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Streamlining radiology operations in one holistic view

As demand for imaging services continues to rise, health systems need to maximize efficiency and improve access for more patients to receive quality care. Stretched radiology departments are often challenged with overwhelming demand, overworked staff, unpredictable scheduling and inconsistent image quality across devices and protocols. Addressing operational efficiency is the main challenge faced by 73% of radiology departments[1], and it is being exacerbated by a global shortage of radiologists and staff.

Gaining analytics into a department's clinical operations and asset management inefficiencies can deliver actionable insights to address challenges, such as staffing and capacity. By optimizing workforce utilization, departments can improve productivity and increase speed of onboarding staff, reduce exam backlogs or cancellations, and increase patient access to care. However, many facilities rely on disparate data from multiple resources, time-consuming analysis and manual tasks in order to achieve their goals.

Imaging 360 changes the paradigm, delivering a cloud-based solution in one holistic view to manage day-to-day department tasks and achieve long-term goals by focusing on three main areas: operations, protocols and remote connectivity. It is a solution that fuels productivity across sites and imaging modalities to scale the imaging enterprise and create full operational visibility in radiology.

With Imaging 360, Brazil Hospital (São Paolo, Brazil), Alliance Medical (UK) and Evidia (Nuremberg, Germany) have optimized productivity, improved efficiency and connected staff to provide support when required and consistent quality of care to patients, regardless of location.

Leveraging actionable data to increase imaging capacity

Brazil Hospital is part of Rede D'Or, one of the largest integrated healthcare systems in Brazil. The radiology department has three MR systems, SIGNA™ Explorer 1.5T, SIGNA™ Voyager 1.5T and SIGNA™ Pioneer 3.0T, and performs approximately 40,000 exams per year.

"Despite prior optimization efforts, we still faced challenges in terms of further reducing protocol times, improving turnover in imaging rooms and managing staff processes," says Pedro Henrique R. Quintino da Silva, MD, Regional Medical Coordinator, Rede D'Or. "Resolving these issues was vital to enhancing the overall efficiency and efficacy of our practices to contribute to improved healthcare delivery and patient outcomes."

The challenges required major changes to how the department was managed, including:

- Implementing a streamlined system that accurately logged triage nursing time with patients
- Managing key performance indicators (KPIs) to track and measure the patient journey in MR imaging
- Develop a comprehensive scheduling system to optimize MR appointments, ensuring minimal wait times for patients, while maximizing MR utilization and staff resources
- Streamline administrative processes for the biomedical team
- Revamp the process for generating and delivering MR reports

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The organization turned to GE HealthCare and implemented Imaging 360 as part of its efforts to optimize imaging services and streamline operations. Their goals included improving productivity and patient access to imaging with easily accessible data, identifying areas for improvement and creating a mechanism for disseminating these enhancements across the fleet.

"We created a set of KPIs that could efficiently track and measure the various stages in the patient journey, including wait times, procedure duration and overall satisfaction," Dr. da Silva explained. "We created and managed a system for patients who are scheduled for an MR, called 'appointment check'. We looked at all the scheduled exams the day before to try to identify any potential problems or complex exams that might cause delays. We do this to try to predict the best flow of patients in each MR system so that we are able to put the right patients in the right MR system to maximize our efficiency."

With Imaging 360, Dr. da Silva and the team implemented solutions such as protocol management and a virtual, real-time collaboration tool to share expertise and advice during an exam, if needed, to help drive image consistency. They also implemented a data management tool to analyze workflow based on imaging modality and device so data analysis can be used to make informed, data-driven decisions regarding exam times and patient scheduling.

"Cloud-based [Imaging 360 Protocols] protocol management allows us to import, review and distribute multi-modality protocols remotely," explained Dr. da Silva. "In my point of view, this is a very important tool to help us track and monitor protocol deviations."

Brazil Hospital also used Imaging 360 to assess the impact of AIR™ Recon DL, GE HealthCare's pioneering deep-learning-based MR reconstruction algorithm that enables radiologists to improve SNR and sharpen images by up to 60%. By removing noise and ringing from raw images, scans are consistently crisp. Improved SNR means scan times can be cut by up to 50%, smoothing workflow and enhancing the patient experience.

	Explorer (RM1)	Voyager (RM2)	Pioneer (RM3)
Overall Time	**44%**	**33%**	**31%**
Neuro	60%	30%	34%
MSK	47%	47%	35%
Spine	42%	23%	31%
Internal Medicine	27%	30%	26%

Table 1. Brazil Hospital: Time differences/scan time reductions from implementing AIR Recon DL, based on their experience.

Brazil Hospital implemented AIR Recon DL to reduce scan time and improve SNR with the goal to improve MR imaging capacity, patient throughput, patient accessibility to MR imaging and patient satisfaction. Dr. da Silva and his team conducted a comparative analysis using data in Imaging 360 collected from various types of MR exams. They found that the average reduction in exam times was 36% (Table 1).

Due to the significant reduction in exam times, there was a corresponding 29% increase in exams per day across all three MR systems (Table 2). In particular, SIGNA Explorer reduced scan times by 6 minutes, on average, and had the most notable exam time reduction of 60% for neuro exams.

As important, image quality increased simultaneously with exam time reduction. Twenty-nine radiologists were asked to rate image quality on random exams/images selected from before and after the implementation of AIR Recon DL. The radiologists' Net Promoter Score (NPS) increased markedly, from an initial 15% to 96%, indicating heightened satisfaction. On a scale of 1 to 5, the

	Pre Project			Post Project			Increase in exams per day
	Exam time (min.)	Total time (min.)	Exams/day	Exam time (min.)	Total time (min.)	Exams/day	
System 1 (Explorer)	25.8	37.7	29	20.2	31.8	41	41%
System 2 (Voyager)	26.4	33.7	33	20.1	31.1	42	27%
System 3 (Pioneer)	21.9	32.1	34	20.9	31.3	41	21%

Table 2. Brazil Hospital: Increase in exams per day across three MR systems. Total time is the sum of exam time and idle time.

AIR Recon DL install	Overall average
Pre	3.89
Post	4.23
%	9%

Category	Overall average
Pre	3.89
IQ	3.84
Spatial Resolution	3.90
Contrast	3.94
Post	4.23
IQ	4.20
Spatial Resolution	4.31
Contrast	4.18

Device	Overall average
Explorer	7%
Pre	3.87
Post	4.13
Pioneer	7%
Pre	4.05
Post	4.34
Voyager	13%
Pre	3.75
Post	4.22

Specialty	Overall average
Internal Medicine	3%
Pre	4.14
Post	4.26
Skeletal muscle	11%
Pre	3.81
Post	4.24
Neuro/Head & Neck	7%
Pre	3.90
Post	4.19

Table 3. Brazil Hospital: Improved image quality on a scale of 1-5 based on the feedback from 29 radiologists.

radiologists rated image quality at 3.89 before implementing AIR Recon DL and at 4.23 after, a gain of 9% in image quality (Table 3).

Due to the image quality improvements, scan time reductions and optimized protocol management/implementation, Brazil Hospital has realized a substantial increase in patient throughput, with an average capacity increase of nearly 10 MR exams per day on each of the three MR systems.

"The ecosystem of Imaging 360, combined with consulting, synergistically worked with our team from reception, operations and even the radiologist's reporting, allowing for a reduction in scheduling time, resulting in a significant increase of nearly 29% in installed capacity."

Dr. Pedro Henrique R. Quintino da Silva

Optimizing productivity across a multi-site imaging fleet

Another customer site, Alliance Medical, was seeking a better way to manage its fleet of over 64 MR systems by improving staff efficiency and exam scheduling, in order to scan more patients.

Alliance Medical is an independent, private organization and a leading medical imaging partner for over 100 National Health Service (NHS) trusts. One of the largest providers of diagnostic imaging services in the UK, the organization created the UK's first community diagnostic center, with nine multi-modality centers, and has employed mobile MR that together have helped reduce patient wait lists. Yet, according to Peter Strouhal, MD, Medical Director and radiologist, he and his team wanted to find a way to scan more patients each day and maximize both equipment and staff resources.

To maximize operations, Alliance Medical collaborated with GE HealthCare by implementing Imaging 360. The organization was particularly focused on scheduling, including efficiently booking patients and identifying patient no-shows or those likely to not attend their scheduled booking, as well as managing protocols across their vast fleet of imaging systems.

"If you are limited to a 12-hour schedule, how do you scan more patients in that time without everyone feeling like they are pressured, stretched and stressed," Dr. Strouhal asks. "One way is to optimize everything you do."

Imaging 360 helped the team at Alliance Medical analyze their patient scheduling process for MR exams and employ a process called "block booking" where the same exam type is scheduled back-to-back. For example, the department will perform a block of neuro scans, followed by a block of lumbar spine scans, then knee exams, etc.

"Block booking has been a massive revelation for us. Imaging 360 has helped us see the benefits of block booking where we aren't changing the coils that much."

Edgar Mutemererwa

"This allows staff to catch up on other stuff they need to do. The patients have the biggest gain because when you have enough time, you don't rush the patients," adds Mutemererwa, who is the Site MRI Unit Manager for Alliance Medical in Sidcup, UK.

Identifying patients who would not attend their appointments was another key area for improvement. Predictive analytics can help to identify if a patient will not show up for their appointment. The results are displayed on a dashboard within Imaging 360, so the staff can call them to confirm if they will keep their appointment.

"Some of the patients who were selected by the system confirmed they were not going to come," says Mutemererwa. "It helped us confirm the patient was not coming and allow someone else to take that slot instead of having an empty slot that day."

"Imaging 360 applications can do all types of predictions, not just on no-shows," adds Dr. Strouhal. "It will also look at the schedule and recommend areas where we can condense the appointment safely and without compromising quality, so we can squeeze in more patients. It gives you a level of flexibility around how you can manage appointments."

The implementation of AIR Recon DL has led to greater efficiency through a reduction in scan times. The identified changes are reported through Imaging 360, where the team can use the data to take action. The result is more patients scanned each day and shorter waiting times to get an appointment—in many cases from four weeks down to two weeks.

Explains Mutemererwa, "We have managed to increase the number of two-week cancer case slots from 2 hours per day to 3 hours per day. We used to scan an average of 1.5 patients per hour. Now, we are scanning an average of 2.5 patients per hour."

"AIR Recon DL and Imaging 360 have enabled us to move from an average of three (cancer) patients per scanner, per day to an average of 7.5 patients per scanner, per day."

Edgar Mutemererwa

Protocol management is another area where Imaging 360 delivers actionable insights and remote management capabilities. Alliance Medical has a set of MR protocols that is loaded onto each new scanner. However, some centers would modify or use slightly different protocols.

"Keeping that consistency across the entire fleet of 64 MR scanners was quite challenging," says James Berry, Head of MRI Services, Alliance Medical. Now with Imaging 360, he has a centralized protocol management solution with remote editing and distribution across the organization's entire GE HealthCare MR fleet. With one click, Berry can view analytics for any selected protocol. He can streamline protocol management with the project management board and leverage the integrated features for offline and cloud-based protocol editing, notes and audit tracking.

"I can simply pull protocols off one scanner and send them to the other scanners without having to physically go onsite," Berry adds. "I can see the protocol, change the protocol and scan the protocol to ensure I'm happy with the image quality, and then I can save it and push it right from my office or home. That's amazing."

Adds Dr. Strouhal, "It also feeds back the other way and we can check if our staff is following the right process in the right protocol so that the image quality is being optimized for the patient."

Consistency across protocols is especially important when images need to be compared to gauge treatment plans. Imaging 360 Protocols help identify deviations in protocol use so the team can direct or train the technologists on the importance of following the same protocol with each patient. Rather than going to the site to check a sample of data, the team can pull it remotely for evaluation.

"It was a massive win to leverage and see the power of the Imaging 360 tools. Each module has its use, but the greatest power is the sum of all its parts. That's been the difference with Imaging 360."

Dr. Peter Strouhal

Connectivity and data inform and empower staff

In addition to helping organizations manage patient scheduling and protocols, the Imaging 360 suite also helps optimize device and staff performance. At Evidia, Laura Kasprowicz, Office Manager, and Peter Dankerl, MD, Managing Director and radiologist, evaluated Imaging 360 as part of a pilot project. They used the data from Imaging 360 to create more efficient workflows across 92 sites.

"Imaging 360 is an extremely powerful data management solution that brings attention to certain details, including inefficiencies or potential challenges."

Dr. Peter Dankerl

When Kasprowicz started at Evidia in 2022, she didn't have a database of information at her fingertips—only manual data that was cumbersome and inefficient to capture. She wanted to know when the organization has an increase in patients and whether the technologists were staffed appropriately. She also wanted to have right skilled technologists at sites where more complex exams are typically performed. This could help her assess if additional training/education was needed to improve the imaging technique.

"With Imaging 360, we can compare our different facilities and understand what works well at one site so we can apply that to the other sites."

Laura Kasprowicz

For example, they looked at the setup and transfer time between examinations that require a coil. Dr. Dankerl and Kasprowicz discovered that they could reduce the time between scheduled appointments to accommodate an additional one or two patients each day. This has further helped reduce patient backlogs and wait time.

"We are more efficient in scheduling and giving quicker appointments to our patients because we search the gaps in our schedule," Kasprowicz explains. Now, empty imaging slots in the schedule typically occur at the end of the day. "The better our workflow is, the better the patient experience is and the quality of our services."

If they see an increase in time between examinations, they can dive deeper into the data to find out the cause. "If the time increase was due to a new technologist, (Imaging 360) explains the outlier but also tells us we are not done with training," says Dr. Dankerl.

Kasprowicz can use the Imaging 360 data to plan the best time for additional training, as well as identify when there is not enough qualified staff at a particular site to handle more complex exams. In these latter cases, the remote capabilities of Imaging 360 enable more experienced technologists to provide the guidance needed to optimize exam quality.

Evidia has also reduced the number of protocol variations by 50% across different sites and different MR systems, allowing for more standardized imaging that can improve image quality.

"If we can maintain certain standards in terms of the matrix, slice thickness and number of slices that we have on every scanner across our sites, that improves the image and radiologist reading," says Dr. Dankerl.

Imaging 360 gives Evidia the data needed to manage the protocols, scanners and staff to implement process change improvement across its sites to achieve the best possible image quality, as well as improve workflow and the patient experience.

With Imaging 360, radiology departments, imaging centers and enterprise healthcare systems get a 360-degree view of operations to manage day-to-day workload and achieve long-term strategic goals including fleet management, scheduling efficiency, consistent protocol management, and remote scan assistance[‡] and collaboration.

References

1. Q: "What do you believe the main challenges in your department will be in the next 1-3 years?" N = 1151; GE Data and Market Research JB19471XX.

[‡]Imaging 360 Remote is enabled either by GE HealthCare's Digital Expert Access or nCommand™ Lite by IONIC Health. Not all products or features are available in all geographies. Check with your local GE HealthCare representative for availability in your country.

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