
CHAPTER 8 – EYES

First Nations and Inuit Health Branch (FNIHB) Pediatric Clinical Practice Guidelines for Nurses in Primary Care.
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For more information on the history and physical examination of the eyes in older children and adolescents, see the chapter “Eyes” in the adult clinical guidelines.

ASSESSMENT OF THE EYES

HISTORY OF PRESENT ILLNESS AND REVIEW OF SYSTEMS

GENERAL

The following characteristics of each symptom should be elicited and explored:

- Onset (gradual or sudden)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency and duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effect on daily activities
- Previous diagnosis of similar episodes
- Previous treatment
- Efficacy of previous treatment

CARDINAL SYMPTOMS

- Visual changes (recent)
- Blurring
- Pain
- Irritation
- Foreign-body sensation
- Photophobia
- Diplopia
- Lacrimation
- Itching
- Discharge
- Corrective measures (glasses, contact lenses)

OTHER ASSOCIATED SYMPTOMS

- Ear pain
- Nasal discharge
- Sore throat
- Cough
- Nausea or vomiting
- Rash
- Fever
- Pain or inflammation of the joints (or both)
- Associated cough (for example, whooping cough)

MEDICAL HISTORY (SPECIFIC TO EYES)

- Eye diseases or injuries (signs of abuse and violence; history of injury to neck and face)
- Eye surgery
- Use of corrective eyeglasses or contact lenses
- Concurrent upper respiratory tract infection
- Immunocompromise from other illness or medications
- Environmental exposure to eye irritants
- Systemic inflammatory disease (for example, juvenile rheumatoid arthritis, Reiter's syndrome)
- Diabetes mellitus type 1
- Cataracts
- Bleeding disorders
- Allergies (especially seasonal)
- Current medications that could cause eye symptoms (for example, dry eye caused by isotretinoin, oral contraceptives or tricyclic antidepressants)

PERSONAL AND SOCIAL HISTORY (SPECIFIC TO EYES)

- Concerns reported by parent, caregiver or teacher about child's vision (for example, squinting, headaches caused by reading)
- Use of protective eyewear for sports and other activities
- Housing and sanitation conditions
- School or daycare exposure to contagious organisms (for example, pink eye)

GENERAL PHYSICAL EXAMINATION

Examine the bony orbit, lids, lacrimal apparatus, conjunctiva, sclera, cornea, iris, pupil, lens and fundi.

Note the following:

- Visual acuity
- Swelling
- Discharge or crusting
- Discolouration (erythema, bruising or hemorrhage)
- Position and alignment of eyes in relation to ears
- Corneal light reflex test, cover-uncover test (for example, strabismus, *see the section “Strabismus”*)
- Reaction of pupil and its accommodation to light
- Extraocular movements
- Visual fields by confrontation
- Corneal clarity, abrasions and lacerations
- Lens opacities (cataracts)
- Red reflex
- Hemorrhage or exudate of retina
- Optic disk and retinal vasculature

Palpate the bony orbit, eyebrows, lacrimal apparatus and pre-auricular lymph nodes for tenderness, swelling or masses. Do not palpate the globe if rupture injury is suspected or if the client has recently undergone eye surgery.

Apply fluorescein stain to test for corneal integrity. After application of fluorescein stain, corneal cells that have been damaged or lost will stain green; cobalt blue light allows easier visualization of the abrasion. Note: Remove contact lenses prior to application. Look for foreign body in lower eyelid and sclera.

An ear, nose and throat (ENT) examination, including the lymph nodes of the head and neck, should also be performed if there are symptoms of a systemic condition such as viral infection.

An abdominal, genitourinary and rectal exam should be completed if eye symptoms are associated with symptoms of a sexually transmitted disease.

A musculoskeletal system and extremities exam should be completed if eye symptoms are associated with joint symptoms.

PEDIATRIC VISION SCREENING^{1,2,3}

Screen all children for vision abnormalities. Screening should include the techniques included in each age category below. Any abnormalities should result in physician consultation.

NEWBORN TO 3 MONTHS OF AGE⁴

- A complete examination of the skin and external eye structures, as well as the conjunctiva, cornea, iris and pupils, is an integral part of the physical examination of all newborns, infants and children
- The retina should be inspected (by means of the red reflex) for opacities of the lens (cataracts) and signs of posterior eye disease (retinoblastoma). Look for symmetrical colour between eyes and for any opacities or any inconsistencies in the redness of each retina
- Failure of visualization of the retina or abnormalities of the red reflex are indications for urgent referral to an ophthalmologist
- Corneal light reflex should be done to test ocular alignment (misalignment = strabismus); if abnormal, a referral to an ophthalmologist is necessary (*see “Tests for Strabismus” in the chapter “Pediatric Prevention and Health Maintenance”*)

6–12 MONTHS OF AGE

- Examination as for newborn to 3 months of age
- Cover-uncover test to test ocular alignment. It should be normal (*see “Tests for Strabismus” in the chapter “Pediatric Prevention and Health Maintenance”*); otherwise refer to an ophthalmologist
- Observe fixation and following a target

3–5 YEARS OF AGE

- Examination as for 6–12 months of age
- Visual acuity testing (*see “Visual Acuity Testing” in the chapter “Pediatric Prevention and Health Maintenance”*)

6–18 YEARS OF AGE

- Examination as for 6–12 months of age
- Visual acuity testing every 2 years until 10 years of age, then every 3 years until 18 years of age (*see “Visual Acuity Testing” in the chapter “Pediatric Prevention and Health Maintenance”*)

OTHER SUGGESTED SCREENING TECHNIQUES

Birth to 4 Months of Age (Near-Visual Acuity)

Observe child and ensure that the following occur:

- Regards face (of examiner or mother) in line of vision
- Follows object or light to midline

- Follows object or light past midline
- Follows object or light through 180°
- Grasps rattle or interesting object when offered
- Reaches toward an object placed in line of vision

COMMON PROBLEMS OF THE EYE

BLEPHARITIS

Inflammation of the eyelid margins.

TYPES

- *Anterior* affects the skin, cilia follicles and/or the accessory glands of the eyelids
- *Posterior* involves inflammation or infection of the meibomian glands

CAUSES

Anterior

- Seborrhea or bacterial infection (with *Staphylococcus aureus*)
- Rosacea, dry eye syndrome, lice infestation of the lashes

Posterior

- A build-up of keratin plugging the glands

HISTORY

- Burning, itching or irritation of lid margin
- Condition commonly chronic, with frequent exacerbations
- Usually bilateral
- History of seborrhea (of the scalp, brows or ears)
- Loss of lashes

PHYSICAL FINDINGS

- Lid margin red, scaly
- Crusting at base of lashes may be present
- Lashes may grow inward
- Visual acuity normal

- PERLLA (pupils equal, round, reactive to light; accommodation normal)
- Conjunctival redness may be present

Bacterial Form

- Dry scales
- Lid margin red
- Ulceration may be present
- Lashes tend to fall out

Seborrheic Form

- Greasy scales
- Lid margins less red
- No ulceration

Mixed Form

- Dry and greasy scales
- Lid margins red
- Ulceration may be present

DIFFERENTIAL DIAGNOSIS

- Allergic blepharitis
- Dry eye syndrome (keratoconjunctivitis sicca)
- Hordeolum (stye)
- Chalazion
- Conjunctivitis
- Skin cancer (unilateral) (for example, sebaceous cell carcinoma)

COMPLICATIONS

- Secondary bacterial infection common in seborrheic form
- Recurrence, possibly chronic
- Hordeolum (stye)
- Chalazion

DIAGNOSTIC TESTS

- Swab exudate for culture and sensitivity (do only if there is no response to empiric treatment)

MANAGEMENT

Goals of Treatment

- Keep lid margin clean and free of scaly build up
- Prevent infection

Appropriate Consultation

Consult a physician if the inflammation or infection is extensive (that is, includes more than the lid margins), as in orbital cellulitis.

Treat for several weeks, until the blepharitis is completely gone, to reduce chance of recurrence.

Nonpharmacologic Interventions

Eyelid Hygiene:

Twice daily, apply warm compresses for 5 minutes to soften the scales and crusts. Massaging the lid edge (start at inner edge, near the nose moving toward the ear) with a circular motion may improve secretion and help loosen scales and crusts. Next, using a folded gauze, gently scrub the eyelid margin and the bases of the eyelashes with a solution of water and baby shampoo (90 mL [3 oz] water and 3 drops of shampoo). Rinse with clear water and remove lid debris with a dry, cotton-tipped applicator. Advise patients to avoid rubbing eyelids and exposure to wind, smoke, cosmetics or other irritants. Contact lenses should not be worn during treatment.⁵

If nits and lice are present in the eyelashes, they can be carefully removed from the eyelashes with tweezers followed by application of white petrolatum two to four times daily for 10 days.⁶

Client Education

- Counsel client about appropriate use of medications (dose, frequency, application)
- Instruct client in proper hygiene of eyelids
- Recommend that client avoid rubbing or irritating eyelids
- Recommend avoidance of cosmetics, wind, smoke and other irritants
- If chronic blepharitis is present, daily eyelid hygiene is recommended⁵ (see “Eyelid Hygiene”)

Pharmacologic Interventions

Apply a topical antibiotic eye ointment to the lid margins and into the lower conjunctival sac:

erythromycin (Diomycin), 0.5% eye ointment, 1.25 cm qhs for 6–8 weeks^{7,8}

Identify and manage underlying seborrhea (scalp, eyebrows or other skin areas).

Monitoring and Follow-Up

Follow up in 10–14 days.

Referral

Usually not necessary unless there is no response to therapy or if infection becomes more extensive (for example, orbital cellulitis).

CHALAZION

See “Eyes,” in the adult clinical practice guidelines for detailed information on the clinical presentation and treatment of chalazion. Treatment is the same for children and adults.

CONJUNCTIVITIS

Inflammation of the conjunctival membrane of the eye. This is one of the most common causes of red eye in children.

See also “Conjunctivitis” in the adult chapter “Eyes” for detailed information on the clinical presentation.

CAUSES

Viral or bacterial conjunctivitis is common in children.

The allergic form is more common in adolescents (see “Conjunctivitis” in the adult chapter “Eyes”).

Bacterial Pathogens

- *Chlamydia*
- *Haemophilus influenzae* (non-typable)
- *Neisseria gonorrhoeae*
- *Staphylococcus aureus*
- *Streptococcus pneumoniae*
- In an adolescent, gonococcal or chlamydial infection should be considered if the history is supportive of this diagnosis and the adolescent is sexually active

Viral Pathogens Adenovirus

- Enterovirus
- Epstein-Barr virus and herpes zoster virus (less common)
- Measles and rubella viruses

HISTORY

- Eye red and itchy
- Discharge or sticky eye common upon waking in the morning
- Sensation like that of sand in the eye
- Commonly, a viral URTI has preceded the eye infection
- Complicating bacterial infections, such as otitis media, may be evident
- Perform a general assessment if the child appears systemically ill (for example, fever)

Children with mild viral or superficial bacterial conjunctivitis do not usually have significant systemic symptoms.

PHYSICAL FINDINGS

- Assess both eyes for symmetry
- Carefully document all evidence of external trauma
- Assess visual acuity and pupillary reaction, essential for measuring improvement or deterioration – both should be normal
- Examine the anterior segment of the globe with a small penlight, and use a fluorescent stain to assess for corneal abrasion or ulcers if history or physical findings suggest corneal abrasion
- Assess ocular mobility by checking range of movement
- Check for reddened conjunctiva (unilateral or bilateral)
- Check for discharge (purulent, watery, milky), which is usually present
- Check for white granules (phlyctenules) on the edge of the cornea surrounded by erythema
- Pre-auricular adenopathy may be present in viral and gonococcal conjunctivitis⁹

DIFFERENTIAL DIAGNOSIS

- Infectious conjunctivitis
- Trauma
- Foreign body
- Corneal abrasion
- Blepharitis
- Allergic conjunctivitis
- Keratitis
- Glaucoma
- Uveitis (iritis)
- Preseptal or orbital cellulitis
- Measles-associated conjunctivitis

COMPLICATIONS

- Spread of infection to other eye structures
- Spread of infection to others

DIAGNOSTIC TESTS

- Measure visual acuity if > 3 years old
- Swab any drainage for culture and sensitivity only if there is no resolution of symptoms after an empiric course of treatment

MANAGEMENT**Goals of Treatment**

- Relieve symptoms
- Rule out more serious infections (for example, uveitis)
- Prevent complications
- Prevent spread of infection to others

Appropriate Consultation

Consult a physician immediately if any of the following occur:

- Significant associated eye pain
- Any deficit in visual acuity or colour vision
- Suspicion of another more serious cause of red eye
- Evidence of preseptal or orbital cellulitis
- No improvement after 48–72 hours of empiric treatment
- Chickenpox on the face
- Suspicion of gonorrhoea or chlamydial conjunctivitis, either of which requires systemic antibiotics; see also the most recent “*Canadian Guidelines on Sexually Transmitted Infections*”¹⁰ (available at: <http://www.phac-aspc.gc.ca/std-mts/sti-its/guide-lignesdir-eng.php>)

Nonpharmacologic Interventions

Client Education¹¹

- Supportive care and good hygiene for both forms of infectious conjunctivitis
- Cleansing of eyelids up to 4 times/day by application of cool, clean compresses of saline or plain water
- Teach cleansing the affected eye by whipping from the inner canthus outward using a single tissue or cotton ball. The use of a solution of water and a no-tear baby shampoo (90 mL [3 oz] water and 3 drops of shampoo) may be used to clean eyelashes
- Avoid sharing personal items; use separate facecloth and towels and ensure frequent hand-washing
- Advise regarding both forms of conjunctivitis being highly contagious for the first 48–72 hours
- For bacterial form: limit school or daycare contact for 24–48 hours after treatment is initiated
- For viral form: the condition may last for 2 weeks
- For allergic form: recommend that child avoid going outside when pollen count is high and that protective glasses be worn to prevent pollen from entering the eyes
- Do not allow client to use an eye patch

Pharmacologic Interventions

Never use steroid or steroid-and-antibiotic combination eye drops, because the infection may progress or a corneal ulcer may rapidly form and cause perforation.

Bacterial Conjunctivitis:¹²

Topical antibiotic eye drop to both eyes:

polymyxin B/gramicidin (Polysporin) eye drops
1 drop qid for 5–7 days¹³

or

erythromycin 0.5% eye ointment, 1.25 cm applied
qid for 5–7 days¹³

An antibiotic eye ointment may be used if drops are too difficult to instill or may be used at bedtime in addition to the antibiotic eye drops used during the day.

These treatments should not be used for gonorrheal or herpetic eye infections, for which urgent physician consultation is required.

Viral Conjunctivitis:

Antibiotics are not helpful and are not indicated. Cool saline compresses and/or artificial tears 4–8 times a day as needed¹⁴ often provide excellent symptomatic relief.

Allergic Conjunctivitis:

Cool compresses often provide excellent symptomatic relief (antibiotics are not helpful and are not indicated). Artificial tears used during the day can help to remove and dilute allergens.

Topical antihistamines may be helpful if symptoms are not relieved by cool compresses. Topical antihistamines have a quicker onset than mast cell stabilizers which can take up to 5–14 days for effect.

If symptoms are severe, consult a physician before using oral antihistamines. Pediatric dosage is age related:

Children 6–12 months: cetirizine (Reactine),
2.5 mg once daily

Children 12–23 months: Initial: cetirizine, 2.5 mg
once daily; dosage may be increased to 2.5 mg
twice daily

Children 2–5 years: cetirizine 2.5 mg/day; may be
increased to a maximum of 5 mg/day

Children 6 years to adult: cetirizine 5–10 mg/day
once daily

Other second-generation antihistamines may also be appropriate choices (for example, loratadine [Claritin]).

Monitoring and Follow-Up

Follow up appropriately in 2 or 3 days, or sooner if symptoms worsen.

Referral

Referral is indicated under the following circumstances:

- The diagnosis is in doubt and significant ocular infection (for example, uveitis) cannot be ruled out
- There is associated trauma
- Visual acuity is decreased
- There is significant associated ocular pain
- The child's condition deteriorates or the symptoms persist despite treatment
- The condition recurs frequently
- Chickenpox on the face

HORDEOLUM OR STYE

An external hordeolum is an acute infection of a hair follicle of an eyelash, a Zeis (sebaceous) gland or a Moll (apocrine sweat) gland of the eyelid. An internal hordeolum is an inflammation of the meibomian gland, generally of the upper lid. A hordeolum that does not resolve and forms granulation tissue is better known as a chalazion (*see* “Chalazion”).

TYPES

Internal:

- Points inward toward the palpebral conjunctiva
- Usually larger than external hordeolum

External:

- Most common presentation
- Points to skin surface at the lid margin

CAUSES

- Bacterial infection (*Staphylococcus aureus*)

HISTORY

- Pain
- Swelling of eyelid
- Redness of eyelid
- Vision not affected
- Similar eyelid infection in the past

PHYSICAL FINDINGS

- Localized redness and swelling of eyelid
- Mild conjunctival injection
- Possible purulent drainage along the lid margin
- Acutely tender
- Pre-auricular adenopathy may be present

DIFFERENTIAL DIAGNOSIS

- Chalazion
- Blepharitis
- Dacryocystitis
- Orbital cellulitis

COMPLICATIONS

- Conjunctivitis
- Orbital cellulitis

DIAGNOSTIC TESTS

- Swab any drainage for culture and sensitivity if recommended by a physician or nurse practitioner

MANAGEMENT

Goals of Treatment

- Relieve symptoms
- Prevent spread of infection to other eye structures

Appropriate Consultation

Usually not necessary for simple stye. Should a chalazion develop and not resolve after a 6-week period, this may require an ophthalmological referral for a surgical excision and drainage.

Nonpharmacologic Interventions

Apply warm, moist compresses for 15 minutes qid.

Client Education

- Stress importance of not squeezing the hordeolum
- Teach the client eyelid hygiene: wash eyelid with mild soap and water; use a single tissue or cotton ball or a separate area of washcloth for each eye (*see* “Eyelid Hygiene” in the section “Blepharitis”)
- Stress importance of washing hands to prevent spread of infection
- Recommend avoidance of cosmetics during acute phase (current eye cosmetics should be discarded because they may harbour bacteria and cause recurrent infection)
- Client should not wear contact lenses until infection clears
- Counsel client about appropriate use of medications (dose, frequency, application)
- Stress importance of follow-up if symptoms do not improve with treatment or if inflammation extends to involve the periorbital tissues
- Educate about and stress the importance of not contaminating medication tube

Pharmacologic Interventions

External hordeolum:

Although hordeola are frequently treated with topical antibiotics there is little evidence that these are helpful in promoting healing.¹⁵

If inflammation persists with a conservative treatment of warm compresses consider:

erythromycin 0.5% eye ointment, 1.25 cm qid for 5–7 days

or

polymyxin B /gramicidin (Polysporin) eye drops, 1 drop qid for 5–7 days

Those experiencing frequent hordeola in the setting of rosacea-associated blepharitis may benefit from a topical antibiotic/corticosteroid ointment combination.⁷ Discuss this with a physician.

Internal hordeolum:

Systemic anti-staphylococcal antibiotics (for example, cloxacillin, amoxicillin/clavulanic acid) may be needed to treat the internal type because they rarely drain spontaneously. Consult a physician for dosage.

Monitoring and Follow-Up

Follow up in 3–4 days if symptoms do not respond; follow up sooner if infection spreads.

Recurrent hordeolum may result from a refractory error of the eye and will require optometric or ophthalmologic evaluation.

Referral

Consult a physician if the lesion does not respond to nonpharmacologic interventions or if there is evidence of infection of the periorbital soft tissue.

NASOLACRIMAL DUCT OBSTRUCTION (DACRYOSTENOSIS)

A congenital disorder of the lacrimal system characterized by blockage of the nasolacrimal duct and resulting in excessive tearing and mucopurulent discharge from the affected eye. The condition occurs in approximately 2–6% of newborns. Onset is usually within the first few weeks of life.

CAUSES

Persistence of a membrane at the lower end of the nasolacrimal duct results in incomplete canalization of the duct and its consequent obstruction.

HISTORY AND PHYSICAL FINDINGS

- Usually unilateral but may be bilateral
- Conjunctival erythema and irritation minimal
- Tearing within the affected eye
- Pooling or puddling of tears
- Epiphora (frank overflow of tears)
- Accumulation of mucoid or mucopurulent discharge in the affected eye, which results in crusting (usually evident upon awakening)
- Erythema or maceration of the skin under the eye

- Expression of clear fluid or mucopurulent discharge when the area of the nasolacrimal sac is massaged, which may be intermittent or continuous over several months
- Upper respiratory tract infection may exacerbate the condition

DIFFERENTIAL DIAGNOSIS

- Dacryocystitis
- Dacrocystocele
- Pericycystitis
- Mucocele
- Preseptal or orbital cellulitis

COMPLICATIONS

- *Dacryocystitis*: inflammation of the nasolacrimal sac, accompanied by edema, erythema and tenderness of the skin over the area of the affected duct (acute or chronic)
- *Pericycystitis*: inflammation of the tissues surrounding the affected duct
- *Mucocele*: a bluish, subcutaneous mass below the medial canthal tendon
- *Preseptal or orbital cellulitis*: inflammation around the ipsilateral eye (this is an eye emergency)

DIAGNOSTIC TESTS

- Eye swab for culture and sensitivity (if purulent discharge present) to rule out a lacrimal infection

MANAGEMENT

In 90% of cases, the condition resolves, with conservative management, once the child reaches 1 year of age.

Goals of Treatment

Observe, to monitor for and prevent complications.

Appropriate Consultation

Consult a physician any time there are complications (for example, dacryocystitis, pericycystitis, preseptal or orbital cellulitis, an eye emergency). In acute episodes, consult physician after 72 hours if not responding to treatment.

Nonpharmacologic Interventions

- Provide reassurance to parents or caregiver
- Offer support and encouragement, as condition may take many months to resolve

- Recommend nasolacrimal massage two or three times daily, followed by cleansing of the eyelid with warm water. Suggest gentle massage of lacrimal sac toward the nose, to clear the passage. Ensure nails are cut short and hand-washing is adhered to prior to massage
- Warm compresses
- Teach parents or caregiver the signs and symptoms of complications, and instruct them to report any that occur

Pharmacologic Interventions

Topical antibiotics for mucopurulent drainage:

erythromycin 0.5% eye ointment, 1.25 cm qhs for 5–7 days

or

polymyxin B/gramicidin (Polysporin) eye drops, 1 drop qid for 5–7 days

Referral

Refer to a physician if the condition has not responded to conservative management by the time the child reaches 6 months of age or any time there are complications (for example, dacryocystitis, pericystitis, preseptal or orbital cellulitis, an eye emergency).

A surgery consult may be necessary for lacrimal probing, which may be repeated once or twice. Definitive surgery is indicated if lacrimal probing (performed up to three times) fails to resolve the problem.

OPHTHALMIA NEONATORUM

Severe conjunctivitis in newborns (< 28 days of age).

This condition must be differentiated from the more common mild conjunctivitis; see “Conjunctivitis”.

CAUSES

- Generally acquired from the maternal genital tract
- Bacterial organisms include Chlamydia and *Neisseria gonorrhoeae*
- Chlamydial infection is a very common sexually transmitted infection in North America and is thus the more common cause of neonatal conjunctivitis
- Less commonly, *Haemophilus* strains, *Staphylococcus aureus*, *Streptococcus pneumoniae* and other gram-negative organisms may be involved

HISTORY

Depends on causative organism.

Gonorrhea

- Generally presents early (day 3–5 of life)
- Should be considered in any infant who presents with conjunctivitis at less than 2 weeks of age
- Significant purulent discharge and edema

CHLAMYDIAL INFECTION

- Children present with a history of eye redness and discharge after incubation period of 1–2 weeks
- Less discharge and edema than with gonorrhea
- Should be considered in any child who presents with conjunctivitis in the first 3 months of life and who does not respond to usual topical antibiotics for mild conjunctivitis

PHYSICAL FINDINGS

The child may appear severely ill, but the physical findings are generally limited to the eye examination:

- Edema or erythema of the conjunctiva
- Purulent secretion
- Eyelids may be stuck together secondary to the purulent secretions

DIFFERENTIAL DIAGNOSIS

- Infectious conjunctivitis
- Trauma
- Nasolacrimal duct obstruction (dacryostenosis)

COMPLICATIONS

- Gonorrheal conjunctivitis (also known as GC conjunctivitis) may be fulminant, leading rapidly to extensive orbital infection and possibly blindness
- Systemic infections, including blood, joint and central nervous system (CNS) infections, may occur secondary to *Neisseria gonorrhoeae* infection

DIAGNOSTIC TESTS

- Swab drainage for culture and sensitivity, *N. gonorrhoeae* and *Chlamydia*
- It is important to rule out chlamydial infection by means of a *Chlamydia* antigen swab

MANAGEMENT

Goals of Treatment

- Treat infection
- Prevent complications

Appropriate Consultation

Consult a physician immediately, before commencing treatment, especially if you suspect gonorrheal or chlamydial infection.

See also “Conjunctivitis”.

Nonpharmacologic Interventions

- Prevention of perinatally acquired infections through prenatal clinics and screening and through sexually transmitted infection control
- Appropriate follow-up of infected mother and her partner

Pharmacologic Interventions

- Prevention
- Routine prophylaxis with erythromycin ointment for all newborns at birth

Treatment if causative organism is *Chlamydia trachomatis*:¹⁶

erythromycin 20–40 mg/kg/day po in divided doses for at least 14 days (maximum 2 g/day)

plus

erythromycin 0.5% eye ointment, 1.25 cm bid-tid x 3 weeks¹¹

Test of cure to be performed 3–4 weeks after the completion of treatment in all prepubertal children.¹⁶

Topical treatment alone is not effective in eliminating nasopharyngeal colonization.

For more detailed information on the treatment of chlamydial infections in children see the most recent “Canadian Guidelines on Sexually Transmitted Infections” (available at: <http://www.phac-aspc.gc.ca/std-mts/sti-its/guide-lignesdir-eng.php>).

Treatment if causative organism is *Neisseria gonorrhoeae*:

Gonorrheal ophthalmia is a medical emergency. Contact a physician to initiate treatment.

Referral

Refer all suspected cases of gonorrheal ophthalmia to a physician immediately. Treatment usually requires intravenous (IV) or intramuscular (IM) administration of antibiotics (for example, cephalosporin).

Refer all cases of *Chlamydia* infection to a physician if there is no improvement after 2 or 3 days of oral treatment.

RED EYE

Inflammation in and around the structures of the eye. Red eye is common in a wide variety of ocular conditions, some of which are a serious threat to vision and require immediate referral to an ophthalmologist.

CAUSES

There are numerous causes of red eye in children (see Table 1, “Features of Various Causes of Red Eye in Children”).

- Infection: conjunctivitis, keratitis (bacterial, viral [herpetic or nonherpetic] or other)
- Ocular inflammation: uveitis, iritis, episcleritis, scleritis
- Blepharitis with secondary conjunctivitis or keratitis (or both)
- Allergy (for example, allergic conjunctivitis)
- Glaucoma (for example, acute angle-closure glaucoma)
- Toxic, chemical or other irritants such as topical eye drugs, contact lens solution, acids or alkalis, smoke, wind or ultraviolet rays
- Traumatic injury (for example, corneal abrasion, foreign-body irritation, hyphema, subconjunctival hemorrhage)
- Pterygium or inflamed pinguecula
- Infection of lacrimal system (for example, dacryocystitis)

Table 1 – Features of Various Causes of Red Eye in Children¹⁷

	Conjunctivitis*			Corneal Injury or Infection	Uveitis (Iritis)	Angle Closure Glaucoma
	Bacterial	Viral	Allergic			
History	Sudden onset, exposure to infection			Trauma, pain	Fairly sudden onset, may be recurrent	Fast onset, possible previous diagnosis
Bilateral eyes	Often	Often	Yes	Not usually	Occasionally	Rarely
Vision	Normal	Normal	Normal	Reduced if central injury	Reduced	Very reduced
Pain	-	- Itching, burning and tearing	- Itching and burning	+	+	+++
Photophobia	+/-	-	-	+	++	+/-
Foreign-body sensation	+/- Gritty Feel	+/-	-	+	-	-
Itch	+/-	+/-	++	-	-	-
Tearing	+	++	+	++	+	-
Discharge	Muco-purulent, crusted lids in morning	Mucoid to watery	Watery or string mucoid	Watery or mucopurulent	Watery	Watery
Pre-auricular adenopathy	-	+	-	-	-	-
Pupils	Normal, reactive	Normal, reactive	Normal, reactive	Normal or small, reactive	Usually small, sluggish, maybe irregular shape	Moderately dilated and fixed, oval
Conjunctival hyperemia	Diffuse	Diffuse	Diffuse	Diffuse with ciliary flush	Ciliary flush	Diffuse with ciliary flush
Cornea	Clear	Sometimes faint punctate staining or infiltrates	Clear	Depends on disorder; irregular light reflex with abrasion	Clear or lightly cloudy	Cloudy
Intraocular pressure	Normal	Normal	Normal	Normal	Reduced, normal or increased	Increased

+, present (to various degrees); -, absent; +/-, may be present

* Hyperthyroidism may cause conjunctival injection.

Some of the conditions associated with red eye are covered in detail in other sections of this chapter. Refer to the table of contents for specific diseases covered.

HISTORY

- An accurate history is very important
- History may point to a systemic illness such as juvenile rheumatoid arthritis or the possibility of trauma
- Ask about preceding viral upper respiratory tract infection (URTI) (which would indicate infectious conjunctivitis)
- Ask the child (if of an appropriate age) about visual acuity, pain on movement of the eye and contact with chemical agents or makeup (the last of which might indicate allergic conjunctivitis)
- For newborns, inquire about exposure to silver nitrate or the possibility of maternally acquired infections such as gonorrhea

PHYSICAL FINDINGS

- Assess both eyes for symmetry
- Carefully document any evidence of external trauma
- Assess visual acuity and pupillary reaction, essential for measuring improvement or deterioration
- Examine the anterior segment of the globe with a small penlight, and use a fluorescent stain to assess for corneal abrasion or ulcers
- Assess ocular mobility by checking range of movement

Features of Dangerous Red Eye

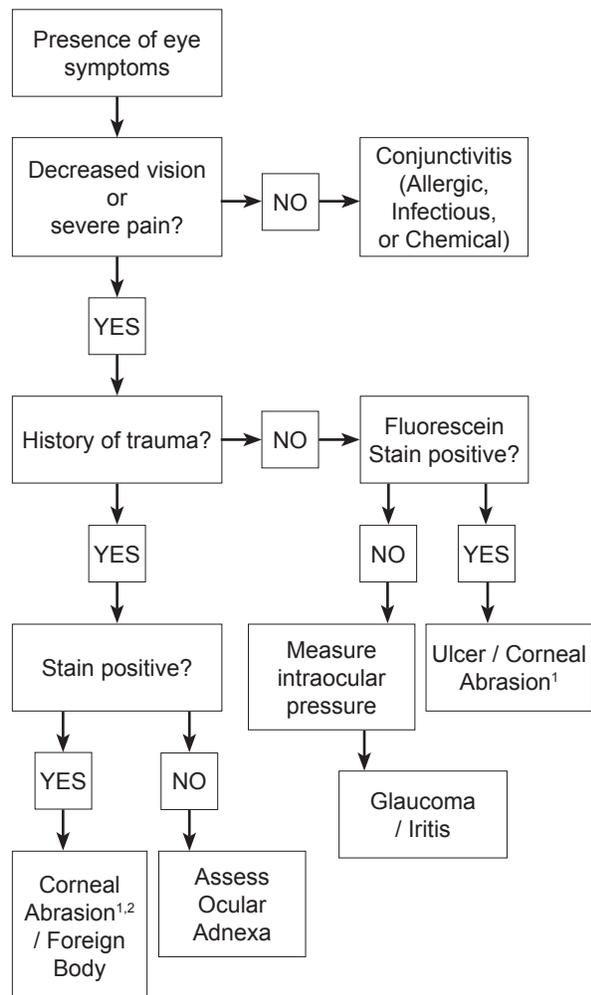
The first step is to differentiate major or serious causes of red eye from minor causes. The following danger signs call for urgent consultation with a physician and/or referral to an ophthalmologist.

- Severe ocular pain, especially if unilateral
- Photophobia
- Persistent blurring of vision
- Exophthalmos (proptosis)
- Reduction of ocular movements
- Ciliary flush/injection
- Irregular corneal reflection of light
- Corneal epithelial defect or opacity
- Pupil unreactive to direct light
- Worsening of signs after 3 days of pharmacologic treatment for conjunctivitis
- Immunocompromise (for example, neonate, immunosuppression)
- Ocular pain associated with headache/vomiting
- Pupil irregular in shape
- Recent trauma to eye

DIFFERENTIAL DIAGNOSIS

- Ophthalmia neonatorum
- Conjunctivitis (bacterial, viral or allergic)
- Traumatic injury (for example, corneal abrasion)
- Foreign body
- Glaucoma
- Uveitis (iritis)
- Preseptal or orbital cellulitis

Differential Diagnosis of Red Eye:



Note:

1. Classified as either: Foreign body related, contact lens related, or spontaneous.
2. Classified as Traumatic.

Note: Intraocular pressure with iritis may be normal or slightly decreased in the acute phase due to decreased aqueous humor production; however, pressure may become elevated as the inflammation subsides.¹⁸

Ninety percent of patients with elevated intraocular pressure (IOP) do not have glaucoma, though they have increased risk of developing it.

In the presence of a positive diagnosis of glaucoma, 50% of patients will have normal IOP.¹⁹ Primary open angle glaucoma has elevated IOP, other glaucomas are usually normal IOP.²⁰

MANAGEMENT

Some of the diseases (for example, ophthalmia neonatorum, see “*Ophthalmia Neonatorum*”) associated with red eye are covered in detail elsewhere. See *table of contents*.

Referral

When in doubt about the diagnosis or if there is significant associated ocular trauma or decreased visual acuity, urgent consultation with and referral to a physician is indicated.

For more details about the causes, assessment and management of conditions associated with red eye not covered in this chapter, see *the adult clinical guidelines chapter, “Eyes.”*

STRABISMUS

Any abnormality in the alignment of the eyes.

The classification of strabismus is complex. On an etiologic basis, it may be paralytic or nonparalytic, but it can also be classified as congenital or acquired, intermittent or constant, or convergent or divergent.

PATHOGENESIS²¹

When the eyes are positioned so that an image falls on the fovea (the area of best visual acuity) of one eye, but not the other, the second eye will deviate so that the image falls on its fovea as well. This deviation may be up, down, in or out and results in strabismus.

- *Esotropia*: one or both eyes converge medially (crossed eyes)
- *Exotropia*: one eye deviates laterally
- *Hypertropia*: one eye deviates upward
- *Hypotropia*: one eye deviates downward

Early recognition and treatment are important for the development of both normal binocular vision and good cosmetic results. Persistent, untreated strabismus may lead to decreased visual acuity of the deviating eye. For best results, strabismus must be treated before the child reaches 5 years of age.

MAIN TYPES

Heterophoria:

Intermittent (latent) tendency to misalignment.

- Eyes deviate only under certain conditions (for example, stress, fatigue, illness)
- Common
- May be associated with transient double vision, headaches, eye strain

Heterotropia:

Constant misalignment of eyes.

- Occurs because normal fusional mechanisms are unable to control eye deviation
- Child is unable to use both eyes to fixate on an object and learns to suppress the image in the deviating (nonfixating) eye
- *Alternating*: child uses either eye for fixating and the other eye deviates; vision develops normally in both eyes because there is no preference for fixation
- *Consistent*: one eye is used consistently for fixating, and the other eye consistently deviates; child is prone to defective development of vision in the deviating eye (because of constant suppression of the visual image)

CAUSES

Paralytic

- Weakness or paralysis of one or more ocular muscles
- Deviation is asymmetric
- *Congenital*: secondary to developmental defect in muscle or nerves or to congenital infection
- *Acquired*: due to extraocular nerve palsies; indicates a serious underlying problem (for example, fracture of facial bone, CNS tumor, neurodegenerative disease, myasthenia gravis, CNS infection)

Nonparalytic

- Most common type of strabismus
- Extraocular muscles and the nerves that control them are normal
- Occasionally, this form may be secondary to underlying ocular or visual defects such as cataracts or refraction errors
- Overall, seen in 3% of children

Pseudostrabismus

Young infants have a broad nasal bridge; therefore, less of the inner eye is seen, which may give the impression of squinting.

Intermittent eye convergence (crossed eyes) in infants 3–4 months of age is usually normal but should be monitored. If it persists, the child should be evaluated by a physician.

HISTORY

- Family history (about 50% of cases are hereditary)
- Constant or variable squint in one or both eyes
- Squinting worse with fatigue or stress
- Child tilts head or closes one eye (compensatory mechanisms for weak eye)

PHYSICAL FINDINGS

First assess the following:

- Extraocular eye movements (by having child visually follow an object): watch for asymmetry of movement
- Visual acuity (with Snellen or similar chart)

Then assess alignment with the following two techniques.

Corneal Light Reflex Test (Hirschberg Test)

1. Sit at child's eye level.
2. Hold a light source (penlight or ophthalmoscope) 13 inches (32 cm) away from the child, in front of your own nose. Direct it towards the child's face.
3. Ask child to focus on the light, if child is old enough to understand and follow the instruction.
4. Observe position of the light reflex as it bounces off the eye.

Responses:

- *Normal alignment:* both eyes are focused in the same position, and the light reflects off the same area of the cornea on both eyes, usually slightly to the nasal side of the pupil centre
- *Abnormal alignment:* eyes are not aligned in position, and the light reflexes are asymmetric, that is, coming off different areas of the cornea for each eye; this may indicate strabismus

Cover-Uncover Test

Perform this test only if the child is able to cooperate.

1. Cover one eye with an opaque object (a large plastic spoon-shaped cover designed for this purpose may be available; otherwise, improvise).
2. Instruct or try to get the child to fix his or her gaze on a light source (held in front of him or her) with the uncovered eye and ensure eye is covered for 2–3 seconds.
3. Quickly remove the cover from the covered eye, and observe the position of that eye and any change in position of the uncovered eye.
4. Repeat steps 1, 2 and 3 for the other eye.

Responses:

- *Normal alignment:* both eyes are focused in the same position and do not change with covering or uncovering
- *Abnormal alignment:*
 - *Phoria:* when deviating eye is covered, it tends to move; therefore, when the deviating eye is uncovered, the examiner can observe the eye as it resumes its former position (*see "Cover-Uncover Test" figure*); that is, movement is seen on uncovering the deviating eye
 - *Tropia:* when fixating eye is covered, the deviating (uncovered) eye moves because it is forced to fixate so the child can see; that is, movement is seen in the deviating eye when covering the usually fixating eye

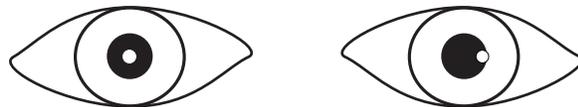
COVER-UNCOVER TEST

(what practitioner sees when facing child)

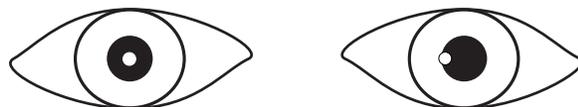
Normal



Left eye turned out



Left eye turned in



COMPLICATIONS

- Amblyopia

DIAGNOSTIC TESTS

None.

MANAGEMENT

Goals of Treatment

- Prevent complications

Referral

- Refer all children with suspected strabismus to a physician for evaluation
- All children with fixed (paralytic) strabismus need more urgent referral, particularly if the paralytic strabismus is acquired
- New onset strabismus

Early referral and treatment give the best chance for good vision in both eyes and good ocular alignment.

Monitoring and Follow-Up

As recommended following consultation.

EMERGENCY PROBLEMS OF THE EYE

See “Eyes,” in the adult clinical practice guidelines for detailed information on the clinical presentation and treatment of the following emergency eye conditions. Some treatment choices may be similar for children and adults, but the pharmacologic dosage(s) or intervention(s) may differ. Refer to the adult guidelines, but consult a physician prior to administering any pharmacologic intervention to a pediatric patient for the following conditions:

ACUTE ANGLE-CLOSURE GLAUCOMA

See “Acute Angle-Closure Glaucoma” in the adult chapter, “Eyes”.

BLUNT OR LACERATING OCULAR TRAUMA

See “Blunt or Lacerating Ocular Trauma” in the adult chapter, “Eyes”.

CHEMICAL BURNS

See “Chemical Burns” in the adult chapter, “Eyes”.

CORNEAL ABRASION

See “Corneal Abrasion” in the adult chapter, “Eyes”

FOREIGN BODIES, CONJUNCTIVAL, CORNEAL OR INTRAOCULAR

See “Foreign Bodies, Conjunctival, Corneal or Intraocular” in the adult chapter, “Eyes”.

UVEITIS (IRITIS)

See “Uveitis (Iritis)” in the adult chapter, “Eyes”.

ORBITAL CELLULITIS²²

Severe life-threatening bacterial infection of the deep tissues of the posterior orbital space, including the fat and muscle contained in the bony orbit.

Orbital cellulitis and preseptal cellulitis may coexist in the same person. It is often difficult to distinguish the two conditions.

CAUSES

Usually a serious complication of acute sinusitis or other facial infection or trauma. Common causative agents can be:

- *Streptococcus pneumoniae*
- Group A *streptococcus*
- *Haemophilus influenzae* (non-typable)
- *Staphylococcus aureus*

Predisposing Factors Acute sinusitis

- Ophthalmic surgery
- Orbital trauma
- Dacryocystitis
- Infection of teeth, middle ear or face

HISTORY

- Preceding history of acute sinusitis (although such a history is not often present in children that are < 6 years old)
- Often no obvious antecedent event in children
- Fever
- Mild or marked swelling and pain on movement of the eye
- Mild to marked visual impairment

PHYSICAL FINDINGS

- Inflammation and swelling of the surrounding orbital tissues and eyelids
- Erythema around eye(s)
- Pain with eye movement
- Exophthalmos (proptosis) may be present in severe cases
- Mild to moderate ophthalmoplegia (inability to move eye)
- Mild to significant decrease in visual acuity
- Double vision may be present
- Globe displacement may be present
- Low- to high-grade fever
- Child may appear mildly ill to moribund, depending on severity of infection

Assess for any neurologic complications and level of consciousness (*see “Pediatric Glasgow Coma Scale” in the section “Secondary Survey”, in the pediatric chapter “General Emergencies and Major Trauma”*).

DIFFERENTIAL DIAGNOSIS

- Preseptal cellulitis
- Trauma, including insect bite
- Allergic reaction
- Conjunctivitis
- Rhabdomyosarcoma
- Dacryocystitis
- Tumor
- Hordeolum
- Lesions secondary to herpes or varicella

COMPLICATIONS

- Intracranial cavernous sinus thrombosis (associated with signs of central nervous system irritation, puffiness of the face, deterioration in level of consciousness)
- Orbital or subperiosteal abscess
- Infection of other orbital structures
- Meningitis
- Intracranial abscess
- Blindness
- Death

DIAGNOSTIC TESTS

- Swab any discharge for culture and sensitivity before starting antibiotics

MANAGEMENT**Goals of Treatment**

- Treat infection
- Prevent complications

Appropriate Consultation

Consult a physician immediately.

Adjuvant Therapy

- Start IV therapy with normal saline to keep vein open

Nonpharmacologic Interventions**Client Education**

- Explain to the parents or caregiver the nature, course, expected treatment and outcomes of disease

Pharmacologic Interventions

- IV antibiotics should be started urgently, before transport. Discuss choice of antibiotics with a physician

Monitoring and Follow-Up

Careful repeated assessment of the child’s neurologic status is important until child reaches hospital.

Referral

Medevac to hospital.

PRESEPTAL CELLULITIS²²

Infection of the soft tissues anterior to the orbital septum (for example, outside the bony orbit). It is much more common than orbital cellulitis. It is rare for preseptal cellulitis to progress to orbital cellulitis.

Preseptal cellulitis and orbital cellulitis (*see “Orbital Cellulitis”*) may coexist in the same person. It is often difficult to distinguish the two conditions.

CAUSES

Bacteria gain access to the tissues around the orbit. Usually arises from a focus of infection on the eyelids or face (for example, stye, trauma, skin pustules, insect bites).

- *Haemophilus influenzae* (type B) – often seen and of significance in children < 5 years old
- *Streptococcus pneumoniae*
- *Staphylococcus aureus*
- *Streptococcus pyogenes*

HISTORY

- May be a preceding history of a stye, trauma or insect bites to the eye area, but frequently there is no antecedent history
- Parents or caregiver may have noticed that the eyes are swollen to the point of shutting
- Examination of the child may be very difficult, because of edema, pain and anxiety

PHYSICAL FINDINGS

- Child usually afebrile, not ill-looking
- No pain on movement of the eye
- Visual acuity usually normal (if it can be assessed)
- Orbital edema and erythema
- Discharge from the eyelid and surrounding tissues

Unless other complications have occurred, the child should show no evidence of neurologic problems.

DIFFERENTIAL DIAGNOSIS

- Orbital cellulitis

COMPLICATIONS

- Central nervous system infection
- Meningitis

DIAGNOSTIC TESTS

- Swab any discharge for culture and sensitivity before starting antibiotics

MANAGEMENT

Appropriate Consultation

Consult a physician for all cases of preseptal cellulitis, especially if the child has moderate to severe infection, is immunocompromised, is < 3 months, appears systemically unwell (for example, fever) or if a previously treated child is worsening on oral antibiotics.

Nonpharmacologic Interventions

Client Education

- Explain to parents or caregiver the nature, course, expected treatment and outcomes of the disease
- If child is being treated on an outpatient basis, counsel parents or caregiver about appropriate use of medications (dose, route, side effects)

Pharmacologic Interventions

Discuss choices with a physician first.

If the infection is mild or moderate, the physician may decide to treat the child as an outpatient using oral antibiotics (for example, amoxicillin/clavulanate [Clavulin]).

If the infection is more extensive, intravenous antibiotics may have to be started before transfer to hospital.

Referral

Medevac for admission to hospital and treatment with IV antibiotics may be needed for more severe infections.

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