



David Smit, MB.BCh

Dunedin Hospital in Dunedin, New Zealand



Jill Oliver, DCR, MSc

Dunedin Hospital in Dunedin, New Zealand

Going digital with SIGNA Artist

helps prepare Dunedin Hospital for the future

In many hospitals, MR is a problem-solving tool that can help save the lives of critically ill or injured patients. This is especially true at Dunedin Hospital, a 388-bed tertiary and teaching facility that covers a large geographic area spanning the South Island of New Zealand's second-largest city and surrounding areas.

"We have a fairly complex mix of pathologies and patients, both referred and brought into the ER by ambulance or helicopter," says David Smit, MB.BCh, Director of MRI at Dunedin Hospital. "So, we need very robust equipment to handle the vast array of cases that we see each day."

It is not uncommon for inpatients at Dunedin Hospital to have immobility issues and complex disease processes with multiple comorbidities. So, when it came time to replace the hospital's 11- to 12-year-old SIGNA™ HDxt MR scanner, a key consideration was what their patients would require.

"It was not what we thought our patients would need, or what we could find available. Rather we looked at the complexity of our patients and what would truly benefit them," explains Jill Oliver, DCR, MSc (MRI), Lead MR Technologist. One of the key considerations for any new system would be patient comfort—and not just the scanner hardware but also the coils.

Dr. Smit and Jill required a scanner that could grow with the hospital—a scalable platform that would enable them to stay on pace with advancements in technology, novel sequences and coil development.

"If we have up-to-date technology, then we can tackle clinical questions that we previously couldn't answer, and that is clearly beneficial for our patients."

Dr. David Smit

After witnessing installations in nearby Australia and assessing image quality and upgrade potential for hardware and software, Dr. Smit, Jill and their colleagues at Dunedin Hospital chose the SIGNA™ Artist through GE Healthcare's SIGNA™ Lift program. This economical upgrade path started with the Optima™ MR450w with plans to transition to the SIGNA Artist

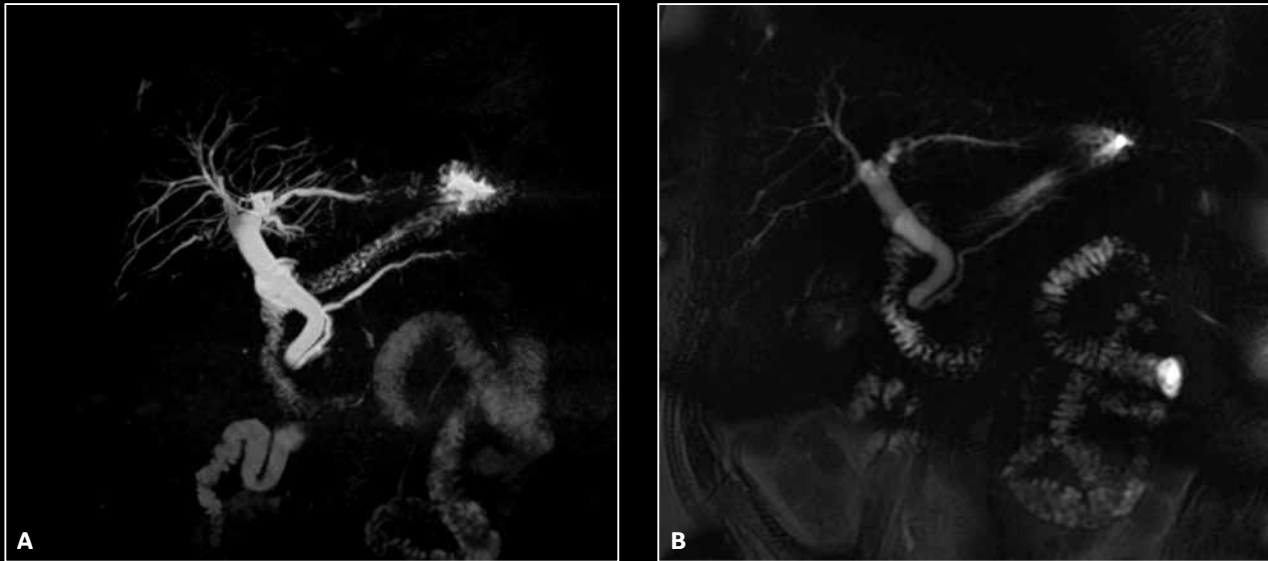


Figure 1. 3D T2 Auto Navigator with HyperSense and HyperCube, 1.4 mm slice thickness; (B) 2D SSFSE breath-hold.

when commercially available, making Dunedin Hospital one of the first worldwide installations for the new system.

The upgrade

A key reason Jill wanted the SIGNA Artist was the new hardware platform with Total Digital Imaging (TDI), which enables an increase in image quality. TDI eliminates unnecessary noise with a Direct Digital Interface, intelligent Micro Electro-Mechanical Switches (MEMS) in the RF coil design and exceptional SNR and sensitivity from surface coils. TDI also delivers superior homogeneity and deeper signal penetration with an upgrade path to Digital Surround Technology (DST), including compatibility with higher channel coils.

“TDI and the complete digital signal gave us a future upgrade path with 16-channel coils and other high-channel coils.”

Jill Oliver

Plus, the reliability of Dunedin Hospital’s SIGNA HDxt scanner over more than a decade of use was an important factor for staying with GE Healthcare’s MR technology.

“If we have robust technology that can keep pace with the future, then it’s possible we can reduce additional imaging tests to answer the clinical question,” says Dr. Smit. “It’s not just the capital outlay but the day-to-day operations and whether we can save on those other peripheral costs and avoid unnecessary or additional imaging.”

Once SIGNA Artist became available, GE Healthcare went to work with a plan that would minimize downtime for the department. The scanner was down for only five days, but what was most impressive was that Dunedin only lost two clinical working days.

“GE had a very good process that was well organized. They planned for a weekend when we didn’t have a long list of scheduled patients,” Jill says.

Adds Dr. Smit “It went as well as any install could go, and it seemed to me to be quite seamless and well-handled.”

Clinical impact

Patient imaging on SIGNA Artist has been impressive so far. Yet, what really stands out to Jill is the increase in SNR.

“The increase in signal has been fantastic. We were pleased with the Optima MR450w, but the addition of the TDI has given us more flexibility. Our quality assurance has increased 26-27% in SNR, delivering higher resolution. Or, we can choose to scan faster at the same SNR.”

Jill Oliver

What Jill and Dr. Smit wanted for their department was a 1.5T workhorse. And, that’s exactly what they got with the SIGNA Artist and the SIGNA™Works productivity platform of applications.

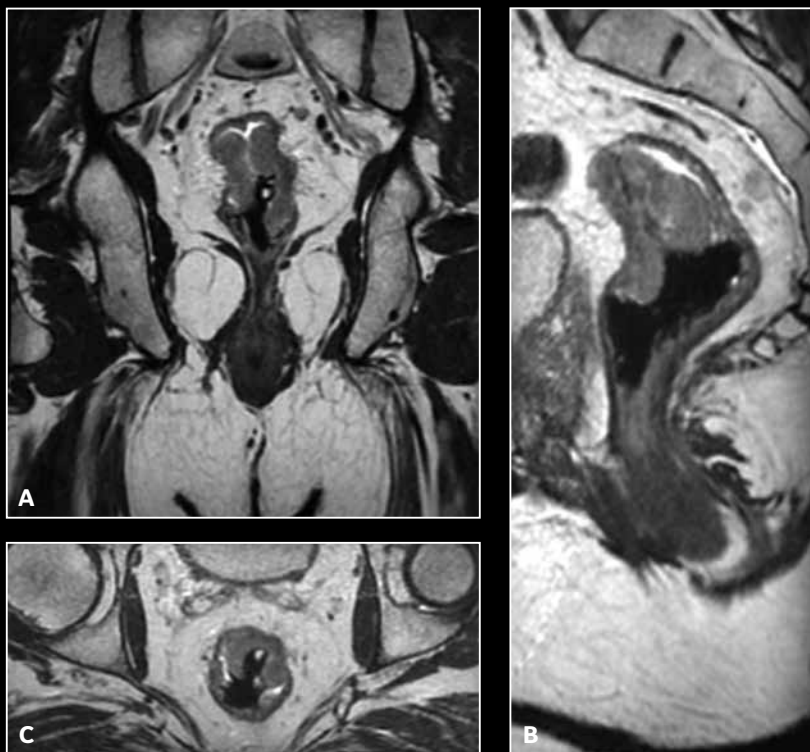


Figure 2. HyperCube + HyperSense in a patient with rectal cancer. Scan time 4 min, FOV 26 x 23.4 cm, slice thickness 1.2/0.6 mm.

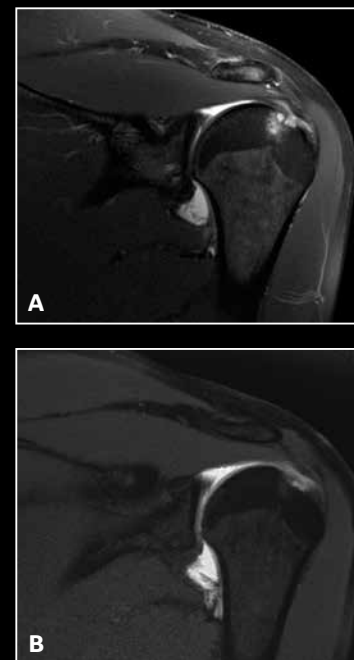


Figure 3. 16-channel Shoulder Coil + PROPELLER MB. (A) Coronal T2 FSE PROPELLER MB 3/0.6 mm, 16 cm FOV, 3:26 min acquisition. (B) Coronal T1 FSE 3/0.6 mm, 16 cm FOV, 3:30 min acquisition.

Dr. Smit has found that HyperSense delivers clearer abdominal images with less patient movement due to the reduction in scan time. The department has shaved 4 seconds off Coronal FIESTA sequences of the liver with excellent image quality and signal. Dr. Smit says the department also performs a lot of liver imaging for HCC, metastatic disease and post-RF ablation. It's these types of cases where the fast scans for contrast enhancement really make a difference.

HyperSense can also be utilized to gain spatial resolution while maintaining scantimes. This is especially important in Magnetic Resonance CholangioPancreatography (MRCP) exams in cases of suspected sclerosing cholangitis.

“I can see the narrowing and dilation of the intrahepatic ducts more clearly and have more confidence in the findings.”

Dr. David Smit

HyperSense and HyperCube are regularly used in pelvic imaging. According to Jill, the ability to reformat an Axial 3D HyperCube into Coronal and Sagittal planes along with TDI are making a big difference in the quality of fast scanning techniques.

Dunedin Hospital also does a large volume of prostate cancer imaging, where the new synthetic diffusion, MAGic DWI, and FOCUS diffusion sequences are regularly used. “I’m more confident with a prostate cancer diagnosis than I was before, and these

two sequences are a large part of that from my perspective,” says Dr. Smit.

Adds Jill, “The image quality for prostate is shockingly good at 1.5T with the new DWI sequences.” There is a large demand for prostate MR in the area, and Jill anticipates Dunedin can help alleviate existing backlogs with the speed and quality of the new MR system. She believes they are delivering the highest quality 1.5T MR prostate exams in their region.

DISCO is also regularly used in both prostate and liver imaging for its high temporal resolution. In the liver, DISCO has helped with the timing of breath-hold acquisitions.

For orthopedic imaging, FSE Flex in the spine and large field-of-views (FOVs) have also resulted in excellent image

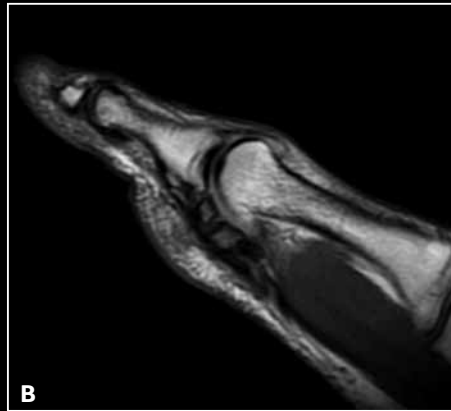
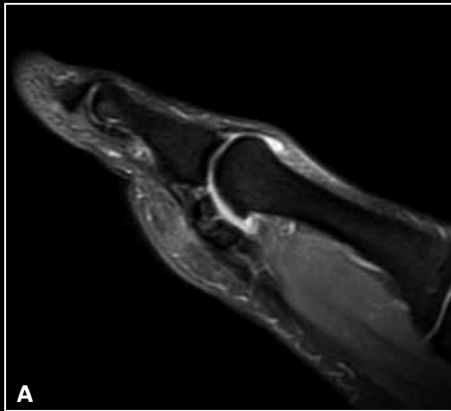


Figure 4. High-resolution imaging of patient with "Turf Toe," using the 16-channel Small Flex Coil. Sagittal FSE Flex PD and PD FatSat, 3/0.3 mm, 320 x 224, scan time of 2:24 min. (A) Water, (B) in-phase and (C) Coronal T1.

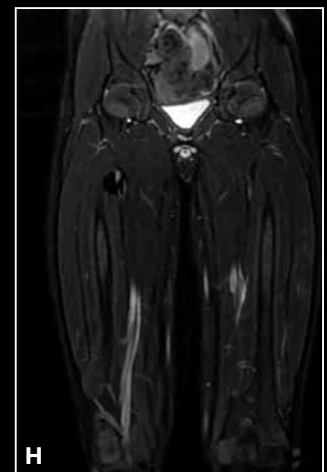
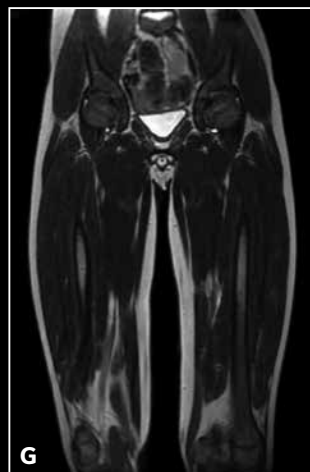
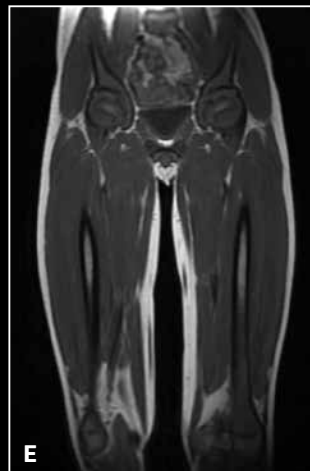


Figure 5. A 10-year-old patient with suspected Gaucher's Disease. Protocol: Sagittal lumbar T1 & T2 with/without FatSat + Coronal femoral T1 + T2 without FatSat. Total exam time was 15 min versus 1 hour on prior system. (A, B) T2 FSE FLEX 3:30 min; (C, D) T1 FSE FLEX 3:20 min; (E, F) T1 FSE FLEX 3:03 min, in-phase and water only; and (G, H) T2 FSE FLEX 3:55 min, in-phase and water only.

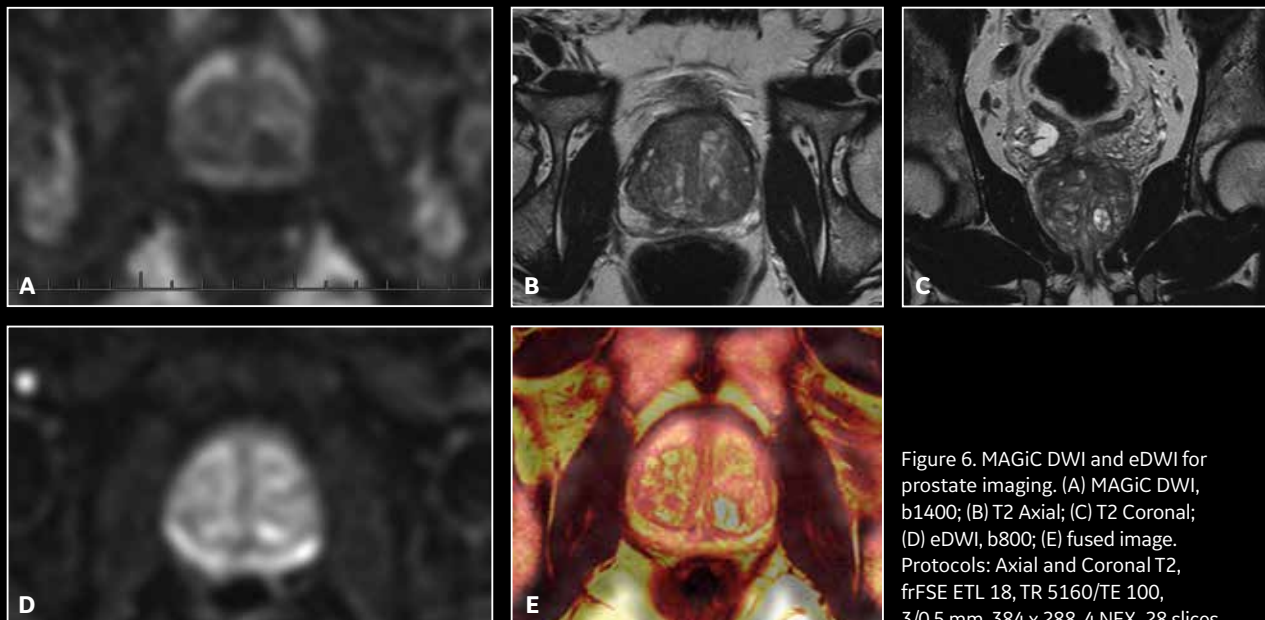


Figure 6. MAGiC DWI and eDWI for prostate imaging. (A) MAGiC DWI, b1400; (B) T2 Axial; (C) T2 Coronal; (D) eDWI, b800; (E) fused image. Protocols: Axial and Coronal T2, frFSE ETL 18, TR 5160/TE 100, 3/0.5 mm, 384 x 288, 4 NEX, 28 slices.

quality. Based on this success, Jill intends to utilize it in smaller FOVs such as the hand, foot and wrist. The Proton Density (PD) sequence—both with and without FatSat—has produced very good, high-resolution images and is useful for differentiating bone infarction from osteomyelitis while also helping to shorten scan times.

Whole-body MR in rheumatology patients is another area where the SIGNA Artist shines. Although the exam includes the use of multiple integrated coils, patients have tolerated it well and Jill says they are getting really good images using whole-body STIR and whole-body T1 sequences.

“The key improvement is the uniformity over large FOVs, and that is really why the whole-body imaging on this system is so much better—it is predictable and that enhances clinical confidence,” Jill says.

Adds Dr. Smit, “Rheumatologists rely on MR for determining the best area to biopsy. As a radiologist, we don’t want to review MR images with a lot of flare as we are looking for brightness in the muscle. With this system and using many of these new imaging techniques, we are now much more confident that the signal in the muscle is truly abnormal. In the past, we didn’t always have that clarity of identification.”

Thanks to the speed and precision of SIGNA Artist and SIGNA™Works, patients are more comfortable and there has been a noticeable reduction in the use of sedation and general anesthesia. The ability to image a patient feet first has also enhanced satisfaction.

“Feet-first imaging is a real plus for our patients,” says Jill. “They have tolerated it so much better.”

Jill also feels rather “spoiled” by GE Healthcare and its support teams given the geography of New Zealand being separate from other countries. Anytime Jill has a question she can pick up the phone and get an answer right away—and that filters right down to a higher quality of patient care.

“The SIGNA Artist allows us to help more patients that we might otherwise not be able to help. It really lowers the barrier for patients who have difficulty tolerating MR so we can do what we need to get done on a daily basis, and that has been great for our patients and our clinicians.”

Dr. David Smit

