SIEMENS Healthineers

White paper

Bridging the lung cancer screening gap

How the MetroHealth System and Siemens Healthineers are using AI to expand access and ease workloads

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Value Partnerships

Edition #17

Executive summary: AI services built for radiology teams

Facing rising imaging demands and a national radiologist shortage, the MetroHealth System partnered with Siemens Healthineers to pilot AI-Enablement Services (AIES) to streamline CT lung cancer screenings.

MetroHealth integrated AIES for lung nodule detection seamlessly into its existing PACS and reporting systems, allowing radiologists to continue their familiar workflows without disruption. By streamlining routine tasks such as annotation and measurement, the service reduced cognitive load and accelerated case reviews, making daily work more efficient while keeping radiologists firmly in control. This strong fit laid the groundwork for measurable improvements in accuracy, speed, and user satisfaction – results that underscored the value of scaling AIES across the network.

Results[1]

- **Strong performance of detecting clinically relevant nodules**
- **20% perceived time savings**
- **High radiologist adoption and satisfaction**

MetroHealth is now expanding AIES for lung nodule detection across its network, demonstrating how human-centered AI can scale screening access, preserve clinical control, and improve outcomes in high-need communities.

Introduction: Radiologist shortage threatens timely cancer detection

The U.S. healthcare system faces a severe radiologist shortage, with projections indicating a deficit of up to 42,000 radiologists by 2033.[2] This shortage is particularly concerning in the fight against lung cancer, the nation's leading cause of cancer-related deaths.[3] Although low-dose computed tomography (LDCT) screenings can significantly improve survival, it remains vastly underused, with only 6% of high-risk individuals receiving it. This gap is even more pronounced among Black, Latino, Indigenous, and rural populations who face compounded barriers such as limited primary care access, inadequate health insurance coverage, and a scarcity of radiologists and screening facilities.[4–6] Together, these challenges raise a central question for healthcare leaders and providers alike: How do we bridge the gap between the need for and the availability of efficient and equitable lung cancer nodule detection?

Most common AI roadblocks

Disconnected workflows	**Too much data**	**Low trust**	**Struggles with complexity**
Many AI tools don't integrate smoothly with PACS, RIS, or EMRs, complicating workflows.[8,9]	AI output can overwhelm radiologists with excessive or irrelevant data.[9]	Black-box algorithms, data privacy, and bias reduce clinical confidence.[9,10]	AI often struggles with complex, small, or overlapping nodules.[9,11]

The opportunity: AI holds promise but adoption challenges persist

Artificial intelligence (AI) has the potential to be a game changer in radiology, particularly in lung cancer nodule detection. AI tools, especially machine learning/deep learning algorithms, have demonstrated the ability to support radiologists by enhancing nodule detection and improving diagnostic accuracy.[7] However, despite this promise, AI adoption in clinical practice has been slow due to key roadblocks.

The roadblocks: Why most AI tools don't make meaningful impact in practice

Despite growing enthusiasm around AI in radiology, widespread adoption remains limited. Four core barriers continue to challenge clinical integration – and they often intersect. Understanding these friction points is key to building AI tools that truly support radiologists rather than disrupt them.

The solution: An AI service purpose-built for radiology

However, these roadblocks can be overcome. RadEnablement Services from Siemens Healthineers offers a full-service, fully managed suite of solutions that supports radiology departments through the power of digitalization. By enabling automation of routine tasks, RadEnablement Services empowers team members to deliver fast, accurate diagnoses, focusing on what matters most: patients. AI-Enablement Services (AIES), a core component of the suite, supports radiology workflows by applying quality-gated (for pre-selected use cases), configurable AI observation summaries, including disease-specific labeling and image reconstruction, to assist with reading efficiency and cognitive workload management. Images are accessed directly from DICOM systems or designated scanners, and then a portfolio of Siemens Healthineers and trusted third-party clinical and operational AI algorithms are applied across selected clinical conditions and modalities to analyze, annotate, and even enhance the images. Structured, report-ready outputs are then delivered back into the health system's reporting environment through a secure, vendor-neutral platform.

This white paper explores how one health system partnered with Siemens Healthineers to address challenges in lung cancer screening by adopting and customizing AIES for CT Lung Nodule Detection (hereafter referred to as AIES for lung nodule detection). This collaboration tackled key barriers – workflow integration, data overload, and trust – demonstrating how AI can improve nodule detection and help radiologists deliver efficient care, even amid staffing shortages.

MetroHealth aims to provide lung cancer screening for more patients

The Glick Center, the new state-of-the-art main campus hospital of MetroHealth

MetroHealth has been a cornerstone of healthcare in Cleveland, Ohio, for nearly two centuries, serving as a vital lifeline for underserved communities. Guided by its mission, "Devoted to Hope, Health, and Humanity," MetroHealth delivers high-quality care to over 300,000 patients annually – two-thirds of whom are uninsured or covered by Medicare/Medicaid.[12] With a broad network of hospitals, emergency departments, and community sites across Cuyahoga County, MetroHealth is committed to removing barriers to care through outreach, education, and mobile services. Initiatives like its Mobile 3D Mammography Coach exemplify how the system brings lifesaving diagnostics into neighborhoods, making early detection more accessible and reaffirming its role as a leader in health equity and innovation.

Lung cancer rates and mortality in Ohio – and especially Cleveland – exceed national averages, highlighting the urgent need for earlier detection and improved access to care.[13–14] In response, MetroHealth is taking action.

With an early-adopter mindset and a deep commitment to innovation, the system is embracing AI to make lung cancer nodule detection more efficient and widely available. Their goal: screen more patients, detect lung cancer earlier, and save lives – all without adding complexity for their radiology team.

Figure A: Radiologists use a three-screen workflow: case worklist (L), CT image review (C), and real-time reporting via PowerScribe (R).

The current radiology workload

MetroHealth conducts approximately 4,000 lung cancer CT screenings each year, supported by a team of fellowship-trained radiologists and a lung cancer screening coordinator. To meet increasing demand, the system has developed a centralized, digitally optimized workflow that leverages advanced technologies, including Sectra IDS7 PACS, PowerScribe 360 for reporting, and the Epic EMR. This integrated infrastructure enables seamless image distribution, semi-automated reporting, and efficient case management.

CT lung cancer nodule detection is performed across the MetroHealth network and consolidated within the central PACS. Radiologists typically use a three-screen setup, which allows for an average interpretation time of about nine minutes per case (see Figure A).

However, as screening volumes rise and radiologists operate at full capacity, the value of an integrated AI service solution becomes increasingly clear – providing essential support to clinical teams, easing workloads, and helping staff focus on what matters most: patient care.

Customizing AIES for lung nodule detection with MetroHealth clinicians

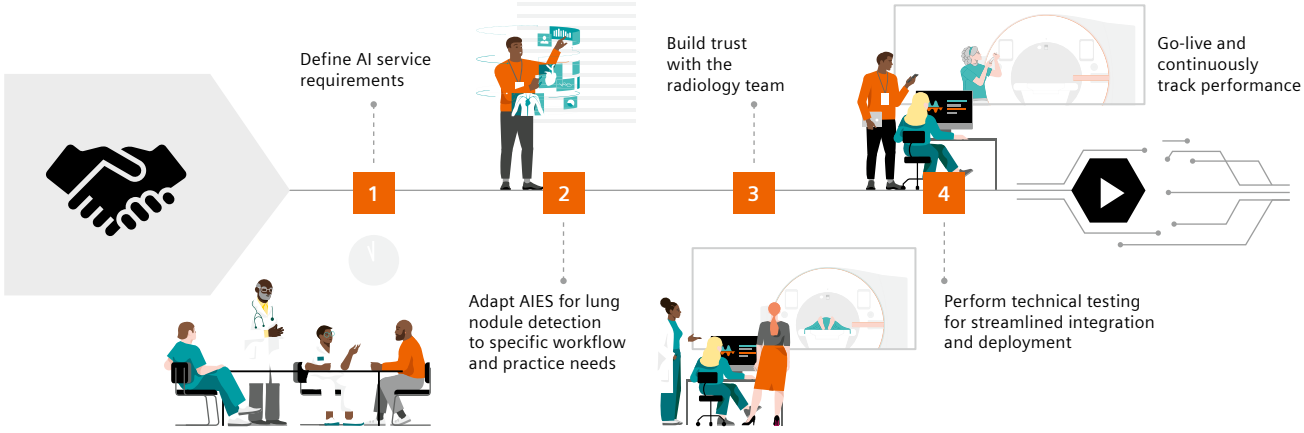

Figure B: The MetroHealth-Siemens Healthineers collaboration journey

Driven by a shared vision to enhance CT lung cancer nodule detection for underserved communities, MetroHealth partnered with Siemens Healthineers to test AIES for lung nodule detection in real-life settings. The journey, as illustrated in Figure B, outlines the key steps of their collaboration.

1. **Define AI service requirements**
2. **Adapt AIES for lung nodule detection to specific workflow and practice needs**
3. **Build trust with the radiology team**
4. **Perform technical testing for streamlined integration and deployment**
5. **Go-live and continuously track performance**

A multidisciplinary team of cross-functional experts within Siemens Healthineers – including clinical specialists, technical engineers, user experience designers, and a customer success manager– was actively involved in each phase, ensuring that the service approach addressed real-world clinical needs, technical feasibility, user experience, and ongoing customer support.

Step 1: Define AI service requirements

The journey began in fall 2023, when MetroHealth's faculty joined a kickoff workshop with Siemens Healthineers to explore the potential of AIES for lung nodule detection. While enthusiasm was high, radiologists raised a few key concerns:

- *Can I trust that the service is detecting all clinically relevant nodules? Has the service been trained on diverse populations, including ours? Is it FDA cleared?*
- *Do I need to change the way I do my reading and reporting?*
- *Will the service truly help us to be faster, or will it complicate our workflow?*
- *Will the service replace me as a radiologist? Will I lose control?*

	William C. Baughman, MD Body Imaging including MRI Diagnostic Radiology Interventional Radiology	Michael A. Markovic, MD Neuroradiology	Jonathan B. Glaab, MD Radiology
Joined MetroHealth:	2009	2020	2018
Academic Affiliation:	Associate Professor, Case Western Reserve University School of Medicine	Clinical Assistant Professor, Case Western Reserve University School of Medicine	Assistant Professor, Case Western Reserve University School of Medicine

Figure C: MetroHealth power users for AIES for lung nodule detection

These questions and concerns played a pivotal role in shaping the future development of the AIES for lung nodule detection, guiding the definition of its key solution requirements:

- **Reliable performance** of AIES for detecting all relevant lung nodules
- **Streamlined workflow integration** with MetroHealth's Sectra PACS and PowerScribe reporting systems
- **Full oversight and responsibility** for reporting and clinical diagnosis retained by radiologists, with their complete control over impressions and continuous access to source images
- **Measurable efficiency improvements** to allow radiologists to focus on complex and value-added clinical tasks

To ensure the service truly met MetroHealth's needs, three radiologists were selected as "power users" to support design and test the service with Siemens Healthineers: William C. Baughman, MD; Michael A. Markovic, MD; and Jonathan B. Glaab, MD; (Figure C).

Figure D: Job shadowing

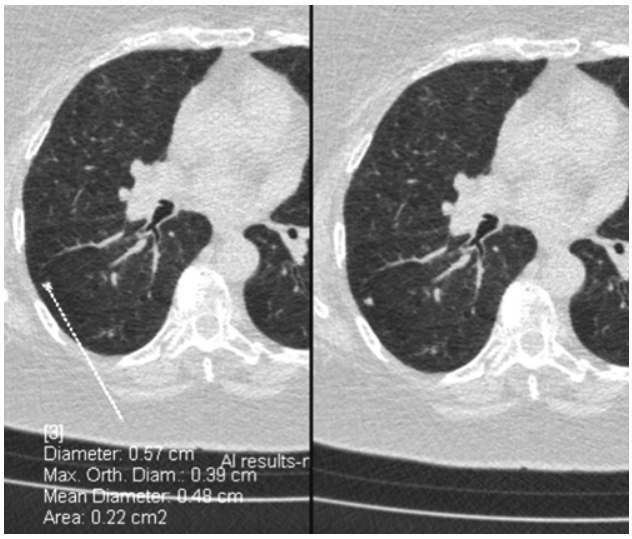

Figure E: Synchronized series viewing: annotated image (L), original image (R).

Step 2: Adapt AIES for lung nodule detection to specific workflow and practice needs

With the requirements defined, Siemens Healthineers embedded its team within MetroHealth's radiology department. Through **job shadowing** (see Figure D) and **structured interviews**, technical and clinical specialists observed radiologists at work, refining the technical and clinical requirements of AIES for lung nodule detection to ensure the integration into existing reading and reporting workflows.

Interactive mock-ups were created to give radiologists an early hands-on experience of how the service would fit into their workflows, enabling real-time feedback and iterative improvements.

Step 3: Build trust with the radiology team

To build radiologist confidence in the clinical reliability of AIES for lung nodule detection, the team aligned outputs with guidelines, particularly Lung-RADS, which recommends follow-up for nodules ≥ 4 mm.

During initial testing, however, AIES for lung nodule detection aimed to flagg all nodules, including those smaller than 4 mm. This gave MetroHealth radiologists full visibility into the service's detection capabilities, ensuring nothing was overlooked and allowing comprehensive performance evaluation.

Daily reviews of real cases followed, with radiologists providing detailed feedback that shaped refinements to the system. Radiologists were able to scrutinize every nodule – regardless of size. This exhaustive review built confidence that the AIES for lung nodule detection could be trusted not to miss clinically relevant nodules. Over time, reporting thresholds were adjusted:

- Nodules ≥ 4 mm were flagged for follow-up.
- Smaller nodules were included in a reference summary.

In addition, synchronized series viewing allowed radiologists to see the original and annotated images side by side in real time (see Figure E). Instead of switching back and forth, they could verify annotations directly against original images – reinforcing

transparency while streamlining oversight. Customizable markers ensured annotations were clinically meaningful across the scan.

"AIES for lung nodule detection was thoughtfully integrated through close collaboration and open dialogue. By working together in real-world settings, we refined the system to ensure every relevant nodule was captured before aiming to improve speed or efficiency. At first, radiologists were checking every nodule, so it was a slower process, but it was essential for building trust."

Carlos Revilla Portero,
RadEnablement Services Global Portfolio Management & Operations Lead, Siemens Healthineers

To provide additional reassurance for the radiologists, Siemens Healthineers clinical experts conducted random peer reviews, comparing AIES for lung nodule detection summaries with MetroHealth's final radiology reports for two consecutive months. The analysis showed AIES for lung nodule detection had a strong performance in detecting clinically relevant nodules, with only minor non-critical differences observed.

Step 4: Perform technical testing for streamlined integration and deployment

A successful AIES for lung nodule detection service needs more than a reliable detection of clinically relevant nodules – it must fit into existing radiology workflows without adding friction. At MetroHealth, this meant building on a solid technical foundation rather than reinventing it. Siemens Healthineers worked alongside MetroHealth's IT and radiology teams to ensure AIES for lung nodule detection became a natural extension of existing systems.

Back-end integration: Reliable data flow

The priority was ensuring results flowed smoothly through MetroHealth's radiology infrastructure. Using HL7 standards, AIES for lung nodule detection observations were structured and transferred directly into PowerScribe, the radiology reporting tool. This guaranteed that every case arrived ready for review, correction, and integration into the final report, while radiologists retained full control of impressions and conclusions.

Front-end integration:
Preserving the three-screen workflow
On the front end, the goal was to minimize workflow disruption. Radiologists continued to use their familiar three-screen setup – worklist, image review, and reporting – while AIES for lung nodule detection results appeared alongside the original scans. This preserved efficiency and eliminated the need to toggle between applications.

Intelligent hanging protocol:
Speeding up case review

To maximize efficiency, Siemens Healthineers introduced a customized hanging protocol that automatically displayed AI annotations in the sequence radiologists preferred, from lung apex to base. Additional split-screen configurations allowed simultaneous review of source images, summaries, and reference views. This meant less navigation and more time focused on interpretation.

"Through initial discussions and alignment, we developed a customized observations summary tailored to meet MetroHealth's requirements."

Kishan Venkatesan,
RadEnablement Services Technical Product Manager, Siemens Healthineers

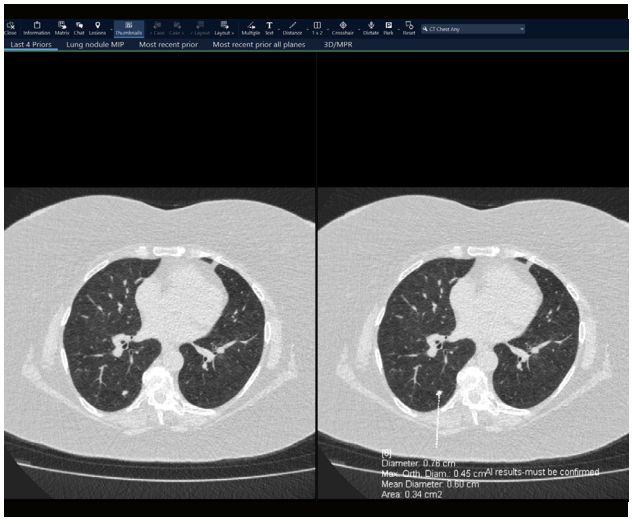

Figure F: Original and annotated images side by side in MetroHealth's PACS.

OBSERVATIONS SUMMARY:
Evaluation of the mediastinum, soft tissues and upper abdomen is limited by the low dose technique.

Nodules:

Nodules are stable, smaller or have grown by less than 1.5 mm.

- 4.1 mm mean diameter solid nodule in the left upper lobe (series 204 image 37), previously 4.1 mm on re-measurement.
- 4.3 mm mean diameter solid nodule in the right upper lobe (series 204 image 60), previously 4.3 mm on re-measurement.
- 4.8 mm mean diameter solid juxta pleural nodule in the right lower lobe (series 204 image 135), previously 4.5 mm on re-measurement.
- 6.0 mm (largest) mean diameter solid nodule in the right lower lobe (series 204 image 155), previously 6.1 mm on re-measurement.
- 5.1 mm mean diameter solid juxta pleural nodule in the right lower lobe (series 204 image 181), previously 5.0 mm on re-measurement.
- 5 mm mixed density nodule in the right lower lobe (Series 204, Image 143) with 1.5 mm soft tissue component (Series 204, Image 143). This is new from the prior study of October, 2023.

Mediastinum: [Unremarkable]

Lymph nodes: [No supraclavicular, axillary, or mediastinal lymphadenopathy. Evaluation of hilar lymph nodes is limited without contrast.]

Cardiovasculature: [Moderate calcified plaque in the aortic arch.]

Lungs: The lungs are well inflated without evidence for consolidation, effusion or pneumothorax. Central airways are patent. Moderate background emphysema.

Visualized musculoskeletal structures: [No acute fracture or destructive osseous lesion is identified.] Mild dextrocurvature of the thoracic spine.

Included images of the upper abdomen: [The patient is status post cholecystectomy.]

Figure G: Customizable observations summary example.

Customization of AIES for lung nodule detection results to MetroHealth's specific reporting needs

MetroHealth also tailored AIES for lung nodule detection's output to match its reporting style, ensuring observation summaries were clinically meaningful (See Figure G). MetroHealth leveraged the flexible structure to ensure their radiology team had results they wanted to work with, both in detail and in format.

- Standardized templates to account for each hospital's predefined templates for clinical procedures:
  - Full report customization of observations to MetroHealth's preferences for format, terminology, and style
  - Adaptive text integration for radiologists to review and modify results from AIES for lung nodule detection directly within PowerScribe
- Customized summary section for immediate insights, including:
  - Growth indicators for nodules that had grown beyond a certain threshold, helping radiologists prioritize follow-ups
  - Direct alerts so if high-risk cases were identified, a follow-up email/call would be directed to the clinical team

The clinical team collaborated with Siemens Healthineers to configure the observation summary with the following requirements. The key nodule characteristics are presented in a sentence-based format to support both high-throughput environments and nuanced diagnostic reviews:

- Nodule size: Report mean diameter, rounded for clarity. Enabled 2D tracking to align with Lung-RADS.

- Nodule type and morphology: Automatically classifies nodules as solid, part-solid, or non-solid and as smooth or spiculated – supporting malignancy risk stratification.
- Lobe segment localization: Observations are mapped to precise anatomical segments (RUL, RML, RLL, LUL, LLL) for consistent longitudinal tracking.
- Nodule progression: Changes are flagged as stable, growing, or shrinking, with objective quantification by change in mean diameter.
- Image slice reference: Each nodule includes a direct slice number for fast verification in the CT viewer.

Outputs include an executive summary, for example: "Nodules are stable, smaller or have grown by less than 1.5 mm." In addition detailed examples of these nodules are provided: "6.0 mm (largest) mean diameter solid nodule in the right lower lobe (series 204 image 155), previously 6.1 mm on re-measurement." This structure enabled MetroHealth to speed up interpretation and reduce variability. Because health systems can determine the measurement mode, sorting logic, exclusion criteria, and optional or additional fields, the customizable observation summaries work for the team members while also supporting efficiency. The outputs and final report were reviewed by a certified radiologist at MetroHealth.

Step 5: Go-live and continuously track performance

In the beginning of 2024, MetroHealth and Siemens Healthineers officially piloted AIES for lung nodule detection, marking a significant milestone in MetroHealth's radiology transformation. However, the go-live was just the beginning. To ensure maximum impact, the teams established a structured feedback loop for ongoing optimization based on real-world use.

The User Experience Team at Siemens Healthineers developed a robust KPI framework to measure not only technical performance but also the true value of AIES for lung nodule detection to radiologists, tracking clinical impact, efficiency, and impact on cognitive load. This continuous evaluation was critical in ensuring that the service was aligned with MetroHealth's evolving needs and the daily realities of their radiologists.

In close collaboration with MetroHealth's leadership and radiology team, Siemens Healthineers refined the KPI framework, ensuring it reflected their priorities and expectations. The result was a clear, concise set of metrics designed to track the effectiveness and integration of AIES for lung nodule detection, fostering long-term success. (See Figure H for the KPI framework.)

"It's clear they're serious about clinical outcomes. We had ongoing conversations, not just during setup but throughout the collaboration, to tweak and improve things based on real-world use," shared Dr. Glaab.

"They didn't just drop off the software and leave. They worked closely with our team, listened to our needs, and even shadowed our radiologists to get the details right. That level of personalization really stood out."

Jonathan B. Glaab, MD, Radiologist

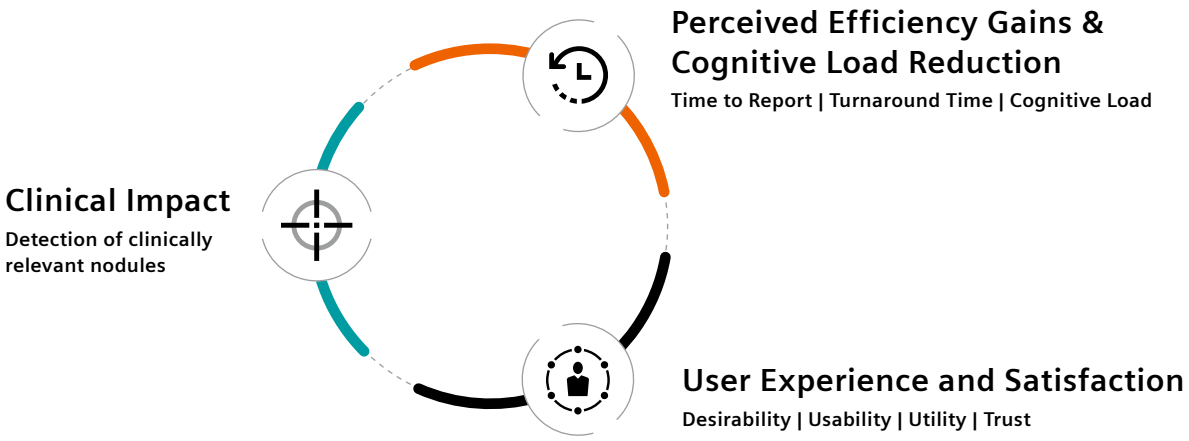

Figure H: MetroHealth KPI Framework for AIES for lung nodule detection

Evaluating success

Three key areas were identified to evaluate AIES for lung nodule detection:

- **Clinical impact:** The service had to deliver a reliable detection of clinically significant nodules, based on LungRads clinical pathways that radiologists could trust. This involved tracking if MetroHealth's radiologists would confirm AI-enabled services' results and identify any missing findings.
- **Perceived efficiency gains and cognitive load reduction:** AIES for lung nodule detection aims to enhance radiologists' workflows by increasing efficiency and speed required to read CT lung cancer screenings. Time savings were measured using PACS data (e.g., timestamps from case opening to report submission) and direct user feedback.
- **User experience and satisfaction:** Radiologists assessed ease of use, utility, and dependability, including their willingness to recommend AIES for lung nodule detection for broader use. Data for these KPIs was collected, with baseline reviews, regular feedback surveys, and performance reviews at the end of the pilot phase. This iterative process allowed Siemens Healthineers and MetroHealth to fine-tune AIES for lung nodule detection, making real-time improvements based on the radiologists' feedback.

Results: 20% efficiency gains with exceptional performance of detecting clinically relevant nodules

The results of the pilot phase highlighted the significant benefits of AIES for lung nodule detection, particularly in clinical impact and workflow efficiency. It achieved strong performance on detecting clinically relevant nodules, with radiologists quickly adopting and trusting the service.

"AIES for lung nodule detection has become an essential part of our workflow," said Dr. Baughman. "The perceived sensitivity for the AI detection of lung nodules is high.

There were many cases were AI pointed out difficult-to-detect nodules abutting the hila and more peripheral bronchovascular structures, which can be difficult to detect even by highly experienced radiologists."

"Having the service populate the report with accurate measurements, image and slice numbers, and comparison measurements is a game changer. Noticeably reduces time and burden. No need for copy and paste from external windows/applications and no need for dictating these tedious findings is a pleasure." There were significant efficiency gains, with case processing times reduced. "After working with AIES for lung nodule detection, I'm moving through the nodule section faster," said Dr. Glaab. "I perceive time savings of 20% that will undoubtedly enhance our overall productivity."

Radiologists also reported a notable reduction in cognitive load, allowing them to focus on more complex findings. "The mental effort required to go through cases has gone down noticeably. It's like having a second set of eyes that takes care of the tedious tasks, letting me focus on more clinically useful conclusions," noted Dr. Glaab. "The lung nodule AI service is very similar to having a resident physician drafting cases to you, with the tedious work of measuring, comparing, and documenting nodules already completed when you open a case. This allows you to move more efficiently through cases and decreases cognitive load," said Dr. Baughman.

The integration of AIES for lung nodule detection with PowerScribe further streamlined the radiology workflow. "Unlike many other post processing and AI systems on the market, the AI results integrate seamlessly into the PowerScribe report including size, image and series numbers with zero clicks, which is a game changer. The integration of the AI results into the PACS system allows users to quickly validate AI results using existing PACS anatomical linking functionality without having to open additional software," said Dr. Markovic.

Overall, the feedback from radiologists was very positive, with a strong willingness to continue using it beyond the pilot phase. "AIES for lung nodule detection has become a valuable asset to our workflow," said Dr. Baughman. MetroHealth is now moving forward with commercial agreements with Siemens Healthineers to expand AIES across its radiology practice.

Conclusion: A new benchmark for collaborative AI adoption

AIES for lung nodule detection is just the beginning of a continuous journey of improvement and growth. The feedback loop, KPI tracking, and iterative refinements will ensure it becomes even more effective over time, delivering greater value to MetroHealth as it becomes an integral part of their daily radiology workflows.

As a key component of Siemens Healthineers RadEnablement Services, a comprehensive suite of digitally-enabled radiology services, AIES sets a new benchmark for collaborative innovation in healthcare. This partnership demonstrates how AI services, when developed in collaboration with healthcare providers, can empower radiologists, enhance workflows, and improve patient outcomes, ultimately making a lasting impact on healthcare delivery.

Contact Siemens Healthineers today

to learn how AIES can empower your radiologists and improve patient outcomes.

Check out our website

siemens-healthineers.com/services/value-partnerships/radiology-services

Special thanks to our partners at MetroHealth for supporting this study!

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We are a team of around 74,000 Healthineers in over 70 countries passionately pushing the boundaries of what is possible in healthcare so that patients can live with hope, not fear of disease.

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