



C-TECC

CT Education and Collaboration Collective

Learning Objectives by Session:

Monday August 10th, 2026

Title: CT 101: Introduction

Presenter: *Tim Szczekutowicz PhD, DABR*

- Describe the evolution of CT technology from the 1970s to modern-day scanners.
- Identify the major components of a CT scanner and explain how they work together.
- Explain how advances in CT technology have directly enabled clinical impact.

Title: CT Contrast Agents and Enhancement Principles

Presenter: *Zahra Alyani Nezhad MS*

- Describe the major types of contrast agents used in CT, including why they work and their clinical applications.
- Explain the physiologic pathway of IV contrast agents through the body, including speed of travel, enhancement changes, and commonly used imaging phases.
- Review the factors that influence CT contrast agent enhancement.

Title: CT Images: What Do These Values Mean and How Can We Use Them?

Presenter: *Aria Salyapongse MS*

- Explain how CT numbers, measured in Hounsfield units, are derived from x-ray attenuation in patient tissues and form the fundamental units of CT images.
- Describe how spectral (multienergy) CT data can be used to generate virtual monoenergetic images, suppress specific material signals, and enable material quantification.
- Identify common issues associated with CT image units, including beam hardening and streaking artifacts, as well as inaccurate material quantification or suppression.

Title: Photon Counting CT: A Crash Course

Presenters: *Ran Zhang PhD; Giuseppe V. Toia MD, MD*

- Describe the difference between energy integrating and photon counting CT detectors.
- Describe the clinical impact of using photon counting detectors relative to energy integrating.
- Summarize the value of photon counting detectors across multiple imaging modalities.

Title: Protocol Optimization

Presenter: *Tim Szczekutowicz PhD, DABR*

- Explain the fundamental tradeoff between scan speed and radiation dose.
- Describe the underlying physics of contrast enhancement in CT.
- Explain how modern automatic exposure control (AEC) systems manage image quality and radiation dose.

Lab: Hands-on CT Protocol Optimization

Presenters: *Martin Wagner Dr. sc. hum; Rachel Bladorn BS RT(R)(CT)*

- Execute and analyze CT protocols through hands-on experience.
- Observe how improper protocol setup can cause scanners to “run out of output.”
- Explain how acquisition and reconstruction parameters directly affect spatial resolution.

Lab: Multi-Material Phantom Scanning & Spectral Decomposition

Presenter: *Giuseppe V. Toia MD, MS*

- Review pre-acquired photon-counting CT datasets of a multi-material phantom with energy-resolved information.
- Generate material-specific images (e.g., iodine, calcium, water) through spectral decomposition techniques.
- Evaluate the accuracy and image quality of material differentiation achieved with photon-counting CT.

Classroom/ Break Out Session : WHAM!: Workflow hurdles and methodology.

Presenters: *Carrie Bartels RT(R)(CT); Kelsey Schluter BS RT(R)(CT); Courtney Goetsch RT(R)(CT); Ran Zhang PhD; Meghan Lubner MD, FSAR*

- Identify a specific CT protocol, dose, or workflow challenge from the participant's institution and clearly define its clinical and operational impact.
- Analyze contributing factors to the identified challenge (i.e., dose, workflow, contrast) using a structured problem-solving framework (e.g., workflow mapping, protocol review, dose drivers).
- Develop a feasible, evidence-based optimization strategy that can be adapted and implemented within the participant's own CT department addressing a dose, workflow, or contrast problem.

Title: CT Dose: Are we really giving people cancer?

Presenter: *Tim Szczekutowicz PhD, DABR*

- Review basic CT dosimetry metrics: CTDIvol, DLP, SSDE, ED
- Explain the linear no-threshold (LNT) model and other common frameworks for radiation risk.
- Describe cumulative effective dose and discuss why its clinical relevance is debated.
- Evaluate modern models that balance the risks of under-dosing (missed diagnoses) against radiation overexposure.

Title: Avoiding CT Pitfalls

Presenter: *Tim Szczekutowicz PhD, DABR*

- Explain how evolving CT technology necessitates rethinking protocol design and why legacy practices can reduce diagnostic utility.
- Describe how poor patient positioning, especially in MSK imaging, can degrade image quality.
- Identify and avoid well-intentioned but misguided dose reduction decisions in pediatric and pregnant patient imaging.

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Tuesday August 11th, 2026

Title: CT Reconstruction: from Filtered Back Projection to Deep Learning

Presenter: *Ran Zhang PhD*

- Explain the fundamental principles of Filtered Back Projection (FBP) and describe its historical significance in CT image reconstruction.
- Identify the inherent limitations of FBP and explain how iterative reconstruction (IR) methods address these challenges.
- Explain the foundational concepts of Deep Learning Image Reconstruction (DLIR) and discuss its potential to further enhance image quality.

Title: A Comprehensive Guide to Interventional CT: Technology, Workflow, and Dose Considerations

Presenter: *Martin Wagner Dr. sc. hum.*

- Describe the use of Interventional CT and outline the typical procedural steps involved.
- Identify the various CT scanner options and explain key features essential for Interventional CT systems, including wide bore access, in-room control, and gantry tilt.
- Explain dose-related concepts in Interventional CT, including factors that influence operator scatter dose.
- Evaluate visualization options and explain the impact of image artifacts and visualization planes along the needle for accurate device guidance in Interventional CT.

Title: Protocolling: from family physician to sub-specialty radiologist

Presenter: *Carrie Bartels RT(R)(CT)*

- Describe the complete process of ordering a CT scan from initiation to completion, from the primary physician entering the order through post-scan.
- Explain the distinction between CT protocols as defined by the radiologist and technologist and those implemented on the CT scanner.
- Analyze different patient histories and CT orders to determine the most appropriate protocol selection.

Lab: CT Intervention: Hands on Biopsy

Presenters: *Giuseppe V. Toia MD, MS & Kelsey Schluter BS RT(R)(CT)*

- Identify patient positioning considerations for interventional procedures.
- Apply integrated tools for needle path planning using diagnostic CT Images
- Utilize the integrated laser for initial needle placement.
- Demonstrate hands on proficiency in navigating a needle to a target lesion within a phantom.

Lab: Exploring the Limits of Scanner Capabilities

Presenters: *Martin Wagner Dr. sc. hum. & Aria Salyapongse MS*

- Compare the effects of different CT reconstruction methods on overall image quality.
- Measure quantitative image quality metrics.
- Explain the trade-off between noise and resolution in CT reconstruction algorithms.
- Evaluate vendor-claimed scanner specifications through hands on experiments.
- Analyze why many specifications cannot be achieved simultaneously in real-world use.

Classroom/ Break Out Session: **BAM!: Building and Modifying CT Protocols**

Presenters: *Tim Szczekutowicz PhD, DABR; Rachel Bladorn BS RT(R)(CT); Courtney Goetsch RT(R)(CT); Meghan Lubner MD, FSAR*

- Describe the key components of a CT protocol and how each parameter influences image quality and patient dose.
- Construct a basic CT protocol for a common clinical indication using guided, step-by-step decision making.
- Adjust fundamental protocol parameters to accommodate differences in patient size, clinical question, patient presentation, or workflow needs.

Title: **Anatomy Crash Course: A CT Primer for Non-Radiologists**

Presenter: *Giuseppe V. Toia MD, MS*

- Identify major structures and anatomic landmarks of the brain.
- Identify major structures and anatomic landmarks of the chest.
- Identify major structures and anatomic landmarks of the abdomen.
- Integrate clinical anatomy into approaches to radiology research.

Title: **Clinical Applications of CT in the Abdomen and Pelvis**

Presenter: *Meghan Lubner MD, FSAR, FACR*

- Explain why CT is the most appropriate modality for specific clinical indications.
- Describe how contrast phase, image thickness, and anatomical plane are tailored to visualize specific lesions and structures.
- Examine a range of clinical CT applications using representative case examples.

Title: **Advantages of Photon Counting by Anatomy**

Presenters: *Meghan Lubner MD, FSAR, FACR; Gregory D. Avey MD; Prashant Nagpal MD FSCCT*

- Evaluate high impact clinical applications of Photon-counting CT (PCCT) in Abdominal Imaging including solid organ and pelvis evaluations.
- Evaluate high impact clinical applications of PCCT in Neuro Imaging with emphasis on the head and neck.
- Evaluate high impact clinical applications of PCCT in Cardiovascular Imaging, including heart and major vascular structures.