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2024 ANNUAL SESSION
michigan dental ASSOCIATION

Eye Safety in Dentistry

Marie T Fluent, DDS, CDICP

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JUNE 13 - 16, 2024
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June 13: Set-up
June 14 & 15: Free Dental Clinic
June 16: Tear-down

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Disclosures:

I have no relevant disclosures related to this course.

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Course Description:

- Dental personnel and patients are at risk of ocular exposure to pathogens and/or physical or chemical injury
- Ocular injuries and infections may lead to serious long-term consequences including potential blindness
- Eye protection by dental team members (and patients) is often suboptimal or lacking
- This session will review best practices for eye protection during all phases of oral healthcare including instrument reprocessing, cleaning and disinfection of environmental surfaces, chairside dentistry, and light curing procedures

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Learning Objectives:

- Describe eye protection for dental healthcare personnel and patients during all phases of the delivery of oral healthcare
- Discuss the proper fit and wear and fit of eye protection
- Describe NIOSH recommendations to reduce eye injuries and protect against ocular infection exposures.

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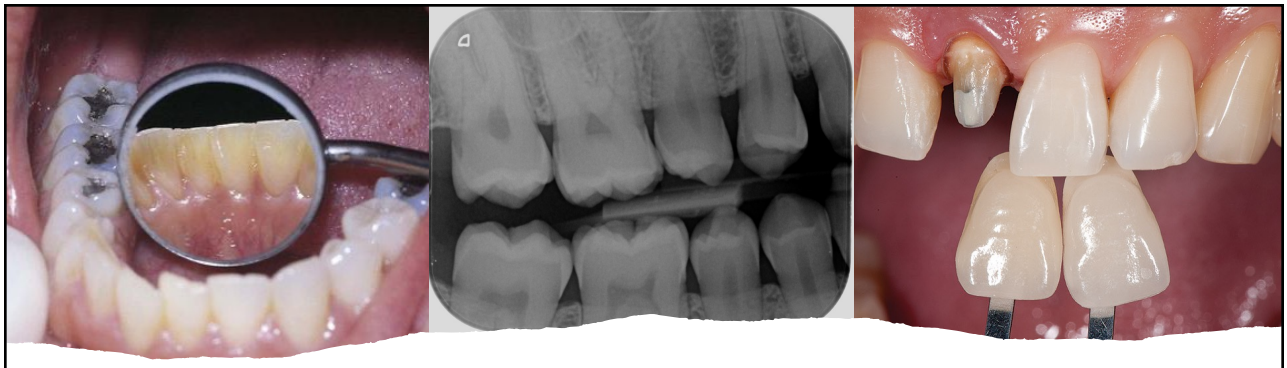

Dentistry is Visually Demanding

- Interpret radiographs
- Examinations: intra- and extraoral
- Perform irreversible procedures
- Shade matching

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By the Numbers:

NIOSH

80
The percentage of sensations we perceive through eyesight

2000
Number of workers who sustain job-related eye injury that requires medical treatment per day in US.

1/3
Fraction of the injuries treated in hospital EDs

100
Number of these injuries result in one or more days away from work

2
Total number of eyes we are granted in our lifetime

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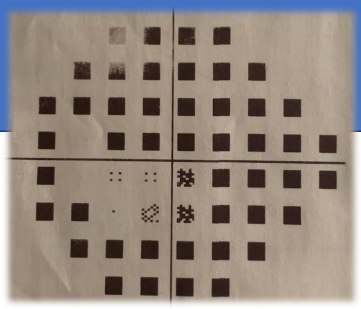
My Story:



- In 2012, I was diagnosed with "NIAON" (Non-arteritic anterior ischemic, optic neuropathy)
- This is a NON-dental injury related condition
- But my vision loss put an abrupt END to my clinical career!

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Eye Hazards in Dentistry (May cause Trauma and/or Infection):

- Blood and other potentially Infectious materials (OPIM)
- Debris
- Chemicals
- Blue light hazards
- Lasers
- Eye Strain

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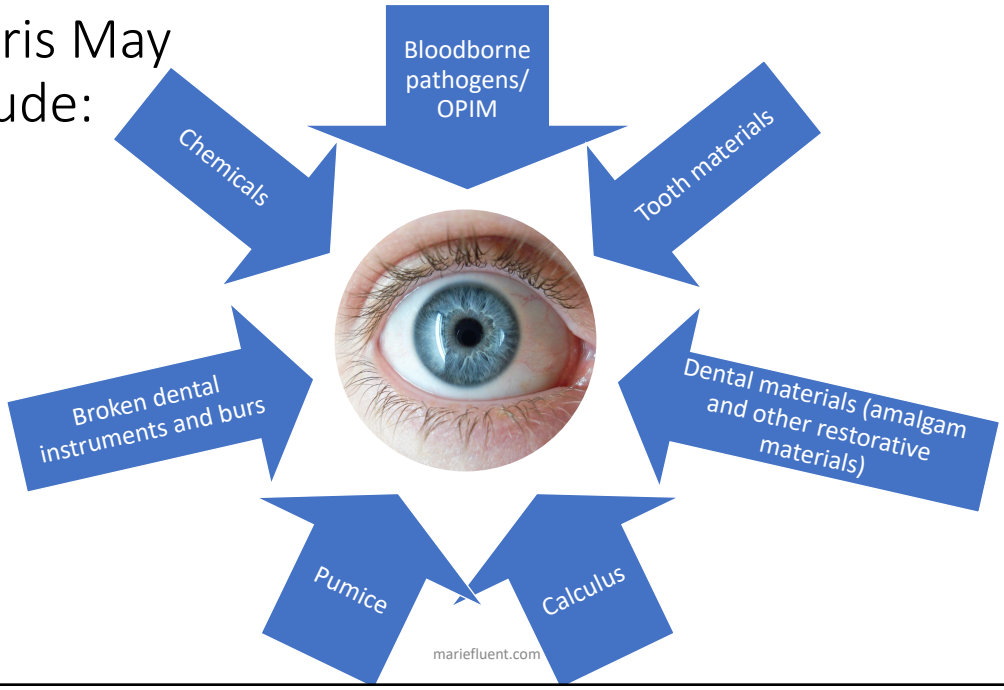
Debris May Include:



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Survey of 148 Dental Surgeons in Southern Nigeria: 9-2010 to 8-2011:

Procedure	N (%)
Scaling	77 (72%)
Tooth preparation	17 (15.9%)
Forcep extraction	10 (9.3%)
Surgical extraction	6 (5.6%)
Amalgam removal	6 (5.6%)
Trimming of denture	6 (5.6%)
Cutting interdental wire	6 (5.6%)
Biopsy	3 (2.8%)
Oral exam	2 (1.9%)
Irrigation	2 (1.9%)
Cutting ortho wire	1 (0.9%)
Suturing	1 (0.9%)
Root planning/currettage	1 (0.9%)
Surgical procedure	1 (0.9%)

Azodo, C, Ezeja, E, Work-related ocular events among Nigerian Dental Surgeons, Ann Occup Enviorn Med.v.27, 2015; https://synapse.koreamed.org/articles/1124864

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Eye Infections:

Microbes

- Conjunctivitis (adenovirus, herpes simplex, Staphylococcus aureus)
- Systemic (HBV, HCV, HIV, herpes viruses, rhinoviruses)

Mode of Transmission

- Fomites
- Direct (splash, respiratory droplets, aerosols)
- Touching eyes with contaminated fingers

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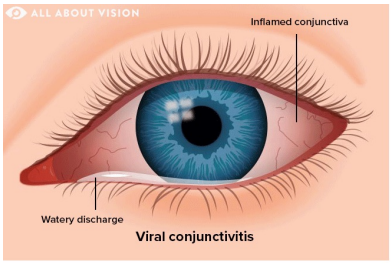
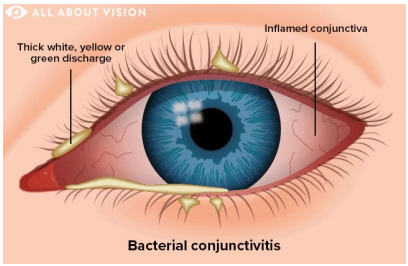
VIRAL Conjunctivitis



Most common form
Extremely contagious
Spread through respiratory droplets, swimming pools, personal items
Can develop with cold/flu
Typically begins in one eye and spreads
Develops watery discharge
Antibiotics NOT effective

BACTERIAL Conjunctivitis



Highly contagious
Typically caused by staph/strep
Spread by respiratory droplets and direct contact (hands)
Develops thick discharge
Typically clears up itself (1-2 weeks) , but may need antibiotic eye drops

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Recommended Work Restrictions for Communicable Diseases in Healthcare Workers

Post-Exposure	Work Restrictions	Durations
Conjunctivitis (Bacterial)	Exclude from work .	Until discharge (constant tearing) ceases and for 24 hours after effective treatment is initiated.
Conjunctivitis (Viral)	Exclude from work if experiencing tenderness in front of ears (preauricular lymphadenopathy) temperature ≥100° F, work restrictions recommended by a physician, or eye drainage.	If adenovirus conjunctivitis is diagnosed, may return to work only when medically cleared by a physician (may remain infectious for ≥7 days).

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Case Scenario #1:

While manual scaling, a dental hygiene student was hit in her eye with calculus

- Student rinsed eye with clean water (not clear how long)
- Irritation continued

Immediate referral to ophthalmologist

- Diagnosis: episcleritis with corneal abscess/ulceration
- Treatment: corneal scraping, Rx antibiotics and anti-inflammatory meds
- Antibiotic Eyedrops and eye ointment
- Sunglasses when outdoors

After 3 days:

- Corneal scraping repeated
- Steroids added to medication

Recovery:

- Returned to routine activities in 1 month
- Complete recovery in 3 months

Bhatsange A, Sharanabasappa J, Deshmukh S, Varma S. Ocular injury during scaling: Are we protecting ourselves?. J Int Clin Dent Res Organ 2016;8:133-6

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Case Scenario #2:

Female DDS injured in right eye with debris during caries removal

- Was wearing personal eyeglasses as PPE
- Rinsed eye with water "couple of times"
- Developed irritation and foreign body sensation
- 3 days later: redness, pain inability to open fully, discomfort, yellow discharge, malaise
- Diffuse swelling, mild pain,

Ophthalmology appointment:

- Diagnosis: Bacterial Blepharitis
- Tx: antibiotic ointment, eye drops, lubricating eye drops for one month
- Avoid cosmetics, apply warm compresses
- Infection was resolving, but was reinfected at one week

Complete recovery in one month

https://joii-journal.springeropen.com/articles/10.1186/s12348-020-00211-5

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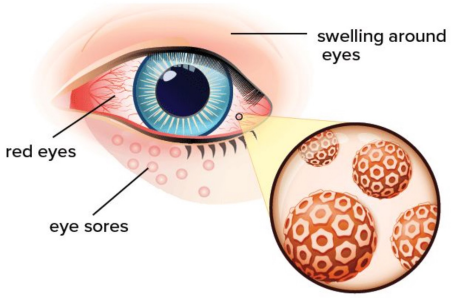
Herpes Simplex Virus (HSV) Keratitis:

- Infection of the cornea
- Caused by HSV
- Generally, heals without damaging the eye
- More severe infections can lead to scarring of cornea or blindness

Symptoms:

- Eye pain/redness, blurred vision, sensitivity to light, watery discharge, foreign object sensation
- Recurrence common



Herpes simplex virus

Basics of HSV Keratitis: https://www.cdc.gov/contactlenses/viral-keratitis.html#:~:text=What%20is%20HSV%20(Herpes%20Simplex,of%20the%20cornea%20or%20blindness.

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Patients with Active Oral Herpes Infection:

- Postpone elective treatment until lesions heal
- Perform only urgent treatment
- Minimize aerosol generating procedures, capture aerosols
- PPE: Wear protective goggles/face shields for DHCP
- For long procedures, perform hand hygiene and change gloves
- Provide eye protection to patient
- Patient education: Causes and transmission of herpes labialis

Image from Harvard Health

Eye-related trauma and infection in dentistry
J Istanb Univ Fac Dent. 2017; 51(3): 55–63.
Published online 2017 Oct 2. doi: 10.17096/jiufd.60117

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- Debris may hit eyes with a speed of 96 km

(60 miles) per hour

Oner B, Ayhan NK. Goze kan ve tukuruk sıcraması sonucu gelisebilecek enfeksiyonlar. *Dis hekimliginde Klinik.* 1994;1:21–23.

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Study of 200 Dentists in UK:

- 48% of general dentists reported experiencing ocular trauma or infection at some point in their career.
- 75% of these incidents resulted from not wearing eye protection.

Br Dent J. 2006 Feb 25;200(4):218-23; discussion 208. doi: 10.1038/sj.bdj.4813257.

Eye safety in operative dentistry - a study in general dental practice

S L Farrier[1], J N Farrier, A S M Gilmour

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Agencies that Impact Protective Eyewear in Dentistry:

Agency	Role	Mission:
CDC (Centers for Disease Control and Prevention)	Advisory	National public health agency
OSHA (Occupational Safety and Health Administration)	Regulatory	Ensures safe working conditions for workers
ANSI (American National Standards Institute) ISEA (International Safety Equipment Association)	Standard Setting	Promotes voluntary consensus standards and conformity of assessment systems

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CDC Guidance:

Protective eyewear with side shields or a face shield should be worn by DHCP during procedures and patient care activities likely to generate splashes or sprays of blood or body fluids

Protective eyewear for patients shields their eyes from spatter or debris generated during dental procedures

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OSHA® Standards for Eye Protection:

1910.133(a)(1) The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

1910.133(a)(2) The employer shall ensure that each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.

The employer shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or protective lenses.

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OSHA® Standards Continued:

(4) Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer

(5) The employer shall ensure that each affected employee uses equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light eradiation.

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ANSI/ISEA Z878.1 Standard:

Standards for Occupational and Educational Personal Eye and Face Protection Devices.

Help ensure that personal eye and face protection devices provide protection from:

Impact

non-ionizing radiation

liquid splash exposures

Z87.1 2020 update addresses:

Product innovations

Product performance

Harmonizing with ISEA standards

Emphasizes the importance of wearing the right protection for the specific job

"Matching the protector to the hazard."

New Standard: ANSI/ISEA Z87.62-2021:
First federal guidance to standardize eye and face protection against bloodborne pathogens and debris.

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CDC HEADS UP

Hitting the Slopes- PPE for Skiers: (Next Slide)

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CDC Guidance for SKI Helmet and Goggles:

Helmet:

Size, Fit

Cleaning, Storage

ASTM certified

Check for Damage

When to replace

"FIT"

Goggles:

Vision (straight forward and side to side)

Protect from flying dirt/snow

Protect from sun

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CDC HEADS UP

Ski Helmet/Goggles "Fit":

- **The helmet should fit snugly on top of the goggles, with no space between the helmet and the top of the goggles**.
- However, the helmet should not sit so low on the skier's head that it pushes down on the goggles. Make sure that the skier can see straight forward and side- to-side.

https://www.cdc.gov/headsup/pdfs/helmets/headsup_helmetfactsheet_ski_508.pdf

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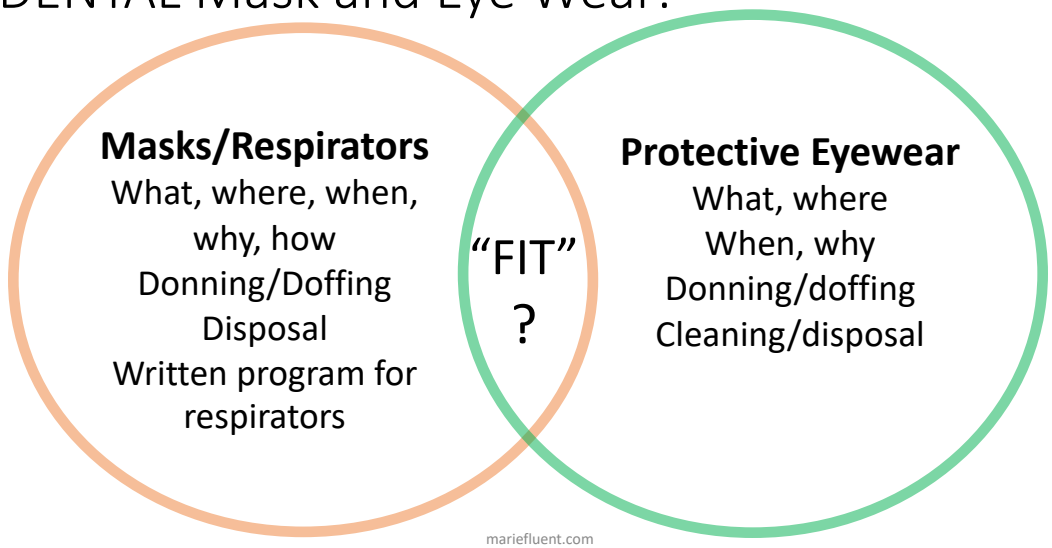
CDC Guidance For DENTAL Mask and Eye Wear:



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CDC and OSHA do NOT address the fit between mask/respirator and goggles. We have a GAP!

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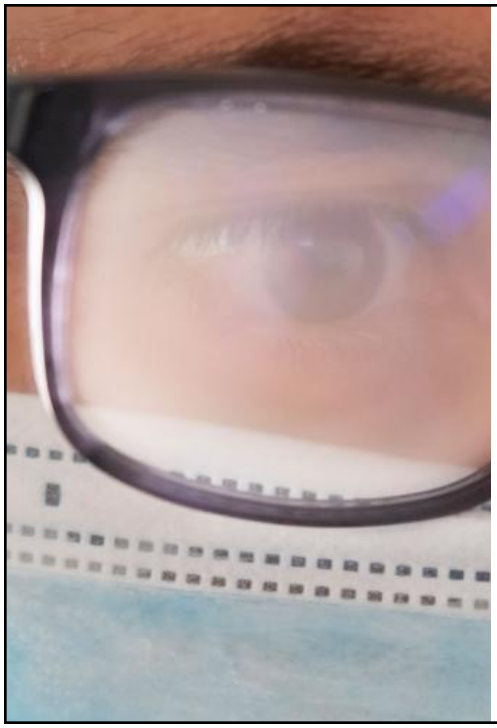

If Mask/respirator and Protective Eyewear Do NOT "FIT":

- Fogging:
  - Cool eyewear encounters warm moist air
  - More about fogging to follow…
  - A common reason for DHCP to remove eyewear during procedure
- Gaps
- Unprotected eyes

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Bottom Gap:

- A breach in modern medical masks
- Created by space between lower rim of medical glasses and top edge of mask
- Included research and development of masks/goggles with gap modifications
- NIOSH noted report, investigated further, replicated studies
- Worked with ANSI to propose new regulation for protective eyewear

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OSHA Compliant Safety Glasses with Side Shields, and flat Ear Loop Mask:

Figure 8

Figure 13

Figure 15

https://www.dentistryiq.com/dental-hygiene/infection-control/article/16350523/eye-safety-in-dentistry

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Mask with full-face shield (without eyewear under mask/shield combination):

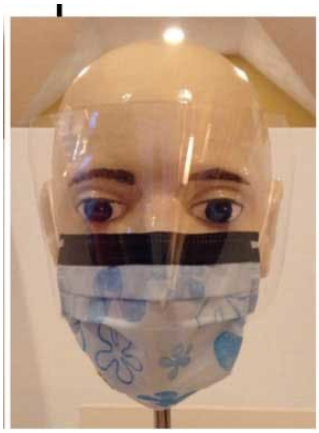

Figure 9

Figure 10

Figure 12

https://www.dentistryiq.com/dental-hygiene/infection-control/article/16350523/eye-safety-in-dentistry

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Recommended PPE Ensembles for Dentistry

Low community Transmission of COVID-19		Continued Community Transmission of COVID-19		Confirmed (or Suspected) COVID-19	
Non-AGP	AGP	Non-AGP	AGP	Non-AGP	AGP
▪ Work clothing, such as scrubs, lab coat, and/or smock, or a gown ▪ Gloves ▪ Eye protection (e.g., goggles, face shield) ▪ Face mask (e.g., surgical mask,)	▪ Gloves ▪ Gown ▪ Eye protection (e.g., goggles, face shield) ▪ At a minimum, face mask (e.g., surgical mask,) with face shield ▪ NIOSH-certified, disposable N95 filtering facepiece respirator (or better) offers more protection to workers who may encounter asymptomatic or pre-symptomatic patients who can spread COVID-19 or other aerosolizable pathogens†	▪ Work clothing, such as scrubs, lab coat, and/or smock, or a gown ▪ Gloves ▪ Eye protection (e.g., goggles, face shield) ▪ At a minimum, face mask (e.g., surgical mask,)with face shield ▪ NIOSH-certified, disposable N95 filtering facepiece respirator (or better) offers more protection to workers who may encounter asymptomatic or pre-symptomatic patients who can spread COVID-19 or other aerosolizable pathogens†	▪ Gloves ▪ Gown ▪ Eye protection (e.g., goggles, face shield) ▪ NIOSH-certified, disposable N95 filtering facepiece respirator or better†	▪ Gloves ▪ Gown ▪ Eye protection (e.g., goggles, face shield) ▪ NIOSH-certified, disposable N95 filtering facepiece respirator or better†	▪ Gloves ▪ Gown ▪ Eye protection (e.g., goggles, face shield) ▪ NIOSH-certified, disposable N95 filtering facepiece respirator or better†

https://www.osha.gov/coronavirus/control-prevention/dentistry

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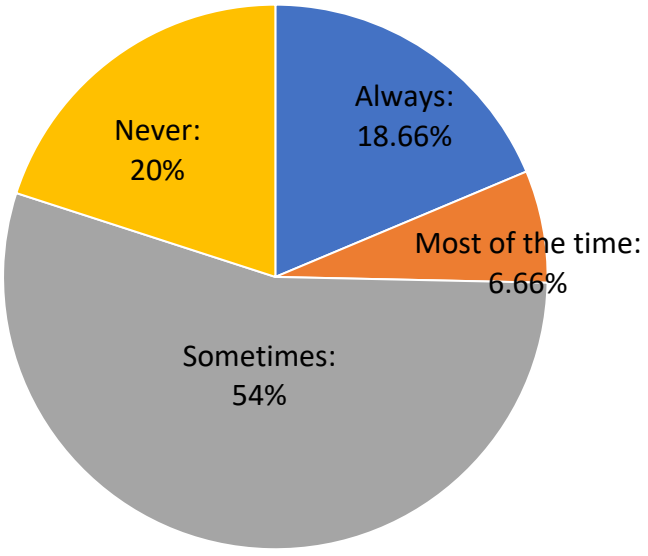
Do Patients Routinely Wear Protective Eyewear?



- Oleksiak A, Campbell C, DiGiovanni A, Relich E. Ocular Incidents: Safety glasses prevent eye injuries among dental patients. RDH; May 11, 2015. http://www.rdhmag.com/articles/print/volume-35/issue5/features/ocular-incidents.html.

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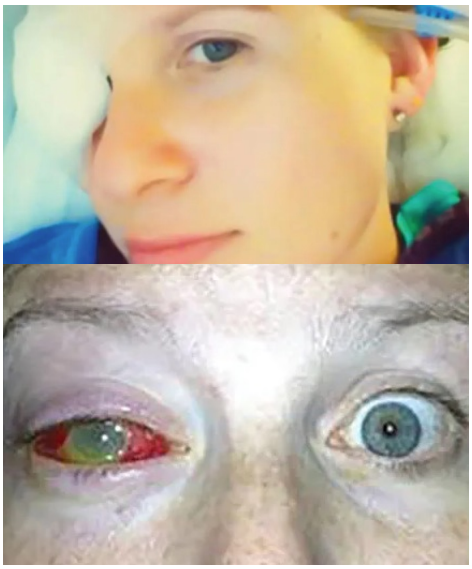

Case Scenario #4: Jenn's Vision:

- Victim of eye injury now patient advocate
- No "regulations" for patient eyewear, but is a best practice
- Note: many states mandate compliance with CDC Guidelines, so now may be considered regulatory.

https://www.rdhmag.com/patient-care/article/16409763/jenns-vision-victim-of-eye-injury-turns-into-advocate-for-eyewear-for-dental-patients

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Emergency Eye Wash: OSHA Standard 29 CFR 1910.1151 (c)

- Eyewash equipment for emergency use where eyes may be exposed to injurious materials
- Flush for a minimum of 15 minutes—then seek medical help
- Temperature should be tolerated
- Should be installed 10 seconds from hazard
- Eyewash equipment required to be inspected annually

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Highlights from ANSI Z3858.1-2014 Compliance Checklist for Eyewash Stations:		
	Controlled, low velocity flow for both eyes, not injurious to user	5.1.1
	Spray heads protected from airborne contaminants	5.1.3
	Delivers at least 0.4 gallons of water per minute	5.1.6, 5.4.5
	Hands-free stay-open valve activates in 1 second or less	5.4.4
	Located 10 seconds (55 feet) from hazard (on same floor level, unobstructed travel path)	5.4.2; B5
	Tepid water (60-100 F)	5.4.6; B6
	Training: proper use and location	5.5.4
	Maintenance (activate at least weekly) Inspection annually	5.5.2 5.5.5

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If an Eye Injury Occurs, DO NOT:

- Rub eye (if you suspect foreign object)
- Irrigate (if you suspect perforation)

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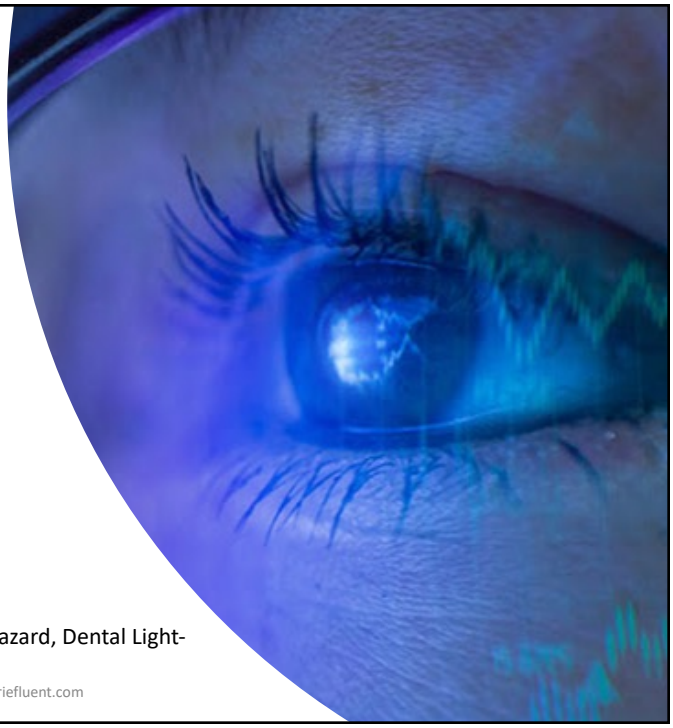
Blue Light Hazard:

- Photochemical damage to retina caused by short-wavelength electromagnetic radiation from 400-500 nm.
- Most damaging wavelength 420-455nm
- This is the wavelengths of most dental curing lights
- Can damage the light-sensing cells (photoreceptors) in retina
- Children more susceptible
- ALL humans are exposed to excessive blue light



Fluent, Ferracane, Mace, Shedding Light on a Potential Hazard, Dental Light-curing Units, JADA, 12-2019

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Dental Personnel Exposure to Blue Light:

Everyday life:

- Sunlight
- Lighting: LED and Fluorescent
- Electronic devices
- Computers

Dentistry:

- Dental Curing Lights
  - In one study, DHCP spend 240 hours per year curing resins
  - 53% of dentists use LED headlamps for more than 5 hours per day
- Operatory light
- Microscopes ?

Fluent, Ferracane, Mace, Shedding Light on a Potential Hazard, Dental Light-curing Units, JADA, 12-2019

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Chronic Exposure to Blue Lights:

Can damage and/or cause death of light-sensing cells (photoreceptors) in the retina

Damage is accumulative

Implicated in retinal degenerative diseases such as age-related macular degermation (AMD)

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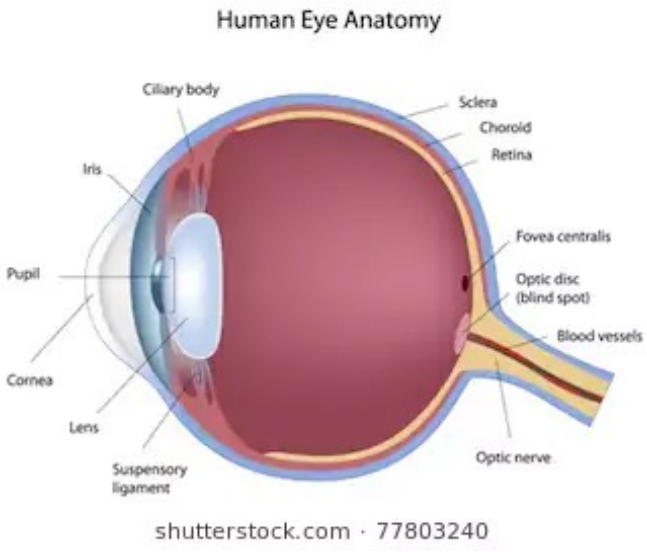
The Blue Light Hazard: Mechanisms and Forms of Ocular Damage

- Eye anatomy
- Wavelengths/penetration depths of ocular tissues
- UV-A radiation exposure:
  - Damage to cornea, cataractogenisis
  - Opacification of the lens
- Blue Light exposure:
  - The most damaging wavelength of blue light is 440nm
  - The narrow band of light may not evoke protective aversion response

Source: Price, 2014



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LED Curing Lights:

- Dominate the market
- Are much more intense
- Emits in blue wavelength region (430-480nm)
- Can cause soft tissue burns
- The threshold of high-power LED curing lights is unknown

year	Output
1970-1990	400-600 mw/cm2
1990's	1000 mw/cm2
Early LED's	1500 mw/cm2
Highest output LED today	6000 mw/cm2

Source: Ultradent website, Valo Cordless, Technical Details

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How Do YOU Protect YOUR Eyes When Using Light Curing Units:

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Type of Eye Protection	Advantages	Disadvantages
Orange shield attached to light guide	• Can be adjusted to protect operator	• Small surface area • Cannot protect DDS and assistant at same time • May restrict access of the light • Consider additional protection for assistant
Orange goggles with side protection	• Provides optimum protection • Allows for hands free protection	• Inconvenient if using loupes
Antiglare cones that fit on tip of LCU	• Easy to use • Hands free protection	• May obstruct view/prevent ideal placement of light tip • Can increase distance between tip and tooth • Cone may easily slip, not provide protection
Paddles	• May provide adequate coverage for DDS and assistant	• Requires an extra hand
”Look away” method	• NONE! • NOT recommended!	• User often glances at operative field • Cannot monitor location of light tip

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FDA U.S. FOOD & DRUG ADMINISTRATION

Considers curing lights to be CLASS II medical devices

- Capable of posing moderate risk to patient and /or user
- Must meet approval standards before being sold in US
- Protective eyewear included, MUST meet standards for safety and efficacy!

Protective eyewear purchased after market:

- Not supplied with the curing light
- Considered CLASS I (low risk to patient/user)
- Not required to submit proof of efficacy and safety!

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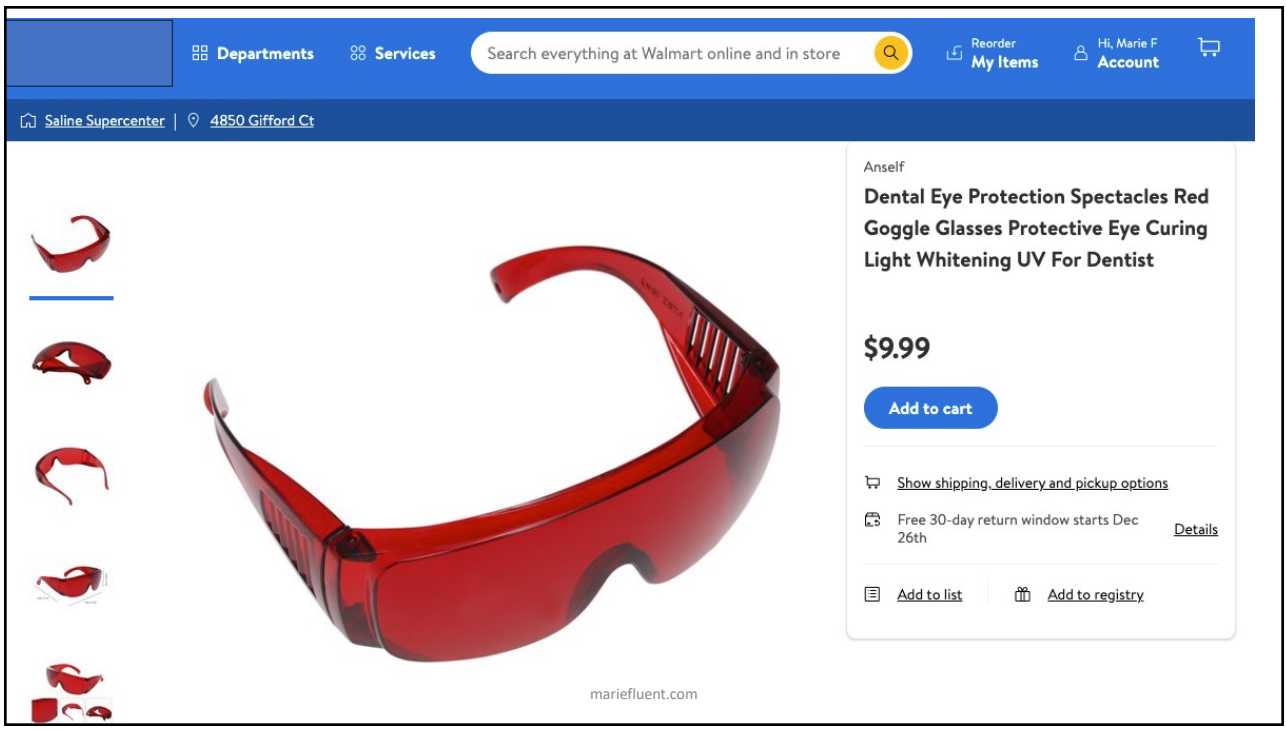
Departments
Services
Search everything at Walmart online and in store
Reorder
My Items
Hi, Marie F
Account
Saline Supercenter | 4850 Gifford Ct
Anself
Dental Eye Protection Spectacles Red Goggle Glasses Protective Eye Curing Light Whitening UV For Dentist
$9.99
Add to cart
Show shipping, delivery and pickup options
Free 30-day return window starts Dec 26th
Details
Add to list
Add to registry
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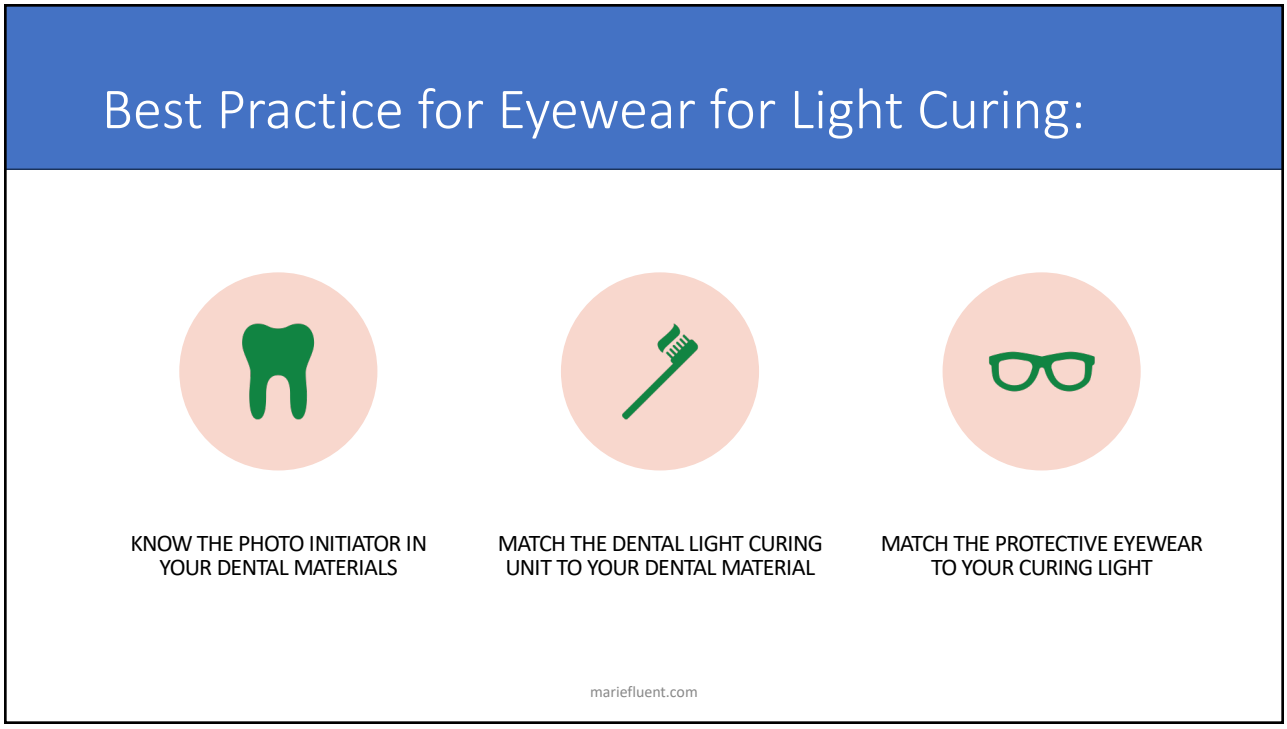
Best Practice for Eyewear for Light Curing:
KNOW THE PHOTO INITIATOR IN YOUR DENTAL MATERIALS
MATCH THE DENTAL LIGHT CURING UNIT TO YOUR DENTAL MATERIAL
MATCH THE PROTECTIVE EYEWEAR TO YOUR CURING LIGHT
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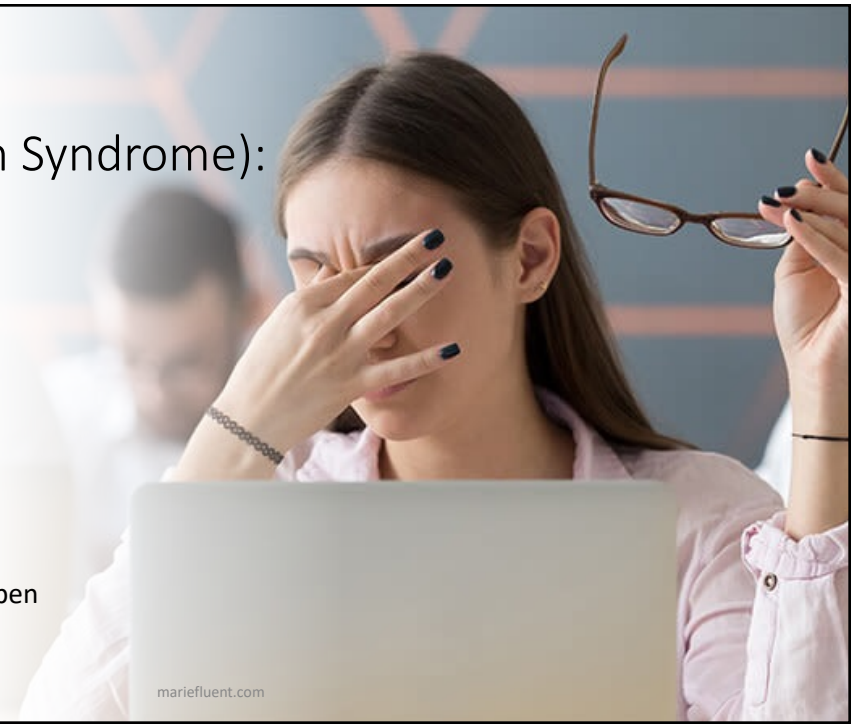
Digital Eye Strain (Computer Vision Syndrome):

- Watery or dry eyes
- Blurred vision
- Sensitivity to light
- Headache
- Neck/shoulder pain
- Difficulty concentrating
- Burning or itchy eyes
- Hard time keeping eyes open



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To Reduce Digital Eye Strain:

Ergonomics:	• Computer screen location:
	  • 15-20 degrees below eye level
	  • 20-28 inches from eye
	• Reference materials Locate above keyboard and below monitor

Lighting:	• Position to avoid glare • Consider anti-glare screen
Seating:	• Comfortable, feet flat on floor, arm support
Rest breaks	• 15 min every 2 hours of compute use • 20-20-20 rule (next slide)
Keep Eyes Moist	• Blink frequently • Tear substitutes

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Eyewear Safety During Non-Patient Care:

Instrument Reprocessing:

- CDC: "Wear appropriate PPE when handling and reprocessing contaminated patient equipment"

Environmental Surfaces

- CDC: "Establish an area outside of the operatory where PPE can be donned and doffed appropriately and safely"

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Eyewear for Laser Safety:

- Consult laser manual to determine protection level needed based on laser output and recommended Optical Density (OD)
- Select a filter whose specifications match the manual and provides highest Visible Light Transmission (VLT)
- Find a frame that provides a comfortable fit
- Provide laser eye protection for all clinical personnel AND patient

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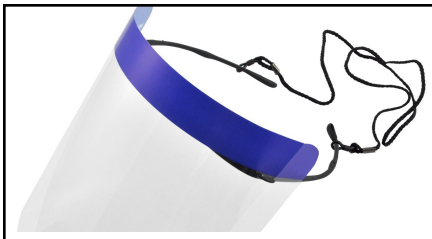

Disposable or Reusable?

- Disposable:
  - Ensure disposable eyewear meets safety standards
  - If Face shield is worn, a mask is still required
- Reusable:
  - Clean and disinfect between patients based on manufactures' IFU
  - Follow instructions for use to prevent film buildup and prevent scratching

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How to Prevent Fogging of Eyewear:

DO:

- Ensure mask is sealed around cheeks and nose
  - Wash eyewear with mild detergent
  - Air dry
  - Use soft low-lint cloth
- ALWAYS follow IFU of Manufacturer!

CAUTION:

- Antifog lens spray or wipes
- Thin layer of soap to form coating that inhibits fog formation

DON'T:

- Use toothpaste, saliva, vinegar, baking soda, alcohol-based hand rubs
- These could damage coatings on lenses and/or distort field of vision

https://www.healthline.com/health/how-to-keep-glasses-from-fogging#antifog-tips

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Cleaning Loupes:

DO:

- Follow Manufactures IFU
- Clean your hands 1st
- Rinse debris: Few drops of H2O
- Clean with microfiber cloth
- Keep loupes in case
- Cover optics

Do NOT:

- Use tissue, paper towel, clothing
- Use unapproved products
  - Window cleaner, disinfectants
  - May affect lens/warranty
- Submerge under running water
- Apply solutions directly
- Place in autoclave

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How Often Should Adults have Comprehensive Eye Examination?

Adults with NO symptoms or risk factors for eye diseases:	Age 40: baseline comprehensive eye evaluation	40-54: Every 2-4 years	55-64: Every 1-3 years
65+: Every 1-2 years	If ocular symptoms: Prompt examination	If at risk for systemic disease or family history of eye diseases, follow recommendations of ophthalmologist	Children should follow screenings throughout childhood according to schedule

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Protective Eyewear Selection: General Considerations

- Certified: Meets ANSI 787.1 Standards
  - Wrap around
  - No bottom gap
  - High impact resistance
  - Filters blue light 400-nm-500nm (during light curing)
- Clarity: Excellent optics for visual acuity
  - Anti-fog
  - Scratch resistant
- Comfortable
- Willingness to use for all DHCP, all the time!

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Ideal Protective Eyewear:

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Take Away Points:

- Education and training for dental personnel:
  - What to wear?
  - Where and when to wear it?
  - Why to wear protective eyewear?
- Eye Safety Policy
- Protective eyewear for dental patients during care
- Protective eyewear during light curing and laser procedures is ESSENTIAL
- "Mind the gaps" between mask and eyewear
- Personal eyewear and contact lenses are NOT considered PPE

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THANK YOU!

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Resources (1):

- CDC *Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care.* March 2016. https://www.cdc.gov/oralhealth/infectioncontrol/pdf/safe-care.pdf
- Guidelines for Infection Control in Health-Care Facilities (2003) – https://www.cdc.gov/mmwr/pdf/rr/rr5217.pdf
- From Policy to Practice: OSAP's Interactive Guide to the CDC Guidelines http://www.osaptraining.org/cws.htm
- Infection Prevention Checklist for Dental Settings https://www.cdc.gov/oralhealth/infectioncontrol/pdf/safe-care-checklist-a.pdf

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Resources (2):

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Hill E., 2006. Eye Safety Practices in U.S. Dental School Restorative Clinics. Journal of Dental Education. December, Volume 70, Issue 12, pages 1294-1297.

Inglis-Arkel, E. 2014. Little-Known Fact: Staring at Blue Lights Can Burn Out Your Eyes. Retrieved from: https://io9.gizmodo.com/little-known-fact-staring-at-blue-lights-can-burn-out-1588535210

Kopperud S.E., Rukke H.V., Kopperud H.M., and Bruzell E.M. Light curing procedures – performance, knowledge level, and safety awareness among dentists. Journal of Dentistry, Volume 58, March 2017, Pages 67-73.

McCusker N., Bailey C., Robinson S., Patel N., Sandy J., Ireland A. 2012. Dental light curing and its effects on color perception. American Journal of Orthodontics, Volume 17, Issue 4.

McCusker N., Lee S.L., Robinson S., Patel N., Sandy J., Ireland A. 2013**.** Light Curing in Orthodontics; Should we be concerned? Dental Materials. Volume 29, Issue 6, pages e85-e90.

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Resources (3):

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Rassaei M., Thelen M., Abumuaileq R., Helscheler J., Luke M., Schneider T. 2013. Effect of high-intensity irradiation from dental photopolymerization on the isolated and superfused vertebrate retina. Graefe's Archive for Clinical and Experimental Opthamology. March, Volume 251, Issue 3, pp 751-762.

Price R., Strassler H., Price H., Sachin S., Lee C. 2014. The effectiveness of using a patient simulator to teach light-curing skills. Journal of the American Dental Association. January, Volume 145, Issue 1, pages 32, 33, 41.

Price R., Labrie D., Bruzell E., Sliney D., Strassler H. 2016. The Dental Curing Light: A Potential Health Risk. Journal of Occupational and Environmental Hygiene. May, Volume 20, Issue 11.

Strassler H. 2011. The physics of light curing. Compendium, July/Aug, Volume 32, Issue 6

Strassler, Howard E. and Price, Richard B. 2014**.** Understanding Light Curing, Part 2: Delivering Predictable and Successful Restorations. Retrieved from https://www.dentalcetoday.com/courses/165%2FPDF%2FDT_June_14_174_fnl.pdf

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