



CT Scanner Buyer's Guide

(For Coroners & Medical Examiners)



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Getting Started

This manual is an introduction to CT (computed tomography) systems. It will give you some basic and useful information not only about CT systems but also about other complementary components and services that will help you achieve efficient and effective PMCT solutions.

To start with, it will be useful for you to know that compared to x-ray plain (projection / 2D) radiography, CT imaging uses x-rays in conjunction with algorithms to capture and detect more subtle variations in the attenuation of x-rays which leads to higher contrast resolution. And these detailed images can be reconstructed into three-dimensional (3D) images.

CT has revolutionized diagnostic radiology in the clinical field and can do the same in the forensic field at a fraction of the cost.

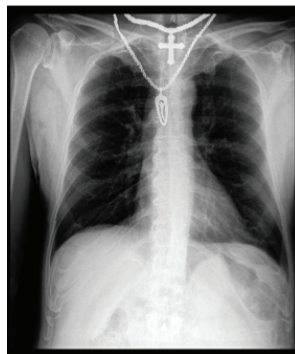
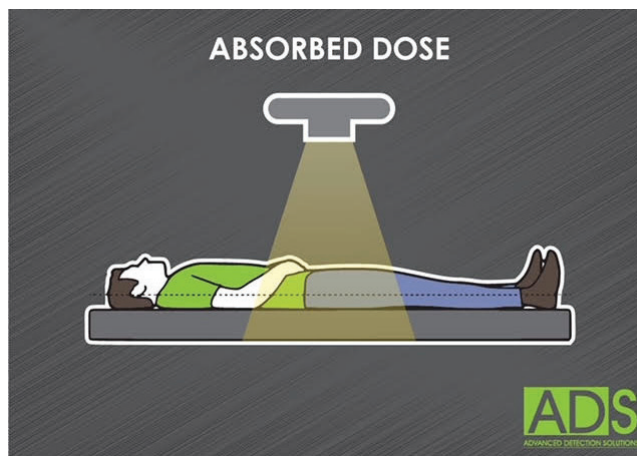
NOTE: *This Buyer's Guide is very specific to forensic use (i.e. decedent imaging) and is not intended for clinical use.*

Mobile X-Ray

2D image / plain (projection) radiography of various body sections viewed frame by frame. 2D static image capture – one body section at a time

- o Ex: MinXray, Kubtec, Carestream
- o Good for: Bones, bullets

Plain (projection) / 2D radiography, frame by frame

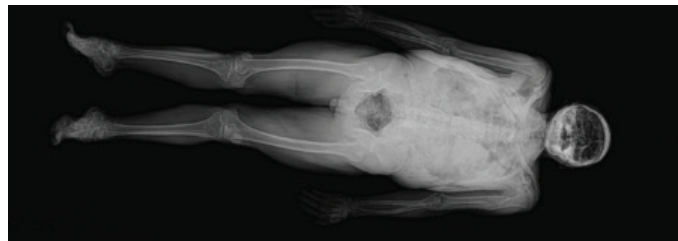
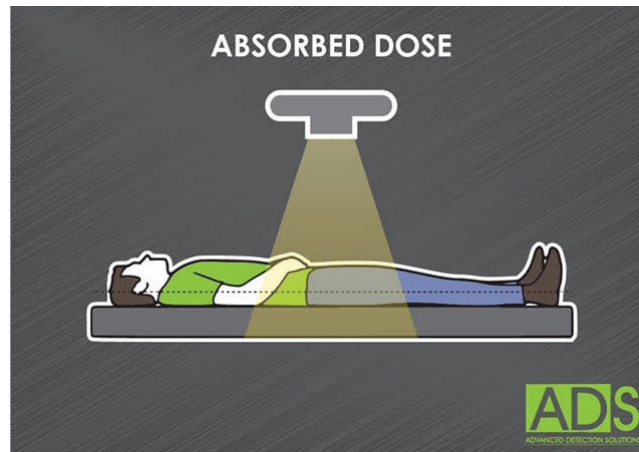


Whole Body X-Ray

2D image / Plain (projection) full body radiography – Static x-ray beam. Provides one angle per view, i.e. rotating C-arm allows to capture images at various angles, however, each image acquisition is fixed at one angle only per scan hence the result of a 2D static image.

- o Ex: Lodox, FOBOS™
- o Good for: Bones, bullets

Plain (projection) / 2D image capture – whole-body in one scan

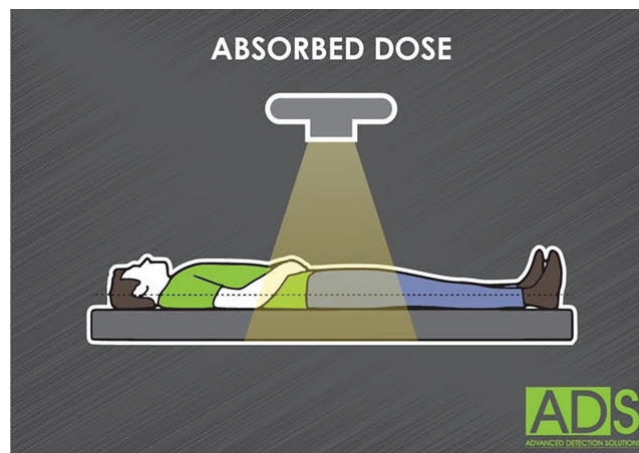


Computed Tomography (CT)

CT captures and detects more subtle variations in the attenuation of x-rays which leads to higher contrast resolutions. A continuous rotating / spiral scan (full 360° angles per scan) provides a comprehensive set of 2D, 3D and Cross-sectional full body image capture.

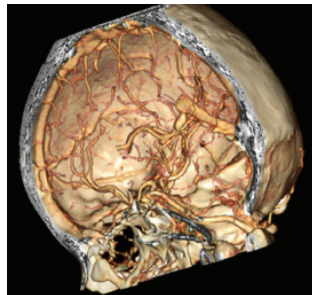
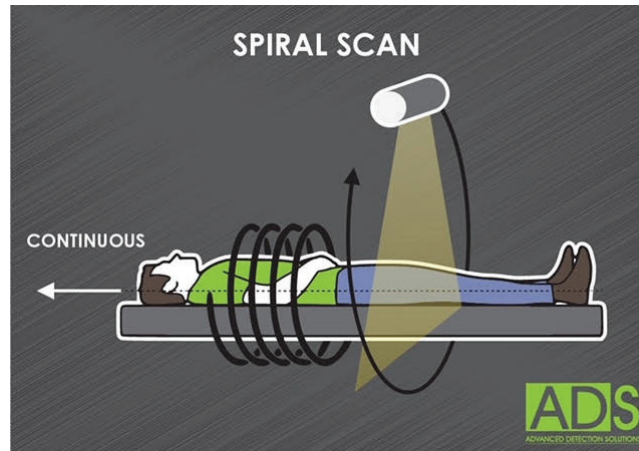
- o Ex: GE LightSpeed, GE BrightSpeed, Ovis™, Canon, etc.*
- o Good for: Bones, bullets + very low density between soft tissues and very low density among soft tissues*

2D image capture – whole body in one scan (a.k.a. scout image)



Computed Tomography (CT)

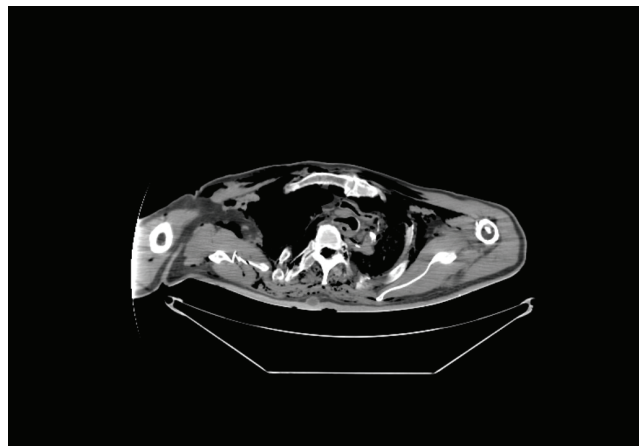
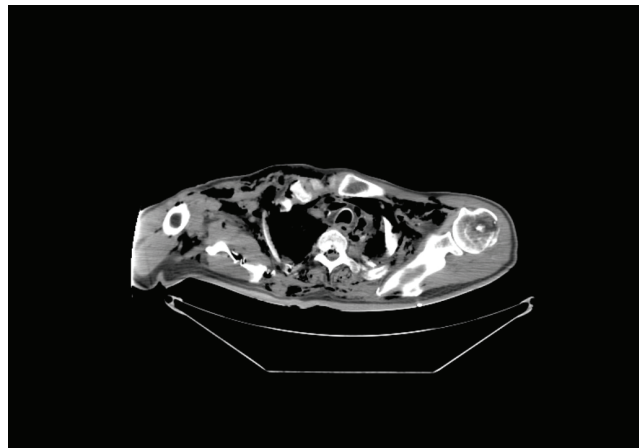
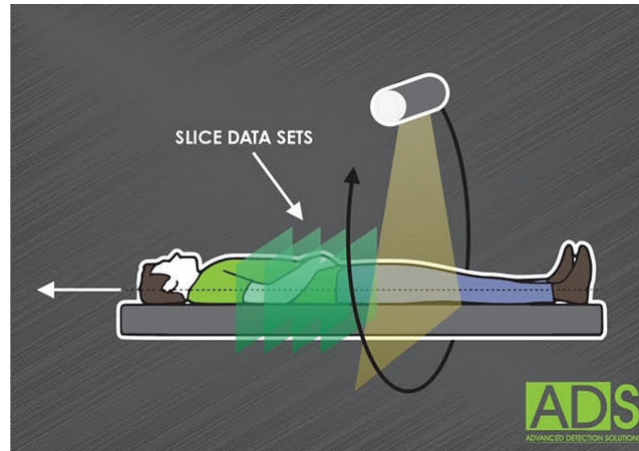
3D Image Capture



NOTE: 3D images courtesy of David Fowler, MD, CME Baltimore, MD

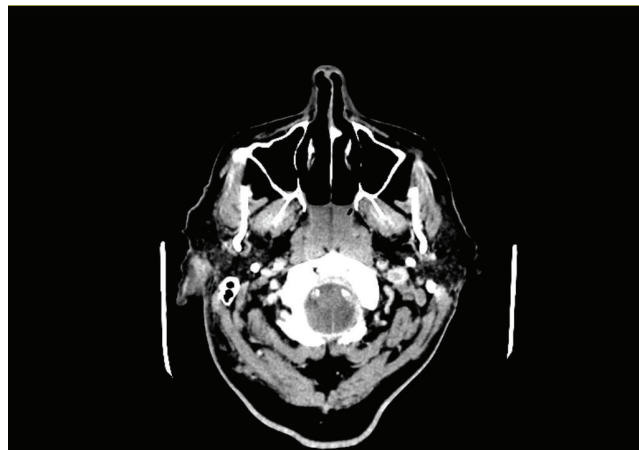
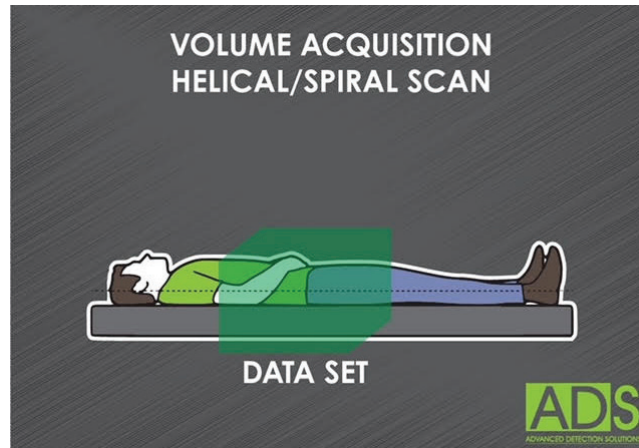
Computed Tomography (CT)

Cross-sectional Image Capture



Computed Tomography (CT)

Volume Acquisition Capture



What type of CT scanner do I need?

- Slice count – 2, 4, 6, 8, 16, 32, 64, 128, 256, 320 (the numbers represent the number of detector rows)

- o *Slice represents the number of detector rows that are captured during an individual rotation*
- o *As the number of slices goes up the time to scan a body goes down*
- o *As the number of slices goes up price of CT goes up*
- o *We recommend a 16 slice CT which is more than enough to provide you with an optimum return on your investment*
- o *Speed is important for the living as it reduces the amount of time of image taking thus equates to less radiation exposure; most important thing in imaging the living due to potential motion artifacts, patient motion, breathing, peristalsis, and heart motion.*
- o *Since you are imaging decedents, the speed of imaging / amount of radiation is irrelevant so why pay more for a negligible time saving?*
- o *The price difference between a 16 slice and a 64 slice, for example, may not be worth it unless you plan on doing cardiac and/or brain studies*
- o *Slice count has nothing to do with image quality*
 - *Contrary to popular belief, the image quality does not improve as you go up in CT slice systems*
 - *So why pay more for a higher slice CT system?*

- Automatic Exposure Control (AEC)

- o *AEC helps maintain an optimal image quality by automatically adjusting the radiation dose relative to body size*

- Protocols

- o *Combination of many adjustable parameters (kV, mA, scan duration, slice thickness, etc) that an operator chooses in order to obtain optimum anatomical visualization of anatomical structures (ex: for imaging different body types / body sections, etc.)*
- o *Protocols can be preset for the operator (by an Applications Specialist) in order to allow maximum efficiency / faster throughput / optimum image quality*
- o *Why do you need an experienced Forensic Applications Specialist?*
 - *Because protocols set up for the living are different from those of decedents*
 - *Relevant protocols need to be taken into account in order to maximize the image quality*
 - *Example: Adjusting image blurring to a low value in order to get high visibility of details increases visual noise and can also lead to increased radiation dose to the body – the latter is of concern to the living but not of concern when imaging a decedent*

- Cooling System

There are two CT scanner cooling methods - Air-cooled systems and Water-cooled systems:

In **Air-cooled systems** the heat is expanded via fans inside the gantry. Advantages are:

- No need for plumbing nor external water chiller
- No concern about the water quality
- Less amount of preventative maintenance
- Smaller footprint

In **Water-cooled systems** the heat is expanded via external chillers connected to a water source. Advantages are:

- No need for an HVAC system
- Quieter and more comfortable system
- Cleaner gantry (from dust, particles, etc.)
- Less concerns about air temperature and humidity control

- DICOM

DICOM (digital imaging and communications in medicine) is a communication standard for digital x-ray images and related data

- PACS

Picture archiving and communication system (PACS) allows to store and manage various x-ray equipment DICOM images.

The PACS Viewer allows the manipulation of images for assessment ...

ADS ForensicPACS™ is both a PACS and a RIS (Radiology Information System) that allows image storage, image viewing, image information management, document savings, and more.

- Refurbished CT Systems

The ADS installed systems will be cosmetically and mechanically “like new” upon delivery. Our systems’ refurbishment process includes:

- System Staging—In-shop set up and power on the system
- System Test and Repair—Complete full system scanning test and replacement of any faulty components in-shop. The system will function as it does coming out of the factory.
- System Decontamination – Complete and thorough external and internal cleaning
- System Painting—The finished product is a factory new appearance.
- ACR Evaluation—Prior to shipment, a complete image quality evaluation is performed to make sure that the images meet all OEM and ACR specifications.

- New CT Systems

There are several manufacturers that offer a wide range of CT systems, such as GE, Philips, Siemens, Canon, Imatrex Ovis™ 32 slice CT scanner sold by ADS, etc.

ADS Comprehensive Offering

- Comprehensive Services

The following services are included in the cost of your CT system:

- Pre-installation visit – to insure that your radiology room is adequate / has all the necessary requirements for a CT scanner
- CT Installation – including full calibration
- First image – joint visit of our CT partners with our Applications Specialist to assist with any requirements and insure proper system operation

- Warranty / Service Plan

Our CT systems come with:

- A full one-year warranty (from normal operation and wear and tear) that includes, parts (incl. tube), travel and labor costs
- Remote access via external PC (only the CT operations is accessible / CT files are not accessible)
- Two semi-annual PM (Preventive Maintenance) services
- 24/7 call center access

Additional years are priced very competitively / can be added at any point in time

- Applications Specialist Training

Training includes how to safely use the CT system, effectively position the body, capture best images, upload images to ForensicPACS™, use ForensicPACS™ and more...

All our CT systems include training by a Forensic Applications Specialist – for more information on Forensic Applications Specialist, please refer to the Protocols section above

Additional Costs & Options

- Radiology Room / Trailer

Adequate radiology room / trailer with appropriate lead shielding, power source, HVAC, etc. is required and is not included in the cost of your CT systems – for additional information on these requirements (CT Project Plan), please contact us

Radiology room – Our health care industry consultants' partners are able to assist you in planning /designing / building your own room with focus on the electrical and mechanical requirements of your CT scanner / diagnostic imaging equipment to insure proper construction and optimum clinical function

Trailer – ADS provides very efficient and inexpensive CT trailers specifically designed for the forensic market – Trailer size: 24' / 26' L x 8' 6" W x 7' 6" (int. HT)

- ForensicPACS™

ForensicPACS™ is included in ADS ForensicQUEST™ PMCT comprehensive system package (CT system, Installation/Warranty/Maintenance Service, ForensicPACS™, Forensic Applications Specialist Training)

ForensicPACS™ is also sold separately and comes in various (upgradable) space / files size requirements, tailored to your needs (i.e., up to 500 CT files, up to 1,000 CT files, up to 5,000 CT files, etc.)

- Radiology Reports / Services – Forensic Radiology Group, LLC (FRG)

*PMCT reports by a team of experienced forensic radiologists
www.forensicrodiologygroup.com*

Services offered are:

- *Audit Services*
- *Quality Assurance (CT image reads)*
- *Modality and Mortality conferences*
- *Consultant Services*
 - > *Non-primary reads*
- *Consulting Projects*
 - > *Education package*
 - > *Review systems*
- *Forensic Reports*
 - > *Primary CT image reads with findings reports*

Planning the CT Project

Site Preparation

Getting your site ready will need the assistance of a variety of specialists including but not limited to: Building Contractors, Electricians, Medical Physicists, Architects and HVAC specialists. There are many steps that you need to be aware of such as:

- o CT room requirements – room size / layout (for CT and Cart access), room foundations, leaded walls, electric requirements, operator's room requirements, HVAC, warning lights, door disconnect / interlocks*
- o Electrical requirements – most CT scanners will need 480V, 3-phase power*
- o HVAC – CT scanners do emit a sizable amount of heat. You therefore need to insure of adequate ventilation in order to minimize downtime*
- o Access, of CT components, to radiology room*
- o Operator's room window – although you are only imaging decedents, you may want to have a leaded window installed to allow you to visualize any potential limb interference during CT scanning*
- o State regulations – check with your local health officials*
- o Radiology room Consultants – Our health care industry consultants' partners are able to assist you in planning /designing / building your own room with focus on the electrical and mechanical requirements of your CT scanner / diagnostic imaging equipment to insure proper construction and optimum clinical function*
- o IT Networking – in order to insure that your CT connects to your PACS system, two static IP addresses will be required*
- o Prior to installation, an ADS representative along with a CT engineer will visit your facility to insure that your site is ready for your CT installation*

Installation

The CT is shipped via a specialized transport service to your facility a few days prior to the installation. A typical 2-man crew will then arrive to your facility to unpack the CT, roll it into position inside your radiology room and install it at the designated location.

- o CT delivery – you need to insure that adequate room / space is available for a truck delivery at your facility. For exact information on size, place and time, make sure to contact your CT supplier prior to delivery*
- o Physical installation – once all the packaging is removed, the CT gantry, table, cables and other components will be installed permanently at their designated location. An electrician may be needed at that time so make sure to coordinate with your CT supplier prior to installation.*
- o System calibration – once all the components have been installed and connected, the CT engineer will turn on the system to insure proper system scanning. The system will be calibrated to OEM specifications.*
- o Documentation – Copy of FDA Form 2579 – Department of Health and Human Services' Report of Assembly will be provided to you as a last step in the installation process indicating that the system has been installed to your satisfaction and that you have accepted the system.*

Post-Installation

Now that you are the proud owners of a CT system, there are a few additional steps that you need to take to insure adequate usage.

- o Division of Radiation Safety and Environmental Management - contact your local health radiation department to insure inspection and radiation safety survey*
- o IT Networking – as mentioned in the Pre-installation section, two static IP addresses are required to connect the PC to your PACS system.*
- o Applications Training*
 - Training includes how to safely use the CT system, effectively position the body, capture best images, upload images to ForensicPACS™, use ForensicPACS™ and more...*
 - ADS' CT systems include training by a Forensic Applications Specialist – for more information on Forensic Applications Specialist, please refer to the Protocols section above*

Additional Documents

Brochures

What is Virtual Autopsy? > Download PDF

Forensic Imaging Systems Comparison > Download PDF

References

*National Institute of Justice, "Can CT Scans Enhance or Replace Medicolegal Autopsies?,"
> Click here to read more...*

*Using Advanced Imaging Technologies to Enhance Autopsy Practices
> Click here to read more...*

*Postmortem Imaging: The Next Radiology Subspecialty?
> Click here to read more...*

*NIJ Advocates for CT Scans to Assist Forensic Pathologists
> Click here to read more...*



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