

Digital Photography - Course Handout

Edward Lowe, DMD

Nelson Rego, CDT

Why Digital Photography in Dentistry?

Record taking for patient records

- Intraoral
- Extraoral
- Treatment planning

Presentation and communication

- Lab Communication
- Website marketing
- Patient portraits
- Print advertising
- Dental articles

Take great pictures...it's your image on the line!!!

Selecting a Camera

Considerations

- How much do you want to spend?
- What are you using it for? Dentistry only or outside of dentistry as well?
- Are you using it or your team members? Is weight a concern?
- What camera brand do you like? Canon? Nikon? Others?
- Do you have existing lenses of a particular brand already?

Point and Shoot Cameras

Pros

- Inexpensive
- Small
- Lightweight
- Easy for dental auxiliaries to operate

Cons

- Setting focal length a challenge to get consistent photos (1:1, 1:2 etc)
- Control of aperture (f-stops) and range is limited (f/2.8-f/9.0) affecting depth of field
- Sensor is tiny = smaller pixels
- Cannot blur backgrounds well
- Point flash causes shadows

Digital SLR (Single Lens Reflex) Cameras

- A digital SLR (single lens reflex) camera looks and functions just like a 35mm film camera body.
- You may interchange lenses and flashes with compatible accessories

- SLR systems are more complex than point and shoot but the images are of higher quality

Ed's Camera Recommendations

Canon 60D kit w/case

\$2533.98 including:

- MR-14EX Ring Flash (\$550)
- 100mm macro lens (\$640)
- Camera Body (\$1100)

Canon Rebel T2i kit w/case

\$2263.98 including:

- MR-14EX Ring Flash (\$550)
- 60 mm macro lens (\$435)
- Camera Body (\$700)

Available from **Leo's Cameras**, Vancouver, BC. See attached Price List.

60mm vs.100mm Macro Lens

- Working distance closer for 60mm than 100mm
- Both good for teeth
- 60mm is a lighter lens
- 60mm is less expensive
- 60mm better for portraits in tight operator
- 100mm works with all Canon bodies including full size sensors. It is a better lens but a bit more expensive
- 60mm will only work with EF-S (Electro-Focus short back focus) mount bodies with smaller APS-C (Advanced Photo System-Classic) size sensors

Digital Camera Components

ISO/ASA Standards – Film (Sensor) Speed

- ISO = International Organization for Standardization
- ASA = American Standards Association
- Lower number – less sensitivity to light e.g. ISO 100
- Higher number – more sensitivity to light e.g. SO 1600

Flash

- Light source for dental photography
- Provides short duration, high power lighting.
- This type of light is very consistent and predictable

Shutter speed:

- Controls the length of time that your shutter is open.
- Faster shutter speeds “freezes” movement
- Slower shutter speeds give photos a feeling of motion e.g. waterfall

Camera Lens

- Aperture** - this adjustable opening regulates the amount of light entering the lens
- F-number** = focal length/aperture diameter e.g. F4 = 100mm/25mm
 - Larger aperture diameter = smaller F-number
- F-Stop**
 - On a camera, the f-number is usually adjusted in discrete steps, known as *f-stops*.
 - Each "stop" is marked with its corresponding f-number

- Represents a halving of the light intensity from the previous stop.

Card Rescue - Photo rescue software for Mac OS X	\$39.95	www.cardrescue.com
Card Recovery - Photo rescue software for PC	\$39.95	www.cardrecovery.com

Flash Settings for Canon

- ETTL = Electronic Through The Lens** metering
- Set on ETTL and forget about it
- Alternate 3 sets of NiMH batteries

Canon Camera Settings

CREATIVE ZONE IS THE AREA WE WILL CONCENTRATE ON INTRAORALLY !

- Av: APERTURE PRIORITY IS ALL YOU WILL NEED!!!

My Set'em and Forget'em settings

- Intra-oral and retracted shots**
 - Image size: Small fine compression
 - ASA/ISO setting: 100
 - Shutter Speed: 1/200 (fixed)
 - F-Stop (aperture): **29**
 - Flash adjustment: -1/3
 - Shooting mode: Av
- Portrait shots (eyes in photo)**
 - Image size: Small fine compression
 - ASA/ISO setting: 100
 - Shutter Speed: 1/200 (fixed)
 - F-Stop (aperture): **11.0**
 - Flash adjustment: -1/3
 - Shooting mode: Av
- The only thing that changed was the F-Stop!**

Sample Settings for popular Canon and Nikon models attached

Image Types

RAW

- Superior Image quality
- Image is "raw" and unprocessed data
- Up to 21 megabyte file size
- No or light **lossless** data compression – no loss of image quality when file size reduced and the maximum amount of image detail is always kept within the raw file.
- HUGE images and file size – 6-8 times larger than JPEG files

- Fewer images can fit on a given memory card
- Not all software can open RAW images
- The purpose of raw image formats is to save, with minimum loss of information, data obtained from the sensor, and the conditions surrounding the capturing of the image (the metadata).

TIFF (Tagged Image File Format)

- TIFF file formats are used for storing very large, high quality images
- TIFF is the favored image format in many graphic applications.
- These include image manipulation programs, desktop publishing and 3-D imaging applications.
- Lossless data compression

JPEG (Joint Photographic Experts Group)

- Most common image type
- Images can be highly compressed
- Recognized by PC's and Apples
- Most cameras can play images
- Works with all imaging softwares
- Camera applies white balance and sharpening adjustments
- Images are compressed with resulting degradation of quality
- Jpegs are inherently "Lossy"

Resolution – the number of vertical and horizontal pixels in a chip; more resolution = more options!

The Gold Standard for Printing is 300 DPI (dots per inch)

- Simply Divide the Horizontal and vertical pixels by 300 to determine the maximum output (best print size)
- Note: Unless you plan to print posters for the wall, a small fine setting is all you need for good dental records

Common Magnification Ratios

- 1:10
- 1:2
- 1:1
- 2:1

Crop Ratio

- Smaller APS-C Sensors captures image data from a smaller area than a 35mm film
- This effectively crops out the corners and sides that would be captured by the 36 mm × 24 mm 'full-size' film frame.
- The magnification ratio is 1.6 for a small sensor to give you the same image as a full sensor.
- 1:1 is 1:1.6, 1:2 is 1:3.2 etc.

Depth of Field

- Is dependent on aperture and magnification.
- Depth of Field reduces sharply with increased magnification ratios (1:1 > 1:10)
- Smaller aperture (f/27) has greater depth of field than larger aperture (f/5.6)

Types of Flash

Ring

- Flat light
- Even light
- Best for Posteriors and Occlusals

Point

- 3-D
- Shadowing
- Dual point
- Best for Smiles, 1:1
- Picks up line angles
- Does not white out areas like ring

Dual point

- Best for Smiles, 1:1
- Picks up line angles
- Does not white out areas like ring

Retractors – Self, Universal, One sided, Wire

Backdrops – car reflector, black sheet, custom background

Dental Photography

- Lab series
- AACD Series
- Retractors – cut retractors for occlusals
- Mirrors – Long occlusal (small and large) and foot shaped mirrors are most useful
- Contrastors – Black metal, black paper (non glare)

Resources for Mirrors and Retractors

- Norman Camera – www.normancamera.com
 - Ask for Andy Thompson - andy@normancamera.com
- PhotoMed – www.photomed.net

Things to look for when shooting this New Patient series of shots. ...Use AACD Photo Guide as well.

1. Full Face

Make sure that the patient is in front of you and at the same height as the camera. Take the image from the top of the patient's hair to their shoulders. This view allows for the overall evaluation of the

patient's smile.

2. Full Profile

Center the view finder on the patient's centrals and move in close enough so you have just under the nose and the point of the chin. This view allows for the evaluation of the buccal inclination of the patient's anterior teeth with regard to their lower lip or the overjet.

3. Face Close Up

Center the view finder on the patients nose and have their hair line to the point of their chin in the shot. Make sure the camera is at the same height as the nose. This view is used to evaluate the cant of the smile with regard to the papillary line.

4. & 5. Right and Left Profile Close Up

Center the view finder on the patient's upper lip and nose. The camera should be at the same height as the face and perpendicular to the lateral. This view is used to evaluate the smile form the side and the curvature of the anterior teeth.

6. 1:2 Smile

Center the camera on the patient's centrals and have the smile, or better yet laugh, and at the same height as the smile. This view is used to evaluate the smile, color lip position, the amount of overlap and the buccal corridor.

7.& 8. 1:2 Right and Left Lateral

Center the view finder on the patient's lateral with the corners of the mouth and the edge of the opposite lateral in the view. This view is used to evaluate the smile form the side as well as the canine-lateral-central relationship with regard to length, shape, and position.

9. 1:2 Retracted Smile: Teeth Together

Center the view finder on the patient's centrals with the edges of the cheek retractors in the view. Have the camera slightly lower than the centrals so the flash is not directed straight at the centrals. This will prevent too much reflection from the facial surface of the centrals. This view is used to evaluate the anterior teeth with regard to the gum line as well as inclination of the anterior teeth.

10. 1:2 Retracted Smile: Teeth Separated

Have the patient open until all the edges of the lower anterior teeth can be seen. Position the camera just slightly below the centrals and center the view finder on the lower centrals. This view is used to evaluate the edges of the lower anterior teeth.

11.&12. 1:2 Right and Left Retracted

Center the view finder on the lateral. The edge of the cheek retractor and the edge of the opposite lateral should be just in the view finder. This view is used to evaluate the canine-lateral-central relationship as well as the gum line.

13,14,&15. 1:1 Retracted Front, Retracted Right and Left with Contraster

Have the patient open as wide as they can. Position the tab inside the mouth and lay it on the lower teeth. It should not be touching the top teeth. Take views by centering the view finder on the centrals and then the laterals. This view allows for easy evaluation of the anterior teeth without having so many distracting details to look at.

16. Upper Arch

Recline the patient to the prone position. Place the mirror on the distal of the lower second molars. Rest the top of the mirror on the lower anteriors. Center the camera on the midline of the palate between premolars and push the shutter button half way down.

17. & 18. Right and Left Top quad

Center the view finder on the premolars. Angle the mirror to the outside of the side you are photographing to move the edge of the retractors out of the way. This view is used to evaluate the posterior teeth for pathology or to photograph the occlusal table for the lab to reproduce.

19. Lower Arch

Recline the patient to the prone position. Place the mirror on the distal of the upper second molars. Rest the top of the mirror on the upper centrals. Center the camera on a spot halfway between the right and left premolars. This view is used to evaluate all the bottom teeth at one time.

20. & 21. Right and Left Bottom quad

Center the view finder on the premolars. Angle the mirror to the outside of the side you are photographing to move the edge of the retractors out of the way. This view is used to evaluate the posterior teeth for pathology or to photograph the occlusal table for the lab to reproduce.

ThumbsPlus is a highly customizable image database / graphics editor application that makes it easy to catalog and locate, as well as, maintain and modify all your graphics and multimedia files.

Good tutorial at downloads section of website at: <http://www.cerious.com/download.shtml>

Thumbs Plus Download - <http://www.cerious.com/>

Free Trial for 30 days Professional Edition will process RAW images and is \$99.95

Dropbox for File Sharing - www.dropbox.com

- Earn up to 10 GB of storage space
- Share files and folders with your network easily

Creating a Presentation for Apple iPad using PowerPoint and iPhoto

1. Decide on a presentation theme:
 - a. General information about the office and what you do
 - b. Specific topic like implants, veneers, fillings, hygiene, etc.
 - c. Smile gallery of your work with testimonials

2. Take pictures to support your theme of:
 - a. Patients
 - b. Doctor and Team
 - c. Dental work
 - d. Office

3. Retouch up and crop your photos using a photo editing program like:
 - a. Photoshop CS5
 - b. Thumbs Plus

- c. Photoshop Elements
 - d. Picasa
4. Create slides of your presentation in PowerPoint
5. Send your slides to iPhoto by selecting File< Send to< iPhoto
- a. Give your new album a name
 - b. Select JPEG format
 - c. Pick all slides or selected ones
 - d. iPhoto will create a new album of your slides as photos
 - e. You can view it as a slide show
 - f. Share it via:
 - i. Ordering prints through Apple
 - ii. Email
 - iii. Facebook
 - iv. Flickr
 - v. Mobile Me
 - g. Synch the iPad with the computer
 - i. iTunes will open
 - ii. Select The iPad from the left menu under Devices
 - iii. Select the sync photos from iPhoto
 - iv. Check off the album you created in iPhoto
 - v. Press the "Sync" button on the bottom left
 - h. After sync, disconnect the ipad
 - i. Open up "Photos" on the ipad
 - i. Tap on your photo album
 - ii. Tap your first slide to leaf through the photos

You can also use the iPad as a Digital Frame.

Portrait Photography Basics

Why take Portraits?

- Office art
- Coffee table book
- Web site

- Print advertising
- Case presentation

Portraits and People

- Fun and popular
- Artistic possibilities are endless
- Subject in composition controlled by instruction rather than viewpoint
- Position, props, facial expressions, background, clothing and makeup

Natural Lighting Portraits

- Very little equipment needed
- Can be outdoors or indoors
- Control light by:
 - Moving subject into light
 - Diffusers
 - Reflectors
- Advantage is space
 - between camera and subject
 - Different lens
 - Composition choices
 - between subject and backdrop
 - Eliminate shadows
 - choice of lighting background or not
- Disadvantage is the elements
 - Harsh sun
 - Too much cloud

Natural Daylight

- Color temperature of 6540 K
- Bluish – UV radiation wavelength
- Good for intraoral shade matching of ceramics
- Extraoral photography – lips or face
- Pros – cheap and WYSIWYG
- Cons – Quality issues – season, time of day, cloud cover, foliage and surrounding buildings and objects
- What is Daylight?
 - Made of sunlight and skylight
 - Skylight is light reflected by the sky
 - Skylight is blue...more skylight = bluer image
 - Sunny day – sunlight drowns out blue effects of skylight
 - Overcast day – skylight and sunlight evenly mixed as sunlight is restricted by cloud, causing a blue tone to photos
 - Daylight Blues...
 - So even though it was a sunny day, the shade blocks the sunlight, allowing the skylight to dominate
 - Use the cloudy day setting for the camera if Auto White Balance does not correct this or correct in Photoshop

Electronic Flash

- Compact (on camera) or Studio
- Most commonly used for dental
- Light outputs corrected to 5500 K

- Photographic Daylight = Red, Green, and Blue present in equal proportions
- Compact Electronic Flash
 - Pros
 - light output is predictable, instantaneous, and adaptable for any camera type
 - Good over short distances
 - Cons
 - Image enhancement needed
 - A weak, harsh, low powered light source

Studio Lighting Portraits

- Use Softbox and Screen
- Use lighting set-ups and backdrops
- Designated studio in office
- Modified operator
- Off site photo studio
- Advantages
 - Weather conditions not a factor
 - Photographer controls the lighting
- Disadvantages
 - Space limitations of studio
 - Cannot blur background
 - Unwanted shadowing on background
 - Use of a wide angle lens
 - More expensive equipment needed

Basic Set-Up

- Camera
- Portraits lens
- Background
- Lighting
- Accessories
- Reflectors
- Diffusers
- Lens filters
- Flash meter
- Camera Format
 - 35mm format is the most popular
 - Film (or sensor) is 36mm wide and 24 mm long
 - Medium and large formats are expensive
 - Advantage is greater detail in bigger formats
 - Medium format
 - 56 x 56mm

- 56 x 42mm
- 56 x 69.5mm
- Large format
 - 120 x 90 mm
 - 240 x 180mm

Camera Settings:

- Canon 60D or 5D MKII or similar
- Set lighting to flash
- Set camera to Manual
- Shutter speed at 1/125 or higher
- F-Stop at f5.6 or higher
 - eg. F9.5 and 125

Background Colors

- Any color can be used as a background
- Universal Colors
 - Royal Blue
 - Gray
 - Blonds
 - Black
 - Chocolate Brown

Focal Length

- When parallel rays of light strike a lens focused at infinity, they converge to a point called the **focal point**.
- The **focal length** of the lens is then defined as the distance from the middle of the lens to its focal point.
- The focal length of a lens is usually displayed on the lens barrel along with its maximum aperture
 - eg. 50mm f/1.8

Lens

- Standard lens
 - Field of view = 45 degrees
 - Similar to field of vision of human eye
 - Focal length of standard lens = 50mm
 - Most natural looking pictures
 - Good for full figure (head to mid-torso shots)
 - Wide apertures (f/1.8) available
- Focal length of 80-150mm best for portraits
 - Less than 50mm – Fish eye effect
 - Greater than 100mm – Flattening effect

Minimum Shutter Speeds

- A few degrees of movement affects a telephoto lens (8°) more than a wide angle lens (75°)
- Use a shutter speed faster or equal to 1/ focal length
- 100mm macro lens = 1/100 sec or higher (1/125)
- 200mm telephoto lens = 1/200 sec or higher (1/250)
- What shutter speeds for 28mm? 50mm?

Exposure

- Light needed to record an image
- Too much = washed out image
- Too little = too dark an image

- Controlled by a combination of:
 - Aperture
 - Shutter speed

Exposure = Filling a glass of Water

- Aperture = How wide the tap is open
- Shutter Speed = How long the tap is open

Aperture

- The aperture is the physical lens opening
- Adjusted to open and close in f-stop increments, allowing more or less light in with a larger or smaller opening.
- The iris diaphragm inside the lens of your camera is adjusted to alter the quantity of light that will reach your film.
- Each aperture opening, or f-stop, lets in twice as much light as the smaller f-stop before it, and half as much light as the larger f-stop after it.
- For example, f5.6 will let in twice as much light as f8, and half as much light as f4.

f/number or f/stop

- Aperture size of the lens
- Corresponds to fractions of the focal length of the lens
- f/2 means the diameter of aperture is half the focal length and at f/4, it is one quarter of the focal length
- f/4 is a smaller aperture than f/2
- f/4 on a 200mm lens is 50mm and on a 28mm lens it is 7mm

Aperture Range

- Wide apertures
 - f/1 to f/2.8
 - Throw backgrounds out of focus
 - Needed for low light situations
 - Known as fast apertures
- Mid-range apertures
 - f/3.5 to f/9.5
 - Give highest resolution pictures
- Small apertures
 - f/11 to f/64
 - Needed in bright conditions
 - Essential when increased depth of field is required

Shutter Speed

- Shutter speed = the length of time your camera's shutter is open.

- As the shutter opens and closes to expose your film, the shutter speed measures in seconds the length that light is reaching your film.
- Shutter speed is quoted in fractions of a second. Eg. 1/60, 1/125, etc
- The longer the shutter speed, the more light you are letting in.
- Very fast shutter speeds will allow you to stop action, but require a great deal of light.

- Slow shutter speeds
 - 1 sec to 1/45 sec
 - Need support like a tripod
 - Essential in low light situations
 - Can provide creative blur
- Mid-Range shutter speeds
 - 1/60 sec to 1/750 sec
 - Most frequently used by photographers
- Fast shutter speeds
 - 1/1000 sec to 1/8000 sec
 - Freeze high speed movement
 - Brighter light needed
 - More sensitive film/higher ISO needed

Exposure Rule of Thumb

- Each halving or doubling of shutter speed represents a difference of a stop on the f/stop scale for the majority of shutter speeds
- 1/60 sec at f/2.8 = 1/30 sec at f/4 = 1/15 sec at f/5.6

Ed's 5 Lenses for Almost Everything

- Covers 15mm to 200mm
 - 15mm Fisheye
 - 17-35mm f/2.8 ultra wide-angle zoom lens
 - 24-70mm f/2.8 macro zoom lens
 - 70-200mm f/2.8 telephoto zoom lens
 - 100mm f/2.8 macro lens
 - *recently added the 24-105mm f/4.0 IS macro zoom lens

- I use the 70-200mm lens for portraits because of:
- Its shallow depth of field and long focal length lets you throw the background out of focus
- Its ability to crop the headshot tightly and flattening effect on facial features

Studio Lighting

- Umbrellas – Small and Compact
- Softboxes – 18 x 18 to 30 x 66

- One Light Set-Up
 - 1 Light – 1 Reflector
- Two Light Set-Up

- Hairlight with Barndoors
 - Gives a Halo effect
 - Separates the head from the background
- Three Light Setup
 - 1 light vs 3 lights with hair light

Portrait Lens Filters

- Tiffen Soft F/X 1 and 2
 - Softens lines on face...great for women
- Tiffen 812 Warming Filter
 - Adds a warm glow to the face
- Tiffen Skylight and UV light filters
 - Great for protecting lens
- Photoshop adds a lot of filter effects as well

Reflectors

- Photoflex MultiDisc 5 'n 1
- Comes in various sizes
- 32 inch and 42 inch my favorite
- Folds up nicely and packs well
- Gives you 5 choices

- Silver
 - Very reflective with good diffusion
- Gold
 - Very reflective with good diffusion
 - Adds color to warm up skin of model
- White
 - Average reflectance and good diffusion
 - White sheet or card works well too
- Zebra
 - Very reflective with good diffusion
 - Combination of gold and silver adds hint of warmth
- Black
 - Good for absorbing light for deep shadow effects
 - Can use a black sheet or black construction paper as well
- Diffuser
 - Softens contrast created by direct sunlight
 - Can be made with a simple wooden frame covered with white netting or cotton
 - Use in combination with a gold reflector for that "sunset" look!

Light Meters

- An exposure meter that takes the guesswork out of correct exposure
- Measures ambient (incident) light as well as reflected light
- Hand held and determines output from studio flash set-up
- The digital camera's light meter measures reflected light only and is less reliable for correct exposure

Broad Lighting

- To create a broad light, you'll need to pose your subject so that 2/3 to 3/4 of their face is facing you and your camera and then direct the key light toward the side of the face that is closest to the camera.
- This is a flattering technique if your subject has a long or thin face, as it will add weight and width to the overall face.

Short Lighting

- For short lighting, you would pose your subject the same way as for broad lighting, but direct your key light toward the side of the face that is furthest away from the camera.
- This type of light will slim a heavier face.

Contact Information:

Email: edlowe@mac.com

Cell: 778-999-8873

Office: 604-683-2483

Nelson Rego

Email: nelson@regosmiles.com

Cell: 562-900-6564

Lab: 1-800-788-7346