CLINICAL GUIDELINE

Preseptal and Orbital Cellulitis
Evaluation and Management in the Emergency Department and Outpatient Settings

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Patient with eye symptoms (e.g. redness, swelling, pain) concerning for preseptal or orbital cellulitis

Perform a full History and Physical (Note 1)

Signs of **orbital involvement,** e.g. proptosis, pain with eye movement, ophthalmoplegia? (notes 2 and 3)

- No → Presumptive diagnosis of **Preseptal Cellulitis** *Routine labs and imaging not recommended unless suspicion for bacteremic periorbital cellulitis* (note 4)
- Yes → Presumptive Diagnosis of **Orbital Cellulitis** If outpatient, send to an ED with ophthalmology available (e.g. Mpls Children's)
- Uncertain → **If outpatient:** send to an ED with ophthalmology available (e.g. Mpls Children's)
  In ED:
  - Consider **Ophthalmology consult** and/or **CT scan** orbits and sinuses with contrast
  - Consider CBC, CRP and blood culture (see note 8)

Does patient meet admission criteria? (note 5)

- No → **Discharge home on oral antibiotics** (note 6)
  - **PCP follow-up in 24-72 hours**
- Yes → **If outpatient**: send to an ED with ophthalmology available (e.g. Mpls Children's)
  In ED: IV antibiotics (note 6) and admit to hospitalists. If preseptal diagnosis is uncertain (no confirmatory imaging), admit to hospital with Ophtho available (e.g. Mpls Children's) (**Inpatient Management** on **Page 3)**

Confirmed **Preseptal Cellulitis?** — Yes → Admit to Mpls hospitalists **(Inpatient Management on Page 2)**

Confirmed **Orbital Cellulitis?** — Yes → Admit to PICU (**off guideline**)

Initial Management:
- **Labs** (note 8): blood culture, creatinine level
  - Consider CBC, CRP
- **Imaging** (if not yet obtained): CT scan orbits and sinuses with contrast
- **NPO and ENT consult if potential for surgery**
- **Consult Ophthalmology** (if not yet done)
- Start **IV Antibiotics:** (see note 10)
  - **If no MRSA risk factors**: IV Ampicillin-Sulbactam monotherapy
  - **If MRSA history/exposure**: IV Clindamycin monotherapy
  - **If history of Clindamycin-resistant MRSA:** IV Ampicillin-Sulbactam PLUS IV Vancomycin
  - **If imminent sight-threatening infection** (e.g. Chandler Type IV orbital abscess, note 9)**:** IV Ceftriaxone PLUS IV Vancomycin PLUS IV Metronidazole

Is patient septic or unstable?
Have altered mental status or concern for CNS infection (e.g. intracranial abscess, meningitis?)

- Yes → Admit to PICU (**off guideline**)
- No → Admit to Mpls hospitalists **(Inpatient Management on Page 2)**

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:
- Age < 60 days
- Immunocompromised
- Concern for sepsis and/or meningitis
- Recent sinus or orbital surgery
- History of orbital prosthetic
- Recent trauma to eye or orbit
- CNS or bone involvement

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Orbital Cellulitis

Inpatient Evaluation and Management

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Orbital Cellulitis

- **Labs** (if not yet obtained) (see note 8): blood culture + creatinine. Consider CBC + CRP
- **Imaging** (if not yet obtained): CT scan orbit and sinuses with contrast OR MRI w/wo contrast (if no urgency or intracranial concerns, and advised by consultants)
- **Diet:** NPO pending ENT evaluation if any potential for surgical intervention
- **IV Antibiotics** per note 10

Consults:

- Ophthalmology: always, within 24 hours of admission
- ENT: if abscess on CT or requiring surgery; if clinical worsening or lack of improvement after 48-72 hours of IV antibiotics
  - If abscess drained, send culture and tailor antibiotics accordingly
- Neurosurgery: intracranial extension (off-guideline)
- ID: concern for atypical organism, Clindamycin-resistant MRSA, failed initial antibiotics or sight-threatening infection

Additional Therapies

- Expert opinion recommends initiation of intranasal sequential Oxymetazoline, Fluticasone and Nasal Saline BID (note 11)
- Consider IV steroids only if recommended by ENT and/or Ophtho (note 12)

Is patient clinically improving?

No → **If clinical worsening or patient not improved after 48 hours of IV therapy:**

- Consult Infectious Disease
- Consider repeat imaging or trending labs
- Discuss need for surgery with Ophthalmology and/or ENT

Yes

Meeting discharge criteria?

Typically after 48-72 hours of IV antibiotics

- Substantial clinical improvement (e.g. ↓ erythema, induration, pain)
- Afebrile > 24 hours + blood culture negative > 24 hours
- Tolerating oral intake
- Cleared for discharge by consultants
- Outpatient follow-up within 1-3 days

Yes → **Discharge Home** with:

- Oral antibiotics (note 10)
- Follow-up with PCP within 2-3 days

No need to watch on oral antibiotics prior to discharge

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Age < 60 days
- Immunocompromised
- Concern for sepsis and/or meningitis
- Recent sinus or orbital surgery
- History of orbital prosthetic
- Recent trauma to eye or orbit
- CNS or bone involvement

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Preseptal Cellulitis
Inpatient Evaluation and Management

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Age < 60 days
- Immunocompromised
- Concern for sepsis and/or meningitis
- Recent sinus or orbital surgery
- History of orbital prosthetic
- Recent trauma to eye or orbit
- CNS or bone involvement

Preseptal Cellulitis
and meeting admission criteria (note 5)

↓

Antibiotics based on severity and suspected source of infection (note 6). If failed previous outpatient antibiotic, consider broadening antibiotic coverage.

↓

Meeting discharge criteria?

- Clinical improvement within 36-48 hours of starting appropriate therapy?
- Tolerating PO
- Outpatient follow-up established within 1-3 days

No

↓

If clinical worsening or not improving after 48 hours of IV therapy:

- Consider expanding antibiotic coverage
- **Consult ophthalmology** and re-evaluate for orbital signs (note 3) or abscess formation with exam and/or CT with contrast
- Consider ENT or ID consult

Yes

↓

Discharge Home with:

- Oral antibiotics (note 6)
- Follow-up with PCP within 1-3 days

No need to watch on oral antibiotics prior to discharge

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Preseptal and Orbital Cellulitis
Notes

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Note 1. History and Exam

History- *complete history should be obtained with special attention to:*

- **Recent precipitating events:** trauma, insect bite, dental/facial or upper respiratory infection, eye infection (e.g. conjunctivitis, hordeolum), surgery involving face
- **Medical history:** similar symptoms, eye/orbital disease or surgery, sinusitis or sinus surgery, recent antibiotics, MRSA infections or colonization, allergies, immunization status, poor dentition
- **Eye symptoms:** redness, eyelid swelling, eye bulging, change in vision (double vision, decreased acuity), pain with eye movements, eye discharge
- **Associated symptoms:** fever, headache, lethargy, facial pain, allergy symptoms, vomiting, mental status changes, seizures, neck stiffness, purulent nasal discharge

Physical Exam- *thorough physical exam should be performed with special attention to:*

- **Eye exam:** visual acuity, motility, pupillary reaction to light, red reflex, appearance of orbit and eyelid, optic nerve head, pupillary shape
    - Technique for difficult eye exams: place fingers on eyelid margins or use cotton tip applicator to evert eyelid margin and pull lids apart
- **Neurological exam:** mental status, neck pain or stiffness, focal neurological signs
- **Oral/dental exam:** dental caries or dental infection

Note 2. Differential Diagnosis

- **Preseptal cellulitis:** cellulitis around the eye, anterior to the septum. The septum is a structure of the eyelid that marks the anterior boundary of the orbit.
- **Orbital cellulitis:** infection posterior to the septum, often caused by sinusitis. Requires IV antibiotic therapy and may also require surgical intervention.
    - High risk of complications including: vision loss, subperiosteal abscess, orbital abscess, subdural empyema, cavernous sinus thrombosis, brain abscess
- **Other:** environmental allergies (usually bilateral), angioedema (usually bilateral), conjunctivitis, hordeolum or chalazion (discrete nodular lesions), local allergic reaction (e.g. to topical ophthalmic antibiotic), herpes infection, tumors (e.g. neuroblastoma, retinoblastoma), granulomatosis with polyangiitis of the orbit

Note 3. Exam Signs of Orbital Involvement

Orbital cellulitis may present with one or more of these signs, which distinguish it from preseptal cellulitis.

- Photophobia, pain with eye movement, ophthalmoplegia (restriction of ocular movement in any direction), or chemosis (conjunctival redness or swelling)
- Proptosis- globe bulging outward, distinct from eyelid swelling
- Strabismus (misalignment), diplopia (double vision), decrease in visual acuity, or optic disc changes (e.g. swelling, pallor)
- Relative afferent pupillary defect (i.e. shine light in one pupil and both constrict quickly, but swing the light to the other pupil and both pupils enlarge)

Note 4. Bacteremic periorbital cellulitis: very rare in patients up to date with PCV and Hib vaccines. Usually seen in infants <18 months old in the context of several days of a recent viral URI, now with sudden high fever, ill-appearance, and acute rapid progression of eyelid swelling. Typically, there are no signs of orbital involvement. Pathogenesis is usually hematogenous dissemination from a portal of entry in the nasopharynx causing bacteremia. CT may show sinus involvement; likely due to the viral prodrome rather than bacterial sinusitis. In this young age group with meninges susceptible to inoculation from bacteremia, it is prudent to use an advanced-generation cephalosporin empirically and perform a lumbar puncture unless clinical picture precludes meningitis. If concern for meningitis, patient is off this guideline.

Note 5. Preseptal Cellulitis Admission Criteria

- Hypotensive, ill appearing or meeting SIRS criteria (off guideline)
- Failed appropriate outpatient treatment (≥48 hours of appropriate antibiotics without clear improvement)
- Rapidly progressing cellulitis
- Cannot tolerate oral medications
- Concern for eyelid abscess
- Consider admission for any patient <12 months old
- Need for urgent subspecialty consultation

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Preseptal Cellulitis
Notes

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Note 6. Antibiotic Recommendations for Preseptal Cellulitis

Determine possible source of infection to guide empiric antibiotics

Suspect direct skin inoculation

Usually Streptococcus pyogenes and Staphylococcus aureus

Inpatient IV

IV First line: IV Cefazolin (33 mg/kg/dose q8h, max 2g/dose)

If Cefazolin contraindicated (see Beta-Lactam Allergy Guideline) or prior MRSA history: IV Clindamycin (13 mg/kg/dose Q8H, max 900 mg/dose)

Outpatient/Oral

First line: Cephalexin PO (25 mg/kg/dose TID, max 1000 mg/dose)

If Cephalexin contraindicated (see Beta-Lactam Allergy guideline) or prior MRSA history: PO Clindamycin (10 mg/kg/dose TID max 600 mg/dose)

***Treatment duration: 7 days**

Suspect sinusitis with resultant sterile inflammatory edema of eyelid

Sinusitis-related organisms such as Pneumococcus, Non-typable Haemophilus influenzae and Moraxella

Inpatient IV

IV First line: IV Ampicillin-Sulbactam (50 mg/kg/dose Q6H, max 2g/dose of Ampicillin component)

Outpatient/Oral

Amoxicillin/clavulanate PO (90 mg/kg/day of Amoxicillin component divided BID, max 2g/dose, use 600-ES suspension or 875 mg tabs BID)

***Treatment duration: 10 days**

Suspect bacteremic periorbital cellulitis (note 4)

Streptococcus Pneumoniae, Haemophilus influenzae Type B

Inpatient IV

Consult Infectious Disease

IV First line, if no concern for meningitis: **IV Ceftriaxone** (50 mg/kg/dose Q24H, max dose of 2g/dose)

IV First line, if concern for meningitis: **IV Ceftriaxone** (50 mg/kg/dose Q12H, max dose of 2g/dose) **PLUS IV Vancomycin** (15 mg/kg/dose Q6H)

Off Guideline

Outpatient/Oral

(after bacteremia clears and meningitis ruled out)

Amoxicillin/clavulanate (90 mg/kg/day of Amoxicillin component divided BID, max 2g/dose, use 600-ES suspension or 875 mg tabs BID)

***Treatment duration: 10 days**

Animal bite (note 7)

Polymicrobial including anaerobes

Inpatient IV

IV First line: IV Ampicillin-Sulbactam (50 mg/kg/dose Q6H, max 2g/dose of Ampicillin component)

If Penicillin contraindicated, see Beta-Lactam allergy guideline, and consider replacing with: IV Ceftriaxone (50 mg/kg/dose Q24H, max 2g/dose) PLUS IV Clindamycin (13 mg/kg/dose Q8H, max 900 mg/dose)

Outpatient/Oral

Amoxicillin/clavulanate (90 mg/kg/day of Amoxicillin component divided BID, max 2g/dose, use 600-ES suspension or 875 mg tabs BID)

If beta lactam allergy, see Beta-Lactam Allergy Guideline, and consider replacing with: Bactrim (dosing dependent on formulation) and Clindamycin (10 mg/kg/dose TID max 600 mg/dose)

***Treatment duration: 7 days**

****Treatment duration may need to be extended depending upon treatment response and presence of complications***

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Preseptal and Orbital Cellulitis
Notes

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Note 7. Additional Considerations after Animal Bite
Tetanus prophylaxis: see table below

Received doses of adsorbed tetanus toxoid	Administer Tetanus Toxoid-containing Vaccine (<7 years old: DTaP, ≥ 7 years old: Tdap)	Administer TIG
< 3 doses or unknown	Yes	Yes
≥3 doses and < 5 yrs since last tetanus-containing vaccine	No	No
≥3 doses, but ≥ 5 yrs since last tetanus-containing vaccine	Yes	No

Rabies prophylaxis:
- If animal *available* for testing or quarantine/observation, delay rabies prophylaxis until results available or observation completed for 10 days
- If animal is *not available* for testing, approach depends on animal type:
  - Small rodents (e.g. mice, rats, squirrels): usually don't carry rabies, no intervention necessary
  - Dogs, cats, bats, skunks, racoons, foxes, large rodents: assumed to be rabid and treat with post-exposure prophylaxis (immunization and Rabies immunoglobulin)

Note 8. Utility of Labs in Orbital Cellulitis
- Some studies suggest that a higher CRP should raise suspicion for orbital cellulitis, rather than preseptal cellulitis. Additionally, when clinical improvement is equivocal, trending labs may be useful in assessing response to antibiotics.
- Though there is no proven utility of obtaining blood cultures in well-appearing children with preseptal cellulitis, rates of bacteremia are higher in orbital cellulitis (4-15%) and blood culture may be useful for organism identification.

Note 9. Orbital Cellulitis with Abscess, classification: An unconfined orbital abscess (i.e. Chandler Type IV) is associated with an increased risk of spread to the optic nerve and brain, as compared to a walled-off subperiosteal abscess (Chandler Type III), thus warranting more aggressive empiric antibiotic therapy.

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

Orbital Cellulitis
Notes

Children's MINNESOTA

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Note 10. Antibiotic Recommendations for Orbital Cellulitis

Orbital cellulitis is often a polymicrobial infection with most common pathogens being Staphylococcus aureus, Streptococcus pneumoniae, anaerobes, anginosus group Streptococci (S. anginosus, constellatus, & intermedius), Streptococcus pyogenes and Haemophilus influenzae.

Situation	IV Antibiotic selection for Inpatients	Transition to oral antibiotics when meeting discharge criteria
First Line	IV Ampicillin-Sulbactam monotherapy (50 mg/kg/dose of Ampicillin component Q6H, max 2g/dose)	Oral Amoxicillin-Clavulanic Acid 45 mg/kg/dose BID (max 2g/dose, use 600-ES suspension or 875 mg tabs BID)
If MRSA history or exposure*	IV Clindamycin monotherapy (13 mg/kg/dose Q8H, max 900 mg/dose). **In an analysis of all patients admitted to Children's Minnesota with orbital cellulitis 2018-2022, all MRSA isolates were Clindamycin sensitive.*	Oral Clindamycin 10 mg/kg/dose (max 600 mg/dose) TID
If history of Clindamycin-resistant MRSA	IV Ampicillin-Sulbactam (50 mg/kg/dose of Ampicillin component Q6H, max 2g/dose) PLUS IV Vancomycin (15 mg/kg/dose Q6H)	Discuss with ID
If imminent sight-threatening infection (per Ophthalmology)	IV Ceftriaxone (50 mg/kg Q12H, max 2g/dose) PLUS IV Metronidazole (10 mg/kg/dose Q8H, max 500 mg/dose) PLUS IV Vancomycin (15 mg/kg/dose Q6H)	Discuss with ID

Total Duration of Antibiotics:

- Typical antibiotic course of uncomplicated orbital cellulitis, if clinically improving as expected: 10-14 days
- Complicated infections and/or undrained abscess may require longer durations: consult ID

***Utility of MRSA PCR nares swab in patients with Orbital Cellulitis to rule-out MRSA infection:**

In pediatric Orbital Cellulitis, the utility of assessing for MRSA colonization with a nares PCR in order to tailor antibiotics has not yet been well studied and is of unknown clinical utility.

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Orbital Cellulitis
Notes

Aim: to standardize the diagnosis and management of preseptal and orbital cellulitis in pediatric patients ≥ 2 months old

Note 11. Nasal Therapies in patients with Orbital Cellulitis

The utility of intranasal therapies in pediatric orbital cellulitis has not yet been studied, however ENT experts at Children's Hospital of Minnesota suggest initiating these therapies due to their efficacy in acute sinusitis and the sinogenic etiology of orbital cellulitis. To minimize risk of excessive nasal dosing, oxymetazoline should be administered with the spray bottle in an upright position with the child also upright. Children's Minnesota ENT recommends the use of oxymetazoline, fluticasone, and nasal saline sequentially. If patient does not tolerate all three sprays, Children's Minnesota ENT recommends prioritizing oxymetazoline.

Duration of nasal spray therapy:

Oxymetazoline BID: 3 days
Fluticasone nasal spray BID: 2-4 weeks
Nasal saline nasal spray BID: 2-4 weeks

Note 12. IV Steroids in patients with Orbital Cellulitis

A 2021 Cochrane Review determined that there is, as of yet, insufficient evidence to draw any conclusions for or against the use of systemic corticosteroids in the treatment of periorbital or orbital cellulitis. Expert opinion at Children's Hospital of Minnesota suggests that systemic steroids (e.g. IV Decadron 0.3 mg/kg/day x 3 days) may be considered in cases of severe inflammation, refractory disease, or orbital pseudotumor, but should be initiated after ≥ 36 hours of IV antibiotics.

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26

CLINICAL GUIDELINE

Preseptal and Orbital Cellulitis
References

Children's MINNESOTA

References:

1. The Children's Hospital of Philadelphia. (2019, April 22). *Preseptal or orbital cellulitis clinical pathway - all settings*. Preseptal or Orbital Cellulitis Clinical Pathway - All Settings. Retrieved March 29, 2023, from https://www.chop.edu/clinical-pathway/preseptal-or-orbital-cellulitis-clinical-pathway
2. Burek, A.G., Melamed, S., Liljestrom, T., Qi, J., Kelly, T.G., Suelzer, E., Mitchell, M., Harris, G.J. and Havens, P.L. (2021), Evaluation and Medical Management of the Pediatric Patient With Orbital Cellulitis/Abscess: A Systematic Review. Journal of Hospital Medicine, 16: 680-687.
3. The Medical College of Wisconsin. *Preseptal and Orbital Cellulitis Clinical Guideline Pathway.* Retrieved March 29, 2023, https://mail.google.com/mail/u/0/?zx=ct9ky1l3dni4#search/wi+medical+college+orbital+cellulitis/FMfcgzGrcFgKLXxMvgMxvCGgGgqjMrJG?projector=1&messagePartId=0.1
4. Fernando J. Bula-Rudas, Jessica L. Olcott; Human and Animal Bites. *Pediatr Rev* October 2018; 39 (10): 490–500
5. Zimbelman J, Palmer A, Todd J. Improved outcome of clindamycin compared with beta-lactam antibiotic treatment for invasive Streptococcus pyogenes infection. Pediatr Infect Dis J. 1999 Dec;18(12):1096-100.
6. Lu JE, Yoon MK. The Role of Steroids for Pediatric Orbital Cellulitis - Review of the Controversy. Semin Ophthalmol. 2023 Jan 22:1-4.
7. Kornelsen E, Mahant S, Parkin P, Ren LY, Reginald YA, Shah SS, Gill PJ. Corticosteroids for periorbital and orbital cellulitis. Cochrane Database Syst Rev. 2021 Apr 28;4(4):CD013535. doi: 10.1002/14651858.CD013535.pub2. PMID: 33908631; PMCID: PMC8092453.
8. Pushker N, Tejwani LK, Bajaj MS, Khurana S, Velpandian T, Chandra M. Role of oral corticosteroids in orbital cellulitis. Am J Ophthalmol. 2013 Jul;156(1):178-183.e1.
9. Chen L, Silverman N, Wu A, Shinder R. Intravenous Steroids With Antibiotics on Admission for Children With Orbital Cellulitis. Ophthalmic Plast Reconstr Surg. 2018 May/Jun;34(3):205-208. doi: 10.1097/IOP.0000000000000910. PMID: 28369021.
10. Microbiology of Pediatric Orbital Cellulitis and Trends in Methicillin-Resistant Staphylococcus aureus Cases. Jerry Hsu;Alison D Treister;Hantamalala Ralay Ranaivo;Anne H Rowley;Bahram Rahmani Clinical pediatrics. , 2019, Vol.58(10), p.1056-1062
11. Burek AG, Melamed S, Liljestrom T, Qi J, Kelly TG, Suelzer E, Mitchell M, Harris GJ, Havens PL. Evaluation and Medical Management of the Pediatric Patient With Orbital Cellulitis/Abscess: A Systematic Review. J Hosp Med. 2021 Nov;16(11):680-687.
12. Sands, A.; Mulvey, N.; Iacono, D.; Cerise, J.; Hagmann, S.H.F. Utility of Methicillin-Resistant *Staphylococcus aureus* Nares Screening in Hospitalized Children with Acute Infectious Disease Syndromes. *Antibiotics* **2021**, *10*, 1434. https://doi.org/10.3390/antibiotics10121434
13. Hsu J, Treister AD, Ralay Ranaivo H, Rowley AH, Rahmani B. Microbiology of Pediatric Orbital Cellulitis and Trends in Methicillin-Resistant *Staphylococcus aureus* Cases. Clin Pediatr (Phila). 2019 Sep;58(10):1056-1062. doi: 10.1177/0009922819864587. Epub 2019 Jul 17
14. Catherine E Foster, Elizabeth Yarotsky, Edward O Mason, Sheldon L Kaplan, Kristina G Hulten, Molecular Characterization of *Staphylococcus aureus* Isolates From Children With Periorbital or Orbital Cellulitis, *Journal of the Pediatric Infectious Diseases Society*, Volume 7, Issue 3, September 2018, Pages 205–209
15. Carr AL, Daley MJ, Givens Merkel K, Rose DT. Clinical Utility of Methicillin-Resistant Staphylococcus aureus Nasal Screening for Antimicrobial Stewardship: A Review of Current Literature. Pharmacotherapy. 2018
16. Liao JC, Harris GJ. Subperiosteal abscess of the orbit: evolving pathogens and the therapeutic protocol. Ophthalmology. 2015 Mar;122(3):639-47. doi: 10.1016/j.ophtha.2014.09.009. Epub 2014 Oct 29.
17. Zimbelman J, Palmer A, Todd J. Improved outcome of clindamycin compared with beta-lactam antibiotic treatment for invasive Streptococcus pyogenes infection. Pediatr Infect Dis J. 1999 Dec;18(12):1096-100.
18. Rahmati MB, Mohebi S, Shahmohammadi S, Rezai MS. Fluticasone nasal spray as an adjunct to Amoxicillin for acute sinusitis in children: a randomized controlled trial. Eur Rev Med Pharmacol Sci. 2013 Nov;17(22):3068-72.
19. Meltzer EO, Gates D, Bachert C. Mometasone furoate nasal spray increases the number of minimal-symptom days in patients with acute rhinosinusitis. Ann Allergy Asthma Immunol. 2012 Apr;108(4):275-9. doi: 10.1016/j.anai.2012.01.015. Epub 2012 Feb 14.
20. Jessica L. Markham, Matthew Hall, Jessica L. Bettenhausen, Angela L. Myers, Henry T. Puls, Russell J. McCulloh; Variation in Care and Clinical Outcomes in Children Hospitalized With Orbital Cellulitis. *Hosp Pediatr* January 2018; 8 (1): 28–35.
21. Anosike BI, Ganapathy V, Nakamura MM. Epidemiology and Management of Orbital Cellulitis in Children. J Pediatric Infect Dis Soc. 2022 May 30;11(5):214-220.
22. Burek AG, Tregoning G, Pan A, Liegl M, Harris GJ, Havens PL. Pediatric Orbital Cellulitis/Abscess: Microbiology and Pattern of Antibiotic Prescribing. WMJ. 2023 Mar;122(1):52-55.
23. Red Book: 2021–2024 Report of the Committee on Infectious Diseases (32nd Edition), pp. 169-175. Bite wounds.

Workgroup: Dr. Nadia Maccabee-Ryaboy (Hospital Medicine), Dr. Betty Wu (ED), Dr. Bill Pomputius (ID), Mary Ullman (Pharm, previously Christina Koutsari), Children's MN ENT Group, Dr. Seth Silbert (Ophtho), Mike Raschka (Pharmacy), Dr. Taylor Wells (Residents), Dr. Katie Brunsberg (Quality)

Reviewer: Maccabee-Ryaboy
Revised 11/01/23, Exp date 11/01/26