

IMAGE MANIPULATION FOR THE RADIOLOGIST

Carl Kalbhen, MD

IMAGE MANIPULATION FOR THE RADIOLOGIST

Special thanks to Paul Chang, MD,
for valuable lessons provided in 2005

PowerRAD: Introduction to Personal Image Management and Presentation

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Why

Radiologists in many ways act as photographers and image editors.....albeit with unique and uber expensive cameras



Why

Photography principles in day-to-day radiology

Exposure

Technique

Contrast

Media

Window/level

Framing/cropping

Field-of-view

Viewpoint

Cross-sectional plane

Planar angle

Why

Quality

Radiologist control

Fluoroscopy

Technologist control

Technique

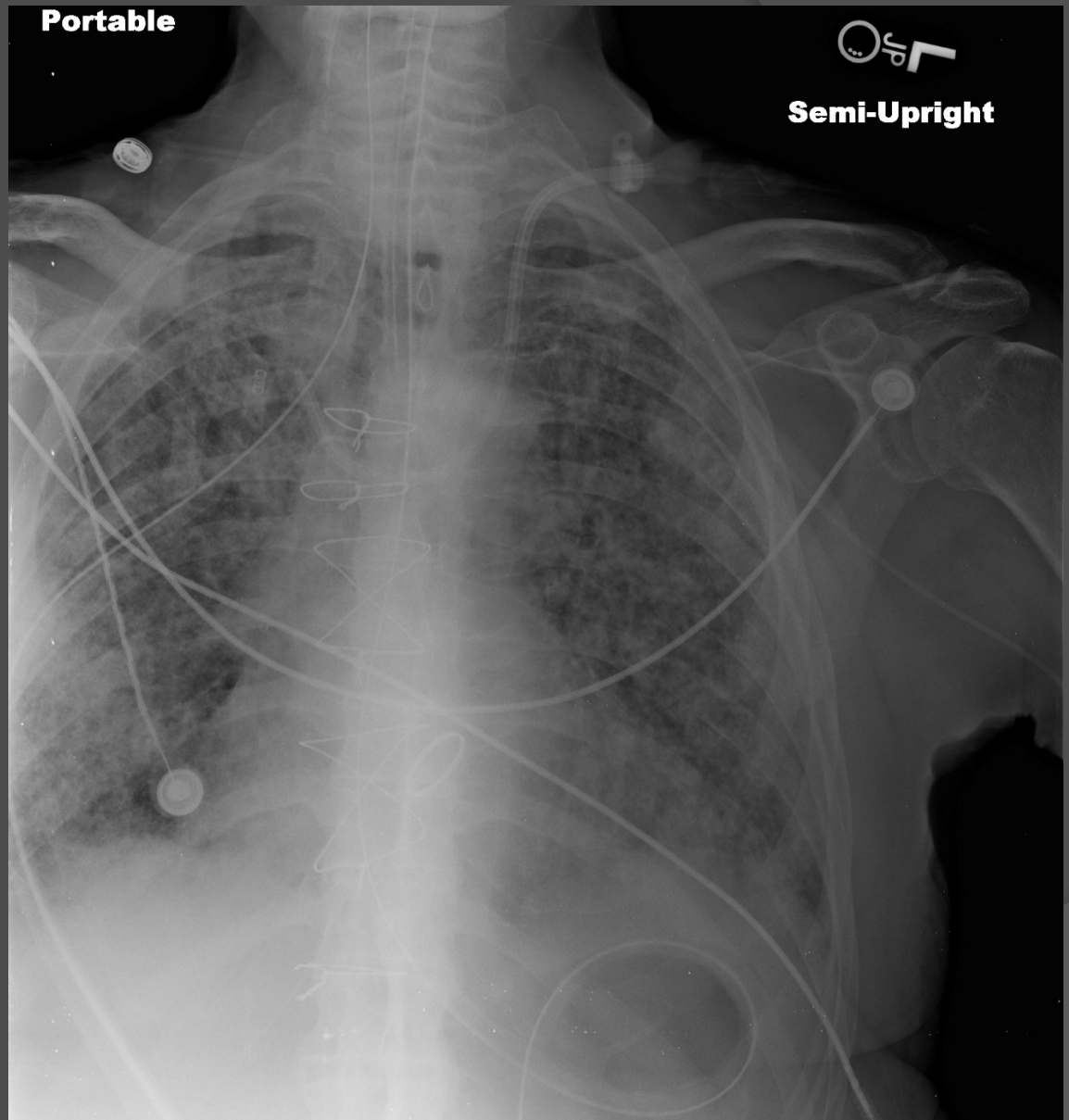
Patient/no control

Body habitus

Motion

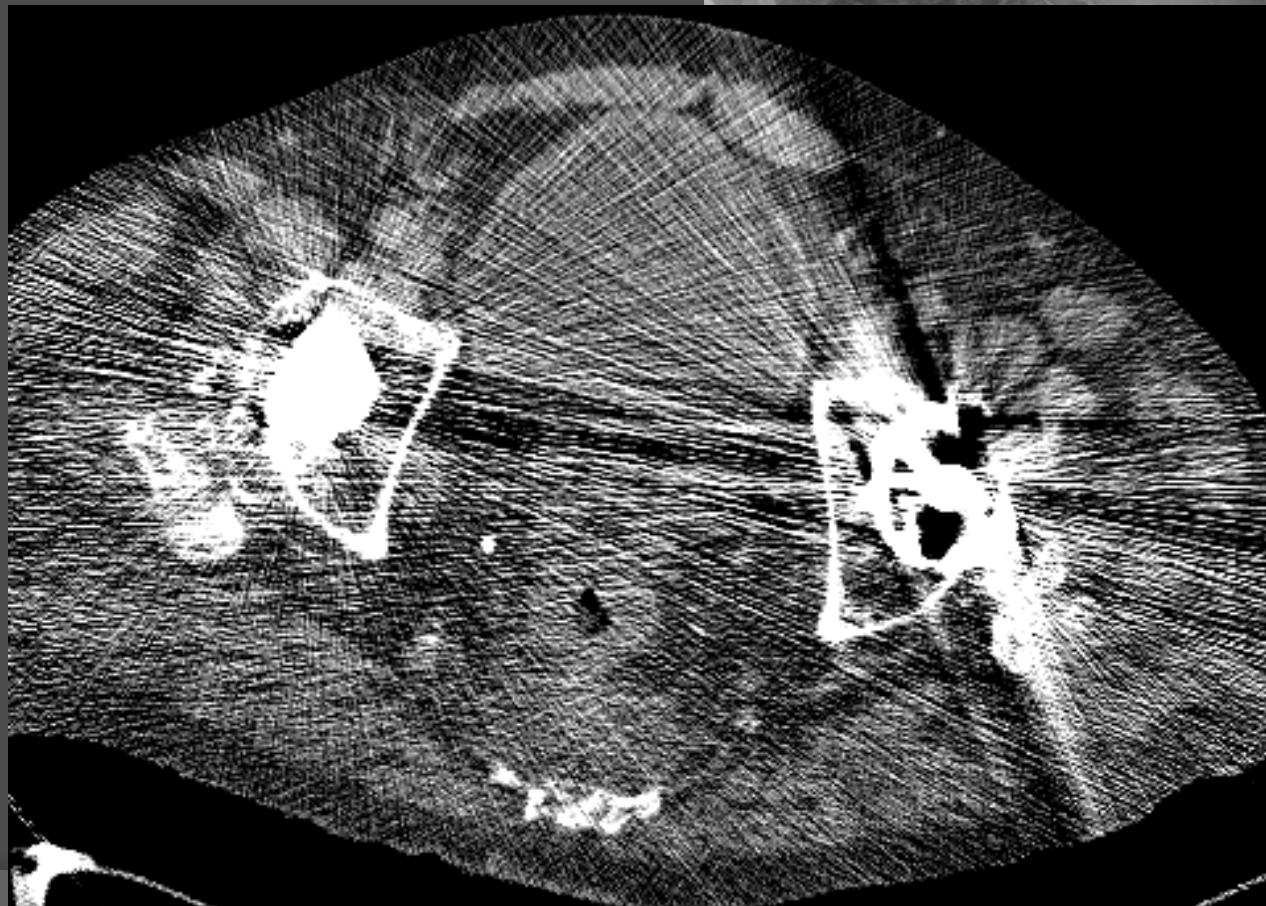
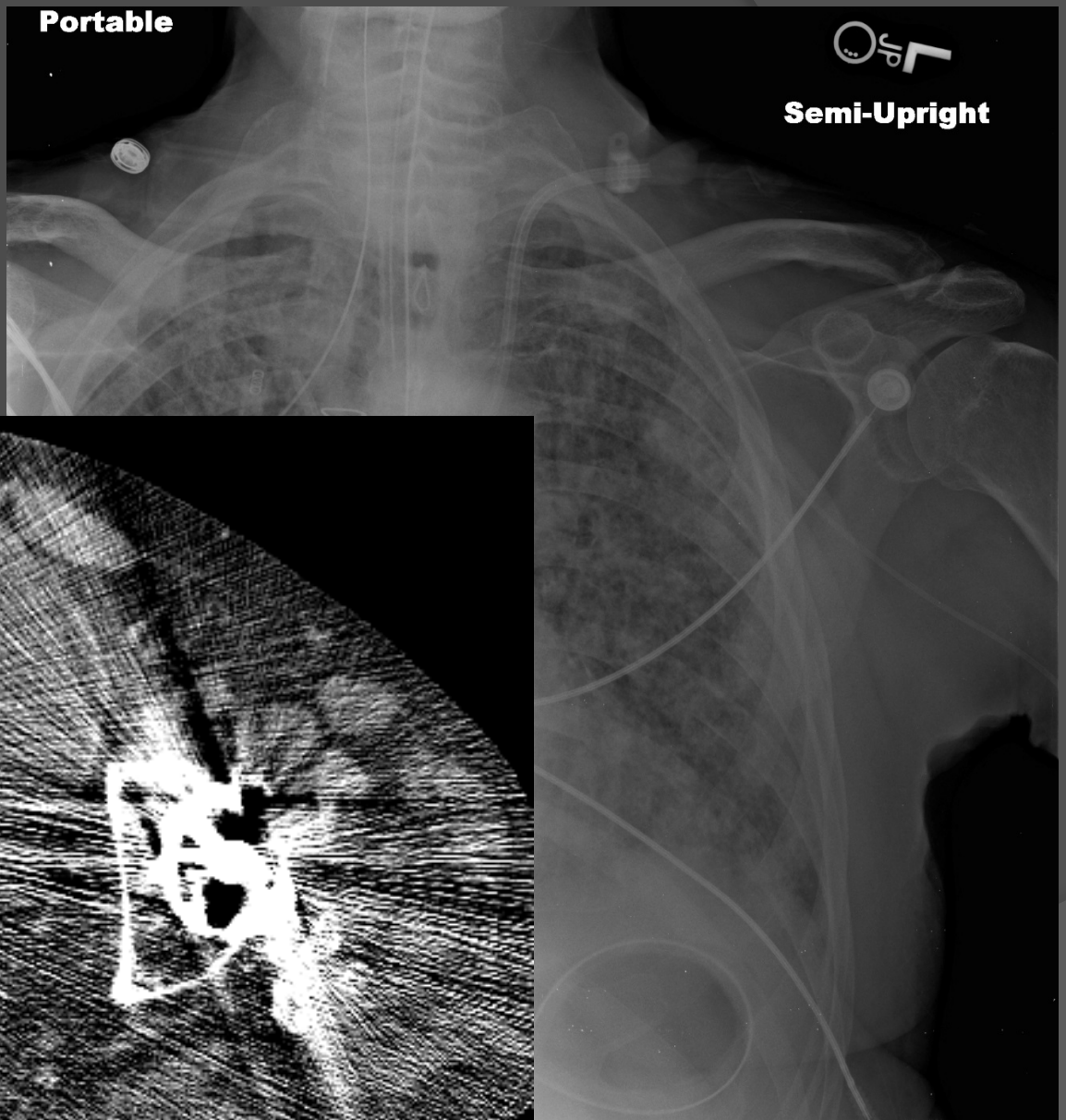
Why

Crappy images



Why

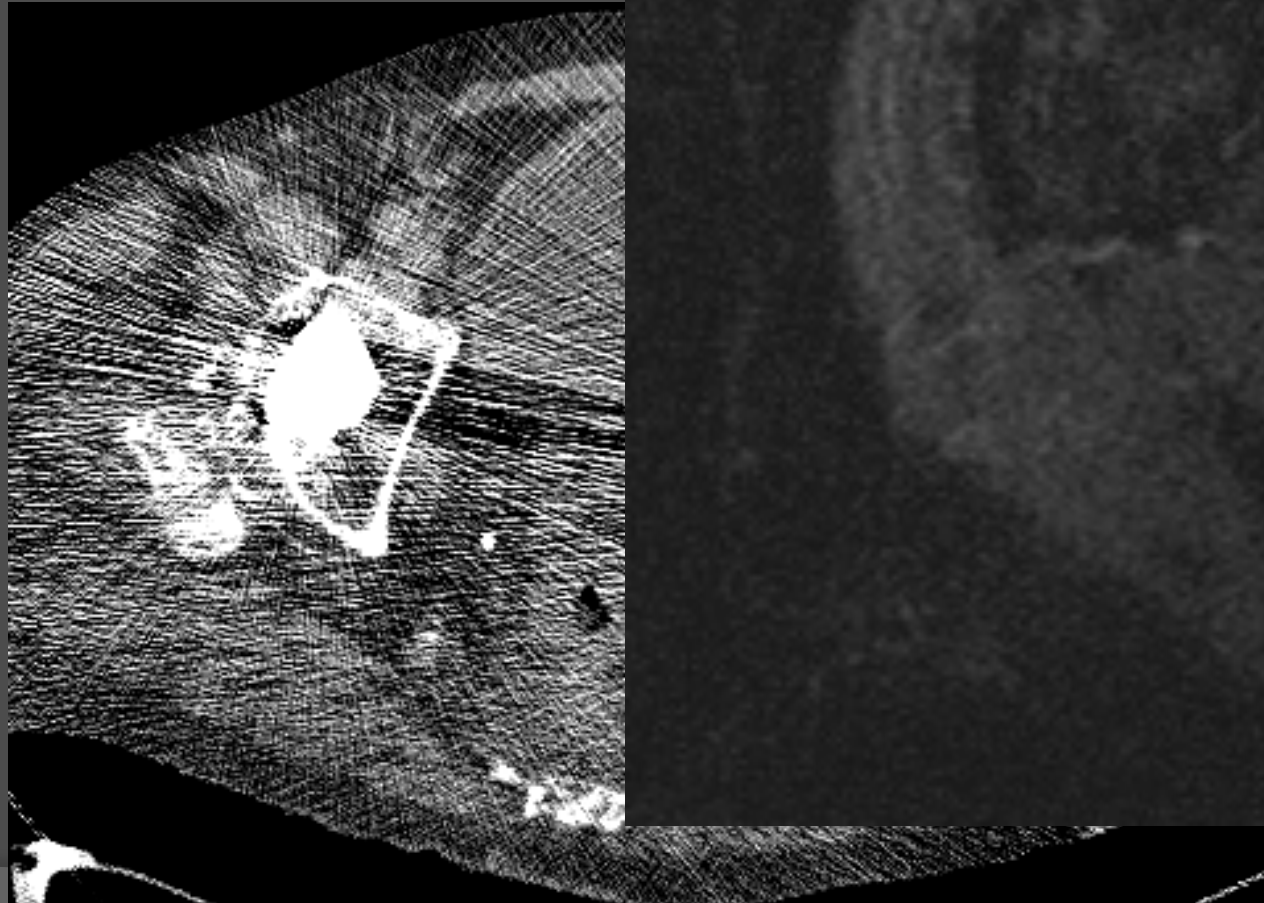
Crappy images



Portable

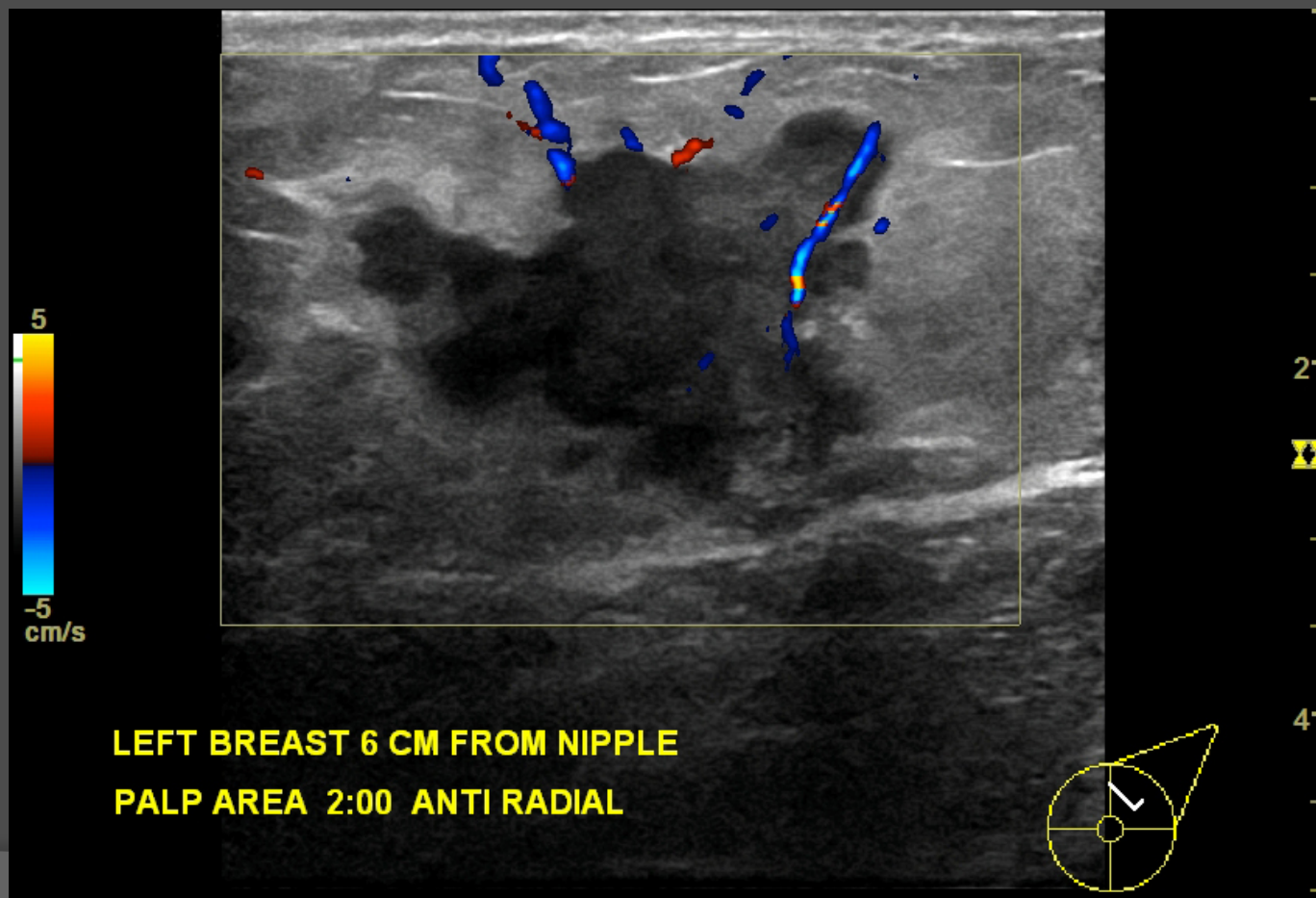
Why

Crappy images



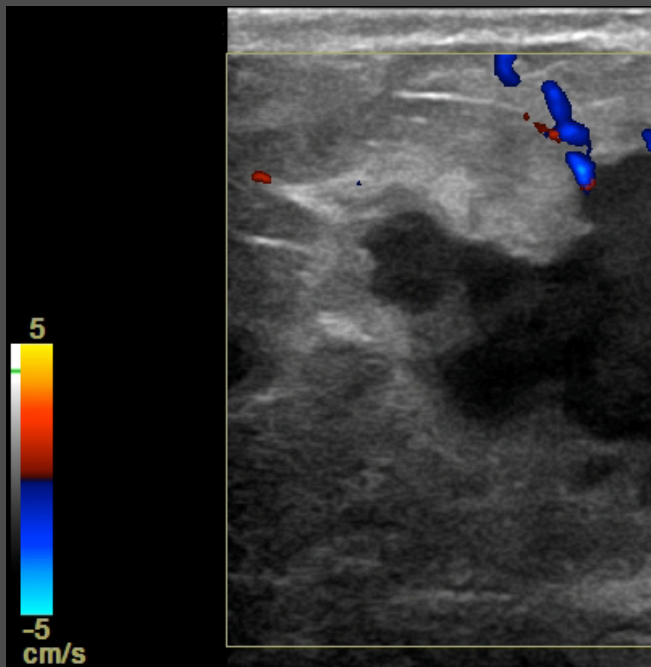
Why

“Pretty” images

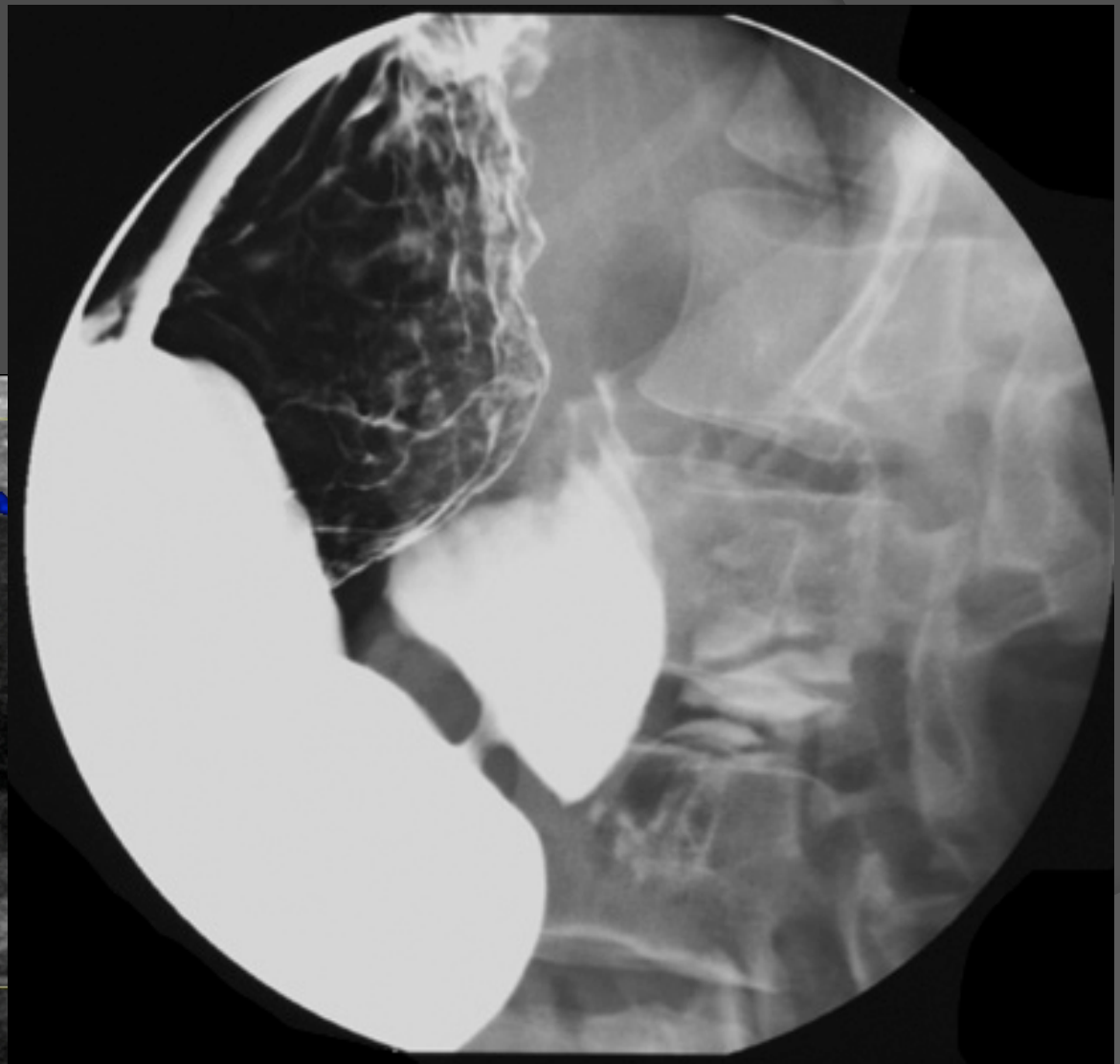
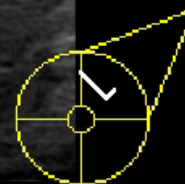


Why

“Pretty” images



**LEFT BREAST 6 CM FROM NIPPLE
PALP AREA 2:00 ANTI RADIAL**



Why

Everyone in this room will give presentations
utilizing diagnostic medical images
Make them look as nice as possible!

Topics

Images

Resolution

Formats

Acquiring

Editing

Videos

Presentations

PowerPoint

Keynote

Resolution

DPI (dots per inch.....really pixels per inch)

72 DPI standard web

300 DPI standard print

600 DPI high-resolution print

Various stages in between

Resolution

Modality

Cross-sectional (sonography, NM, CT and MR)

Typically 256 x 256 or 512 x 512

For a 4" image, about 64 or 128 DPI

Radiography

About 300 DPI

Mammography

About 600 DPI

Resolution

Saving from PACS (Centricity at least)

Automatic/default 72 DPI.....even for mammo

Formats

DICOM

Digital Imaging and Communication in Medicine

TIFF/TIF

Tagged Image File Format

JPEG/JPG

Joint Photographic Experts Group

PNG

Portable Network Graphics

Formats

Typically greyscale

12 bit (4096 shades)

DICOM

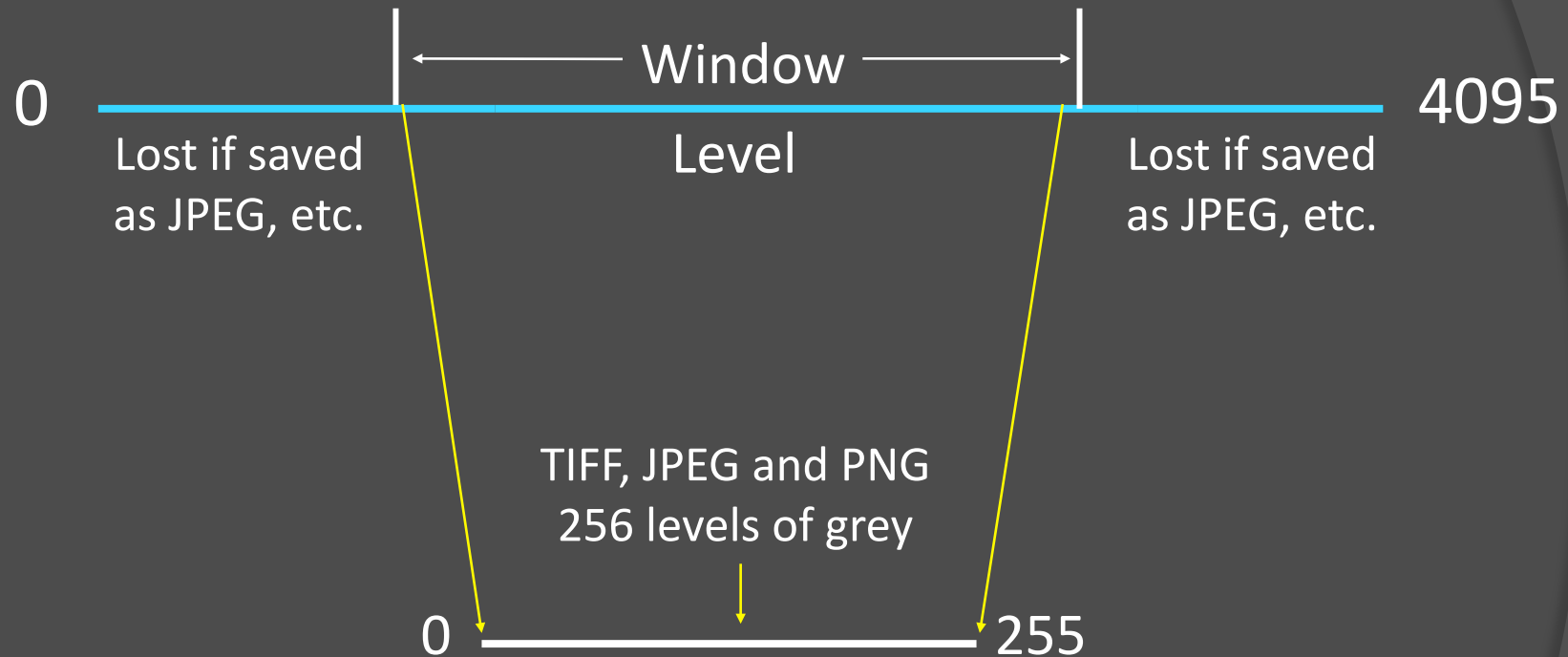
8 bit (256 shades)

TIFF

JPEG

PNG

Formats



DICOM also contains textual data (eg, study parameters, patient demographics) and is more than an image format

Formats

Data compression

Ubiquitous

Makes file sizes smaller when saving

Types

Lossless

Lossy

Formats

Lossless

Ratio 2:1.....at best

No data is lost

Lossy

Variable ratios.....often on order of 20:1

Data is permanently lost

Inexact approximations

Partial discarding

Formats

Lossy



Formats

Lossless

DICOM

Legally must be lossless

TIFF

PNG

Lossy

JPEG

Formats

JPEGs

Can't live with 'em, can't live without 'em

Every time a JPEG is saved, data/quality is permanently discarded

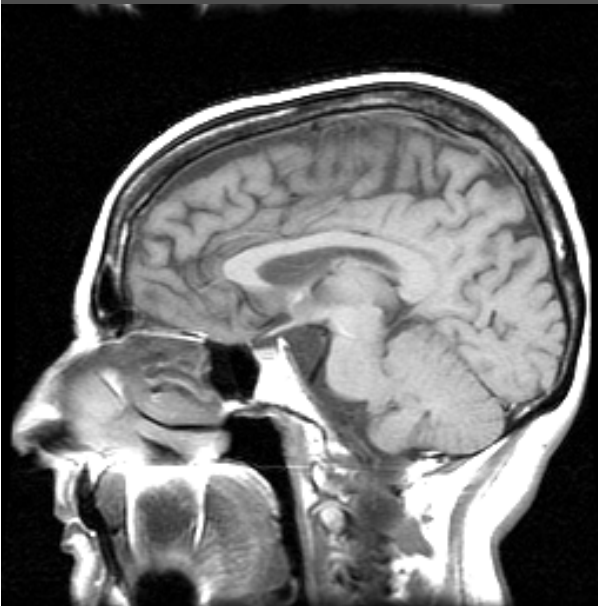
JPEQ quality levels

0-100 (standard)

1-12 (Adobe)

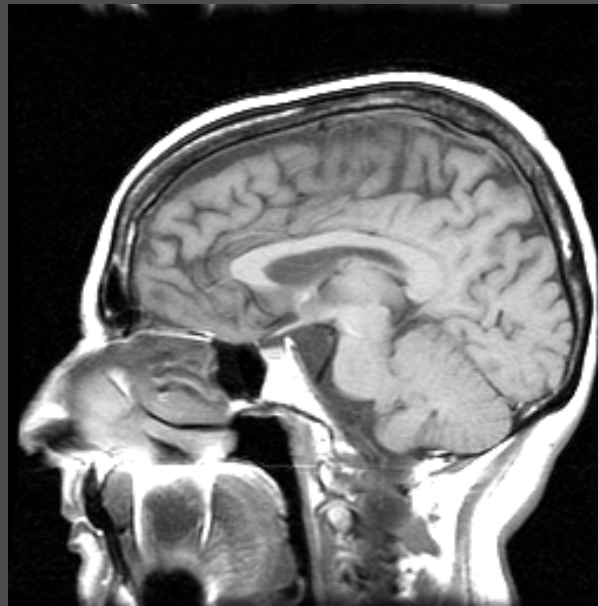
Higher quality level preserves data

Formats



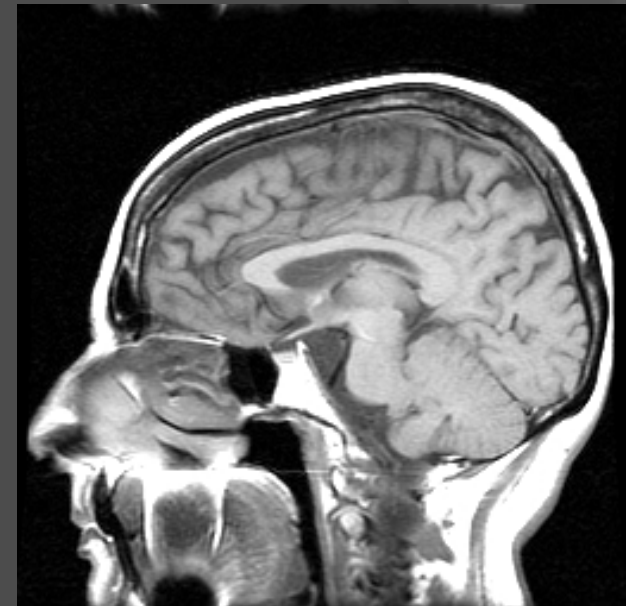
DICOM

Full spatial fidelity
Full dynamic range (W/L)
Format not fully supported
131 kB



TIFF

Full spatial fidelity
Limited dynamic range (W/L)
Format mostly supported
200 kB

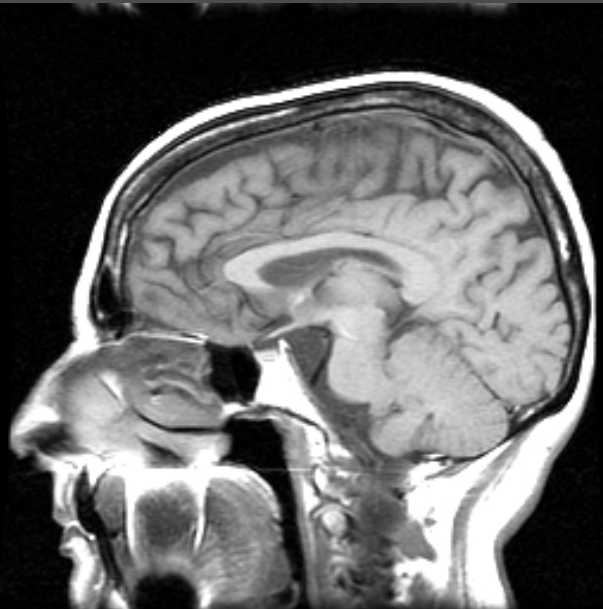


JPEG 100

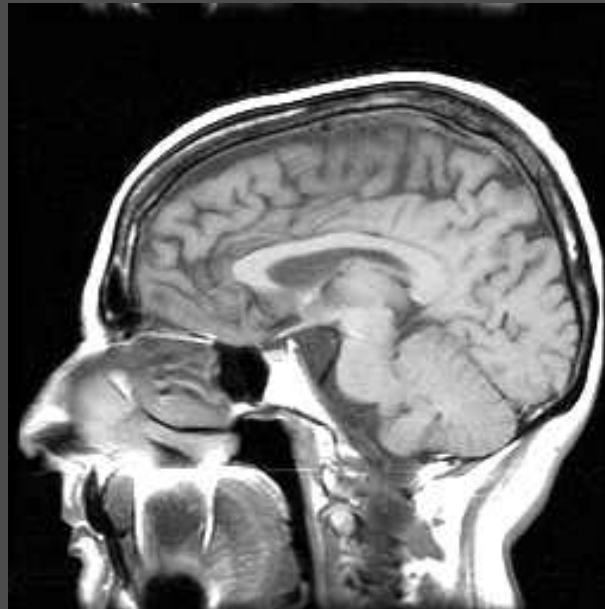
Variable spatial fidelity
Limited dynamic range (W/L)
Format 100% fully supported
50 kB

Formats

JPEG



Quality = 100
4:1 compression
50 kB



Quality = 50
20:1 compression
10 kB



Quality = 10
50:1 compression
4 kB

(DICOM image size: 131 kB)

Formats

JPEG



Quality = 100



Quality = 25

Formats

JPEG



Quality = 100



Quality = 100 - 25

Formats

JPEG



Quality = 25

“Lost with lossy”

Edges

Blur

Ripples

Echoes

Acquiring

Digital

PACS (eg, GE Centricity)

Web

Screen capture

Film.....if you know what this is

PACS

May not be officially allowed

Insert a thumb drive

Try saving to F:.....or something similar

Ask an attending

GE Centricity formats

DICOM

TIFF

JPEG

PNG

PACS

Monitor Re... Image Exam Display

4 Select SaveCur... CK CT B... Opened ... * SYSTEM

412) Oct 17, 2014 08:2) Oct 17, 2014 08:

Series Series

Se: 102 AH Im: 26 AH

R

W: 100 L: 25 PF 5 cm PF 5 cm

- Save Current Exam Alt+S
- Save Current+Comparisons Ctrl+Alt+S
- Close Current+Comparisons Alt+W
- Close All Open Exams Ctrl+Alt+W
- Show Exam As Acquired Alt+J
- View Significant/Key Images
- Send Exam(s) Ctrl+E**
- Print Images Alt+P
- Mark Unverified F4
- Mark Verified F5
- Mark Dictated F6
- Send Exam To Remote WS
- Start Dictation F2
- Save For Conference Alt+B
- Delete Conference
- Launch Report
- Report With Association
- Show/Hide Dictation System

PACS

Exam Export

DICOM Send Export Images

Method: Save to Disk

Export: All Images from Series

Format: JPEG

Send original image(s) from database

De-identify images

File Name: _CKALBH__1018082951

Location: C:\exportedImages_SaveToDisk

Send Cancel

W: 100 L: 35 W: 400 L: 40

W: 2000 L: 350 W: 1500 L: - 500

PACS

Exam Export

DICOM Send | Export Images

Method: Save to Disk

Export: All Images from Series

Format: All Images from Series
Significant Images
Selected Images

De-identify images

File Name: _CKALBH__1018082951

Location: C:\exportedImages_SaveToDisk

Send | Cancel

W: 100 L: 35 | W: 400 L: 40

W: 2000 L: 350 | W: 1500 L: - 500

PACS

Exam Export

DICOM Send Export Images

Method: Save to Disk

Export: All Images from Series

Format: JPEG

- JPEG
- TIFF(8 bit)
- PNG
- DICOM

File Name:

Location: C:\exportedImages_SaveToDisk

Send Cancel

W: 100 L: 35 W: 400 L: 40

W: 2000 L: 350 W: 1500 L: - 500

PACS

The screenshot displays a PACS interface with an 'Exam Export' dialog box open. The dialog box has a title bar 'Exam Export' and a close button. Inside, there is a 'Save' sub-dialog box. The 'Save' dialog shows 'Look In:' as 'exportedImages_SaveToDisk' and 'Save In:' as 'C:\exportedImages_SaveToDisk'. The 'Files of Type:' is set to 'All Files'. There are 'Save' and 'Cancel' buttons at the bottom of the 'Save' dialog. Below the 'Save' dialog, the 'Exam Export' dialog has a 'File Name:' field containing '_CKALBH__1018082951' and a 'Location:' field containing 'C:\exportedImages_SaveToDisk'. There is a 'Send' button and a 'Cancel' button at the bottom of the 'Exam Export' dialog. The background shows a grid of image thumbnails with technical data like 'W: 100', 'L: 35', and '5 cm'.

PACS

The screenshot displays a PACS interface with an 'Exam Export' dialog box open. The dialog has a title bar 'Exam Export' and a close button. Below the title bar, there are two 'PF' buttons and a '5 cm' scale. The main area of the dialog is a 'Save' sub-dialog. The 'Save' dialog has a 'Look In:' dropdown menu showing 'exportedImages_SaveToDisk'. Below this is a tree view of the file system with 'exportedImages_SaveToDisk' selected. The 'Save In:' field shows 'My Documents'. The 'Files of Type:' dropdown is set to 'All Files'. At the bottom of the 'Save' dialog are 'Save' and 'Cancel' buttons. Below the 'Save' dialog, the 'Exam Export' dialog has a 'File Name:' field containing '_CKALBH__1018082951' and a 'Location:' field containing 'C:\exportedImages_SaveToDisk'. At the bottom of the 'Exam Export' dialog are 'Send' and 'Cancel' buttons. The background shows a grid with 'W: 100', 'L: 35', and '5 cm' markings.

PACS

The screenshot displays a PACS interface with an 'Exam Export' dialog box. The dialog box has a title bar 'Exam Export' and a close button. Inside, there is a 'Save' sub-dialog box. The 'Save' dialog shows 'Look In: exportedImages_SaveToDisk' and 'Save In: F:\'. The 'Files of Type' is set to 'All Files'. There are 'Save' and 'Cancel' buttons at the bottom of the 'Save' dialog. Below the 'Save' dialog, the 'Exam Export' dialog has a 'File Name' field containing '_CKALBH__1018082951' and a 'Location' field containing 'C:\exportedImages_SaveToDisk'. There is a blue button with a folder icon between the 'Location' field and the 'Send' and 'Cancel' buttons. The background shows a grid of image thumbnails with technical data like 'W: 100', 'L: 35', and '5 cm'.

PACS

Exam Export

DICOM Send Export Images

Method: Save to Disk ▼

Export: All Images from Series ▼

Format: JPEG ▼

Send original image(s) from database

De-identify images

File Name: _CKALBH__1018082951

Location: F:\

Send Cancel

W: 100 L: 35 W: 4 L: 5 c W: 2000 L: 350 W: 15 L: - 5

Screenshots

Windows

Whole screen: Print key

Mac

Whole screen: Command-shift-3

Cropped area: Command-shift-4

Screenshots

Free software

Windows

MWSnap

Crop

Batch



Google

Web Shopping News Videos Images More Search tools

About 8,520 results (0.21 seconds)

MWSnap - CNET Download.com
download.cnet.com/**MWSnap**/3000-2072_4-10524229.h... Download.com
Jun 2, 2006 - This outstanding freeware application makes capturing and editing screenshot images a breeze. MWSnap may come with an ...

MWSnap - Mirek's Free Windows Software
www.mirekw.com/winfreeware/mwsnap.html
Mar 16, 2003 - (click to zoom). MWSnap is a small yet powerful Windows program for snapping (capturing) images from selected parts of the screen.

mwsnap 3 free download - Softonic
en.softonic.com > ... > Screen Capture > Softonic.com
mwsnap 3 free download - MWSnap 3.00.0.74 Beta: Practical tool to take screen snapshots, and much more programs.

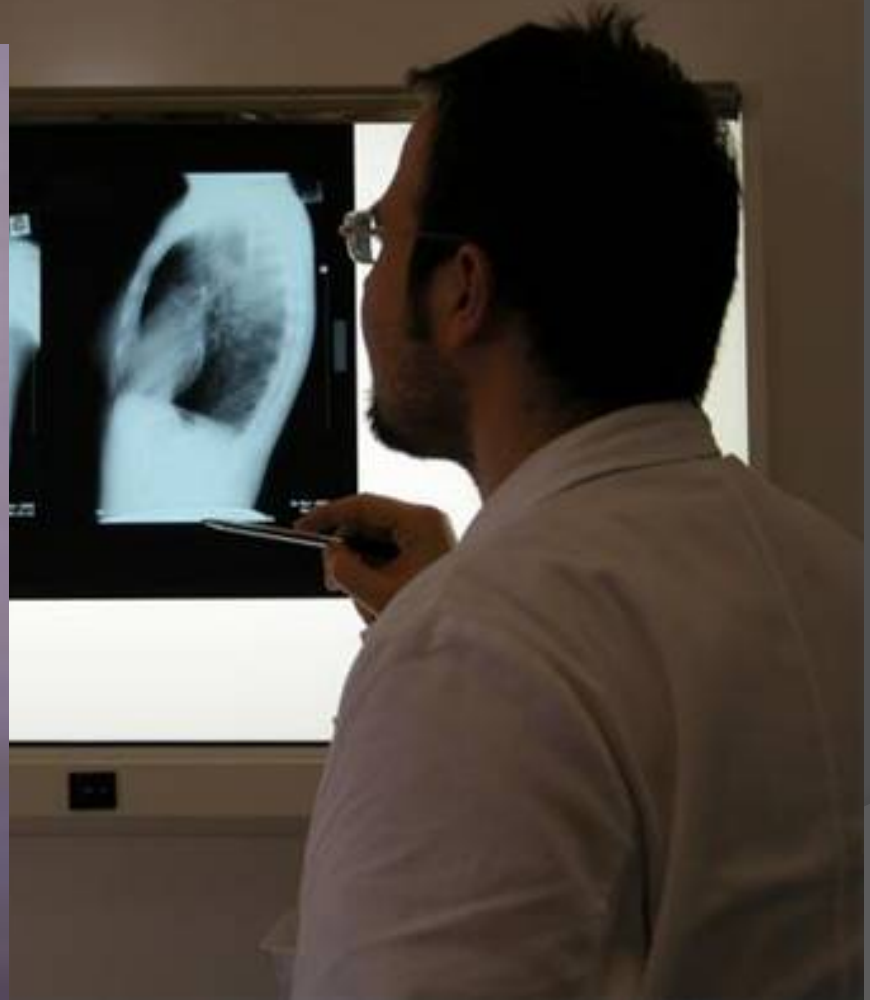
MWSnap Free Download - Softpedia
www.softpedia.com > ... > Multimedia > Graphic > Graphic Capture
★★★★★ Rating: 3.5 - 67 votes - Free - Windows
Aug 13, 2014 - MWSnap is a simple tool which enables you to capture an image from your computer. You can use it to immortalize essential parts of your ...

MWSnap 3.0 Download (Free) - MWSnap.exe
mwsnap.software.informer.com/3.0/
Mwsnap windows 7 · **Mwsnap 3** · Desktop snapshot software · Mwsnap free download windows 7 · **Mwsnap 3** free download · Mwsnap download windows 7.

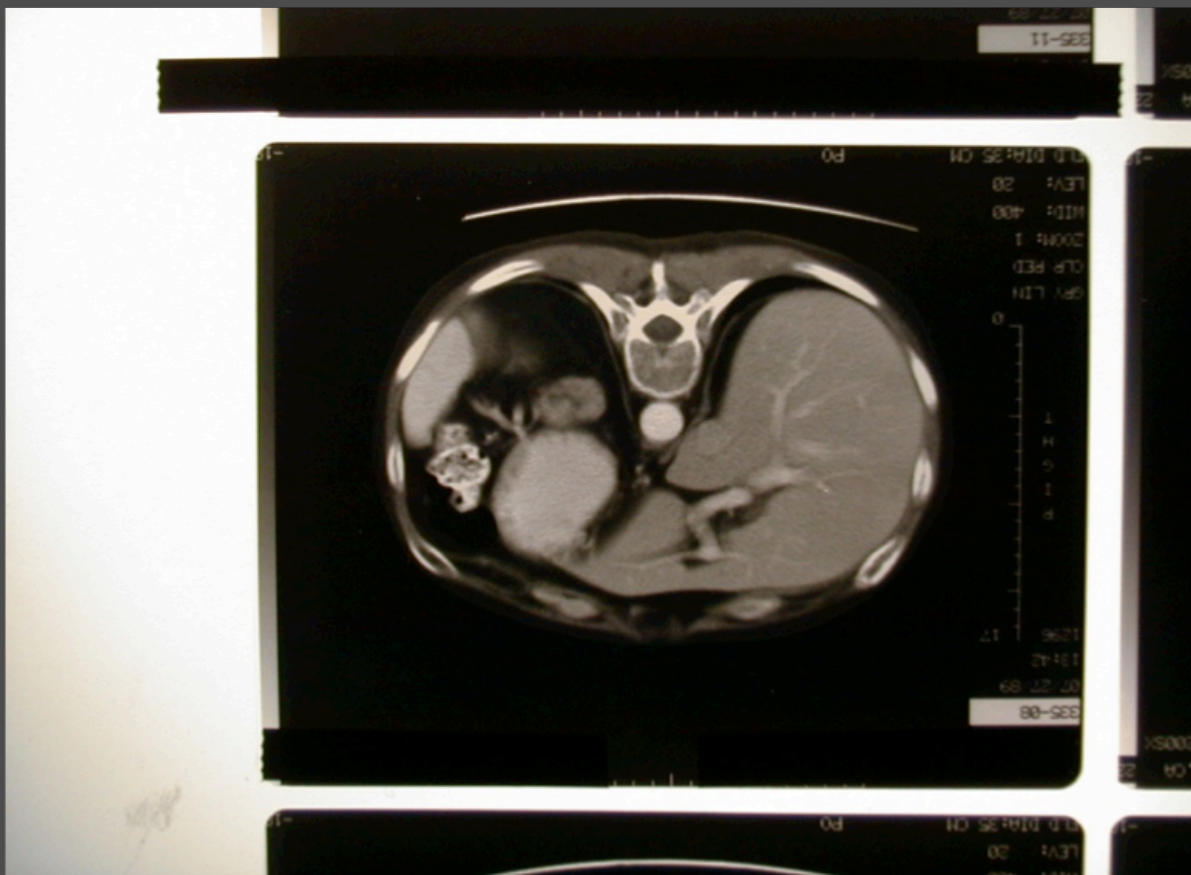
Film



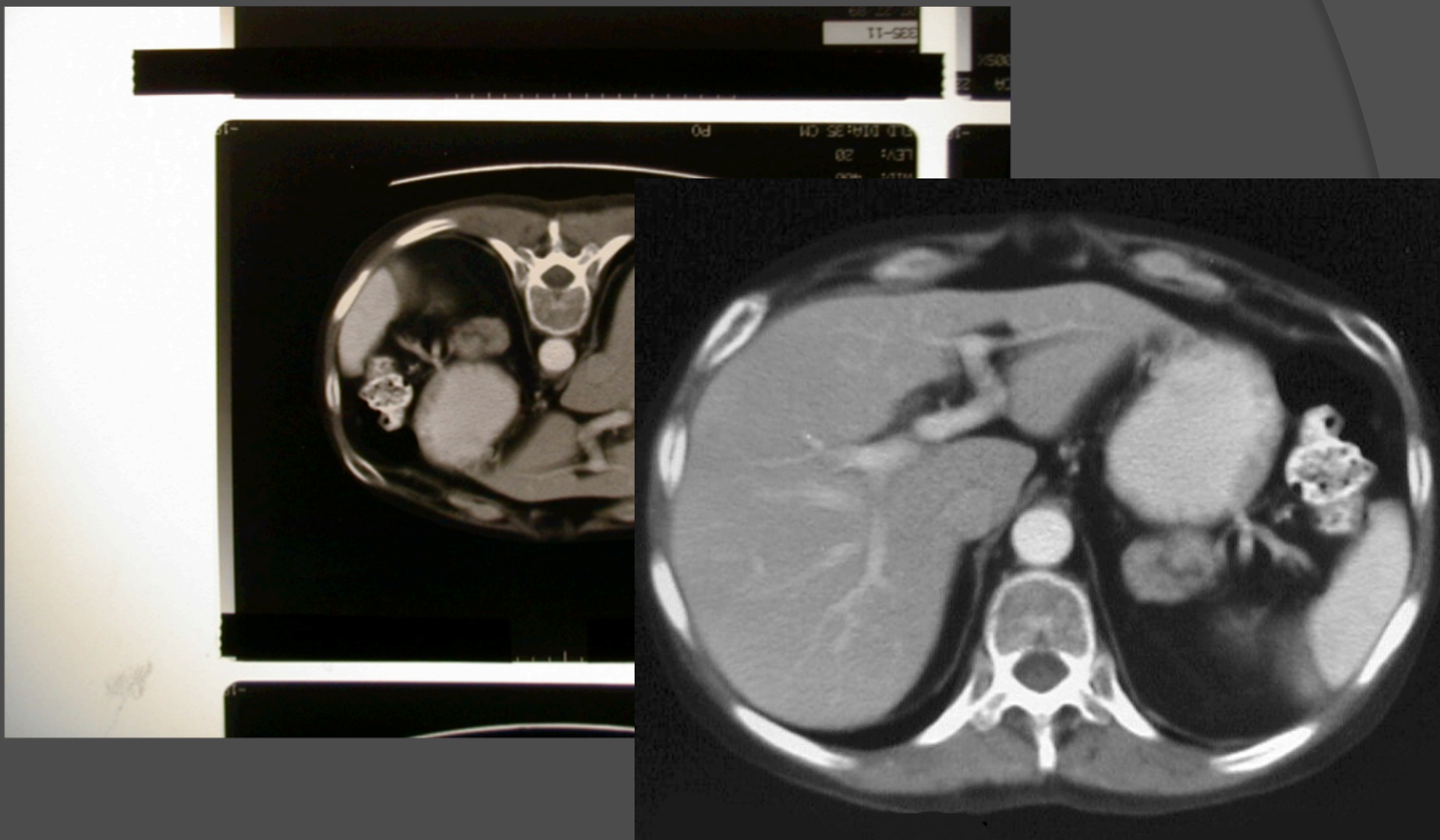
Film



Film



Film



Editing

Greyscale conversion

- Smaller files

- Removes any unexpected color

Cropping

Brightness/contrast

HIPAA compliance

Tweaks

Editing

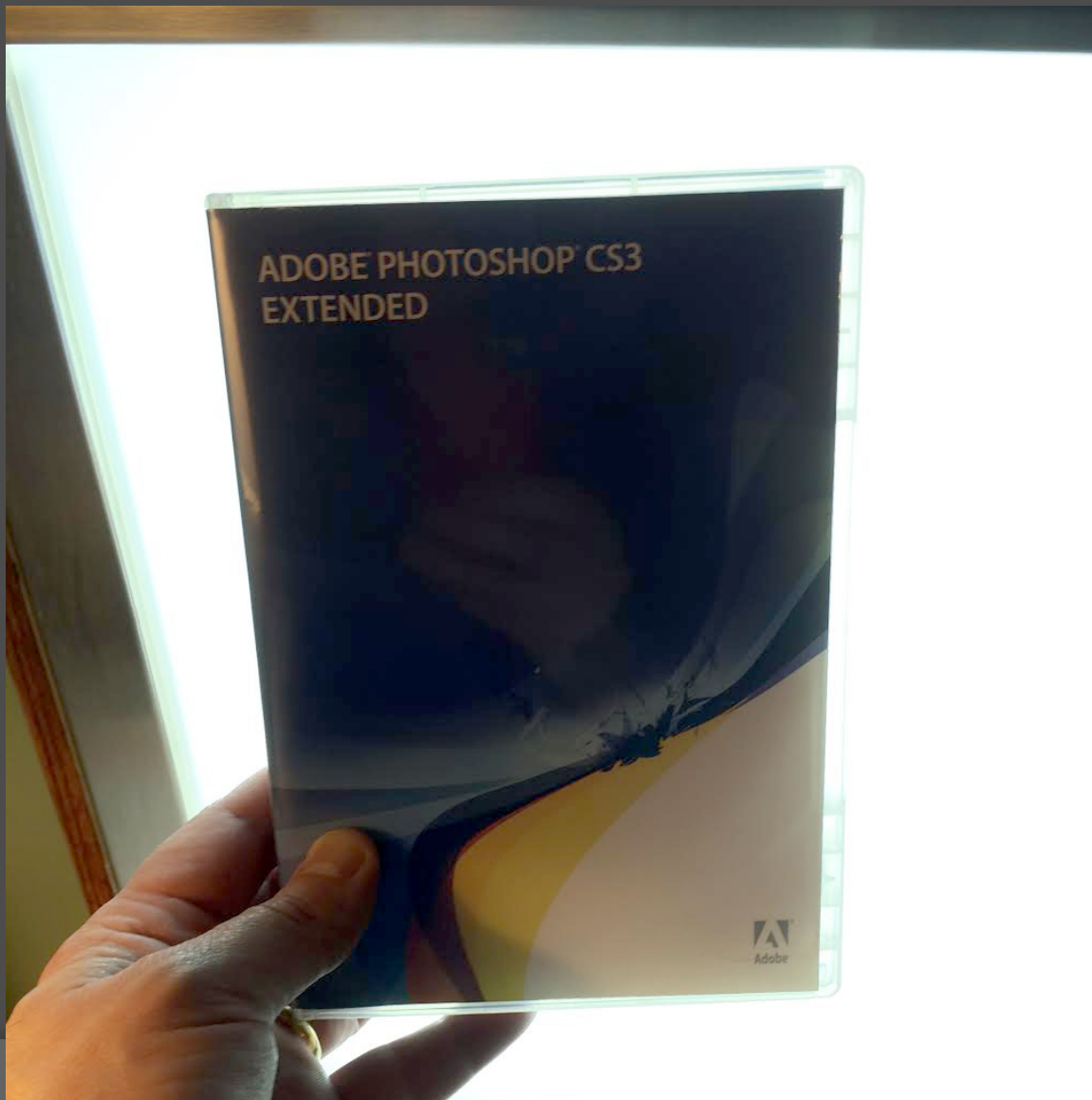
Photoshop

Does a lot, costs a lot

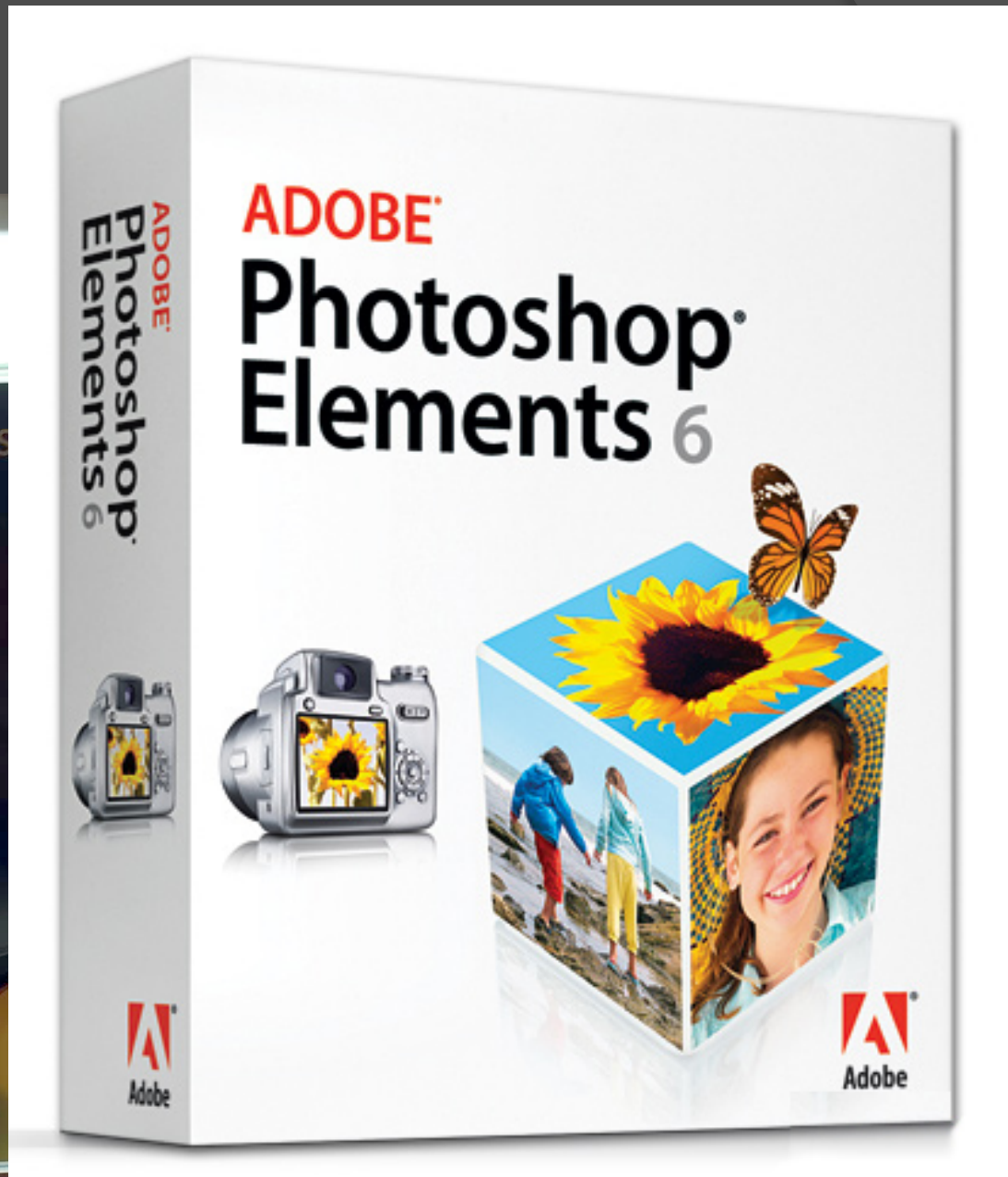
Everything else

Does less, costs less.....or nothing

Photoshop



Photoshop



Editing

Photoshop

Now a subscription

Part of “Creative Cloud”

Many more products available than Photoshop

I have no financial relationship with Adobe



Editing

Photoshop

Cheapest is \$10/month

I pay way more for full Creative Cloud

Cheap/free alternatives

Many exist

Acceptable for radiologists' needs

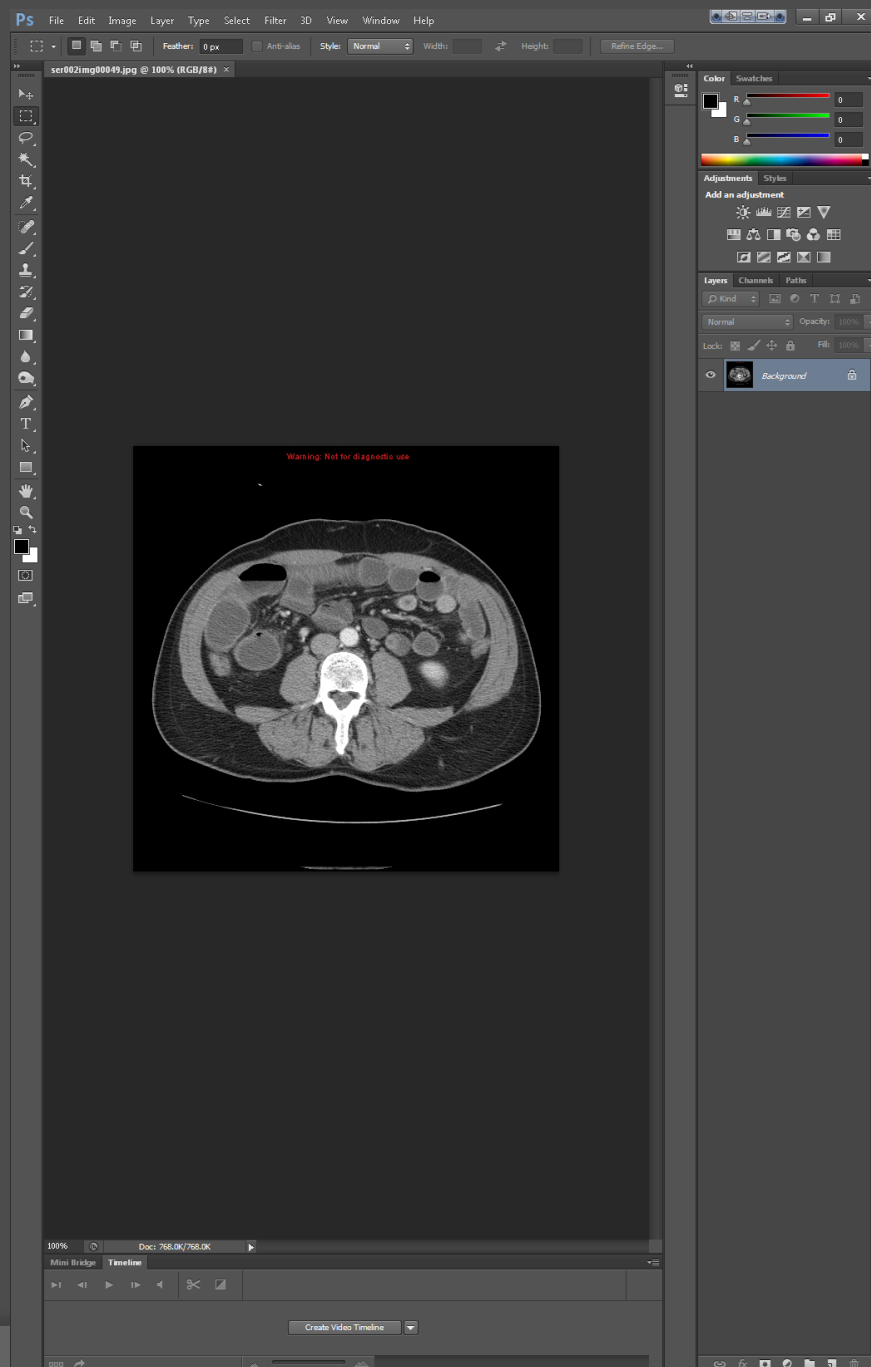
Photoshop



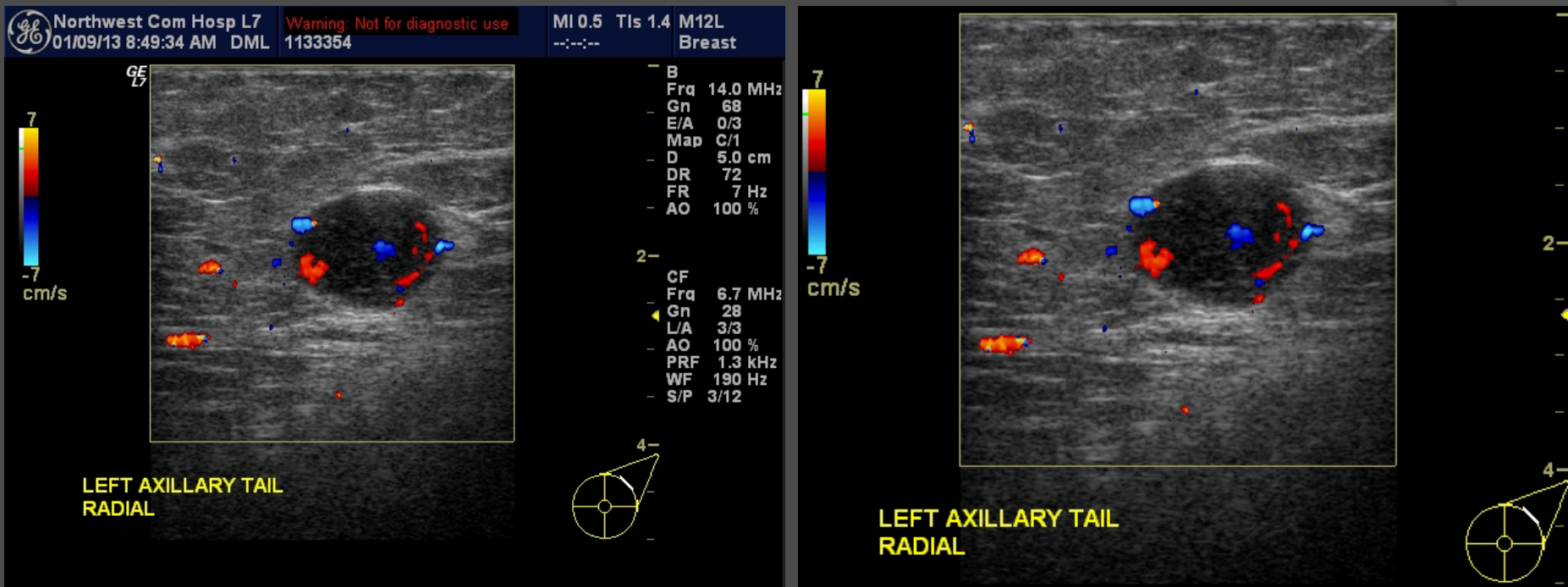
Photoshop



Photoshop



Photoshop



Photoshop

HEAD WITHOUT
ct01
HEAD W/O
Se: 2
Im: 22
Slice Location: -134.3

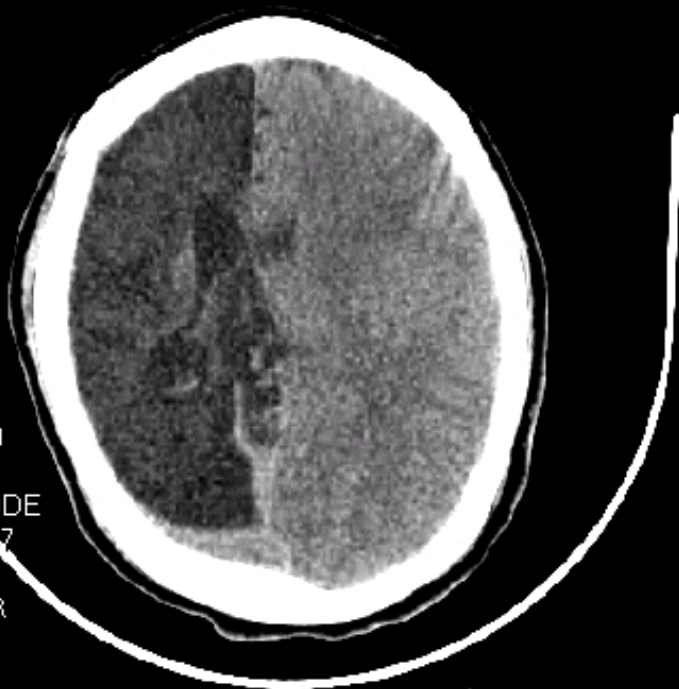
A

LightSpeed 16
Naika Marcelin
Acc: A134931682
010Y F 22.07.14.9CLO
Date:
2014-07-22
11:49:22

512x512

R

AC: 6
KVP: 120
Exp: 50
Exp (ms): 1000
Exp (ma): 200
SO: AXIAL MODE
TH: 149.699997
RD: CW
HEAD FILTER
24000
Th: 2.500
Sp: 0.488\0.488
Pos: -125.000\125.000\134.250



L



Imgs: 56
Zoom: 57%
W: 80 L: 30

Photoshop

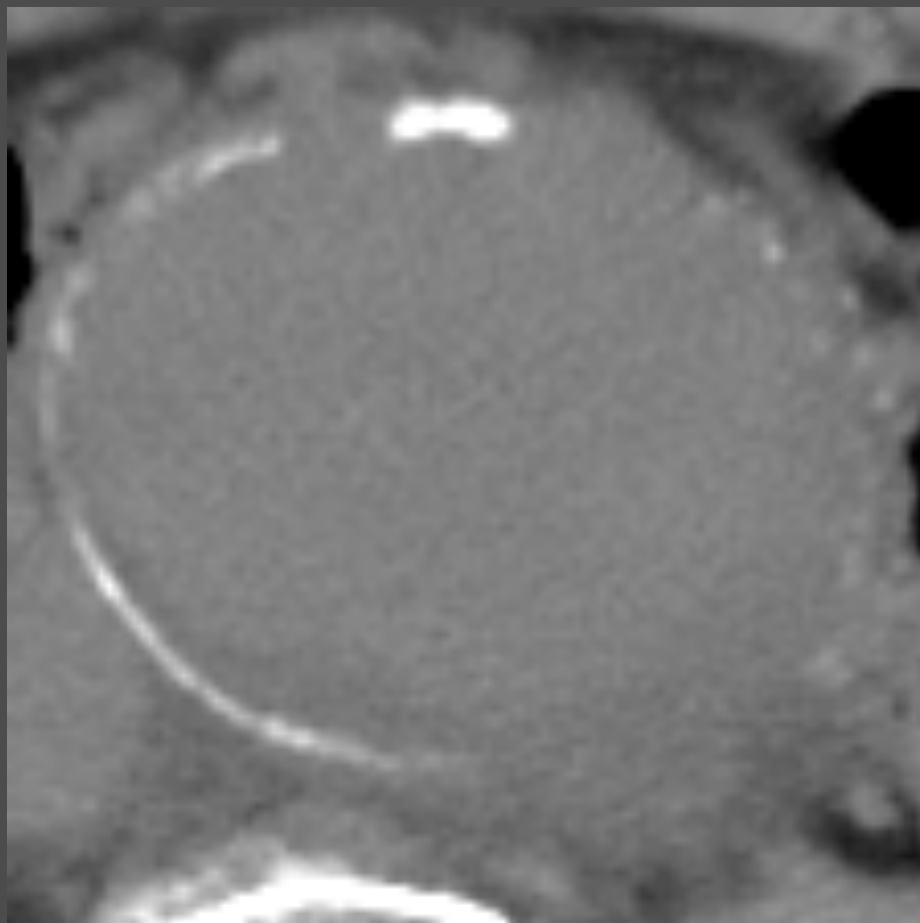
Tell Denver mammo story

Photoshop



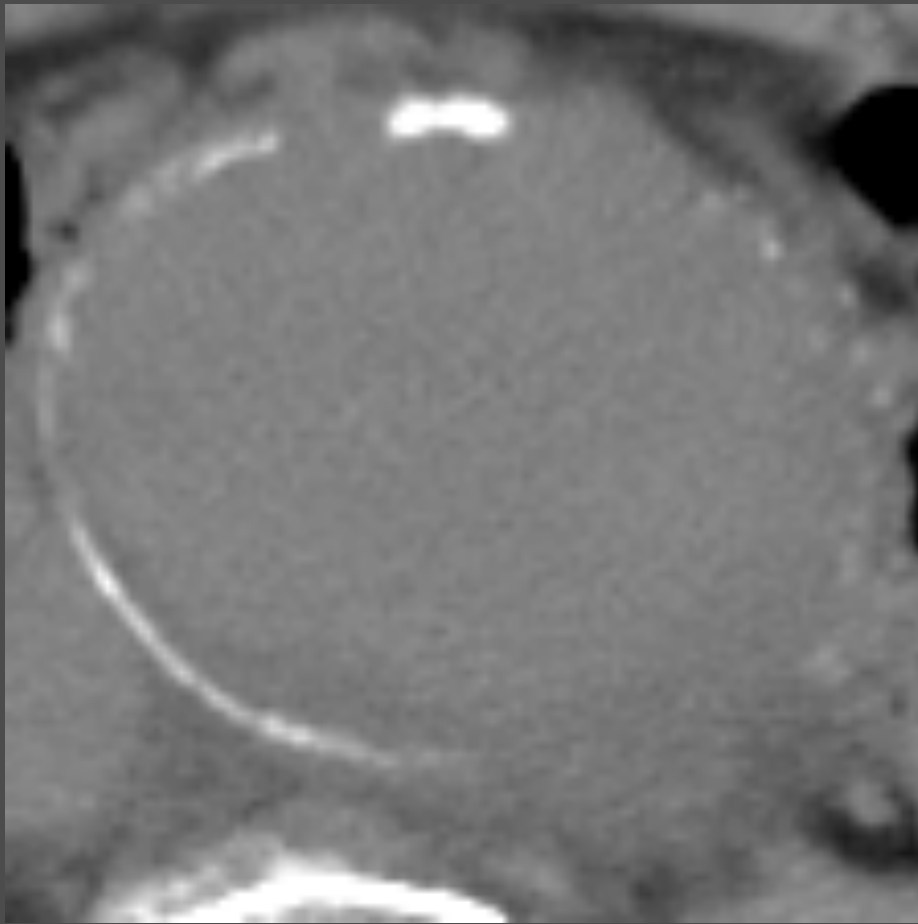
72 DPI TIFF

Photoshop

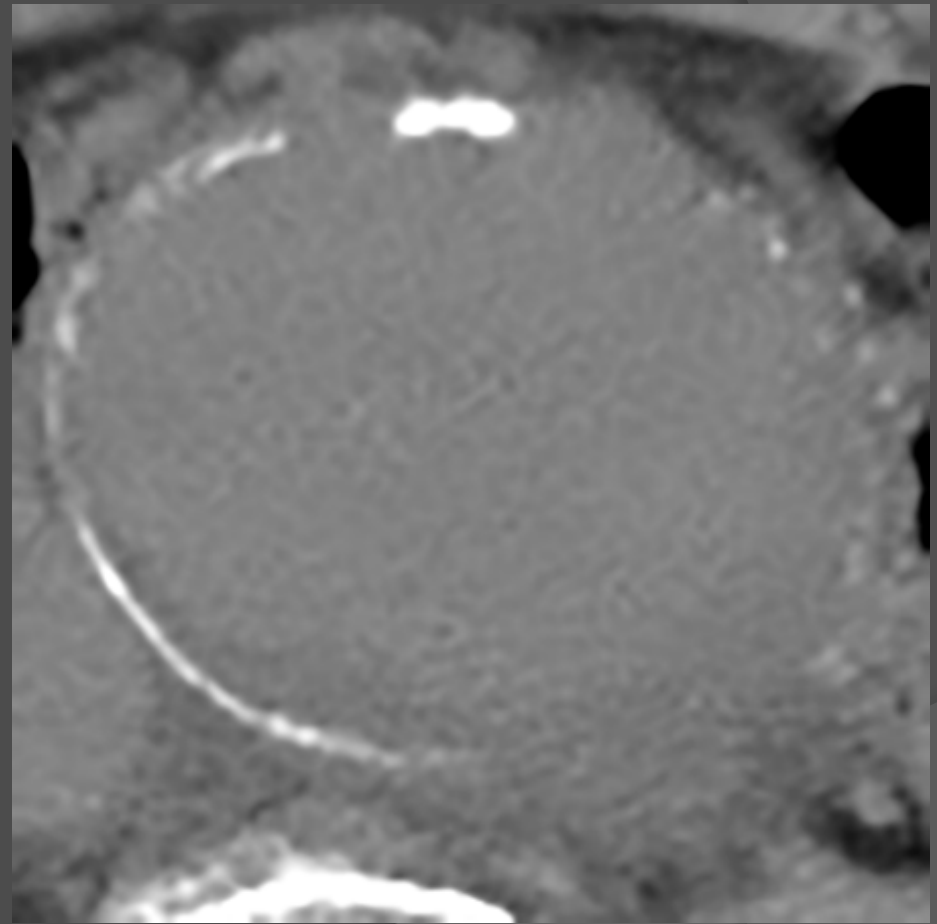


Can “increase” resolution

Photoshop



72 DPI TIFF



300 DPI TIFF

Photoshop



Photoshop



Photoshop



Photoshop



Photoshop



Photoshop



?miliary tuberculosis

Photoshop



75 identical light grey fuzzy “dots” added

Photoshop

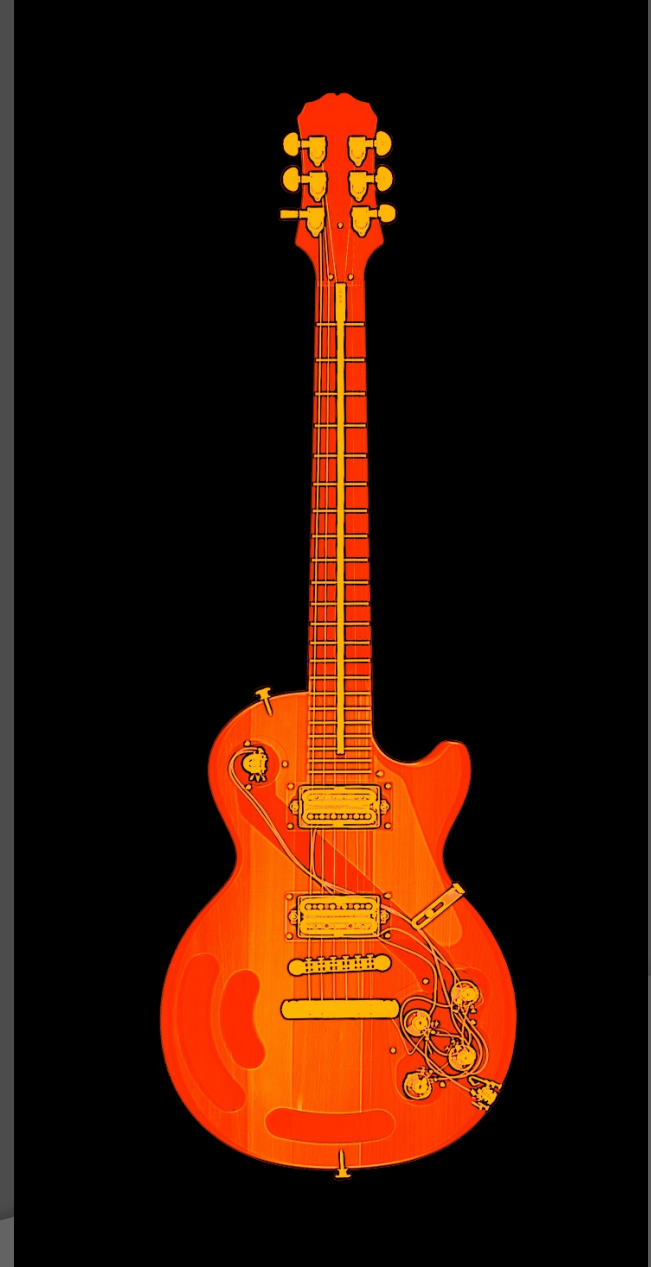
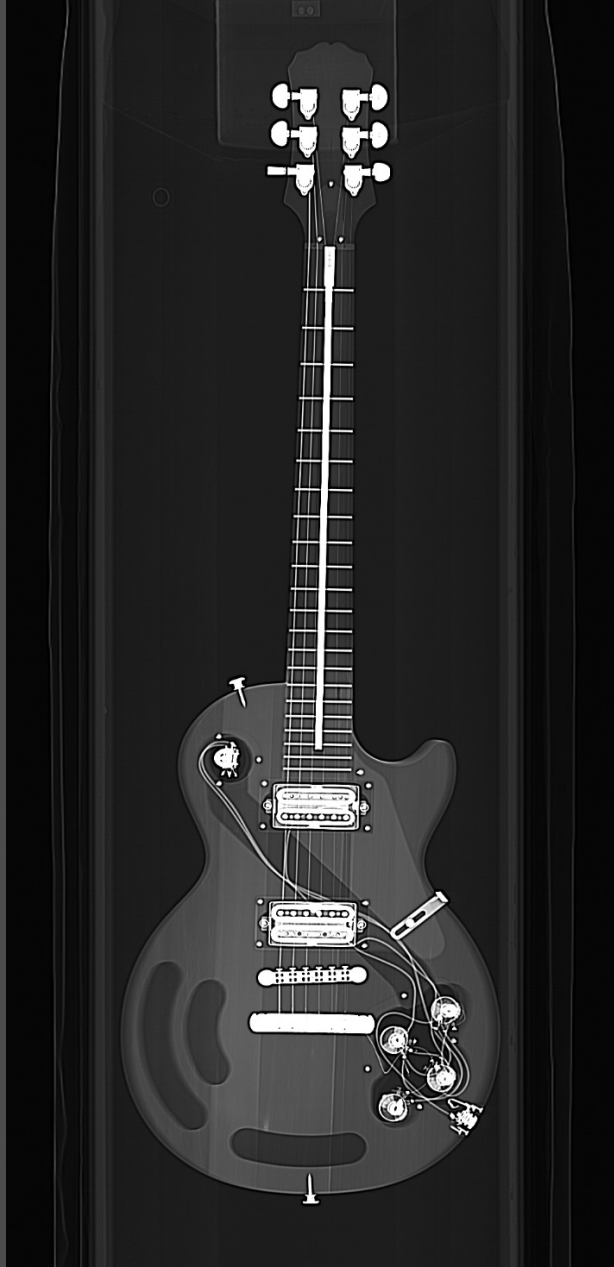


Photoshop

Warning: Not for diagnostic use



Photoshop



Photoshop

No one knows every “trick”

I have taken 4 courses in 10+ years

Knowing a little can help a lot

Everything Else

Free software

Windows

Irfanview

“Photoshop Lite”

A screenshot of a Google search results page for the query 'irfanview'. The search bar at the top shows 'irfanview' and a magnifying glass icon. Below the search bar are navigation tabs for 'Web', 'Images', 'Videos', 'News', 'Shopping', 'More', and 'Search tools'. The search results show approximately 1,100,000 results found in 0.34 seconds. The first result is 'IrfanView - Official Homepage - one of the most popular ...' with the URL 'www.irfanview.com/'. Below this are links for 'Download IrfanView' and 'Plugins'. The second result is 'IrfanView - CNET Download.com' with a rating of 4.5 stars from 3,535 reviews. The third result is 'IrfanView - Wikipedia, the free encyclopedia' with a brief description. The fourth result is 'IrfanView Portable | PortableApps.com - Portable software ...' and the fifth is 'Download IrfanView 4.38 - FileHippo.com' with a rating of 4 stars.

Google irfanview

Web Images Videos News Shopping More Search tools

About 1,100,000 results (0.34 seconds)

IrfanView - Official Homepage - one of the most popular ...
www.irfanview.com/ IrfanView
IrfanView ... one of the most popular viewers worldwide.

[Download IrfanView](#) [Plugins](#)

Thank you very much for downloading and using ... 3) Plugins will be installed into IrfanView "Plugins" directory ...

[More results from irfanview.com >](#)

IrfanView - CNET Download.com
download.cnet.com/IrfanView/ Download.com
★★★★★ Rating: 4.5 - 3,535 reviews - Windows
Irfan View is a compact and powerful photo editing program that gives you the tools to touch up and add effects to your photos.

IrfanView - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/IrfanView Wikipedia
IrfanView /ˈɪrfænvjuː/ is a freeware/shareware image viewer for Microsoft Windows that can view, edit, and convert image files and play video/audio files.

IrfanView Portable | PortableApps.com - Portable software ...
portableapps.com > ... > Graphics & Pictures PortableApps.com
Jun 26, 2014 - IrfanView Portable is a fast, compact and innovative graphic viewer for Windows supporting pictures, vector graphics, animated images, movies ...

Download IrfanView 4.38 - FileHippo.com
filehippo.com/en/download_irfanview/
★★★★★ Rating: 4 - Free - Multimedia
IrfanView is a very fast, small, compact and innovative Freeware (for non-commercial use) graphic viewer for Windows. IrfanView features include:.

Ifranview

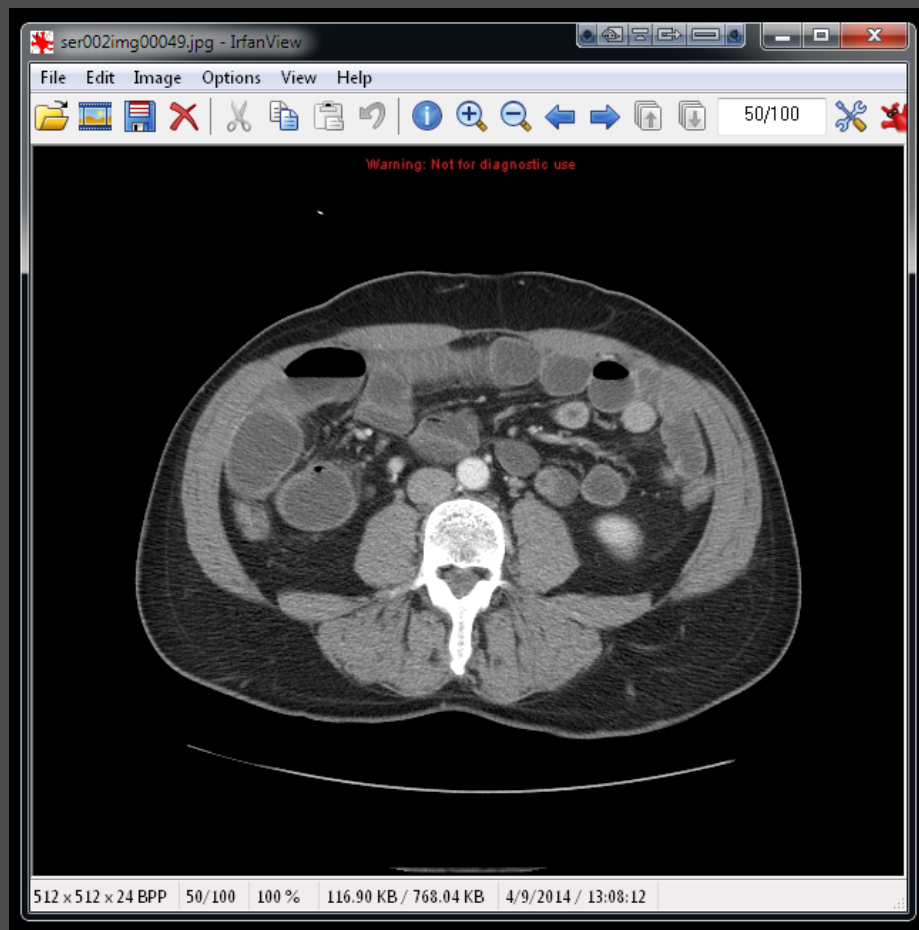
Supports DICOM

Easy to use

No course necessary

Windows only

Ifranview



Great for batch cropping
Easier than Photoshop
Needed for videos

The End