Kim Jensen
Progardia
—
Middelfart, Denmark

Progardia lowers energy consumption, reduces carbon footprint and increases image quality with continued investment in MR and AI

According to the World Health Organization, climate change is the single biggest threat facing humanity.[1] Medical imaging is estimated to account for 1% of global greenhouse gases – from both manufacturing of medical imaging equipment and the energy required to power these systems.[2] The European Congress of Radiology (ECR) 2025 theme of "Planet Radiology" brought the challenges and questions surrounding sustainability front and center for the global medical imaging community, with European Society of Radiology President Andrea Rockall, MD, issuing a call to action to radiology leaders and societies.[3]

Considering the resources needed to power and maintain an MR system, technologies that reduce both scan times and operational hours can have an impact. Progardia is a private clinic in Middelfart, Denmark, that opened in July 2020 and specializes in MR imaging. Equipped with a SIGNA™ Architect 3.0T MR system, the clinic collaborates with the local public hospital system and is known for its high

image quality. In January 2024, the clinic upgraded to the latest software, MR 30.1, and implemented AIR™ Recon DL.

The primary motivation for upgrading to AIR Recon DL was the ability to improve SNR and sharpen images by up to 60%. Progardia's competitive edge in the Middelfart area is its focus on high-quality MR imaging studies. In addition to performing MR examinations across all body areas and disease types, the clinic supports the local public hospital, performs clinical MR research studies and offers whole-body MR examinations to private-paying customers.

Kim Jensen, Chief Radiographer and MR Specialist, performed a cost-benefit analysis to examine the impact the upgrade could have on operations. The clinic wanted to justify making another technological investment on the MR system. While higher image quality and shorter scan times benefit both staff and patients, the management team and investors were also interested in economic and environmental benefits.

"Our expectation was to achieve a reduction in scan times by 15% and, thereby, get better utilization of our MR scanner and our radiographers," says Jensen. While some sites can achieve high scan time reductions, Progardia is focused on high quality and aims to use new technology to further optimize protocols to deliver exceptional imaging results rather than focus only on shorter examination times.

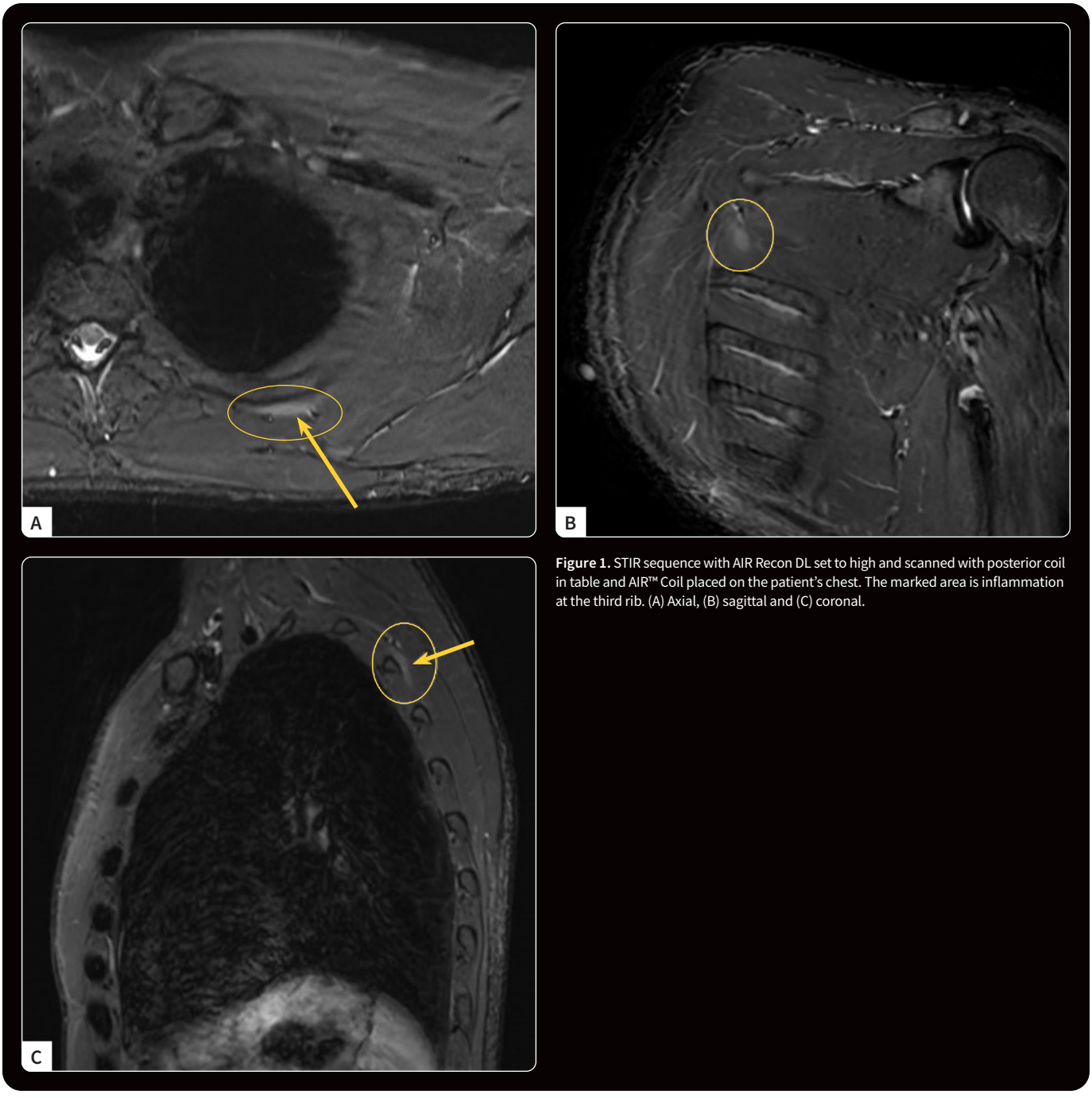

Figure 1. STIR sequence with AIR Recon DL set to high and scanned with posterior coil in table and AIR™ Coil placed on the patient's chest. The marked area is inflammation at the third rib. (A) Axial, (B) sagittal and (C) coronal.

	Current	Projected scan time reductions			
	0%	10%	15%	20%	25%
kWh per patient	33	30	28	26	25
MR idle hours (monthly)	314	345.5	361.1	378.8	392.5
Energy to scan 612 pt (kWh)	20,196	18,176	17,167	16,157	15,147
Idle energy consumed (kWh, monthly)	6,018	6,620	6,921	7,222	7,523
Total energy consumed (kWh, monthly)	26,214	24,796	24,088	23,379	22,670
Energy consumption change (kWh)	—	-1,418	-2,126	-2,835	-3,544
Savings (monthly)	—	957 DKK $138.39 (USD)	1,435 DKK $207.51 (USD)	1,914 DKK $276.78 (USD)	2,392 DKK $345.90 (USD)

Table 1. Operating benefit based on 612 scanned patients in April 2023. DKK to USD conversion based on $0.14 USD per 1 Kr.

	Current	Projected scan time reductions			
	0%	10%	15%	20%	25%
kWh per patient	33	30	28	26	25
Savings per patient	—	47.55 DKK $6.88 (USD)	44.95 DKK $6.50 (USD)	42.31 DKK $6.12 (USD)	38.66 DKK $5.59 (USD)

Table 2. DKK to USD conversion based on $0.14 USD per 1 Kr.

	Current	Estimated increase in capacity			
	0%	10%	15%	20%	25%
Incremental monthly patients in current schedule	—	61	92	122	153

Table 3. Potential increased capacity due to scan reduction times.

Post-upgrade analysis	
Reduction in scan times	28%
Energy consumption per patient, kWh	24
Price per patient	38 DKK $5.50 (USD)
Savings per patient	15 DKK $2.17 (USD)
Patients per month	783
Savings per month	11,599 DKK $1,699.11 (USD)
MR idle (hrs.)	402
Idle energy consumed (kWh)	7,703
Savings from additional idle time	2,679 DKK $387.40 (USD)

Table 4. Actual energy cost-benefit analysis based on 783 patients. DKK to USD conversion based on $0.14 USD per 1 Kr.

"At the same time, I thought that there must also be power consumption savings since the scan time can decrease, which can also reduce our carbon footprint," he adds.

The clinic was already powering down the parts of the system that could be turned off during non-working hours at the end of each day. The following morning, the technologist turns the system on, and it typically takes 5 minutes for the system to be ready for scanning. However, Jensen did not have data on the economic benefit or energy consumption.

Energy cost-benefit analysis

To understand the potential energy cost and environmental benefits, Jensen used the MR imaging production data from April 2023 of 612 patients who underwent a total of 977 MR examinations (some patients had more than one body area/region scanned during their examination, including the whole body). He also modeled the impact of increasing capacity by 10%, 15%, 20% and 25% during the same operating hours, knowing that if they decrease scan and exam times then they could accommodate more patients (Table 1).

Jensen had access to the energy consumption of the entire building as well as in the MR suite, so he could determine the impact on power use when the MR components were turned off.

Prior to AIR Recon DL, the energy consumption in the MR suite was 33 kWh per exam. At a 25% scan time reduction with AIR Recon DL, the energy consumption dropped to 25 kWh (Table 2). With the shorter scan times, Jensen also determined that each month the clinic could add up to 61 more patients with a 10% increase in capacity and up to 153 more patients with a 25% increase in capacity (Table 3). At the larger monthly increase in capacity (25%), the clinic would achieve energy savings of approximately $345.90 per month (1,659.66 DKK). These savings are based on the additional 79 hours the system is powered down each month, from 314 hours prior to installing AIR Recon DL to 392.5 hours, due to the shorter scan times and subsequent working hours (Table 1).

"These values demonstrate the economic and energy savings that can be achieved by implementing AIR Recon DL."

Kim Jensen

Based on the data, Progardia upgraded its software to implement AIR Recon DL across all exams.

After the implementation, Jensen reevaluated the cost and environmental benefits based on the actual scan time reductions of 28%. Now, the energy used per examination is 24 kWh, based on 403 hours with the system powered off, with an economic benefit of approximately $387.40 and the potential to add up to 171 patients in one month, based on the same operating hours.

"We are in competition with other private providers for MR scans, so if energy can be saved, we are more competitive," Jensen says. "It is also important for us to have a much smaller carbon footprint."

In addition to the energy savings of 11,599 DKK per month, or $1,699.11 (USD), Progardia is able to scan more patients each day with a 28% higher capacity, further increasing revenue and realizing a faster return on their investment (Table 4).

Clinical benefits of short scan times and high-quality exams

As importantly, Progardia is delivering excellent quality MR exams across all types – MSK, neuro, abdominal/body and pediatric. A standard brain scan at Progardia now takes 7:30 minutes for a total table time of approximately 9 minutes with calibration scans and shimming.

"We have increased our image quality over all of our exams and still have 28% extra MR capacity. Our radiologists are very satisfied due to the better image quality. With the higher matrix, thinner slice thickness and much better SNR, they are more comfortable reading the examinations and can more quickly complete their reports."

Jensen shares the experience of one patient suffering from chronic pain in the left shoulder/left rib area who had undergone X-ray, CT and MR at another site. The patient was told they were fine with no issues. However, after two years without improvement, the patient decided to self-pay for an MR exam at Progardia. With Progardia's excellent imaging capabilities, the MR exam demonstrated edema and inflammation in relation to the costa 3, or the costal surface of the scapula.

Progardia has also achieved 40-50% scan time savings in pediatric and claustrophobic patients – historically two difficult demographics to decrease scan times due to the additional care needed. The technologists also reduced NEX and have used other high acceleration techniques, such as HyperSense.

"We have many claustrophobic patients who want their MR examinations at our clinic," Jensen says. The technologists at Progardia are trained with a focus on vulnerable patients.

He recalls a severely claustrophobic patient who was unable to complete their MR examination at two other clinics. Progardia's technologists gave this patient the time and understanding needed to prepare for the exam, including providing a mirror for the patient to see outside of the bore and watch a monitor with patient-selected video content (movies, television shows, etc.), minimizing their claustrophobia. With the mirror, patients can also have eye contact with family members, further calming their fears, which is particularly helpful with pediatric patients.

"We also scan children as young as 5 years old without anesthesia, primarily because of how we prepare them for their MR exam with an interactive app, so they know what to expect. They can also watch movies during their scan," Jensen adds.

Jensen is a co-leader of the Children Centered Care concept and co-authored articles on implementing a multi-faceted approach for pediatric MR imaging that includes an interactive app, trained pediatric technologists, a toy MR scanner in the children's lounge and a child-friendly multimedia environment in the MR room. This approach was found to reduce the use of general anesthesia from 57% to 5% in patients 4-6 years old[4] and increased the pediatric patient's comfort level in undergoing MR without anesthesia to 88% from 77%.[5] Progardia follows the Children Centered Care concept for all pediatric MR exams.

The implementation of AIR Recon DL can provide numerous benefits beyond workflow efficiency, reduced scan times and higher patient capacity. AIR Recon DL delivers environmental benefits by reducing energy consumption and carbon footprint, as well as enhancing patient care in vulnerable populations such as pediatric and claustrophobic patients.

References

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