# SAFETY OF EMERGING IMAGING MODALITIES: CHALLENGES AND OPPORTUNITIES IN MODERN RADIOLOGY

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## Background

- Emerging imaging technologies, including Photon-Counting CT (PCCT) and PET/MRI, enhance diagnostic precision and reduce patient radiation exposure.
- PCCT improves spatial and contrast resolution compared to conventional CT.
- PET/MRI offers combined functional and anatomical imaging with significantly lower radiation, especially valuable in pediatrics and oncology.
- Importance: Safe integration into clinical workflows is essential to maximize their benefits.

## Methods

- Comprehensive review of recent peer-reviewed studies evaluating safety, efficacy, and clinical outcomes of PCCT and PET/MRI.
- Key focus areas:
    1. Radiation dose reduction
    2. Contrast agent safety
    3. Diagnostic accuracy improvements
    4. Workflow integration challenges
    5. Cost-effectiveness analysis
- Synthesis of successful implementations and barriers to adoption.

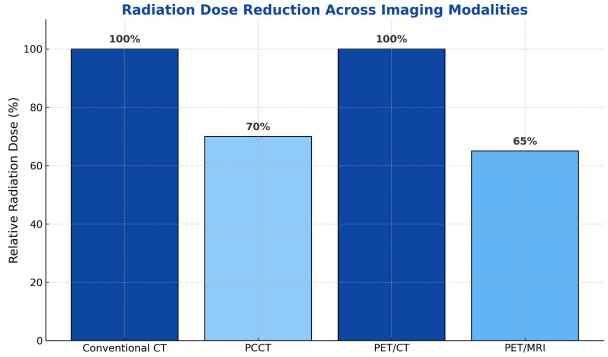
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## Results

- **PCCT:**
    - Enhanced image quality.
    - Up to 30% reduction in radiation dose compared to conventional CT.
- **PET/MRI:**
    - Significant radiation dose reduction, especially in pediatric cases.
    - Superior combined imaging improves diagnostic accuracy.
- **Challenges:**
    - High equipment costs (PCCT: 3–5× more expensive than CT).
    - Limited availability and gaps in long-term safety data.
    - PET/MRI requires substantial workflow adjustments and staff retraining.

**Figure.** Comparison of relative radiation doses across imaging modalities, demonstrating reductions with Photon-Counting CT (PCCT) and PET/MRI compared to conventional standards.




## Conclusion

- PCCT and PET/MRI are transformative, but adoption requires overcoming safety, cost, and operational hurdles.
- Collaboration is needed to:
    - Develop standardized imaging protocols.
    - Innovate new contrast agents.
    - Leverage AI-based dose and workflow optimization.
- Future research must validate long-term safety and efficacy through large-scale, multicenter studies.