tears 6-8 times a day and a topical antihistamine twice daily for symptomatic relief until the virus clears. You advise the child to remain home from school and avoid contact with other humans for the remainder of the week. The patient’s mother is insistent upon the child returning to school because of financial hardship. She is a single working parent and cannot stay at home to care for him. The mother also requests a prescription for a topical antibiotic that she believes will help clear the eye infection.

Figure 22.
12. At this point you should,
   A. Abide by the patient’s wishes and write a note allowing the child to return to school 2 days later
   B. Refer the child (and parent) to another colleague for a 2nd opinion
   C. Educate the parent about the dangers of spreading the virus to the other unaffected eye, to other family members, and to other classmates or teachers
   D. Prescribe a topical antibiotic and tell him to return to school in 3 days
   E. Contact child protective services

13. Which of the following diseases do not have a FDA-approved therapy?
   A. Herpes simplex keratitis
   B. Bacterial conjunctivitis
   C. Adenovirus conjunctivitis
   D. Chlamydia conjunctivitis
   E. Herpes zoster ophthalmicus

After your lengthy conversation and extensive counseling, the parent agrees to keep the child home from school. You see the patient the following week and the right eye no longer has any discharge but it remains faintly red. The left eye is unaffected. The parent reports that no other family members or friends have developed a red eye. The mother is concerned that the child may still be contagious.

14. At this point you should,
   A. Perform repeat ELISA test for adenovirus in the patient’s tears.
   B. Prescribe a topical antibiotic for possible bacterial infection
   C. Prescribe a topical antibiotic-steroid to cover all the bases
   D. Prescribe a topical steroid for possible immune related keratitis
   E. Refer the patient to an ophthalmologist

Discussion – Isolating the Infected Patient and Preventing Epidemic Outbreaks
If the test is negative and the patient no longer has symptoms, the patient can return to work or school without the risk of infecting others. If the test remains positive, the patient must stay at home. Again, it is important to remember that adenovirus can be contagious from 1-5 weeks from the initial presentation of symptoms.[10] This depends on the strain of the virus and the patient’s immune system response. Some patients can develop an immune related keratitis in which the vision can be affected by the presence of corneal opacities known as subepithelial infiltrates (Figure 9). Some patients can also develop conjunctival membranes which could potentially bleed and cause ocular scarring (Figure 8). In these cases the patient may require topical steroids to treat the adenovirus immune related ocular complications. However, at this point, these patients must be referred to an ophthalmologist for further management.

The most important thing that primary care clinicians can do is to limit the spread of adenovirus within the community. By limiting the infection to a single patient, other humans can be spared of the ocular complications caused by the virus. The RPS Adenodetector is a valuable, inexpensive tool that can help patients understand how contagious they are. Currently, there is not an FDA approved treatment for adenovirus conjunctivitis. Topical antibiotics have no effect on adenovirus. Inappropriate antibiotic use simply increases the risk of
resistance and may even expose the patient to an antibiotic adverse reaction. There have been reports of using dilute topical povidone-iodine to treat adenovirus. However, this is not routinely used by ophthalmologists because of the concern of corneal toxicity from direct contact with povidone-iodine and the lack of clinical data. It is possible that there will be a topical antiviral medication approved for adenovirus in the near future. For the current time, clinicians must wait for the virus to run its course in patients and prevent other humans from becoming infected.

Working With Your Friendly Neighborhood Ophthalmologist
Primary care clinicians should never hesitate to consult an ophthalmologist when the diagnosis is in question or when examining the eye is difficult. It is highly recommended that you spend a day or even a week with an ophthalmology colleague in their office. This is an excellent opportunity to gain confidence in managing eye diseases. More importantly, the primary care clinician will finally acquire the proper skills necessary to perform a proper eye exam using a slit-lamp, ophthalmoscope, and basic equipment found in most clinics. An increased recognition of red eye emergencies by primary care clinicians will result in improved patient care that ultimately restores and preserves eyesight. An increased understanding of conjunctivitis will result in fewer infectious epidemics and reduced antibiotic use and complications such as toxicity and resistance. Primary care clinicians can be the gatekeepers in reducing health care costs by appropriately managing the red eye.

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References


