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Oral Pharmaceuticals in Primary Care Optometry

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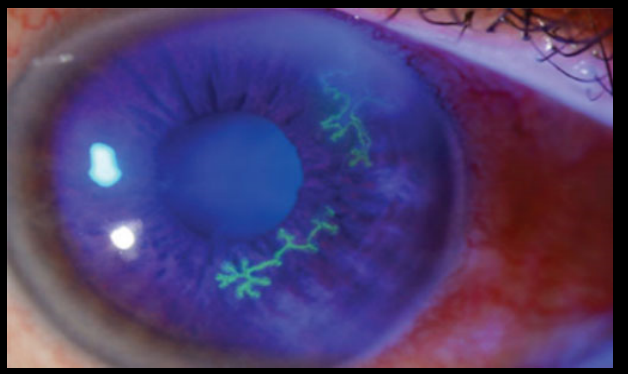
Disclosures:

- Sun Pharmaceuticals: speakers bureau,
- Dompe: advisory board, speakers bureau
- AbbVie: advisory board
- Thea: advisory board
- Apellis: speakers bureau

- All financial relationships have been mitigated.

Case

- 20 year old male presents with a red painful eye
  - Started that morning when he woke up
  - reports a watery discharge, no itching, and is not a contact lens wearer
- SLE:
  - See attached image with NaFl stain



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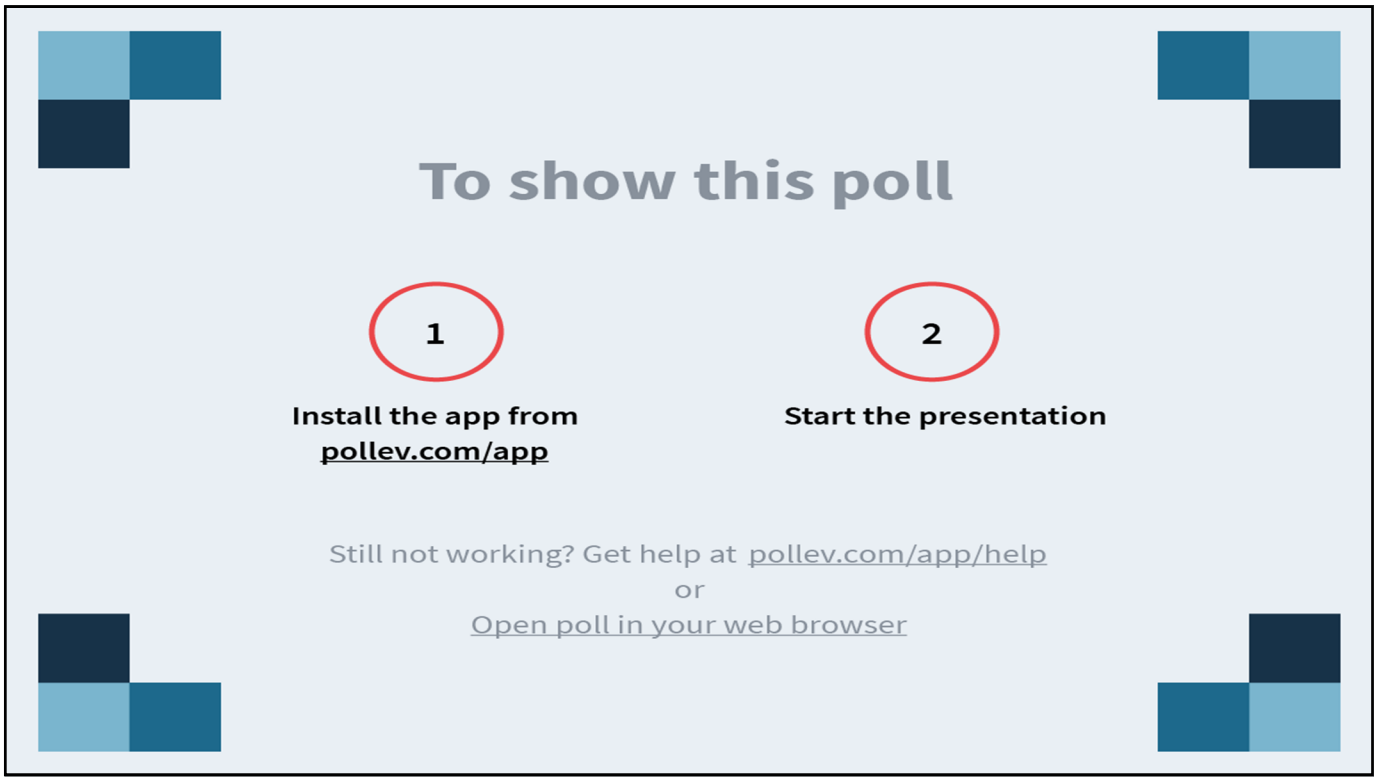

Herpes Simplex Virus (HSV) Keratitis: Clinical Features

- Characterized by primary outbreak and subsequent reactivation
  - Primary outbreak is typically mild or subclinical (90% of people are asymptomatic)
  - Most clinical ocular infections are manifestations of virus reactivation; ocular involvement occurs in fewer than 5% of primary infections
- After primary infection, the virus becomes latent in the trigeminal ganglion or cornea
  - The majority of ophthalmic HSV cases are unilateral, with recurrences affecting the same eye. Bilateral disease (not necessarily concurrent) occurs in 1-12% of cases and is more common in patients with atopy or other immune abnormalities
- Stress, UV radiation, and hormonal changes can reactivate the virus
- Lesions are common in the immunocompromised (i.e. recent organ transplant or HIV patients)

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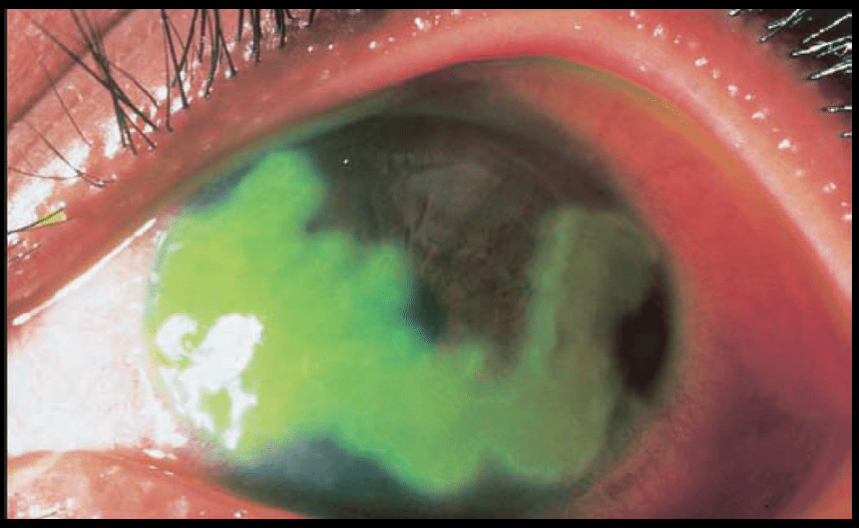
Herpes Simplex Virus Keratitis

- **Epithelial Keratitis:**
  - Symptoms:
    - Ocular irritation, redness, photophobia, watering, blurred vision
  - Signs:
    - Swollen opaque epithelial cells arranged in a course punctate or stellate pattern
    - Central desquamation results in a dendrite***
      1. Central ulceration
      2. Terminal end bulbs
    - ***Corneal sensation is reduced***

Dendritic Ulcers

HSV Geographic Ulcer



https://www.researchgate.net/figure/Geographic-corneal-ulcer-caused-by-herpes-simplex-virus-keratitis_fig1_26730111

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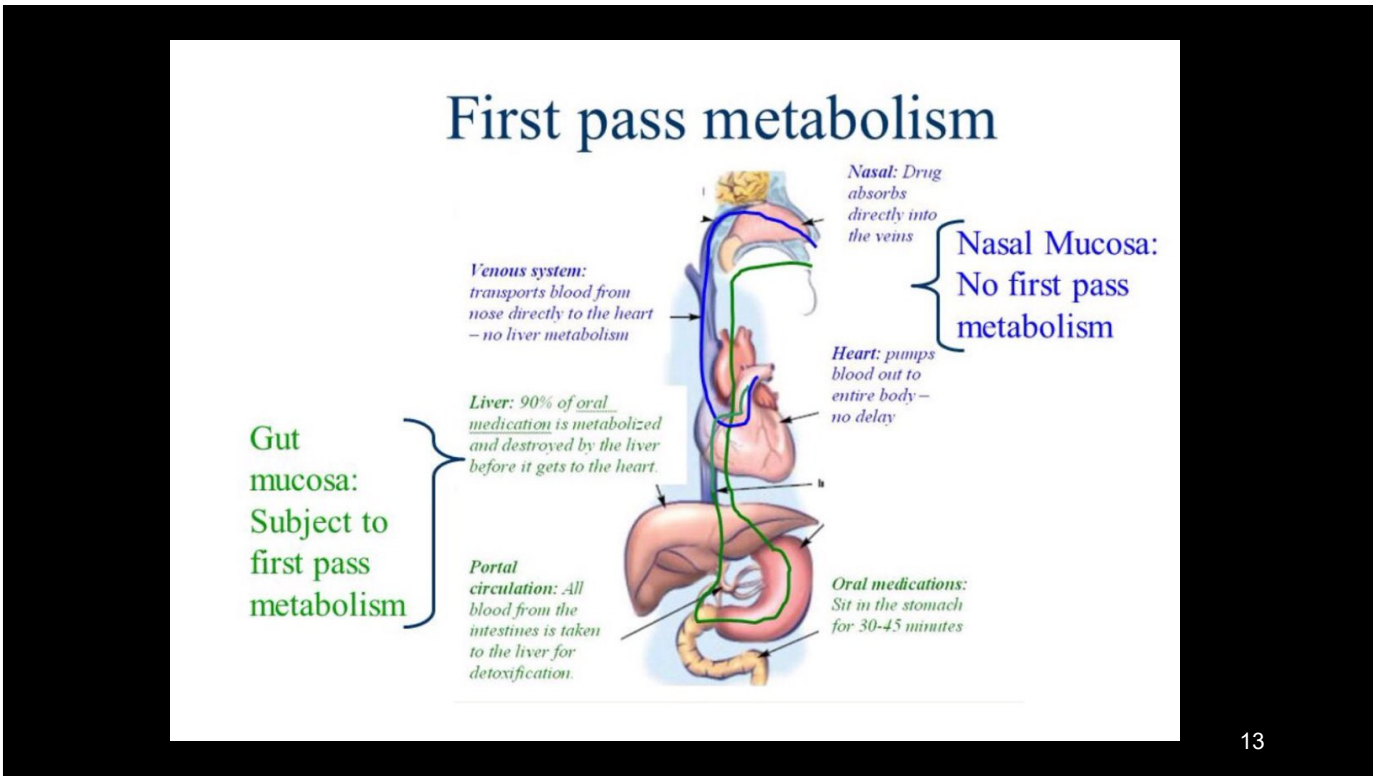
Pediatric HSV Keratitis

- pediatric herpes simplex keratitis has an 80% risk of recurrence, a 75% risk of stromal disease, and a 30% rate of misdiagnosis
- 80% of children with herpes simplex keratitis develop scarring, mostly in the central cornea
  - results in the development of astigmatism
  - 25% of children have more than 2 D of astigmatism, most of which is irregular
- consider pediatric HSV when a patient has unilateral recurrent disease in the anterior segment

Herpes Simplex Virus Keratitis Management

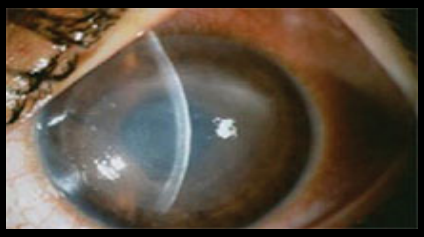
- Topical:
  - Viroptic (trifluridine) q 2h until epi healed then taper down for 10-14 days.
    - Viroptic is toxic to the cornea.
  - Zirgan (ganciclovir) available, use 5 times a day until epi healed then 3 times for a week (US only)



Anti-Viral Medication

Drug	Mechanism of Action	Bioavailability	Dosing	Side Effects
Acyclovir	Acyclovir interferes with DNA synthesis inhibiting viral replication	10-30% gets absorbed Short ½ life *Metabolized in kidneys	Simplex: 400 mg 5x/day Zoster: 800 mg 5x/day	Overall very safe Nausea, vomiting, headaches, dizziness, confusion
Valacyclovir	Acyclovir pro-drug Equivalent to acyclovir but better for pain management	95% converted to acyclovir* Better bioavailability and longer 1/2 life	Simplex: 500 mg tid Zoster: 1 g tid	Same as acyclovir
Famciclovir	Inhibits DNA chain elongation It is metabolized to penciclovir where it is active 10-20x as long as acyclovir	Superior to acyclovir*	Simplex: 250 mgTID Zoster: 500 mg TID	Same as acyclovir

HSV Stromal Disease



- HSV Stromal disease is an immune-mediated disease
  - Stromal involvement is rarely an initial ocular finding, accounting for fewer than 2% of initial presentations but for 20 – 60% of recurrent corneal disease
- Increased risk of scarring and high risk of poor visual prognosis
- Requires corticosteroids (HEDS: corticosteroid reduced risk of progression by 68%)
  - Without epithelial defect: corticosteroids and prophylactic anti-viral dosage
  - With epithelial defect: active infection anti-viral dosage with judicious corticosteroids

How much to dose steroid?

- HEDS used QID of *prednisolone phosphate*
- Current Recommendations:
  - Mod – severe (especially with neo): 1% Prednisolone or Lotemax QID to 6x/day
  - Want the lowest dose needed to control the inflammation
  - AAO EBM Treatment Guideline 2014
    - Topical steroid for 10 weeks (this is based on HEDS results) with oral antiviral

HSV Epithelial Keratitis

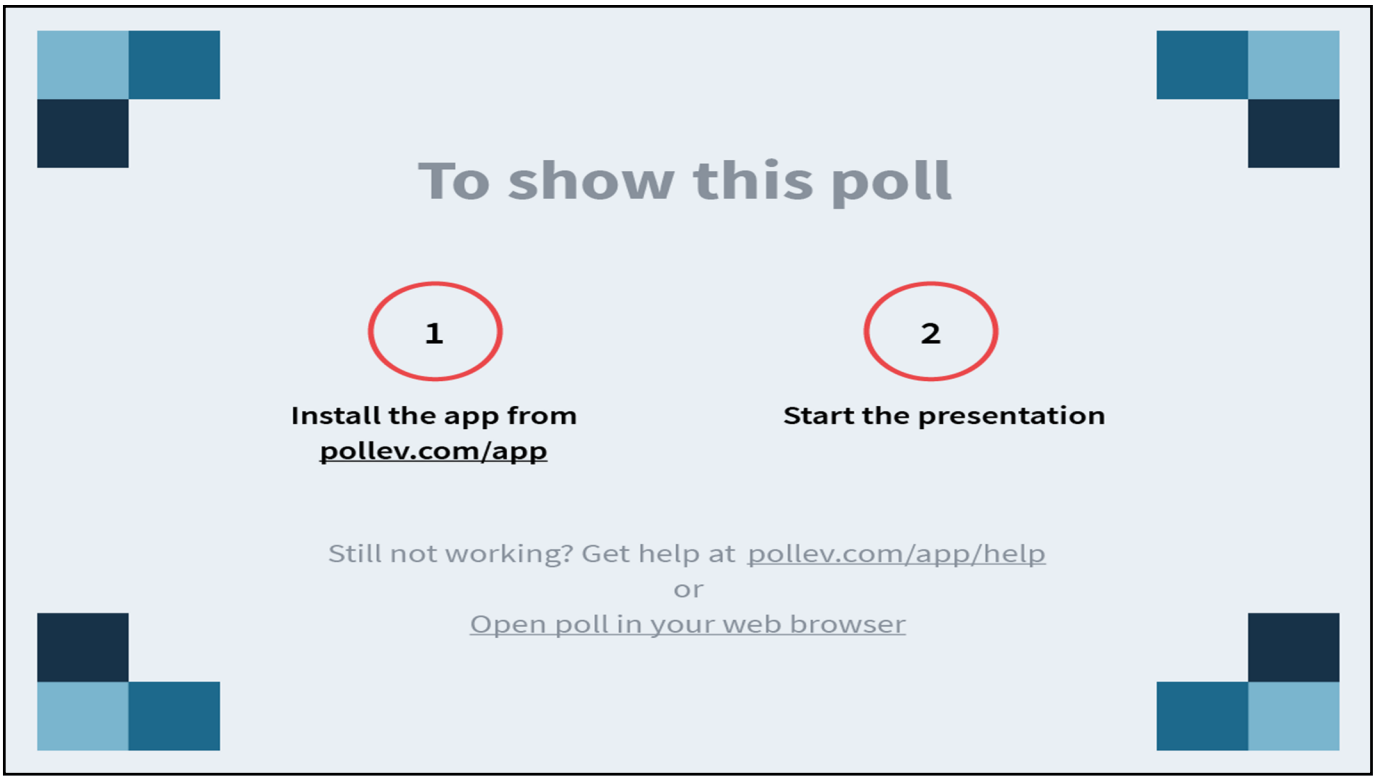
- Treatment Regimen:
  - Zirgan (ganciclovir) available, use 5 times a day until epi healed then 3 times for a week OR
  - Oral valacyclovir 500 mg 3x/day for 7-10 days
  - Artificial tears
  - L-Lysine 2 grams daily?
    - Proven to "slow down" and retard the growth of the herpes virus and inhibit viral replication
  - Debride the ulcer?
    - Prior to topical antiviral therapy debridement was treatment of choice
    - Generally try to avoid use of sharp instruments and use of cotton swab and anesthetic
- RTC 1 day, 4 days, 7 days

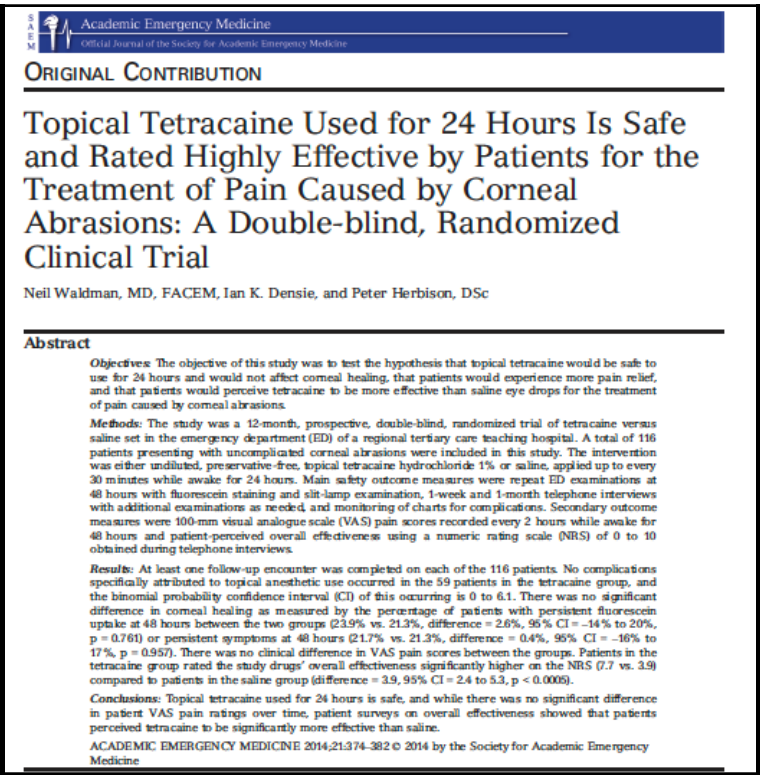
Herpes Simplex Keratitis

- Prophylactic Treatment:
  - Reduces the rate of recurrence of epithelial and stromal keratitis by ≈ 50%
    - Acyclovir 400 mg BID
    - Valtrex 500 mg QD
    - Famvir 250 mg QD
  - L-lysine 1 gram/day:
    - Proven to "slow down" and retard the growth of the herpes virus and inhibit viral replication
  - Frequent debilitating recurrences, bilateral involvement, or HSV infection in a monocular patient

Prophylaxis??

- **Pitfalls to Prophylaxis**:
  - Reduction of recurrence does not persist once drug stopped
  - Resistance????
    - van Velzen, et. al., (2013) demonstrated that long-term ACV prophylaxis predisposes to ACV-refractory disease due to the emergence of corneal ACVR HSV-1.





Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

ORIGINAL CONTRIBUTION

Topical Tetracaine Used for 24 Hours Is Safe and Rated Highly Effective by Patients for the Treatment of Pain Caused by Corneal Abrasions: A Double-blind, Randomized Clinical Trial

Neil Waldman, MD, FACEM, Ian K. Densie, and Peter Herbison, DSc

Abstract

Objectives: The objective of this study was to test the hypothesis that topical tetracaine would be safe to use for 24 hours and would not affect corneal healing, that patients would experience more pain relief, and that patients would perceive tetracaine to be more effective than saline eye drops for the treatment of pain caused by corneal abrasions.

Methods: The study was a 12-month, prospective, double-blind, randomized trial of tetracaine versus saline set in the emergency department (ED) of a regional tertiary care teaching hospital. A total of 116 patients presenting with uncomplicated corneal abrasions were included in this study. The intervention was either undiluted, preservative-free, topical tetracaine hydrochloride 1% or saline, applied up to every 30 minutes while awake for 24 hours. Main safety outcome measures were repeat ED examinations at 48 hours with fluorescein staining and slit-lamp examination, 1-week and 1-month telephone interviews with additional examinations as needed, and monitoring of charts for complications. Secondary outcome measures were 100-mm visual analogue scale (VAS) pain scores recorded every 2 hours while awake for 48 hours and patient-perceived overall effectiveness using a numeric rating scale (NRS) of 0 to 10 obtained during telephone interviews.

Results: At least one follow-up encounter was completed on each of the 116 patients. No complications specifically attributed to topical anesthetic use occurred in the 59 patients in the tetracaine group, and the binomial probability confidence interval (CI) of this occurring is 0 to 6.1. There was no significant difference in corneal healing as measured by the percentage of patients with persistent fluorescein uptake at 48 hours between the two groups (23.9% vs. 21.3%, difference = 2.6%, 95% CI = –14% to 20%, p = 0.761) or persistent symptoms at 48 hours (21.7% vs. 21.3%, difference = 0.4%, 95% CI = –16% to 17%, p = 0.957). There was no clinical difference in VAS pain scores between the groups. Patients in the tetracaine group rated the study drugs' overall effectiveness significantly higher on the NRS (7.7 vs. 3.9) compared to patients in the saline group (difference = 3.9, 95% CI = 2.4 to 5.3, p < 0.0005).

Conclusions: Topical tetracaine used for 24 hours is safe, and while there was no significant difference in patient VAS pain ratings over time, patient surveys on overall effectiveness showed that patients perceived tetracaine to be significantly more effective than saline.

Pain Management: Oral Analgesics

- Conditions potentially requiring use of oral analgesics:
  - Corneal ulcers
  - Herpes simplex/zoster
  - Post-surgical
  - Trauma
  - Thermal burns
  - Periorbital infections (e.g. dacryocystitis/preseptal)

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Oral Analgesics: Guidelines

- Make the proper diagnosis first (ie. Don't prescribe without knowing what you are prescribing for!)
- Treat the underlying cause for the pain
- Treat the pain at presentation..don't wait!
- Treat pain continuously over a 24 hour schedule
- Non-prescription drugs should be first choice and tend to be low cost
- Treat patients with the simplest and safest means to alleve pain

Oral Analgesics: Guidelines

- Mild to moderate pain is often successfully treated with acetaminophen or NSAIDs
- Moderate to severe pain is best treated with opioid analgesics
- Adjunctive treatments are very valuable in pain management:
  - Mydriatic/cycloplegic useful for ocular pain
  - Bandage CL or pressure patch
  - Topical skin: Zostrix Cream (Capsaicin), EMLA Cream (lidocaine 2.5% and prilocaine 2.5%)

Systemic NSAID's

- NSAID's are the drug of choice for treating mild to moderate ocular pain.
  - Very beneficial for treating systemic inflammation as well.
- All NSAID's are rapidly absorbed from the GI tract, highly bound in the plasma, and capable of crossing the blood-brain barrier.
- Exhibit a "ceiling effect" – there is a dosage beyond which no further analgesia occurs.
  - Produce no tolerance or dependence, increasing their safety profile.
- Variability exists in patient responses to NSAID's
  - No definitive recommendation on treatment can be given.
    - If one NSAID does not work – TRY ANOTHER.

Ibuprofen

- Mild to moderate pain, fever
- Adult analgesic dose: 200-400mg q4-6 hours
  - Maximum Dosage: 1200 mg/day for pain (approved for 3200 mg/day in arthritis treatment)
- OTC: 200 mg tabs (US) 400 mg and 600 mg (Canada)
- Rx: 300, 400, 600, 800mg tabs
  - Can prescribe 800 mg q8hrs
- Peak levels 1-2 hours
- Most renal toxic of all the NSAID's
- Brand Names: Motrin, Advil, and Nuprin

Naproxen Sodium

- OTC: 220 mg (Aleve^{R})
- Rx: 550 mg tablets (Anaprox^{R} and Crysanal^{R})
- For mild to moderate pain

- Adult Dose:
  - OTC: 2 tablets first dose, then 1 tablet 8-12 hours (max dose 1250 mg)
  - Rx: 550 initial dose, followed by 275 (half tablet) every 6-8 hours.
    - Maximum Dose: 1375mg/day.

Indomethacin (Indocin)

- used to treat moderate to severe osteoarthritis, rheumatoid arthritis, gouty arthritis, or ankylosing spondylitis.
- Usual Adult Dosage for Pain: 25-50 mg two to three times/day
- Rx Only: 25, 50 and 75mg capsules
- Mainly used as a short-term anti-inflammatory especially for conditions that do not respond to less toxic NSAIDS.
  - Indomethacin has a very high level of intolerance compared to other NSAID's.

- Oral NSAID most widely used in Tx of ocular inflammation
  - E.g. Scleritis treatment 75 mg BID

Ketoprofen

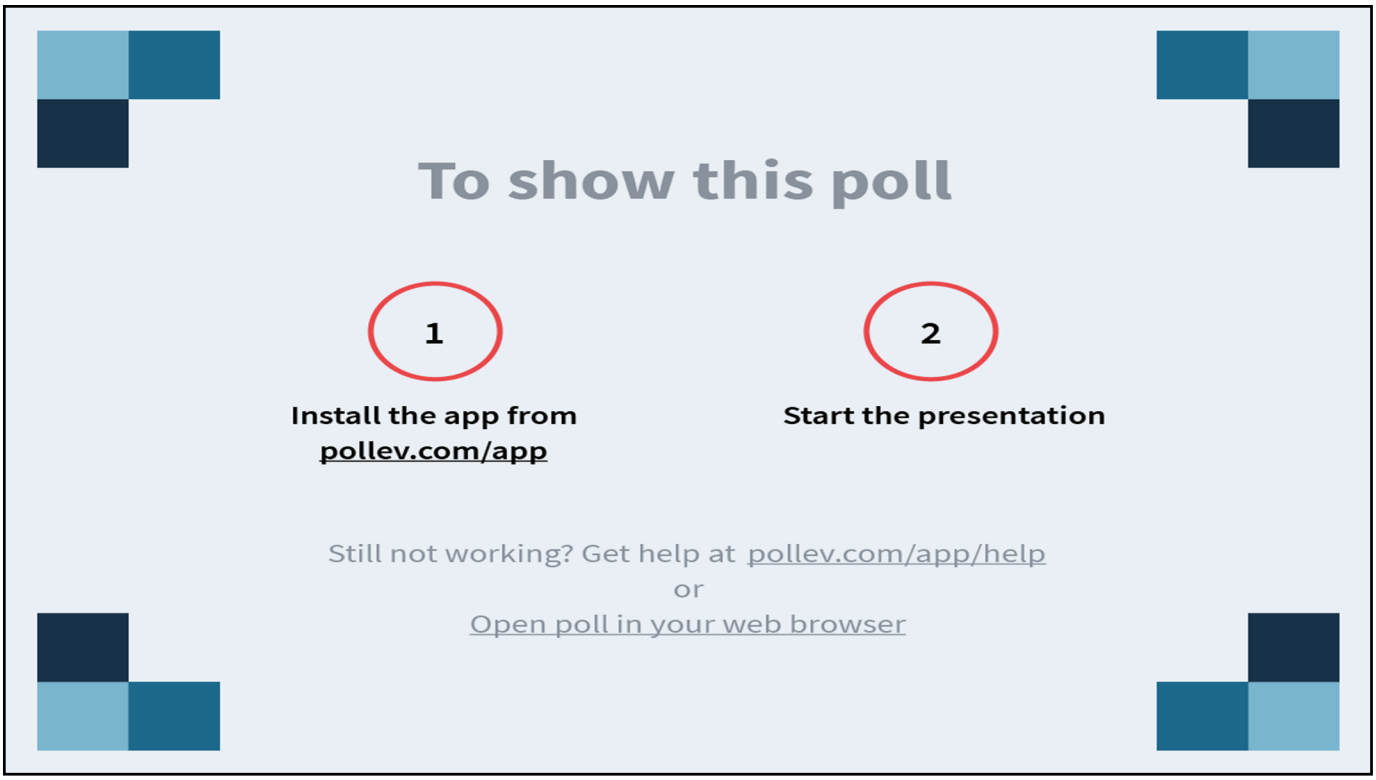
- Indicated for management of mild/moderate pain, menstrual cramps and swelling/pain associated with arthritis
- Oral:
  - Capsule: Generic: 25 mg, 50 mg
  - Capsule Extended Release 24 Hour: Generic: 200 mg
- Adults—25 to 50 milligrams (mg) every 6 to 8 hours as needed.
  - Some people may need to take as much as 75 mg every 6 to 8 hours.
  - Doses larger than 75 mg are not likely to give better relief
- For osteoarthritis and rheumatoid arthritis: Adults—At first, 75 milligrams (mg) 3 times a day or 50 mg 4 times a day.
- Has been used for scleritis patients to avoid the side effects seen with indomethacin

Ketorolac: (Toradol dsc in US)

- Used to treat moderate to severe pain
- Often used in managing post-operative pain and in ER in lieu of opioids
- Often IM or IV for pain management
- Oral: 10 mg
  - Adults (patients 16 years of age and older)—One 10 mg tablet four times a day, 4-6 hours apart. Some people may be directed to take two tablets for the first dose only.
  - Should not be used for more than 5 days.
- To lessen stomach upset, ketorolac tablets should be taken with food (a meal or a snack) or with an antacid.
- Take this medicine with a full glass of water. Also, do not lie down for about 15 to 30 minutes after taking it. This helps to prevent irritation that may lead to trouble in swallowing.

Cox-2 Inhibitors

- Selective agents for only COX-2 designed to protect the GI system from the side effects seen with NSAID's.
- It is approved for the management of the signs and symptoms of osteoarthritis, rheumatoid arthritis, JRA (in patients >2), ankylosing spondylitis and acute pain
- Major agent available on the market is Celecoxib (Celebrex).
  - Other agents Valdecoxib (Bextra) and Rofecoxib (Vioxx) were removed from the market due to increased risk of heart attacks and strokes.
- Available: 50, 100, 200 and 400 mg capsules
- Osteoarthritis Dosage: 100 mg BID or 200 mg single dose daily
- RA: 100 to 200 mg BID daily



Contraindications to NSAIDs

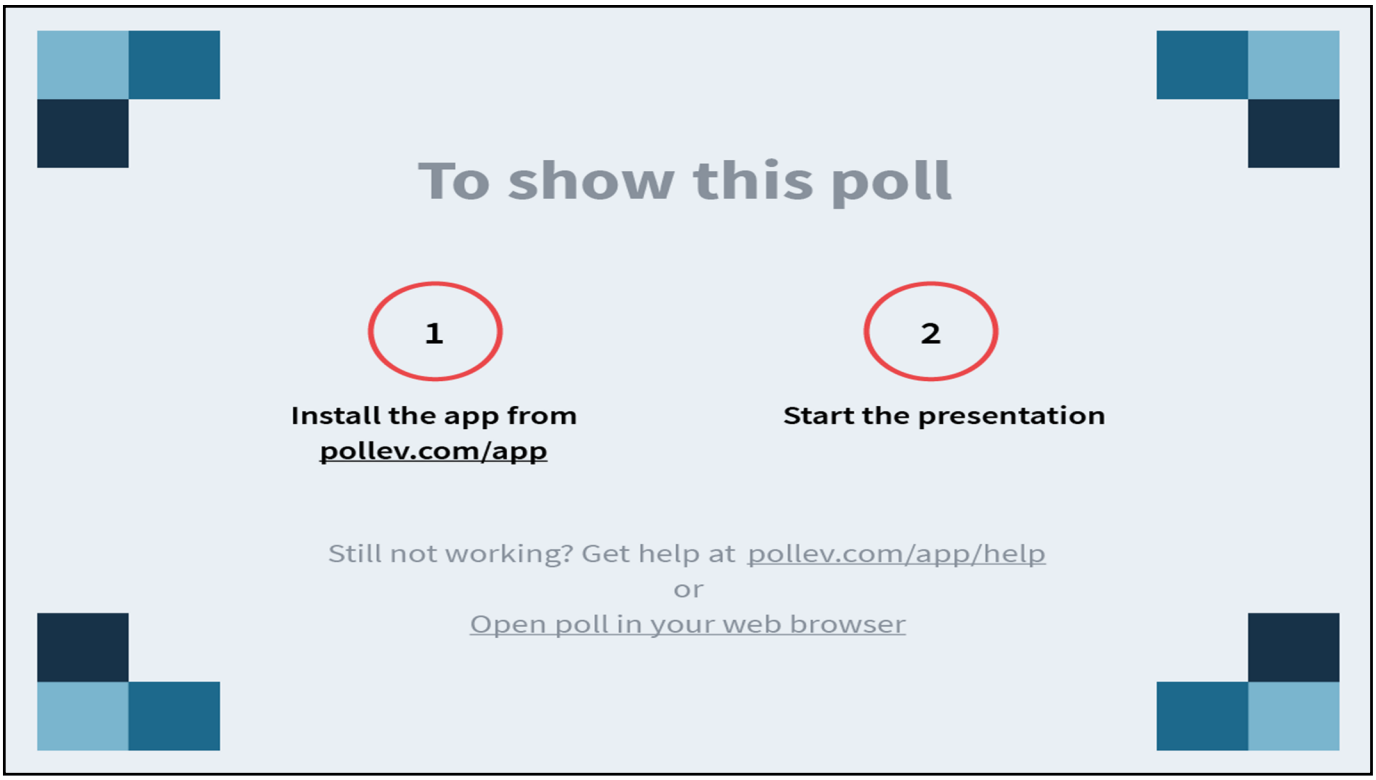
- Avoid in:
  - Pregnancy (especially the late trimesters)
  - Active Peptic Ulcer Disease
  - Cross Sensitivity to ASA
  - Previous Hypersensitivity to NSAIDs
  - Chronic Renal Insufficiency
- At Risk Patients Include:
  - Dehydration
  - HTN or CHF
    - Use of ACE Inhibitors, diuretics and B-blockers
    - Higher doses of NSAIDs and chronic therapy extending beyond a week will be more likely to increase BP
  - Advanced Age

NSAIDS Black Box Warning

- BLACK BOX WARNING:
  - May increase the risk of serious thrombotic events, MI, and stroke.
  - Increase risk of serious GI adverse effects such as bleeding, ulcer, and perforation.

NSAID-related ulcers

- COX-2 inhibitors such as celecoxib (Celebrex) are less likely to cause ulcers than aspirin
- Proton pump inhibitors (e.g. Losec^{R} Prevacid® or Prilosec ®) help to offset the risk of NSAID-related stomach ulcers
  - patients should be treated with concomitant proton pump inhibitors once daily, which results in ulcer healing rates of approximately 80% at 8 weeks in patients continuing to take NSAIDs



Acetaminophen

- Mechanism of Action is not well understood.
  - Possibly some CNS component
  - Very weak inhibitor of prostaglandin synthesis
- One of the most commonly used analgesics for mild to moderate pain.
  - Equal analgesic properties to ASA unless associated with inflammation, where it is less effective.

Take home: Good for pain; Good for fever;
No effect on inflammation

Acetaminophen and Neurodegenerative Disease??

- Acetaminophen has been considered the safest over-the-counter option in pregnancy among all analgesics and antipyretics.
- Conflicting reports in the literature
- Many studies use “parent reported” autism/ADHD
- Most studies do not include sibling data
- Many studies have low cohort numbers that were included in the data analysis
- Studies that do show a “link” do not demonstrate cause and effect

Use of Negative Control Exposure Analysis to Evaluate Confounding: An Example of Acetaminophen Exposure and Attention-Deficit/Hyperactivity Disorder in Nurses' Health Study II

- Frequent maternal use of acetaminophen in pregnancy has been linked to attention-deficit/hyperactivity disorder (ADHD) in children, but concerns regarding uncontrolled confounding remain. In this article, we illustrate use of the negative control exposure (NCE) approach to evaluate uncontrolled confounding bias in observational studies on pregnancy drug safety and explain the causal assumptions behind the method. We conducted an NCE analysis and evaluated the associations between maternal acetaminophen use during different exposure periods and ADHD among 8,856 children born in 1993-2005 to women enrolled in the Nurses' Health Study II cohort. Information on regular maternal acetaminophen use was collected prospectively in biennial questionnaires. A total of 721 children (8.1%) in the cohort had been diagnosed with ADHD as reported by the mothers. Our NCE analysis suggested that only acetaminophen use at the time of pregnancy was associated with childhood ADHD (odds ratio = 1.34, 95% confidence interval: 1.05, 1.72), and the effect estimates for the 2 NCE periods (about 4 years before and 4 years after the pregnancy) were null. Our findings corroborate those of prior reports suggesting that prenatal acetaminophen exposure may influence neurodevelopment. The lack of an association between acetaminophen use in the pre- and postpregnancy exposure periods and ADHD provides assurance that uncontrolled time-invariant factors do not explain this association.

Liew Z, Kioumourtzoglou MA, Roberts AL, O'Reilly ÉJ, Ascherio A, Weisskopf MG. Use of Negative Control Exposure Analysis to Evaluate Confounding: An Example of Acetaminophen Exposure and Attention-Deficit/Hyperactivity Disorder in Nurses' Health Study II. Am J Epidemiol. 2019 Apr 1;188(4):768-775. doi: 10.1093/aje/kwy288. PMID: 30923825; PMCID: PMC6438812.

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Association of Cord Plasma Biomarkers of In Utero Acetaminophen Exposure With Risk of Attention-Deficit/Hyperactivity Disorder and Autism Spectrum Disorder in Childhood

- **Importance:** Prior studies have raised concern about maternal acetaminophen use during pregnancy and increased risk of attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) in their children; however, most studies have relied on maternal self-report.
- **Objective:** To examine the prospective associations between cord plasma acetaminophen metabolites and physician-diagnosed ADHD, ASD, both ADHD and ASD, and developmental disabilities (DDs) in childhood.
- **Design, setting, and participants:** This prospective cohort study analyzed 996 mother-infant dyads,(257 were used in the study) a subset of the Boston Birth Cohort, who were enrolled at birth and followed up prospectively at the Boston Medical Center from October 1, 1998, to June 30, 2018
- **Conclusions and relevance:** Cord biomarkers of fetal exposure to acetaminophen were associated with significantly increased risk of childhood ADHD and ASD in a dose-response fashion. Our findings support previous studies regarding the association between prenatal and perinatal acetaminophen exposure and childhood neurodevelopmental risk and warrant additional investigations.

Ji Y, Azuine RE, Zhang Y, Hou W, Hong X, Wang G, Riley A, Pearson C, Zuckerman B, Wang X. Association of Cord Plasma Biomarkers of In Utero Acetaminophen Exposure With Risk of Attention-Deficit/Hyperactivity Disorder and Autism Spectrum Disorder in Childhood. JAMA Psychiatry. 2020 Feb 1;77(2):180-189. doi:

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Acetaminophen

- Typical Adult Dosage (FDA Based):
  - 650 mg every 4 - 6 hours for Regular Strength (2 X 325)
    - Cannot take more than 10 caplets in 24 hours.
  - 1000 mg every 6 hours for Extra Strength (2 X 500)
    - Cannot take more than 6 caplets in 24 hours.
  - 1300 mg every 8 hours for Extended Release (2 X 650)
    - Cannot take more than 6 capsules in 24 hours.
- Daily dose of acetaminophen should not exceed 3 grams!
  - This has been recently changed from 4000 mg which can be done with doctor approval.
- Should only be used for short term therapy
- Exhibits a ceiling effect, like NSAIDs and ASA.

Dangers of Acetaminophen

- Acetaminophen overdose is the leading cause of liver failure in the U.S.
  - It sends 56,000 people to the emergency room annually and causes approximately 400 deaths yearly.
- Acetaminophen is used in so many products, people are often unaware that they are taking it, leading to more overdoses.
  - Combined with agents to get wide range of symptom coverage.
    - Antihistamines such as diphenhydramine – Tylenol PM
    - Diuretics such as Pyrilamine maleate – Midol Complete
    - Cough Suppressants such as Dextromethorphan - Nyquil

Consider Combining APAP with NSAID's for Mild to Moderate Pain Relief

1:00 pm: Two 325mg Tylenol

3:00 pm: Two 200mg Ibuprofen

5:00 pm: Two 325mg Tylenol

7:00 pm: Two 200mg Ibuprofen

Alternated every 2 hours while awake

- Each medication is q 4 hours.

Oral Analgesics: Guidelines

- Never exceed maximum recommended dosages:
  - ASA: 4 grams/day
  - Acetaminophen: 4 grams/day???? (newer data suggest should be closer to 3-3.2 grams/day)
  - Ibuprofen: 1200 mg/day OTC and up to 3200 mg/day prescription (for RA)
  - Naproxen: 1250/day
  - Naproxen sodium: 1375/day
  - Codeine: 360 mg/day

Gabapentin (Neurontin^{R})

- Classified as an anticonvulsant drug
- Additionally, used in the treatment of patients with chronic pain
- **Gabapentin**, is not currently classified as a **controlled substance** in most states, however, its abuse potential is still being investigated.
  - Kentucky, Michigan, Tennessee, West Virginia ??, Virginia ??, and Ohio ?? have reclassified **gabapentin** as a Schedule V **controlled substance**.

Gabapentin (Neurontin^{R})

- Gabapentin has primarily been studied and found effective for the treatment of postherpetic neuralgia and painful diabetic neuropathy; evidence for efficacy in other types of neuropathic pain is limited
  - The transition of gabapentinoids into a first-line pain medication is in part due to an intentional marketing strategy by the pharmaceutical industry without adequate studies.
- Treatment with gabapentin should be initiated at a low dose with gradual increases until pain relief or dose-limiting adverse effects are achieved.
- Dosage:
  - Day 1 single 300 mg dose
  - Day 2 600 mg dose
  - Day 3 900 mg dose
  - Can be tittered up all the way to 1800 mg/day

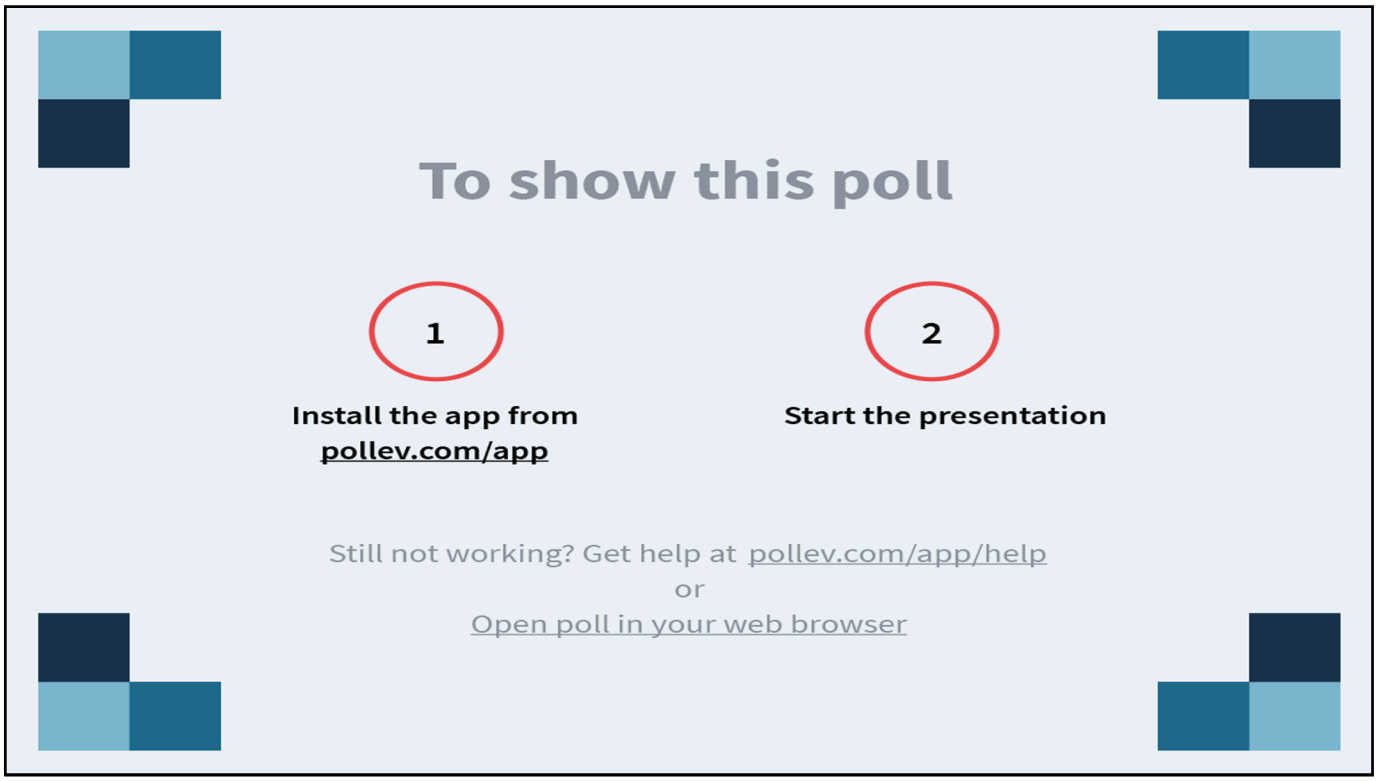
Gabapentin (Neurontin^{R})

- Gabapentinoids have significant risks despite their reputation as safe drugs.
  - Central nervous system effects such as sedation, dizziness, gait instability, and feeling intoxicated are quite common; as many as one in three patients taking therapeutic doses will experience dizziness or somnolence

Opioids vs Ibuprofen + Acetaminophen

1000mg acetaminophen and 400 mg ibuprofen

- **Ibuprofen Plus Acetaminophen Equals Opioid Plus Acetaminophen for Acute Severe Extremity Pain.** Am Fam Physician. 2018;97(5):348
- Effect of a Single Dose of Oral Opioid and Nonopioid Analgesics on Acute Extremity Pain in the Emergency Department: A Randomized Clinical Trial. JAMA. 2017;318(17):1661-1667.
  - no statistically significant or clinically important differences in pain reduction at 2 hours among single-dose treatment with ibuprofen and acetaminophen or with 3 different opioid and acetaminophen combination analgesics



Opioids Information

- Drug of first choice for the treatment of **severe** acute pain.
- Block the body's natural protective mechanism for protecting areas in pain – thus never prescribe unless you know the direct cause of the pain.
- Often administered in combination with acetaminophen to enhance the analgesic effect.

SIGNS OF AN OPIOID OVERDOSE. B.L.U.E.

BREATHING — Breathing during an overdose is shallow, gurgling, erratic, or completely absent.

LIPS — Lips and fingertips are blue, due to decreased oxygen throughout the body.

UNRESPONSIVE — The victim will not respond to verbal or physical stimulation.

EYES — Pupils are pinpoint, as the opioids constrict the pupils to an unusally small size.

Opioid Overdose: Management Naloxone (Narcan^{R})

- Opioid antagonist
- Available routes of administration include IV (preferred), IM, SubQ, and intranasal
- For the initial treatment of an opioid-associated life-threatening emergency, the American Heart Association recommends, after initiation of CPR, the use of intranasal or IM naloxone with a repeat dose as needed.
- If there is an initial patient response (ie, purposeful movement, regular breathing, moan or other response) but the patient then stops responding, begin CPR and repeat naloxone dose.
- If no initial response, continue CPR and use AED as appropriate

Opioid Overdose: Management Naloxone (Narcan^{R})

- 4 mg (contents of 1 nasal spray) as a single dose in one nostril; may repeat every 2 to 3 minutes in alternating nostrils until medical assistance becomes available

Newly Approved Treatments

- March 29, 2023:
  - the FDA approved Narcan, 4 milligram (mg) naloxone hydrochloride nasal spray for over-the-counter (OTC), nonprescription, use – the first naloxone product approved for use without a prescription.
- May 22, 2023:
  - the FDA approved Opvee, the first nalmefene hydrochloride nasal spray for the emergency treatment of known or suspected opioid overdose in adults and pediatric patients 12 years of age and older. This is the first FDA approval of nalmefene hydrochloride nasal spray for health care and community use.

Opioids Side Effects

- Side Effects are very hard to predict because opioids can cause CNS depression or stimulation.
- CNS Side Effects
  - Dizziness, lightheadedness, sedation, and drowsiness are the most common.
  - Mood elevation (euphoria) and disorientation can occur in some patients.
  - Exacerbated if used in combination with alcohol, depression medications such as tricyclic antidepressants, anticholinergics, antihistamines, anti-seizure medications, or muscle relaxants, etc.
  - Visual symptoms such as blurry vision, miosis, and diplopia can occur.

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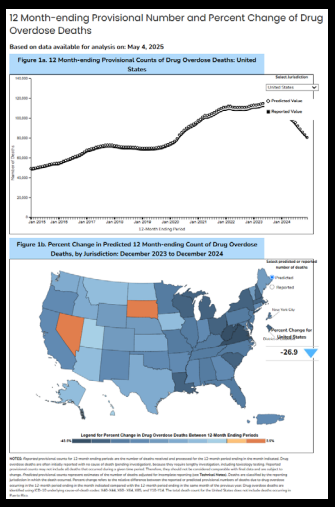
Decrease in Opioid Overdose Deaths in 2024

- Provisional data from the CDC's National Center for Health Statistics indicate there were an estimated 80,391 drug overdose deaths in the United States during 2024—a decrease of 26.9% from the 110,037 deaths estimated in 2023.
- Annual drug overdose deaths are projected to reach their lowest level since 2019.
- Almost all states across the nation saw decreases; Louisiana, Michigan, New Hampshire, Ohio, Virginia, West Virginia, and Wisconsin and Washington, D.C., experienced declines of 35% or more.



Opioid Side Effects

- Nausea and Vomiting (more common in ambulatory pts.)
- Constipation
  - Can be relieved by OTC docusate sodium (Colace).
- Respiratory Side Effects:
  - Respiratory Depression
    - Most serious side effect of the opioids

Patient Education

- Avoid all depressants – especially using along with alcohol.
- Must educate all patients of risks of these symptoms and caution them for driving or operating dangerous machines.
- Stomach upset can be helped by consuming the medication with food.
- Watch for signs of breathing difficulty or changes in blood pressure.

Scheduled Medications – Most Opioids

Schedule	Description	Optometric Medications
I	Not commercially available; no approved indication	
II	Very addictive medications that are accepted for medicinal use	Oxycodone = OxyContin, OxyFast Oxycodone + APAP = Percocet Hydromorphone (Dilaudid) Codeine Sulfate = Codeine Generic Meperidine (Demerol) **Hydrocodone + APAP = Lortab** **Hydrocodone + Ibuprofen = Generic**
III	Significant abuse risk, but less potent than I or II. May still contain narcotics.	Codeine + APAP = Tylenol 3 and Tylenol 4
IV	Relatively low abuse potential and limited risk	Tramadol
V	Very limited abuse potential. May be OTC in some states.	Cough medicine with codeine

Opioids: Codeine

Note: Tylenol 3 and 4 no longer available as Brand name

- Analgesic effect occurs within 20 minutes of ingestion and reaches a maximum at 1 – 2 hours.
  - Ceiling effect occurs.
- Usually administered in combination with acetaminophen .
  - Tylenol 1 (222): codeine 8 mg, 300 mg acetaminophen and 15 mg caffeine (Canada)
  - Tylenol 3 = Codeine 30 mg and Acetaminophen 300 mg
    - Dosage: 1-2 tablets every 4 hours.
  - Tylenol 4 = Codeine 60 mg and Acetamenophin 300 mg
    - Dosage: 1 tablet every 4 – 6 hours

Schedule II Opioids: Hydrocodone

- Approximately 6X more potent than codeine.
- Milder Side Effects than Codeine: Less constipation and sedation.
- Clinically believed to cause more euphoria than codeine, but this is not backed by clinical studies.

Opioids: Hydrocodone

- Used in combination with APAP and Ibuprofen.
  - Lortab: Hydrocodone 5, 7.5, and 10 mg with APAP 325 mg
    - Dosage: 1-2 tablet every 4-6 hours
  - Lortab Elixer: Hydrocodone 10 mg with APAP 300 / 15 mL
    - Dosage: 3 tsp every 4-6 hours
  - Generic:
    - Hydrocodone bitartrate 5, 7.5, 10 mg and acetaminophen 300 mg
    - Hydrocodone bitartrate 5, 7.5, 10 mg and acetaminophen 325 mg
  - Generic Elixer:
    - Hydrocodone bitartrate 7.5, 10 mg and acetaminophen 325 mg per 15 mL
  - Generic:
    - Hydrocodone bitartrate 5, 7.5, 10 mg and ibuprofen 200 mg

Schedule II Opioids: Oxycodone

- Approximately 10-12X more potent than codeine
  - As potent as parenteral morphine when given orally.
- Lower level of side effects in comparison to morphine, but high level of euphoria produced, thus higher level of abuse risk.

Opioids: Oxycodone

- Available in combination with APAP (combinations with ASA or Ibuprofen discontinued in US).
- Dosage: 1 tablet every 4-6 hours
  - Endocet tablets:
    - 2.5, 5, 7.5 or 10 mg Oxycodone with 325 mg Acetaminophen
  - Nalocet:
    - Oxycodone hydrochloride 2.5 mg and acetaminophen 300 mg
  - Percocet Tablets
    - 2.5, 5, 7.5 or 10 mg Oxycodone with 325 mg Acetaminophen
  - Prolate:
    5, 7.5 or 10 mg Oxycodone with 300 mg Acetaminophen
  - Generic:
    - 2.5, 5, 7.5 or 10 mg Oxycodone with 325 mg Acetaminophen

Schedule IV: Tramadol

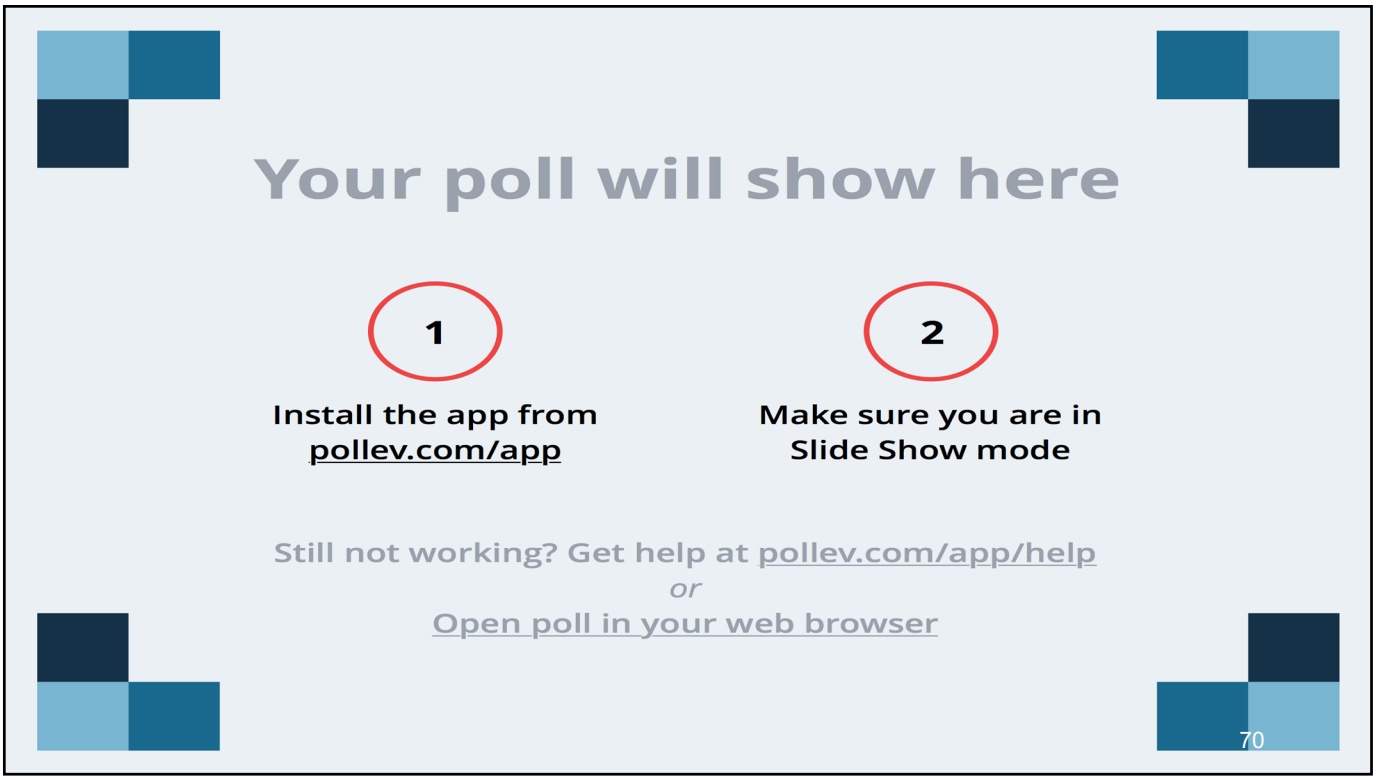
- Central acting narcotic
  - Synthetic analogue of codeine.
  - Binds to mu receptors and inhibits norepinephrine and serotonin reuptake.
  - Potential for abuse is very low, but has occurred.
- Generic: 50 mg, 100 mg
- Dosage: 50 – 100 mg q4 – 6 hours.
  - Analgesia occurs after 1 hour.
  - Maximum dose: 400 mg/day

Tramadol Extended Release

- ConZip:
  - Available dosages of 100, 200, and 300 mg extended.
  - Begin taking 100 mg daily X 5 days
  - Increase by 100 mg if relief not met to 200 mg X 5 days.
  - 300 mg maximum daily.
- Generic: 100 mg, 200 mg, 300 mg
- Does not work on all patients – some need heavy doses every 4-6 hours.
- More for chronic pain control.

Tramadol + APAP

- Generic: Combination of:
  - 325 mg of APAP
  - 37.5 mg of Tramadol
- Dosage: 2 tablets every 4 – 6 hours
- Max: 8 tablets daily



Preseptal Cellulitis

- Infection and inflammation located anterior to the orbital septum and limited to the superficial periorbital tissues and eyelids.
- Usually follows sinus infection or internal hordeolum (possibly trauma)
- Eyelid swelling, redness, ptosis, pain and low grade fever.

Differentiating Orbital vs. Preseptal

FINDING	ORBITAL	PRESEPTAL
Visual Acuity	Decreased	Normal
Proptosis	Marked	Absent
Chemosis and Hyperemia	Marked	Rare/Mild
Pupils	RAPD	Normal
Pain and Motility	Restricted and Painful	Normal
IOP		Normal
Temperature	102 - 104	Normal/mild elevation
HA and Assoc. Symptoms	Common	Absent

Treatment: Orals for Preseptal, Often IV for Orbital

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Preseptal Cellulitis

- Tx:
  - ***Augmentin 500 mg TID or 875 mg BID for 5-7 days***
  - or if moderate to severe IV Fortaz (ceftazidime) 1-2 g q8h.
  - If MRSA possible, consider Bactrim/Septra

Penicillins: Augmentin

- **Augmentin is amoxicillin with potassium clavulanate (clavulanic acid 125 mg).**
- Clavulanate is a B-Lactamase inhibitor which reduces a bacteria's ability to negate the effect of the amoxicillin by inactivating penicillinase (enzyme that inactivates the antibiotic affect).

Penicillins: Augmentin

- **Clavulin (Augmentin) is very effective for skin and skin structure infections** such as:
  - dacryocystitis,
  - internal hordeola,
  - pre-septal cellulitis.
- Treatment of:
  - otitis media,
  - sinusitis,
  - lower respiratory and urinary infections.
- Given prophylactically to dental surgery patients.

Antibiotic Associated Diarrhea (AAD)

- The most common side effects of antibiotics are gastro-intestinal, such as nausea and diarrhea
- AAD arises when the antibiotic disrupts the ecology of the intestinal microbiota, by altering the diversity and numbers of bacteria in the gut.
- Diarrhea is most frequently associated with the use of broad-spectrum antibiotics (e.g amoxicillin)

Agamennone, V., Krul, C.A.M., Rijkers, G. et al. A practical guide for probiotics applied to the case of antibiotic-associated diarrhea in The Netherlands. BMC Gastroenterol 18, 103 (2018

AAD and Probiotics

- The core benefit of probiotics is exercised by contributing to the maintenance of a balanced microbiota and therefore by creating a favorable gut environment
- The efficacy of probiotics in preventing AAD depends on the dose.
  - A daily intake of at least 5×10^9 CFU is associated with significant efficacy for AAD and it has been shown that higher probiotic dose is linked to greater efficacy
  - Example: The probiotic content of yogurt products can range from 90 to 500 billion CFU per serving

Agamennone, V., Krul, C.A.M., Rijkers, G. et al. A practical guide for probiotics applied to the case of antibiotic-associated diarrhea in The Netherlands. BMC Gastroenterol 18, 103 (2018

5 Facts About Penicillin Allergy

- Approximately 10% of all U.S. patients report having an allergic reaction to a penicillin class antibiotic in their past.
  - When evaluated, fewer than 1% of the population are truly allergic to penicillins.
- Approximately 80% of patients with IgE-mediated penicillin allergy lose their sensitivity after 10 years.
- Broad-spectrum antibiotics are often used as an alternative to penicillins. The use of broad-spectrum antibiotics in patients labeled "penicillin-allergic" is associated with higher healthcare costs, increased risk for antibiotic resistance, and suboptimal antibiotic therapy.
- Correctly identifying those who are not truly penicillin-allergic can decrease unnecessary use of broad-spectrum antibiotics.

https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf

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Penicillins: Augmentin.

Adults:

- **250 TID, 500 mg tab BID-TID depending on what you are treating** (also available in chewable tablets and suspension)
- or **875 mg q 12hr (bid)**
- 1000 mg XR: q12 hr and not for use in children <16

Peds: <3 mos 30mg/kg/day divided q12hrs using suspension

- >3 mos 45-90mg/kg/day divided q12hrs (otitis media 90mg for 10 days)

Cephalosporins

- Closely related structurally and functionally to the penicillins,
  - **have the same mode of action,**
  - affected by the same resistance mechanisms.
  - tend to be more resistant to B-lactamases.
- classified as 1st, 2nd, 3rd, 4th and now 5th generation based largely on their bacterial susceptibility patterns and resistance to B-lactamases.
- Typically administered IV or IM, **poor oral absorption**

Cephalosporins

- 1st generation: **cefadroxil (Duricef)**, **cefazolin (Ancef)**, **cephalexin (Keflex)**, and cephalothin
- 2nd generations: **cefaclor (Ceclor)**, cefprozil, **cefuroxime (Zinacef)**, cefotetan, cefoxitin
- 3rd generation: cefdinir (Omnicef), cefixime, **cefotaxime (Claforan)**, **ceftazidime (Fortaz)**, ceftibuten, ceftizoxime, **ceftriaxone (Rocephin IM/IV)**.
- 4th generation: cefepime
- *Keflex, Ceclor, Omnicef,* (all orally administered) are effective against most gram positive pathogens and especially good for skin and soft tissue infections.

Cephalosporins

- **Keflex/Teva-Cephalexin (cephalexin) 1st Generation:**
  - treatment of respiratory, GI, skin and skin structure, and bone infections as well as otitis media
  - Adults: 250-1000 mg every 6 hours
    - **- typical dosing 500 every 6 hours**
  - Children: 25-100 mg/kg/day divided 6-8 hours
  - Available:
    - 250 mg
    - 500 mg
    - 750 mg (pricey)
      - Typically a BID dosing
      - Not commonly used

Cephalosporins

- Cefaclor (Ceclor/Raniclor) (2nd generation):
  - Immediate-release: 250 to 500 mg every 8 hours
  - Extended-release: 500 mg every 12 hours

- Mild preseptal cellulitis = 250-500 mg TID in adults and 20-40 mg/kg/day in three divided doses for children

Cephalosporins

- Cefdinir (Omnicef no longer available in the US, available as generic)
  - Used in the treatment of community acquired pneumonia, acute flare ups of chronic bronchitis, acute maxillary sinusitis and tonsilitis.
  - Adult dosing:
    - comes in 300 mg capsules and recommended dosing is 600 mg per day (single dose is equivalent to 300 every 12 hours)

Co-Trimoxazole (Bactrim/Septra)

- Combination of trimethoprim and sulfamethoxazole (TMX-SMX)
  - shows greater antimicrobial activity than equivalent quantities of either drug alone.
- Has broader spectrum of action than the sulfa's and is effective in treating:
  - UTIs and respiratory tract infections
  - often considered for treatment of MRSA skin infections

Co-Trimoxazole (Bactrim/Septra)

- Available:
  - **Bactrim/Septra tablets (Standard Strength):**
    - contains 80 mg trimethoprim and 400 mg sulfamethoxazole
    - dosing **2 tablets every 12 hours**
  - **Bactrim DS/Septra DS (Double Strength)**
    - contains 160 mg trimethoprim and 800 mg sulfamethoxazole
    - Dosing **1 tablet every 12 hours**

Co-Trimoxazole (Bactrim/Septra)

- Contraindication!!!!!
  - Methotrexate (MTX) is a folic acid antagonist used for the treatment of many autoimmune diseases (e.g. rheumatoid arthritis, JIA, lupus etc)
    - TMP-SMX is an inhibitor of folic acid metabolism and can cause bone marrow suppression.
    - TMX-SMX is also known to decrease the renal excretion of MTX.
    - When used in combination, the potential for toxicity is substantial.
- Drink plenty of fluids to prevent kidney stones.
  - Interacts with diuretics and ACE inhibitors
- Exposure to sunlight, even for brief periods of time, may cause severe sunburn or skin rash, redness, itching, or discoloration.

Oral antimicrobial therapy for treatment of skin and soft tissue infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) in adults

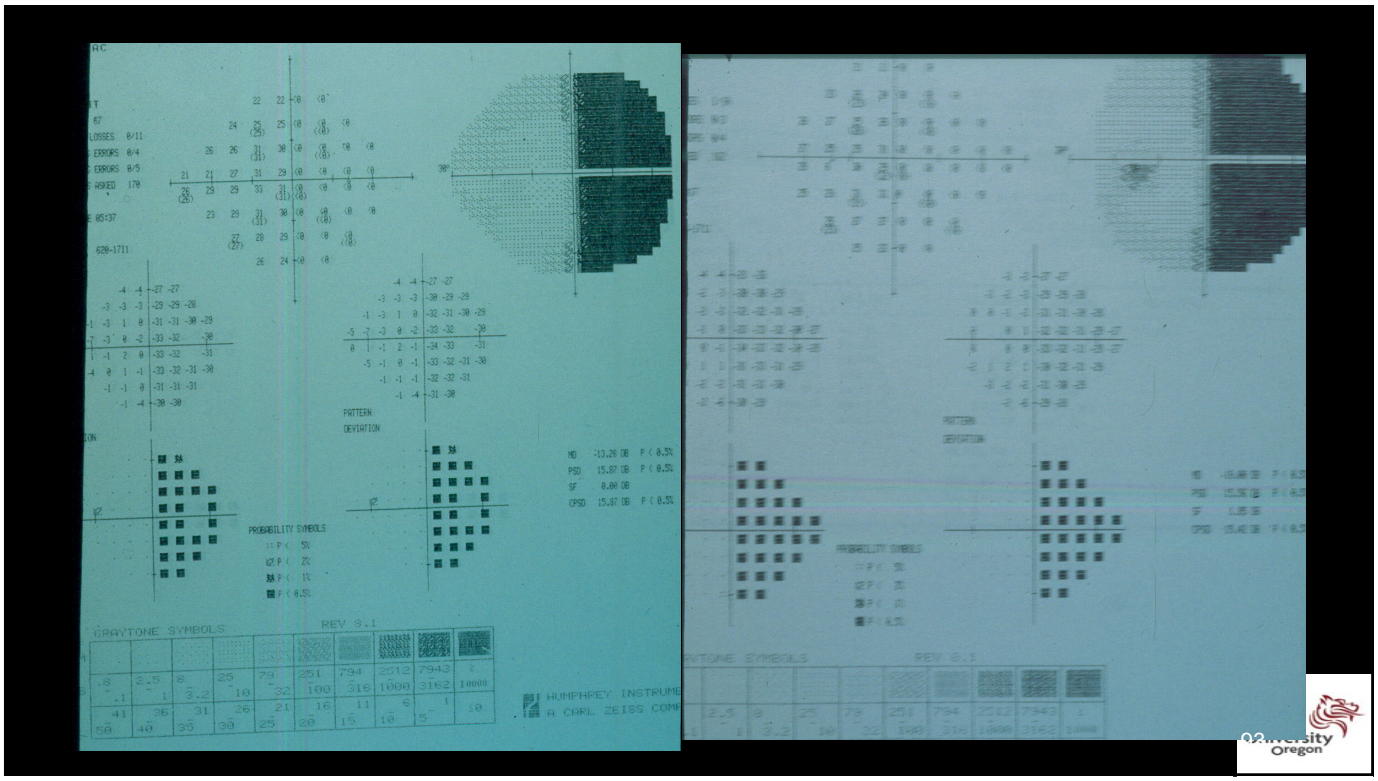
Treatment	Adult dose
Preferred agents*	
Trimethoprim-sulfamethoxazole (cotrimoxazole)	1 or 2 DS tablets twice daily¶
Clindamycin	450 mg orally 3 times daily
Doxycycline	100 mg orally twice daily
Minocycline	200 mg orally once, then 100 mg orally twice daily
Alternative agentsΔ**	
Linezolid	600 mg orally twice daily
Tedizolid	200 mg orally once daily
Delafloxacin	450 mg orally twice daily
Omadacycline	300 mg orally once daily

From Up to Date: MRSA in adults, accessed 09/06/2022

Case Example

- 67 YOF
- HA and vision loss x 2 days
- OHx: unremarkable
- LEE: 3 days ago!
- MHx: unremarkable

Case courtesy of Dr. Tammy Than


PATTERN
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GRAYTONE SYMBOLS
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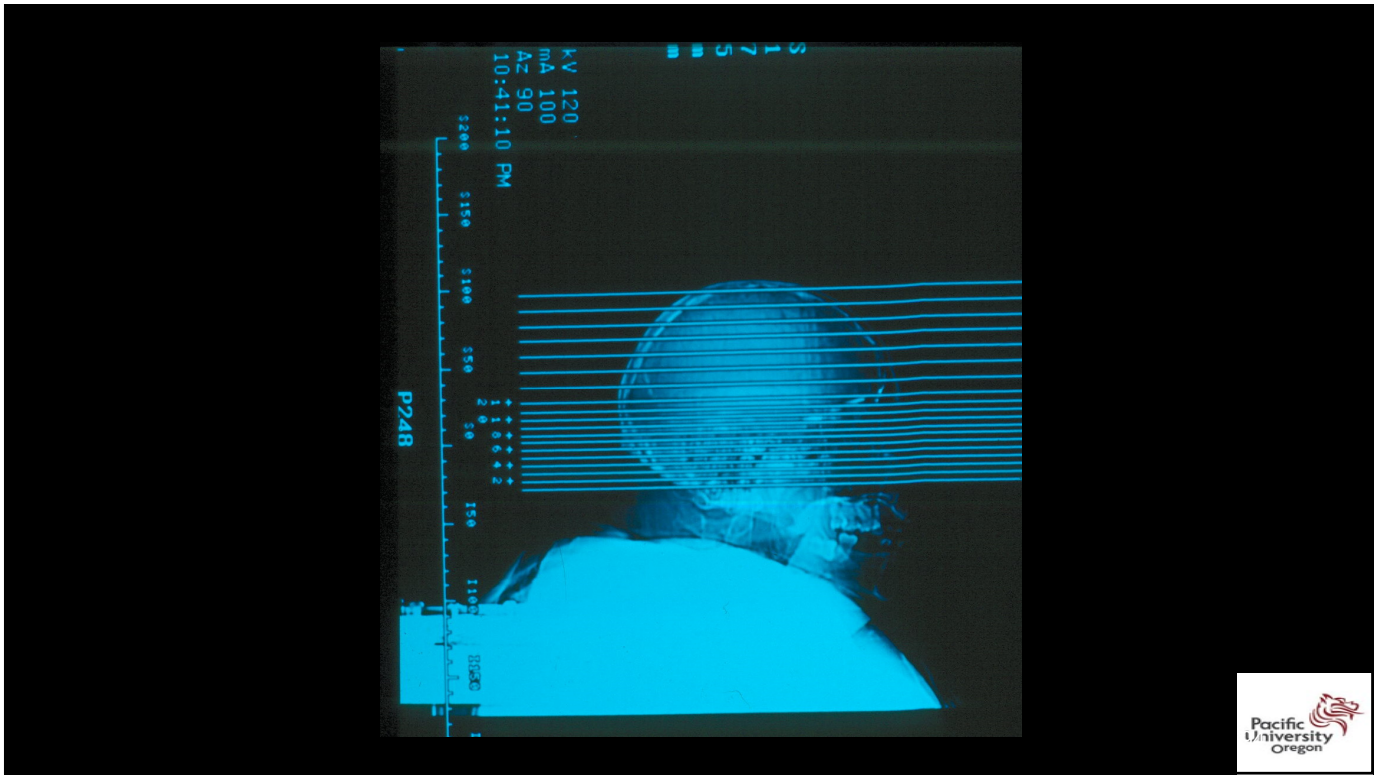
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AZ 90
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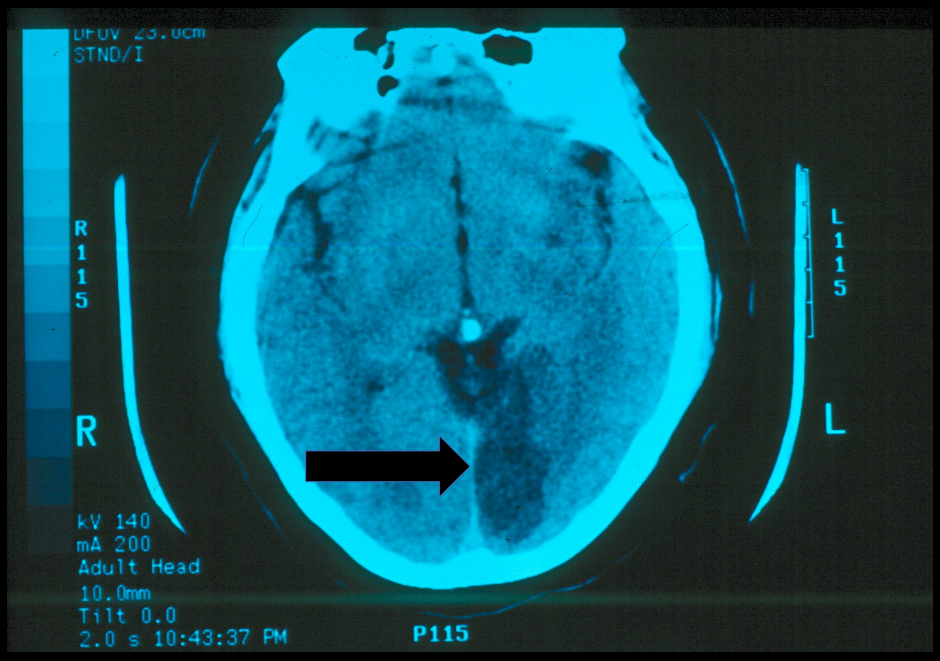

Case courtesy of Dr. Tammy Than

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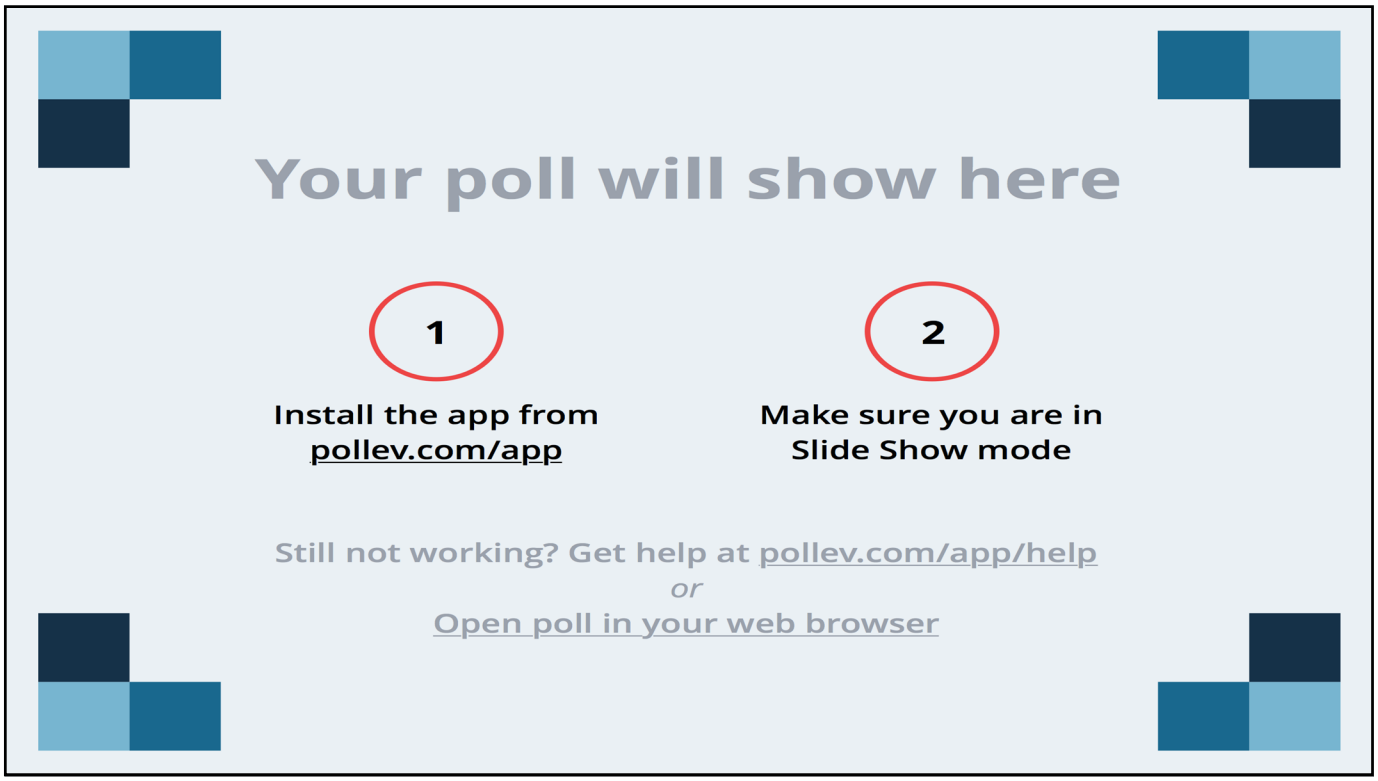


Minocycline?

- Proposed mechanisms
  - ↓ MMPs (MMP-9)
    - Increase in MMP-9 disrupt blood brain barrier and are linked to poor functional recovery
  - Anti-inflammatory
  - Reduction in microglial activation
    - **microglial activation** is believed to play a central role **in** neuroinflammation and pathological progression of ischemic tissue
  - Nitric oxide (NO) production
    - NO plays a neuroprotective role in **acute ischemic stroke**.
  - Inhibition of apoptotic cell death
    - **Apoptosis** may contribute to a significant proportion of neuron death following acute brain **ischemia**

Acute Stroke Management

- N=152
- Open-label, evaluator masked study
- Minocycline 200 mg QD x 5 d or placebo
- Evaluated on NIH Stroke Scale
  - 0-1 complete/nearly complete improvement
  - 2-7 – mild
  - 8-14 – moderate
  - >15 – severe
  - Day 30: 1.8 versus 7.1

Lampl Y, Boaz M, Gilad R, Lorberboym M, Dabby R, Rapoport A, et al. Minocycline treatment in acute stroke. Neurology. 2007;69(14):1404–10

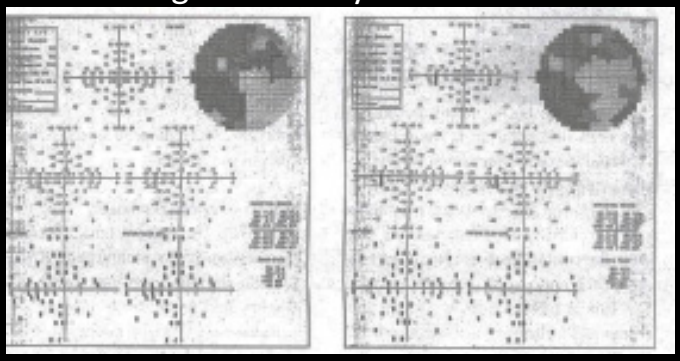
99

TEST	Admission	Day 7	Day 30	Day 90
NIHSS - Min	7.5	6.5	1.8	1.6
NIHSS – Cont	7.6	8.1	7.3	6.5
mRS – Min	2.8	1.5	1.1	0.9
mRS – Cont	2.0	3.1	2.7	2.1
BI – Min	70.0	85.9	90.6	94.9
BI – Cont	63.9	61.9	68.5	77.6

Minocycline for acute stroke treatment: a systematic review and meta-analysis of randomized clinical trials. J Neurol. 2018 Aug;265(8):1871-1879

Case Report

- 77 YOM
- Right occipital infarct
- 3 weeks post stroke
  - Minocycline 100 mg BID x 5 days



Mark Tomsik, OD and Marlene Skulskie, OD

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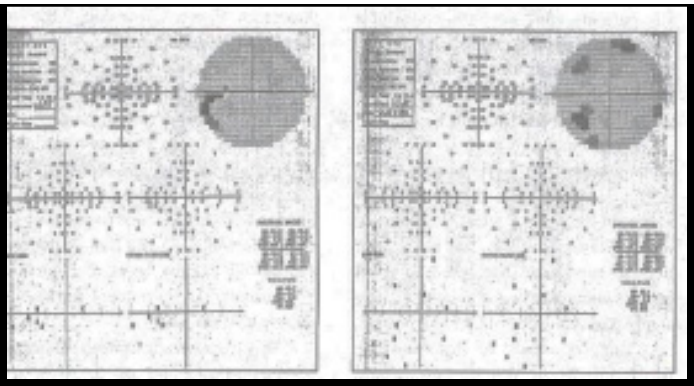
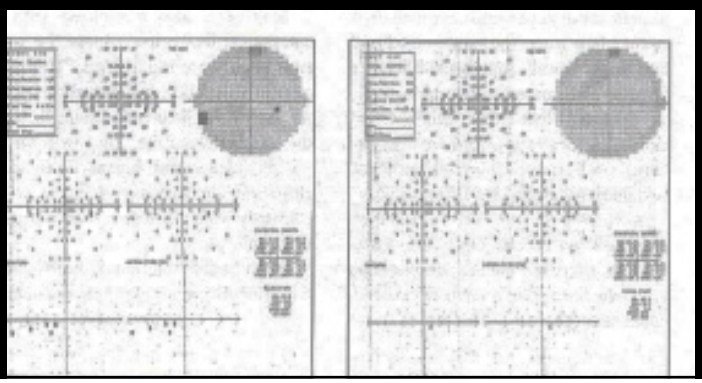
Shortly after TX



1 Year Later



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Tetracyclines

- This group includes:
  - Tetracycline (250mg - 500 mg cap BID-QID) needs to be taken 1 hour before or 2 hours after a meal.
  - Minocycline (100 mg cap BID)
  - **Doxycycline (20mg - 100 mg cap or tab BID)**
    - **In Canada: Apprilon (30 mg doxy + 10 mg slow release doxy)**
- **Rules of Thumb with Doxy:**
  - **Do not take before lying down (>2 hours before)**
  - **Do not take with calcium and avoid antacids**
  - **Do not take with dairy**
  - **Do take with food**
  - **Do educate on sun protection**

Side Effects of Tetracyclines

- Side effects include gastric discomfort, phototoxicity, effects on calcified tissues, vestibular problems, pseudotumor.
- Pregnancy Category D.
  - Tetracyclines are attracted to embryonic and growing bone tissue.
    - Depress growth of long bones in pregnant women/children.
    - Cause changes in both deciduous and permanent teeth during the time of tooth development (Includes discoloration and increased cavities)
- Contraindicated in:
  - Women in the last half of pregnancy
  - Lactating women
  - Children under 8 years of age

Tetracyclines

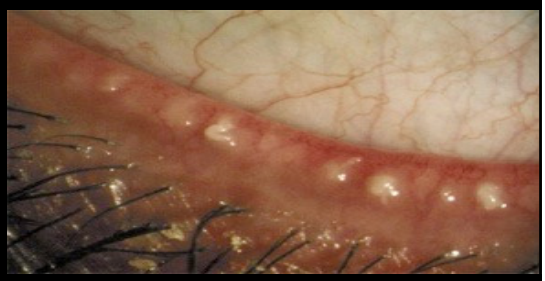
- **Traditional wisdom is that all tetracyclines should not be used in children under the age of 8 due to discoloration of teeth.**
  - Six studies assessed tooth discoloration in at least 338 patients exposed to doxycycline before 8 years of age.
  - Six patients had potential discoloration, but studies consistently found no difference in tooth discoloration between exposed patients and controls.
  - Recommendations have changed stating doxycycline, but not other tetracyclines, can be used for short courses (<21 days) regardless of age.
  - Clinicians should be aware of these data because doxycycline use may extend to disease states apart from tick-borne illnesses in pediatric patients.
    - Stultz JS, Eiland LS. Doxycycline and Tooth Discoloration in Children: Changing of Recommendations Based on Evidence of Safety. Annals of Pharmacotherapy. 2019;53(11):1162-1166.

Tetracyclines

- MRSA: methicillin resistant staph aureus
  - Treatment of MRSA at home usually includes a 7- to 10-day course of an antibiotic (by mouth) such as trimethoprim-sulfamethoxazole (brand name: Bactrim), clindamycin, minocycline, linezolid, or doxycycline.
    - Minocycline: 200 mg orally once, then 100 mg orally twice daily
    - Doxycycline: 100 mg orally twice daily

Meibomian Gland Dysfunction

- Meibomian gland dysfunction:
  - also referred to as meibomitis and patients experience dry eye problems secondary to increased evaporation of the tears.
  - signs include noticeable capping of the glands and frothing of tear film.
- Standard treatment includes:
  - good lid hygiene with warm compresses and lid scrubs in conjunction with
  - **doxycycline 50 mg po BID for 2-3 months**



Meibomian Gland Dysfunction

Alternative treatment:

- **Azythromycin 500 mg/day for 3 days for three- four weeks or from a recent study: 1 gram single dose once a week for 3 weeks**
  - **Recent study: single Z-pak treatment was more effective that 30 day doxy treatment**
  - **Another study: A 3-week course of weekly oral azithromycin was equivalent to a 6-week course of oral doxycycline.**

https://www.healio.com/news/ophthalmology/20230412/azithromycin-shows-equal-efficacy-to-doxycycline-in-meibomian-gland-dysfunction-treatment

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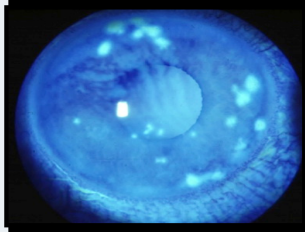

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Herpes Zoster

1. Primary infection – Chicken pox (Varicella)
   - Usually in children
   - Highly contagious***
   - Very itchy maculopapular rash with vesicles that crust over after ≈ 5 days
   - 96% of people develop by 20 years of age
   - Vaccine now available

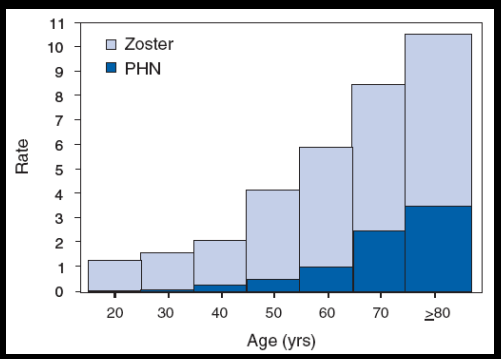
Herpes Zoster

Reactivation – Shingles (Herpes Zoster)

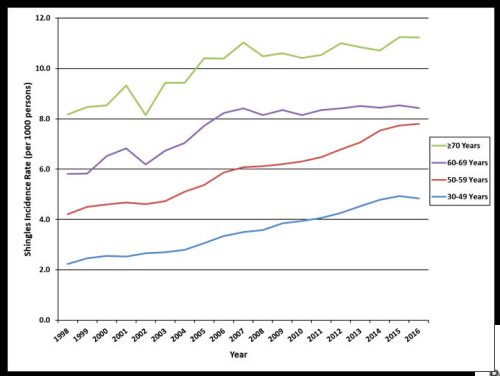
- More often in the elderly and immunosuppressed (AIDS)
  - Systemic work-up if Zoster in someone < 40
- Can get shingles anywhere on the body
- Herpes Zoster Ophthalmicus (HZO)
  - Shingles involving the dermatome supplied by the ophthalmic division of the CNV (trigeminal)
    - 15% of zoster cases

Herpes Zoster

- Associated factors include increasing age, immune deficiency and stress.
  - Traditionally thought to only affect patients over the age of 60 and those patients under 60 should be worked up for immune deficiency
  - Increasing trend to affect patients of younger age who are not immunocompromised



Shingles and Postherpetic Neuralgia† Rates* by Age, United States



Shingles Rates in Adults 30 and Older, 1998-2016

Herpes Zoster

- Symptoms:
  - Generalized malaise, tiredness, fever
  - Headache, tenderness, paresthesias (tingling), and pain on one side of the scalp
    - Will often precede rash
  - Rash on one side of the forehead
  - Red eye
  - Eye pain & light sensitivity

Herpes Zoster

- Signs:
  - Maculopapular rash -> vesicles -> pustules -> crusting on the forehead
  - Respects the midline***
  - Hutchinson sign
    - rash on the tip or side of the nose***
  - Classically does not involve the lower lid
  - Numerous other ocular signs

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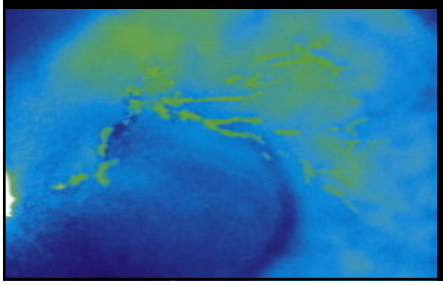
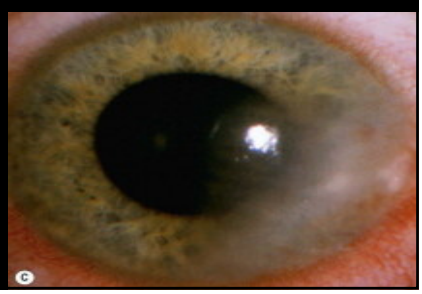
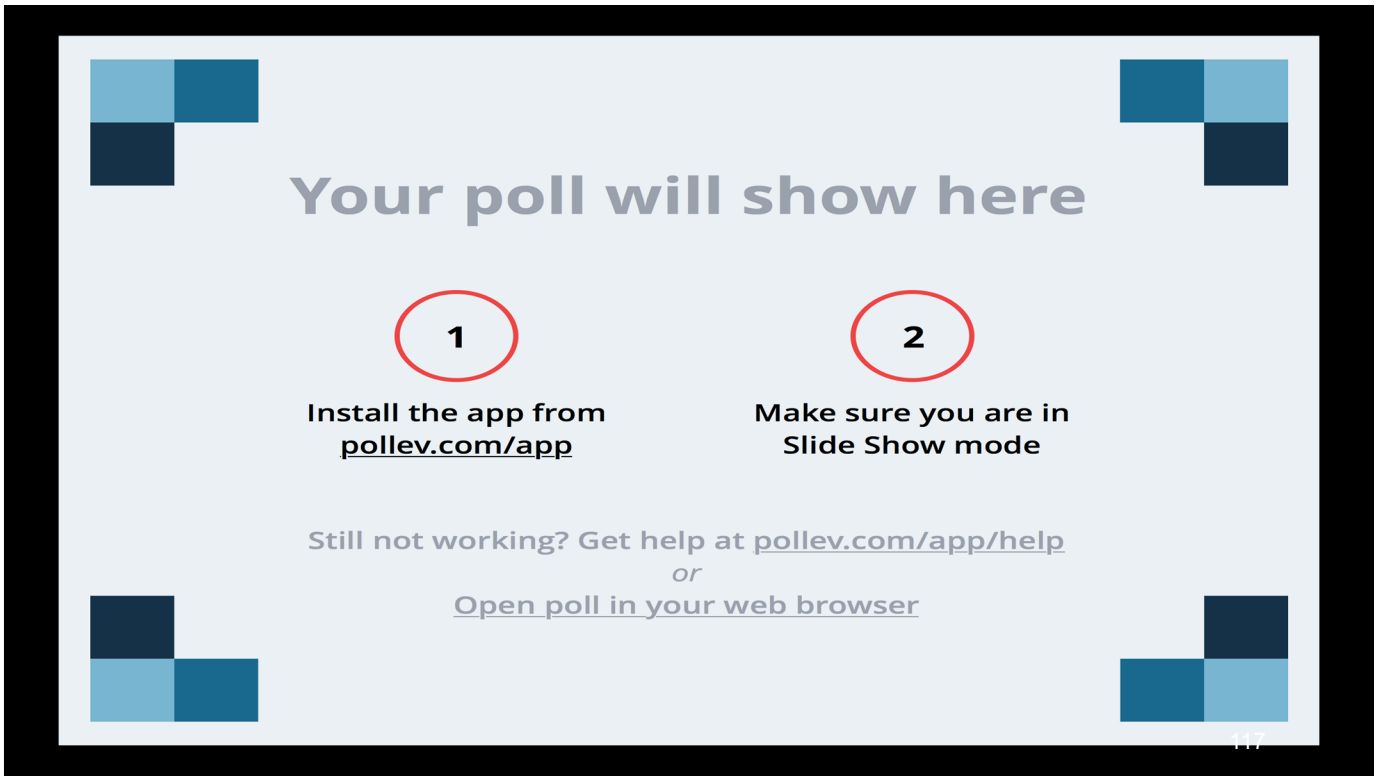
Herpes Zoster

- Other Eye Complications (Acute):
  - Anterior uveitis (most common ocular manifestation)
  - Acute epithelial keratitis (pseudodendrites)
  - Conjunctivitis
  - Stromal (interstitial) interstitial keratitis
  - Endotheliitis (disciform keratitis)
  - Neurotrophic keratitis





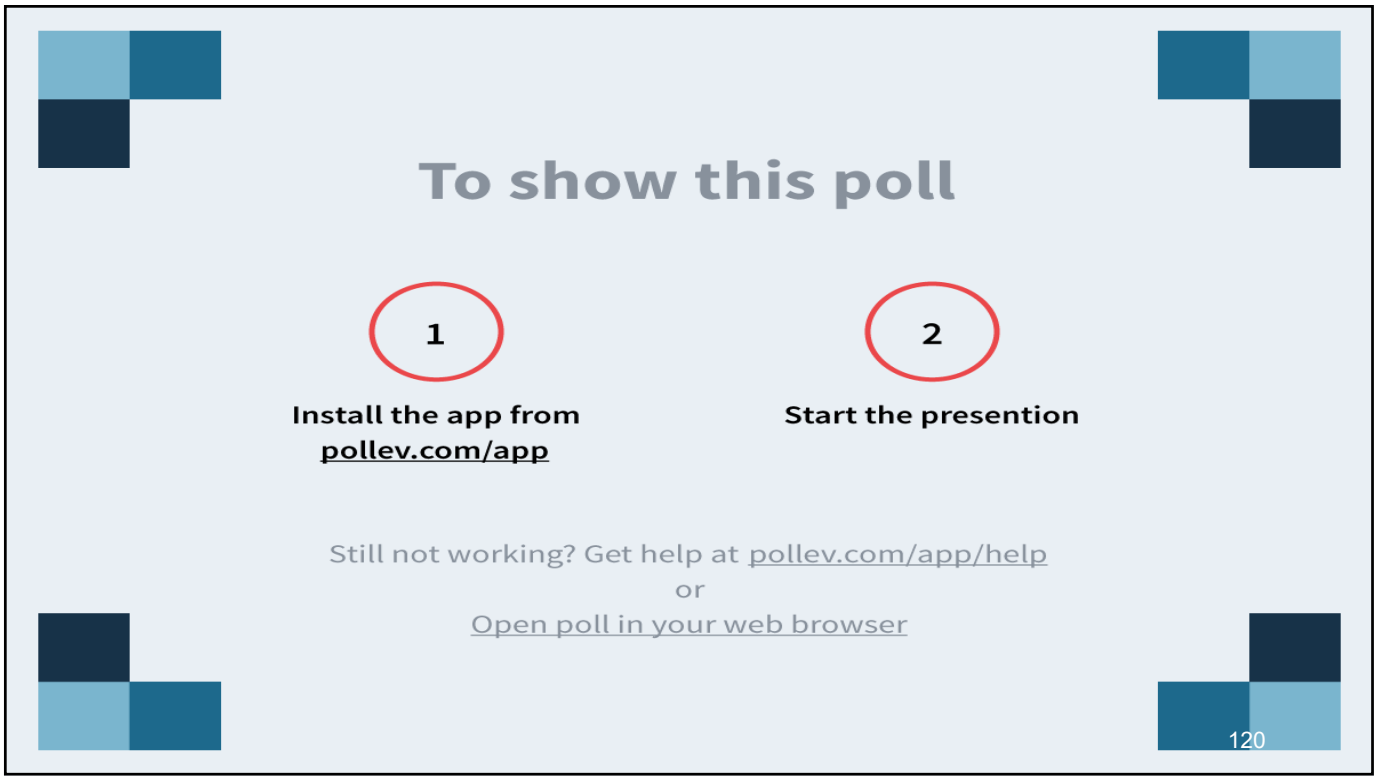


Herpes Zoster

- Associated factors include increasing age, immune deficiency and stress.
- Only people who had natural infection with wild-type VZV or had varicella vaccination can develop herpes zoster.
- Children who get the varicella vaccine appear to have a lower risk of herpes zoster compared with people who were infected with wild-type VZV.

Herpes Zoster

- A person's risk for herpes zoster increases sharply after 50 years of age.
- Almost 1 out of 3 people in the United States will develop herpes zoster during their lifetime.
- A person's risk of developing post-herpetic neuralgia also increases sharply with age.



Herpes Zoster

- Management includes:
  - oral antivirals:
    - 800mg acyclovir 5x/day
    - valacyclovir (Valtrex) 1g TID,
    - famciclovir (Famvir) 500 mg TID
  - effectiveness of therapy is best started within 72 hours
  - oral steroids (clinical trials show variable results but often prescribed with antiviral to reduce pain)
  - management of pain (capsaicin, tricyclic antidepressants, gabapentin).
  - If ocular complications, consider topical steroids (Pred Forte QID).

Purpose of ZEDS

- To find out whether or not 12 months of low dose valacyclovir treatment, compared with placebo, delays time to development of new or worsening of specific eye disease manifestations of Herpes Zoster Ophthalmicus(HZO)
- Secondary objective: To find out whether there is persistent treatment benefit at 18 months, 6 months after cessation of treatment

ZEDS Guidance for Evidence-based Clinical Practice

- Evidence supports suppressive valacyclovir treatment 1000 mg daily for one year to reduce new or worsening keratitis or iritis in immunocompetent, non pregnant adults with good renal function
- Pre-specified analysis of primary endpoint did not show overall benefit at 12 months, but did at 18 months (secondary endpoint)
  - Evidence supports suppressive valacyclovir treatment to reduce multiple episodes of keratitis or iritis

ZEDS Guidance for Evidence-based Treatment of PHN/Pain

- Recommend 1 year of suppressive valacyclovir in HZO patients
  - HZO Onset < 60 years, chronic stratum
- Significantly lower pain scores at 12(p=0.05), 18months (p=0.02)
- HZO Overall
  - Significant decrease pain duration at 18months (p=0.05)

Shingrix HZ Vaccine

- Approved in US/Canada as of October 2017
- non-live antigen, to trigger a targeted immune response, with a specifically designed adjuvant to enhance this response and help address the natural age-related decline of the immune system
- Shingrix is 97% effective against shingles for people between the ages of 50 and 69 and 91% effective for people 70 or older.
- It is 91% effective against postherpetic neuralgia for people 50 and older.
- These rates are based on evidence presented to the committee from clinical trials with over 38,000 total participants.

Shingrix HZ Vaccine

- recommended for healthy adults aged 50 years and older to prevent shingles and related complications
- recommended for adults who previously received the current shingles vaccine (Zostavax®) to prevent shingles and related complications
- the preferred vaccine for preventing shingles and related complications

Thank you!!

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