Ask EuroSafe Imaging Tips & Tricks

CT Working Group

Ultra-low dose emergency chest CT

Bo Mussmann (Odense University Hospital, Denmark)
Gerlig Widmann (Medical University of Innsbruck, Austria)
Daniela Origgi (IEO, European Institute of Oncology IRCCS, Milan, Italy)
Medical emergency patients are usually referred for a chest x-ray as this is first line imaging modality (1)

The urgent questions to be answered via imaging are (2):

• Lung consolidation present?
• Pulmonary edema/opacity present?
• Pneumothorax present?
• Pleural effusion present?
• Additional findings
Supine emergency X-ray

Unfortunately many emergency patients cannot stand for an AP/lateral so a supine chest x-ray is performed instead.

- Often poor image quality (3)
- No information from the volume behind the heart
- Respiration may be difficult to control depending on patient status
Could ultra-low dose CT be a beneficial substitute?

- The radiation dose in a chest x-ray is approx 0.1 mSv (4)
- A regular chest CT has up to 7 mSv (4)

Ultra-low dose chest CT can be performed at <0.1 mSv

- Potential drawbacks to chest x-ray:
  - The imaging procedure demands more time
  - More images to assess
Chest protocol examples

**Standard**
- 100 kVp (with kV assist)
- 20 – 570 mA range
- DLP 275.12 mGy*cm
- DLP AP/Lat scout 3 mGy*cm
- 0.35 sec/rotation
- Pitch 0.992
- Noise index 27

**Ultra-low dose**
- 80 kVp
- 10 mA (fixed)
- DLP 2.92 mGy*cm
- No scout
- 0.5 sec/rotation
- Pitch 0.992

Both examples using a GE Revolution CT (GE Healthcare, Waukesha, IL, USA)
Scan range 350 mm, 80 mm Z-coverage
Example; normal weight patient
82 years old male, BMI 24.1

- Effective dose estimates converted according to Dugeni et al (5)
Example; overweight patient
77 years old male, BMI 38

- Image quality with ULD-CT clearly inferior to HRCT, but more information than CXR
Summary

- Ultra-low dose chest CT is a promising technique that may potentially benefit patients and clinicians in emergency settings.
- Chest CT can be performed at <1 mSv excluding scout view.
- Clinical studies in emergency settings are lacking. Therefore, be careful.
- Recently, sub-mSv chest CT for nodule detection has been achieved with automatic exposure control. (6)
References


4. Radiation Dose in X-Ray and CT Exams.


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1. Dept. of Radiology, Odense University Hospital, DK
2. Dept. of Clinical Research, University of Southern Denmark
3. Dept. of Respiratory Medicine, Odense University Hospital
4. Department of Emergency Medicine, Odense University Hospital