Beyond the AI Upgrade: Extending MRI Performance Across the Imaging Fleet

Joseph Jalkiewicz



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Robert P. Jones, MD
Jackson Hole Medical Imaging and St. John's Health

Today's radiology departments face a dual balancing act. The first is to meet exponential growth in demand for magnetic resonance imaging (MRI) exams while allocating fixed operational resources. The second is to optimize department throughput when clinical protocols must constantly be adjusted to balance acquisition speed against image quality, diagnostic resolution, and radiologist confidence.

This is no small challenge for many health care enterprises that operate a widely disparate fleet of scanners. Managing equipment across different ages, field strengths, and original equipment manufacturers (OEMs) creates systemic variations in software capabilities, hardware metrics, and imaging consistency. As a result, many institutions are engaged in a continual search for tools that optimize existing assets without forcing them to rely on costly hardware upgrades.

Bringing Contemporary AI to Existing MRI Systems

To this end, imaging centers are increasingly turning to scanner-neutral AI post-processing software. Advanced deep-learning applications, such as SubtleHD™(MR) (Subtle Medical), function independently of specific hardware providers, offering a scalable method to modernize legacy scanners.

By applying deep-learning denoising and sharpening to reconstructed images from accelerated scans, SubtleHD(MR) mitigates the classic trade-off between scan time and image quality. Older hardware systems that cannot natively support modern, vendor-proprietary software upgrades can still achieve significant enhancements in signal-to-noise ratio and image sharpness. As a result, these technologies can extend the clinical and financial lifecycle of MRI scanners, unlocking high-field capabilities on standard legacy configurations.

"This has been somewhat of a sea change for us at our small institution," says Robert P. Jones, MD, a board-certified radiologist specializing in diagnostic and pediatric radiology at Jackson Hole Medical Imaging and St. John's Health. "We have a single MR scanner, and it's at least 12 to 15 years old, so it is not a young scanner."

Jones explains that for independent or tight-budget facilities such as St. John's, a rural community hospital, the software delivers significant clinical benefit with a financial footprint far smaller than that associated with frequent upgrades.

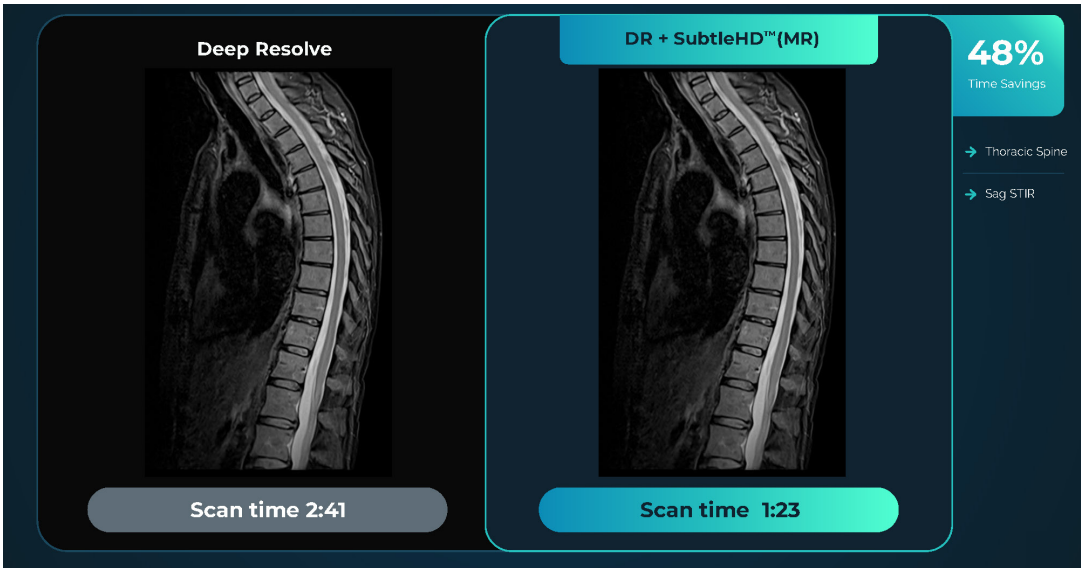
The Evolution of OEM AI Reconstruction

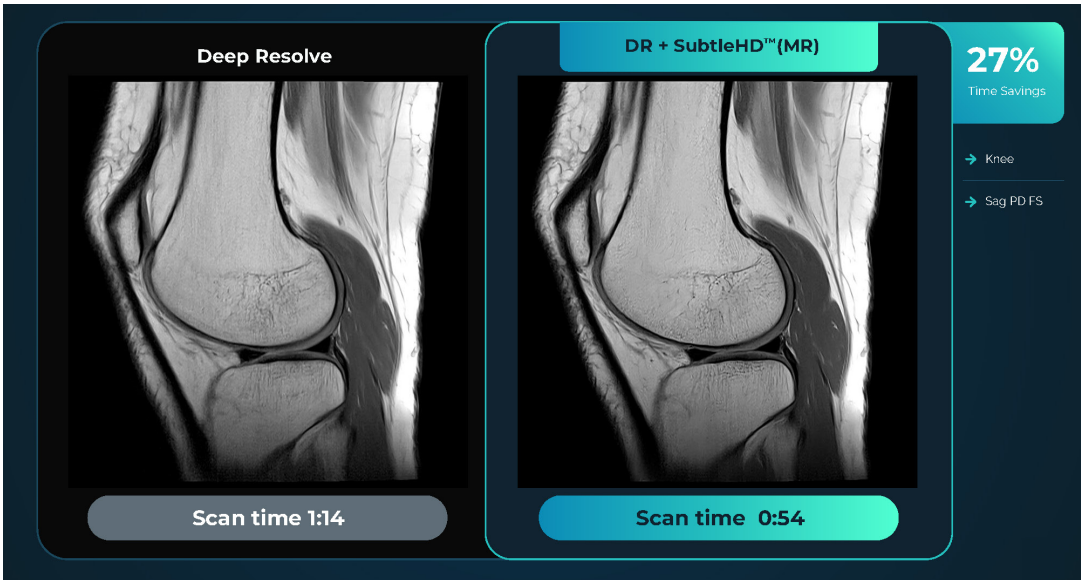
Medical imaging has witnessed a major evolution in scanner-specific hardware capabilities. Large manufacturers are building proprietary, deep-learning reconstruction models directly into their newest scanners. Key technologies driving this shift include Deep Resolve (Siemens Healthineers), AIR Recon DL (GE HealthCare), SmartSpeed (Philips), and Advanced Intelligent Clear-IQ Engine (AiCE; Canon Medical Systems).

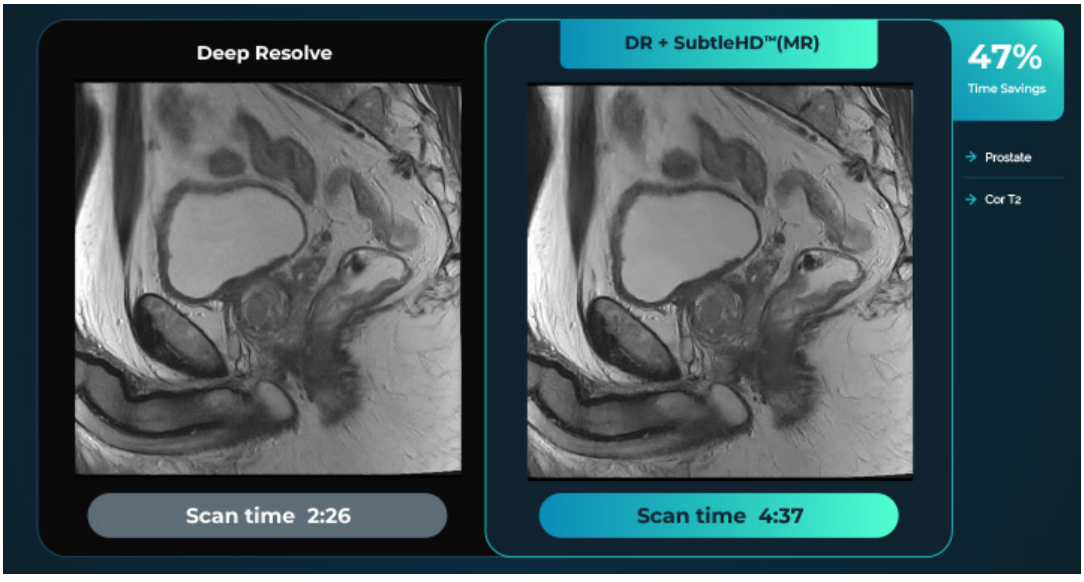
These tools have elevated baseline clinical expectations for MRI acquisition speed and efficiency, as well as for automated spatial resolution. Their usefulness, however, is limited by the inherent capabilities of the hardware. Consequently, they can

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The successful implementation of a multi-tiered, "Layered AI" workflow demonstrates that software solutions can continuously optimize clinical throughput without compounding hardware expenses

SubtleHD(MR) applies secondary, highly specialized noise-reduction and increased sharpness for an increase in image speed and diagnostic quality

widen the performance gap between a medical facility's premium systems and its legacy fleet.

From Alternative to Complement: The "Layered AI" Approach

While early deployment strategies framed scanner-neutral applications strictly as alternatives for scanners lacking built-in AI, emerging protocols are leading to a new paradigm, one centered on a complementary, layered framework. Rather than replacing scanner-specific technology, scanner-neutral software can be applied in addition to OEM deep-learning reconstructions, effectively creating an "Layered AI" pipeline.

Jones says St. John's Health serves as an ideal use case for this approach, layering SubtleHD(MR) on top of Siemens Deep Resolve. Rather than forcing administrators and clinicians to choose between proprietary and independent systems, they function synergistically. The OEM scanner optimizes initial data acquisition and k-space reconstruction, while SubtleHD(MR) applies secondary, highly specialized noise-reduction and increased sharpness for an increase in image speed and diagnostic quality, he notes.

In 2022, the hardware and software of the department's original Siemens Aera 1.5 T MRI system were upgraded to the Siemens Magnetom Sola Fit, while the magnet itself, which dated to 2012, was kept in place, Jones says. The MRI currently operates on Siemens' syngo MR XB10, which is the upgraded software component.

"If Deep Resolve gives you a 20 percent time savings and then you add SubtleHD(MR) on top of that, you're getting images that are less noisy," Jones says. "I particularly find that the postcontrast images are clear in a way that they weren't to the same degree before."

He draws an analogy to dental hygiene: "The OEM software is sort of like the regular toothbrush, whereas Subtle is the electric toothbrush," he says. "You have your teeth, but having an electric toothbrush really adds a lot."

Extending AI Across the MRI Fleet

The usefulness of open-architecture AI applications like SubtleHD(MR) is especially apparent when the goal is to standardize a diverse, multi-vendor fleet. Many imaging networks wrestle with variance; a scan sequence performed on a newly installed system may look vastly different from the same sequence executed on an older system across town.

By leveraging an external, hardware-agnostic AI layer, Jones says, imaging networks can establish uniform image quality across all their locations. For example, the technology can bring the diagnostic output of older 1.5-T systems closer to the baseline of modern 3T systems, as well as harmonize images produced by different vendor platforms. Jones calls this capability a vital tool for reducing daily friction.

"We read for several remote sites that don't have SubtleHD(MR), so I always have to do a mental reset with each MR machine that I'm reading from," he says. "Having homogeneity is really nice because it can remove a lot of the head-scratching: Is this artifact? Is this just the machine? Or is this real?"

In addition, he says, the vendor-neutral framework bypasses complex cross-vendor IT bottlenecks, creating a seamless overlay that works natively across mixed environments.

Measuring the Impact

Ultimately, the value of a comprehensive AI strategy must be measured in terms of clinical impact and the financial bottom line. According to Jones, his department experienced a rapid transformation in five areas after integrating SubtleHD(MR):

- **Acquisition Efficiency.** Adding SubtleHD(MR) on top of Deep Resolve yielded an average reduction in scan time of approximately 15% per patient, translating to a savings of 1-8 minutes per exam.
- **Targeted Workflow Acceleration.** High-volume examinations, such as stroke brain protocols, knee studies without contrast, and hip studies without contrast, saw total scan times cut by nearly 50%.
- **Scheduling Capacity.** Overcoming scheduling bottlenecks allowed the center to seamlessly add 1-2 extra patient slots per day to the active MRI register.
- **Financial Performance.** With an institution baseline of $815 in average net revenue per MRI study, the added throughput created an immediate, tangible financial benefit to total net revenue.
- **Patient Experience.** Faster sequences mitigated patient movement, reducing motion artifacts and preserving overall diagnostic confidence.

"SubtleHD(MR) is helpful for patients. It's helpful for technologists. It's helpful for radiologists. It's helpful for the CEO of the hospital," Jones says. "The image-quality improvement may be an option for some people, but the time savings and the money savings are real, tangible metrics that are hard to ignore."

Looking Ahead

As medical imaging continues its digital transformation, enterprise AI is transitioning from a localized, temporary hardware patch to a foundational, long-term fleet management strategy. The successful implementation of a multi-tiered, "Layered AI" workflow demonstrates that software solutions can continuously optimize clinical throughput without compounding hardware expenses.

Jones believes health care networks that adopt a unified, vendor-neutral layer on top of their current scanner's capabilities will be positioned to maximize scanner utilization, maintain cross-facility consistency, and deliver superior patient care well into the future.

"This platform has allowed us to take an existing, well-run system and improve it far beyond the cost of the product," Jones concludes. "We've been really happy with it. It has truly delivered on what was promised."