

Digital Imaging for the Electronic Medical Record

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Introduction

- Images for diagnosis and treatment
- Image requirements
- Camera requirements
- Pixel resolution primer
- Capture
- Display
- Why Digital?

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Why not?

- Easy to modify
- Archival properties
 - File format
 - Longevity of media
- Analog media recognizable without hardware

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Benefits of reference images

- Objective reference
- Involve patient/family in decisions
 - serial images and compliance
- Involve other disciplines
 - nutritional status, turning patient

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Patient Safety

- Infection control policy
- Clean equipment
- Two person job

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Repeatable and Valid

- Image accurate representation
- Variables must be eliminated
 - magnification ratio, background, color balance, lighting

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Protocol

- Standard system
- Native resolution
- Background
- Image log
- Consistent distance
- Scale

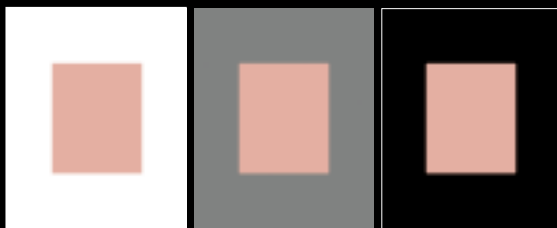
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Protocol

- Color correction
- Image annotation
- Format
- Crosscheck
- Attach to progress note

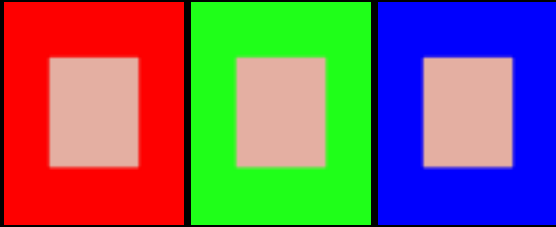
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Value influences color perception



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Hue influences color perception



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Magnification ratio influences wound size perception



13.5" (.35m)

18" (.5m)

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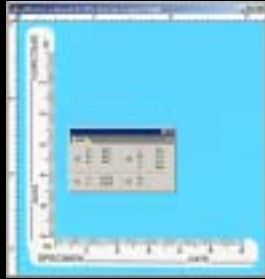
Pull Focus

- Technique to ensure consistent magnification ratio



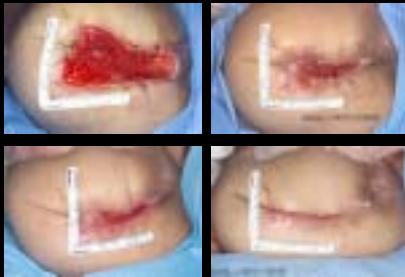
Visual Size Reference

- Scale in all images
- Two 6cm scales at right angles
- Lower left image area
- Neutral highlight reference



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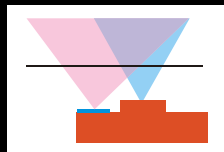
Only the Wound Changes



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Point and Shoot Cameras

- Parallax
flash/viewfinder
– not for macro or cavity
- Auto Focus only
– no Pull Focus
– skin difficult for
focusing sensors
- No external filters
– no provision for cross
polarized light



Anatomy of effective clinical camera

- Manual exposure and focus
- Distance scale on lens barrel
- Manual flash
- Axial lighting
- 1.5 Mp
- Image quality



Image Resolution Requirements

- Displayed on 1024x768 monitors
- 1.5 Megapixel minimum
- Limit camera resolution
- Catch 22
- Variable resolution cameras

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Pixel Resolution

- Resolution complements display
- Surplus resolution for other use
- Minimum file size

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1024 x 768

- Full screen image, 2.25M



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1600 x 1200

- Full screen image, 5.5M
- Plan for future requirements



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DCS 420 Native Resolution

- DCS 420, 1.5 megapixel

$$\begin{array}{r} 1524 \\ \times 1012 \\ \hline 1,542,288 \end{array}$$

- Pixel resolution, 4.42M (500kb .jpg)



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DCS 760 Native Resolution

- DCS 760, 6.1 megapixel

$$\begin{array}{r} 3032 \\ \times 2008 \\ \hline 6,088,256 \end{array}$$

- Pixel resolution, 17.5M (5M .jpg)



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Image size for publication

- Resolution 2x line screen
- 150 line screen, 300ppi image
- 4.5M image size satisfies most publication needs



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Interpolation (Resample Image)

- Should not resample images



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Resample Increases Pixel Resolution

- Resample Image creates new pixels from algorithm
- Guess



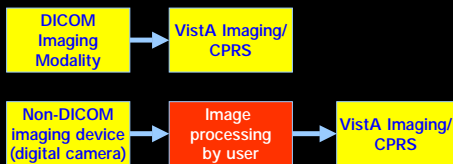
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DICOM

- Digital Imaging and Communications in Medicine
- File format and transfer protocol

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DICOM vs. non-DICOM workflow



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DICOM and VistA Imaging

- No DICOM compliant digital cameras
 - user intervention required
- Software requirements
 - image editing program
- User proficiency and training
 - color correction

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Image Preparation

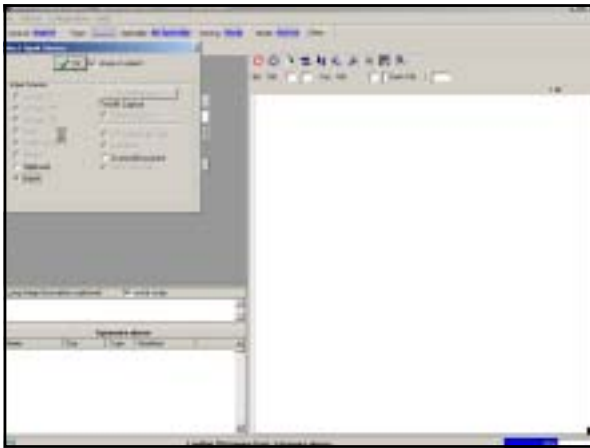
- Acquire image
- Color correction
- Annotate
- Save to network directory
- ICC profiles

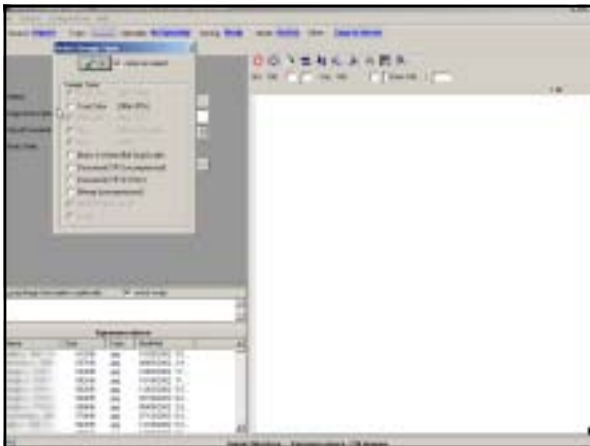
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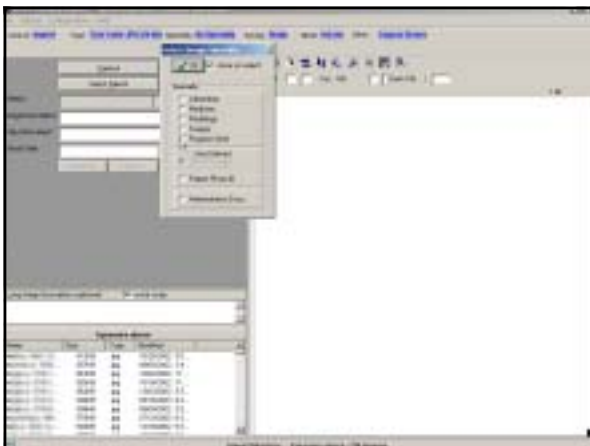
VistA Imaging Capture

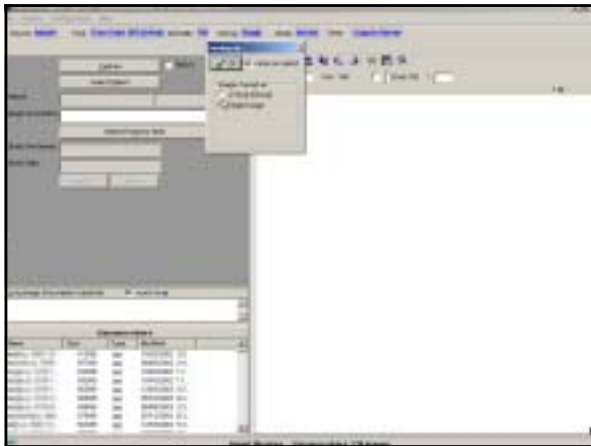
- CPRS-GUI
- Attach images to progress note
- Restricted access
- Simple process

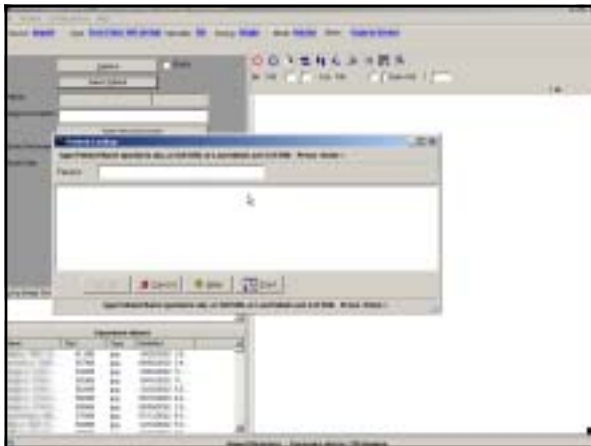
30

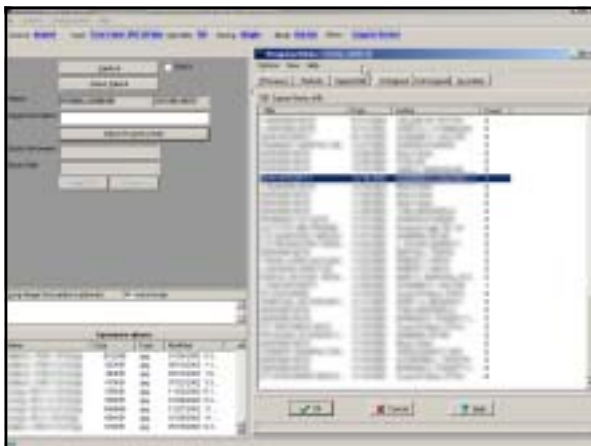
















Vista Imaging Display

- Open access to Vista Display



Vista Imaging Display

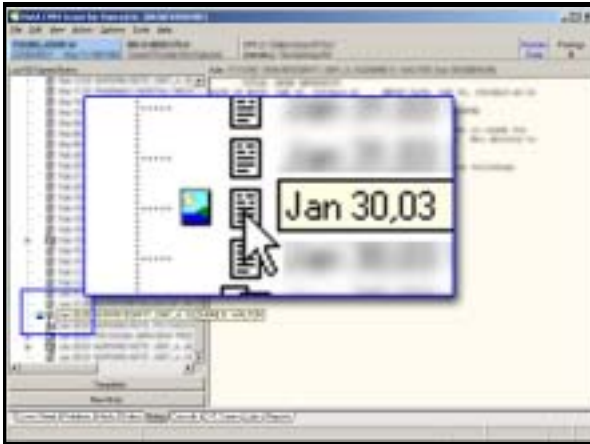


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CPRS-GUI



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Viewer Considerations

- Confidence in images
- Color management

The Great Myth

- The hard part of clinical photography is film processing.

Summary

- Only valid images in medical record
- Hardware, software requirements
- Point & Shoot cameras inappropriate
- Develop protocol
- Clinicians need specialized training
- Crosscheck before attaching
