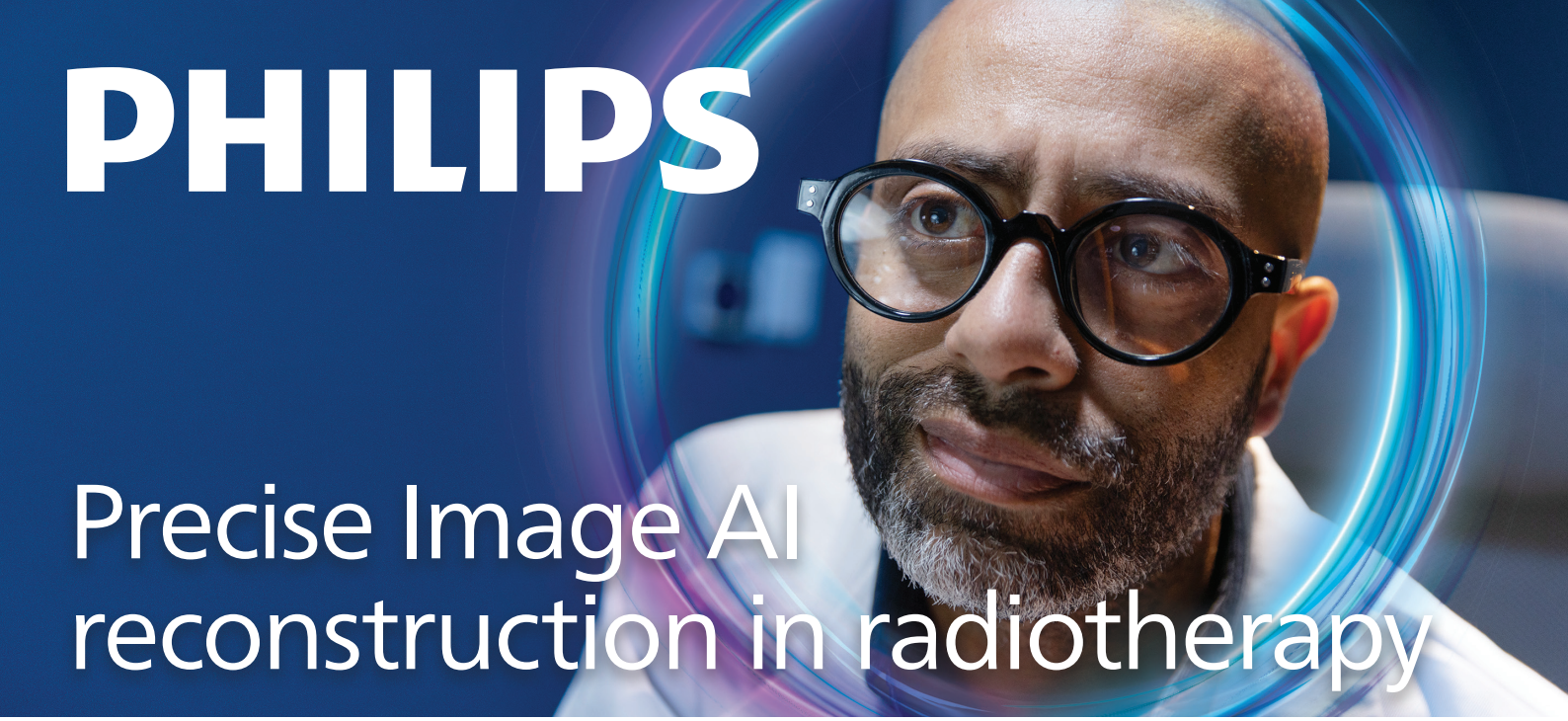
PHILIPS



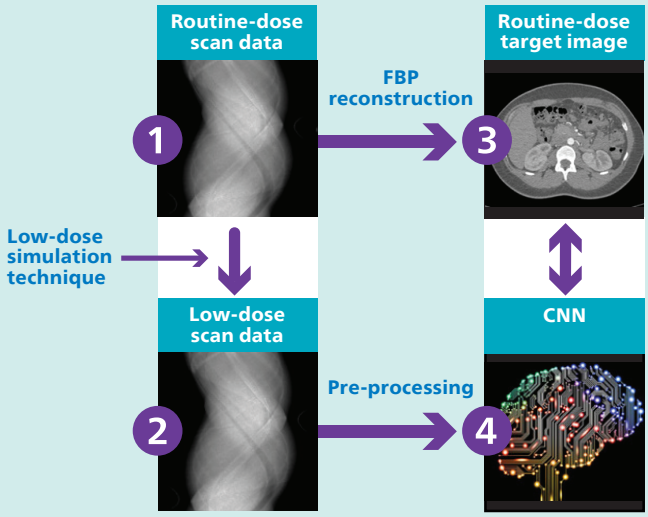
Precise Image AI reconstruction in radiotherapy

Background

High image quality is essential in radiotherapy because it directly impacts the visualization of anatomical structures. Better visualization of structures potentially leads to improved accuracy in target and organ-at-risk delineation, which is fundamental for effective treatment planning and delivery. Philips has now incorporated Precise Image* — an advanced AI-based CT reconstruction technology — into its radiotherapy platform, providing high-quality images with a familiar appearance that supports accurate delineation.

Precise Image

Filtered back projection (FBP) has been the industry standard for CT image reconstruction for decades. Over time, Philips developed several reconstruction methods such as iDose[4] (hybrid iterative technique) and Iterative Model Reconstruction (IMR) to further improve image quality and reduce noise. Incremental improvements with iterative reconstruction are effective in noise reduction, but often at a cost of unfamiliar appearance in noise texture. Philips Precise Image is an advanced AI-based CT reconstruction technology that uses a deep-learning convolutional neural network (CNN). Precise Image reconstructs images with an appearance that more closely resembles that of typical FBP while retaining the noise-reduction capabilities of advanced iterative reconstruction methods, even at low dose. It is trained through a supervised learning process in which low-dose scan data is simulated from routine-dose scans. The CNN learns to replicate the image appearance of routine-dose FBP images using low-dose inputs **(Figure 1).** This approach allows Precise Image to retain the familiar image texture of FBP, with improved image quality.[1] Precise Image offers five distinct levels of noise reduction: smoother, smooth, standard, sharp and sharper – enabling clinicians to select the option that best meets their specific preferences and clinical requirements.



1. Acquires data from routine-dose clinical scans.
2. Generates low-dose scan data from the routine-dose data by a sophisticated low-dose simulation technique that accurately models both photon and electronic noise in low-dose scans.[1]
3. Reconstructs routine-dose scan data with a traditional FBP technique.
4. Trains the CNN to reproduce the image appearance of the routine-dose FBP images with low-dose scan data.

Figure 1 The training process for Precise Image AI reconstruction.

*Not available for sale in all geographies.

Improved image quality

Accurate delineation of target volumes and organs at risk requires high image quality. Clinical evaluation showed that images reconstructed with Precise Image at 50% of the routine dose were rated higher for sharpness, noise level, image texture and artifacts compared to iDose[4] at full dose.[1] Another study using lifelike 3D printed phantoms confirmed superior performance of Precise Image on all image quality metrics compared to FBP and iterative reconstruction.[2] Additionally, visualization of subtle tissue differences can further improve accurate delineation. The detectability index (d') is a metric that can assess the ability to accurately detect lesions by considering factors such as noise, resolution and lesion-specific characteristics. Precise Image significantly improved detectability indices for three simulated chest lesions of 5 mm in diameter with varying contrast (50, 200 and 950 HU). The detectability index for all simulated lesions increased with increased smoothing and radiation dose.[3] Other phantom studies confirmed that Precise Image improves detectability of clinically relevant lesions (e.g., hepatocellular carcinoma, liver metastases, bone lesions) relative to iDose[4].[4,5]

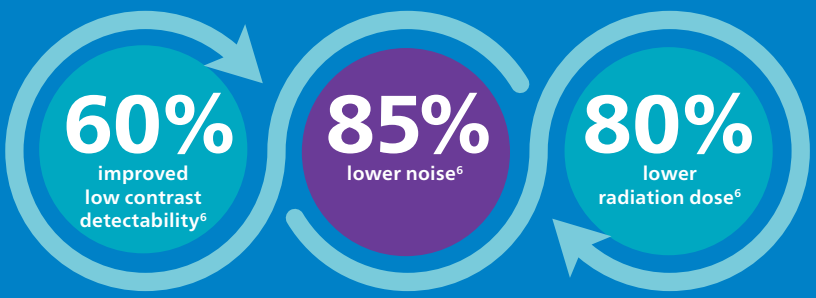
Potential benefits for radiotherapy

Precise Image offers potential advantages for radiotherapy planning by providing improved delineation of anatomical structures and target volumes. Leveraging advanced AI-based reconstruction, Precise Image produces CT images with markedly reduced noise — up to 85% lower than traditional FBP — while maintaining a familiar image texture. This substantial noise reduction, combined with up to 60% better low-contrast detectability, allows clinicians to visualize subtle tissue differences and boundaries more clearly, even at substantially reduced radiation doses (up to 80% lower).[1] These improvements directly support more accurate and confident contouring of tumors and organs at risk, which is critical for precise radiotherapy targeting.

- The neural network is trained and validated on a diverse range of patient data, making it robust to variations in patient size, anatomy and scan parameters. This provides consistent image quality for all patients, which is critical for individualized radiotherapy planning.
- All reference protocols can be reconstructed in under one minute (excluding 4DCT).[1] These fast reconstruction times provide streamlined workflow and minimize delays in radiotherapy planning.
- Precise Image enables lower radiation doses compared to FBP and iDose[4] while maintaining or even improving image quality.[1-5] In adaptive radiotherapy strategies where repeated imaging is required or in higher dose scans such as 4DCT, the possibility of dose reduction can be beneficial.
- Precise Image provides high-quality images while retaining HU accuracy as compared to FBP, facilitating its potential use for radiotherapy treatment planning dose calculations.

Conclusion

Philips has launched Precise Image AI reconstruction for its radiotherapy platform, offering high-quality imaging that facilitates accurate delineation — an essential component for effective treatment planning and delivery.



References

1. Philips white paper. Precise Image: AI for significantly lower dose and improve image quality (2024).
2. Im, et al. Patient-derived PixelPrint phantoms for evaluating clinical imaging performance of a deep learning CT reconstruction algorithm. Physics in Medicine & Biology (2024) 14;69(11):115009.
3. Greffier, et al. Impact of an artificial intelligence deep-learning reconstruction algorithm for CT on image quality and potential dose reduction: a phantom study. Medical Physics (2022) 49:5052-5063.
4. Greffier, et al. Contribution of an artificial intelligence deep-learning reconstruction algorithm for dose optimization in lumbar spine CT examination: a phantom study. Diagnostic and Interventional Imaging (2022) 104:76-83.
5. Greffier, et al. Improved image quality and dose reduction in abdominal CT with deep-learning reconstruction algorithm: a phantom study. European Radiology (2023) 33:699-710.
6. In clinical practice, the use of Precise Image may reduce CT patient dose depending on the clinical task, patient size and anatomical location. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. Dose reduction assessments were performed using reference body protocols with 1.0 mm slices at the "Smoother" setting, and tested on the MITA CT IQ Phantom (CCT189, The Phantom Laboratory) assessing the 10 mm pin and compared to filtered back projection. A range is seen across the 4 pins, using a channelized hoteling observer tool, that includes lower image noise by 85% and improved low-contrast detectability from 0% to 60% at 50% to 80% dose reduction. NPS curve shift is used to evaluate image appearance, as measured on a 20 cm water phantom in the center 50 mm x 50 mm region of interest, with an average shift of 6% or less. Data on file.

www.philips.com/healthcare
Printed in the Netherlands.

4522 991 91401 * DEC 2025