C-TECC
CT Education and Collaboration Center

Learning Objectives by Session:

Tuesday August 12th, 2025

Title: **CT 101: Introduction**

8:30-9:00am

Presenter: *Tim Szczykutowicz PhD, DABR*

- Learn how CT has evolved from the 1970s to modern-day scanners.
- Understand the major components of a CT scanner and how they work together.
- Appreciate how advances in technology have directly enabled clinical impact.

Title: **Protocol Optimization**

9:00-9:30am

Presenter: *Tim Szczykutowicz PhD, DABR*

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

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

9:45-10:15am & 10:45-11:15am

Presenters: *Carrie Bartels RT(R)(CT) and Kelsey Schluter BS RT(R)(CT)*

- Understand the process of ordering a CT scan from start to finish:
  - Primary Physician enters a request for a CT scan
  - Decipher the difference in "protocol" from radiologist & technologist to what is on the scanner.
  - CT scan is completed, sent to PACS, results are posted.

<u>Title</u>: **A Comprehensive Guide to Interventional CT: Technology, Workflow, and Dose Considerations**

10:15-10:45am & 11:15-11:45am

   <u>Presenter</u>: *Martin Wagner Dr.sc.hum*

- Understand the use of Interventional CT and be able to outline the typical procedural steps involved.
- Understand various CT scanner options and specific features that are crucial for Interventional CT systems, such as wide bore access, in-room control, and gantry tilt.
- Understand dose-related concepts in Interventional CT, including factors influencing operator scatter dose.
- Understand visualization options and the significance of image artifacts and visualization planes along the needle in Interventional CT for accurate device guidance.

<u>Lab</u>: **Hands-on CT Protocol Optimization**

9:45-10:45am (Session 1) & 10:45-11:45am (Session 2)

   <u>Presenters</u>: *Tim Szczykutowicz PhD, DABR; Rachel Bladorn BS RT(R)(CT); Courtney Goetsch RT(R)(CT)*

- Gain practical experience in designing, executing, and analyzing CT protocols.
- Observe how improper protocol setup can cause scanners to "run out of output."
- Learn how acquisition and reconstruction parameters directly affect spatial resolution.

<u>Title</u>: **CT Dose: Are we really giving people cancer?**

12:30-1:00pm & 1:30-2:00pm

   <u>Presenter</u>: *Tim Szczykutowicz PhD, DABR*

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

<u>Title</u>: **CT Reconstruction: from Filtered Back Projection to Deep Learning**

1:00-1:30pm & 2:00-2:30pm

   <u>Presenter</u>: *Ran Zhang PhD*

- Understand the fundamental principles of Filtered Back Projection (FBP) and its historical significance in CT image reconstruction.
- Identify the inherent limitations of FBP and describe how iterative reconstruction (IR) methods address these challenges.

- Understand the foundational concepts of Deep Learning Image Reconstruction (DLIR) and discuss its potential to further enhance image quality.

<u>Lab</u>: **CT Intervention: Hands on Biopsy**

12:30-1:30pm (Session 1) & 1:30-2:30pm (Session 2)

<u>Presenters</u>: *Martin Wagner Dr.sc.hum and Kelsey Schluter BS RT(R)(CT)*

UW affiliated personnel who have taken a radiation safety module can be in the scan room during fluoroscopy lesson (lead aprons will be provided): https://ehs.wisc.edu/training/radiation-safety-101-radiation-safety-for-radiation-workers-part-1/

- Understand patient positioning considerations for interventional procedures.
- Use integrated tools for needle path planning from a diagnostic CT image.
- Use the integrated laser for initial needle placement.
- Gathering hands on experience in navigating a needle to a target lesion in a phantom.

Wednesday August 13th, 2025

<u>Title</u>: **CT Contrast Agents and Enhancement Principles**

9:45-10:15am & 10:45-11:15am

<u>Presenter</u>: *Zahra Alyani Nezhad MS*

- Learn about the major types of contrast agents used in CT: why they work and their clinical applications
- Understand the route IV contrast agents take through the body: speed of travel, changes in enhancement, and commonly used imaging phases
- Review the factors that influence CT contrast agent enhancement

<u>Title</u>: **CT Images: What Do These Values Mean and How Can We Use Them?**

10:15-10:45am & 11:15-11:45am

<u>Presenter</u>: *Aria Salyapongse MS*

- CT numbers, measured in Hounsfield units, are the fundamental units of CT images and come from the attenuation by patient tissues of x-rays.
- Spectral (i.e., multienergy) CT data can be used to make virtual monoenergetic images, suppress specific material signals, and quantify materials.
- Common issues with CT image units include: (1) beam hardening and streaking artifacts and (2) inaccurate material quantification or suppression.

Lab: **Exploring the Limits of Scanner Capabilities**

9:45-10:45am (Session 1) & 10:45-11:45am (Session 2)

> Presenters: *Tim Szczykutowicz PhD, DABR and Ran Zhang PhD*

- Qualitatively compare the effects of different CT reconstruction on overall image quality.
- Learn to measure quantitative image quality metrics.
- Understand the noise-resolution trade-off in CT reconstruction algorithms.
- Test vendor-claimed scanner specifications through hands on experiments.
- Discover why many specifications cannot be achieved simultaneously in real-world use.

Title: **Avoiding CT Pitfalls**

12:30-1:00pm

> Presenter: *Tim Szczykutowicz PhD, DABR*

- Learn how evolving technology requires rethinking protocol design—legacy practices can reduce diagnostic utility.
- Understand how poor patient positioning, especially in MSK imaging, can degrade image quality.
- Identify and avoid well-meaning but misguided "dose reduction" decisions in pediatrics and pregnancy.

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

1:00-1:45pm

> Presenter: *Giuseppe V. Toia MD, MS*

- Learn major structures and anatomic landmarks of the brain.
- Learn major structures and anatomic landmarks of the chest.
- Learn major structures and anatomic landmarks of the abdomen.
- Contextualize clinical anatomy in approaches to radiology research.

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

1:45-2:30pm

> Presenter: *Meghan Lubner MD, FSAR, FACR*

- Understand why CT is most appropriate for specific indications.
- Understand how we tailor contrast phase, image thickness and anatomical plane to visualize specific lesions and structures.
- Examine a range of clinical CT applications with supporting case examples.