



Jayson Argyle

Intermountain Healthcare in Salt Lake City, UT

“Child first and always”

philosophy drives investment in advanced MR technology at Intermountain Healthcare

Named one of the top-ranked pediatric hospitals in the nation by *U.S. News & World Report's* 2017-18 Best Children's Hospitals¹, Primary Children's Hospital (Salt Lake City, UT) delivers exceptional care across 10 pediatric specialties, from cancer care to neurology. In fact, the Intermountain Healthcare facility is one of 24 hospitals in the nation to be ranked in all 10 specialties rated by the publication.

“As a dedicated pediatric hospital, we strive to have an environment where we have the full gamut of pediatric imaging, whether it is for a routine study to rule something out or the most complex scenario working with neurosurgeons or oncologists,” says Jayson Argyle, Director of Imaging for Intermountain Healthcare. “What really differentiates us is our ability to care for these children. Our philosophy is child first and always.”

Embracing that commitment to pediatric care, Primary Children's was one of the first hospitals in Utah to implement a 3.0T MR system in 2005. A decade later, the hospital replaced its 60 cm 3.0T MR with the Discovery™ MR750w, a 70 cm wide bore system.

“We wanted to stay on the cutting edge of technology with the more robust sequences that became available, such as the T1 PROPELLER and PROPELLER Multi-Blade,” says Derek Maxfield,

MR Supervisor. When GE Healthcare launched its SIGNA™ Lift program, enabling existing Discovery MR750w sites to upgrade to SIGNA™ Architect, Primary Children's embraced the opportunity.

SIGNA Lift allows facilities to reset the life of an existing GE MR scanner with new applications and the latest generation hardware. The new system includes the SIGNA™Works productivity platform and new electronics, software and hardware that are built around the site's current magnet.



Derek Maxfield

Intermountain Healthcare in Salt Lake City, UT



Brian Davis

Primary Children's in Salt Lake City, UT



Figure 1. Auto Navigated MRCP in 4 min.

“Often, there is a financial concern when the question of a new scanner is brought up,” Maxfield adds. “However, we worked with GE through the SIGNA Lift program to navigate that concern and make it affordable so we could acquire the best technology.”

Adds Argyle, “We did our due diligence and looked at the pros and cons of a new system versus keeping our magnet intact and upgrading the software and hardware. It made more sense economically and clinically to go with the upgrade.” The hospital also avoided the added expense of construction to remove and replace the existing magnet.

Not only was the upgrade cost-effective, it was streamlined. The GE engineering and applications team arrived on a Thursday, worked through the weekend and had the upgraded scanner back up and running by the following Tuesday.

“We were able to move the patients requiring an MR study to other areas where we had a scanner available, such as scheduling outpatients in our satellite clinics,” says Maxfield. “The entire process was rapid and minimized the negative impact on our patients.”

Embracing advanced apps

“When we first turned it on and started scanning with it, my first impression was that this is what 3.0T scanning

should be,” says Maxfield. “You get more of everything and less of what you don’t want.” Having scanned with first generations of 3.0T MR scanners, he has seen first-hand the leap in technological advancements.

For example, dielectric effects that can exist in 3.0T imaging have been resolved with SIGNA Architect thanks to the new RF receive chain. SAR is also greatly reduced.

“It opens the door to shift exams from one scanner to another based on clinical and patient needs.”

Derek Maxfield

Technologists at Primary Children’s are always trying to achieve the best possible image quality. With Total Digital Imaging (TDI) on SIGNA Architect, they can achieve increases in image quality thanks to the reduction of noise with Direct Digital Interface (DDI), intelligent Micro Electro-Mechanical Switches (MEMS) in the RF coil design and exceptional SNR and sensitivity from surface coils along with superior homogeneity and deeper signal penetration with Digital Surround Technology (DST).

The imaging team was also interested in the 3D imaging options, particularly SIGNA™ Works’ Auto Navigated Turbo LAVA free-breathing Magnetic Resonance CholangioPancreatography (MRCP).

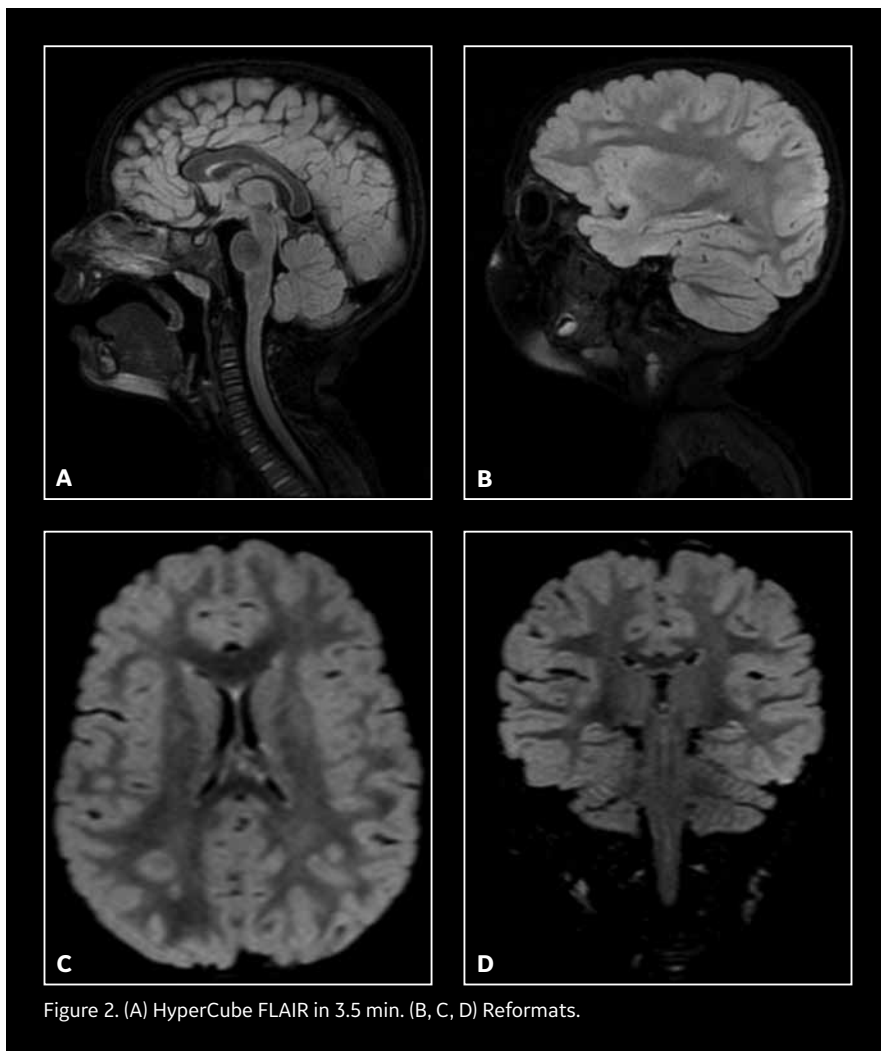


Figure 2. (A) HyperCube FLAIR in 3.5 min. (B, C, D) Reformats.

Auto Navigator further combats respiratory motion in abdominal imaging. In addition to MRCP, Auto Navigator is also compatible with other pulse sequences such as diffusion, dynamic T1 imaging and PROPELLER MB.

Maxfield recalls a situation when the department was behind schedule and therefore, decided to try an abdomen exam on the SIGNA Architect. Maxfield explains, “Previously, we wouldn’t have tried it due to the respiratory motion in the abdomen. When we applied the Auto Navigator in conjunction with T2 and MRCP, I saw that this is a whole new ballgame and we need to rethink our abdominal imaging protocols and consider moving to 3.0T.”

Another key advancement on the new MR system at Primary Children’s is HyperWorks, which includes HyperCube, HyperBand and HyperSense. HyperCube expands the capabilities of 3D imaging by allowing the department to reduce scan times and reduce artifacts such as motion and aliasing. HyperBand enables the acquisition of more slices or directions in diffusion imaging while HyperSense is an acceleration technique based on sparse data sampling and iterative reconstruction for faster imaging without the penalties commonly found in parallel imaging.

“Using Cube FLAIR with HyperSense, we are able to get that sequence down to

under 4 minutes with as much signal as a longer sequence. That is just amazing,” Maxfield explains.

In neuro imaging, Maxfield is evaluating MAGnetic resonance image Compilation (MAGiC) to understand its benefits. “It’s a huge advancement that we are very excited about,” he says. With a single MAGiC scan, Maxfield can get multiple image contrasts including T1, T2, Inversion Recovery (e.g., T1 FLAIR, T2 FLAIR, STIR, PSIR and DIR) and PD contrasts of the brain. He can also change the contrast of the images post acquisition by manipulating TR and TE values after the patient has left, which helps ensure no detail is missed and also avoids call backs and rescans if the wrong contrast was acquired.

GE Healthcare’s new 48-channel TDI Head Coil is also making heads turn with the increase in SNR. Brian Davis, Manager of the Imaging Department at Primary Children’s, says he has received great feedback from the radiologists and neurosurgeons who rely on the MR images for pre-surgical planning.

“They have never seen so much signal in a neuro MR exam. They are learning and growing with the technology because the images do look so much different due to the added SNR.”

Brian Davis

With FSE Flex, a Dixon-based 2D and 3D dual echo fat-water separation technique, Maxfield can see the uniform fat suppression in one of the most challenging areas to image—the soft tissue in the neck. Reliably, reproducibly and with no increase in time, he can achieve exceptional T1 and T2 fat-suppressed images.

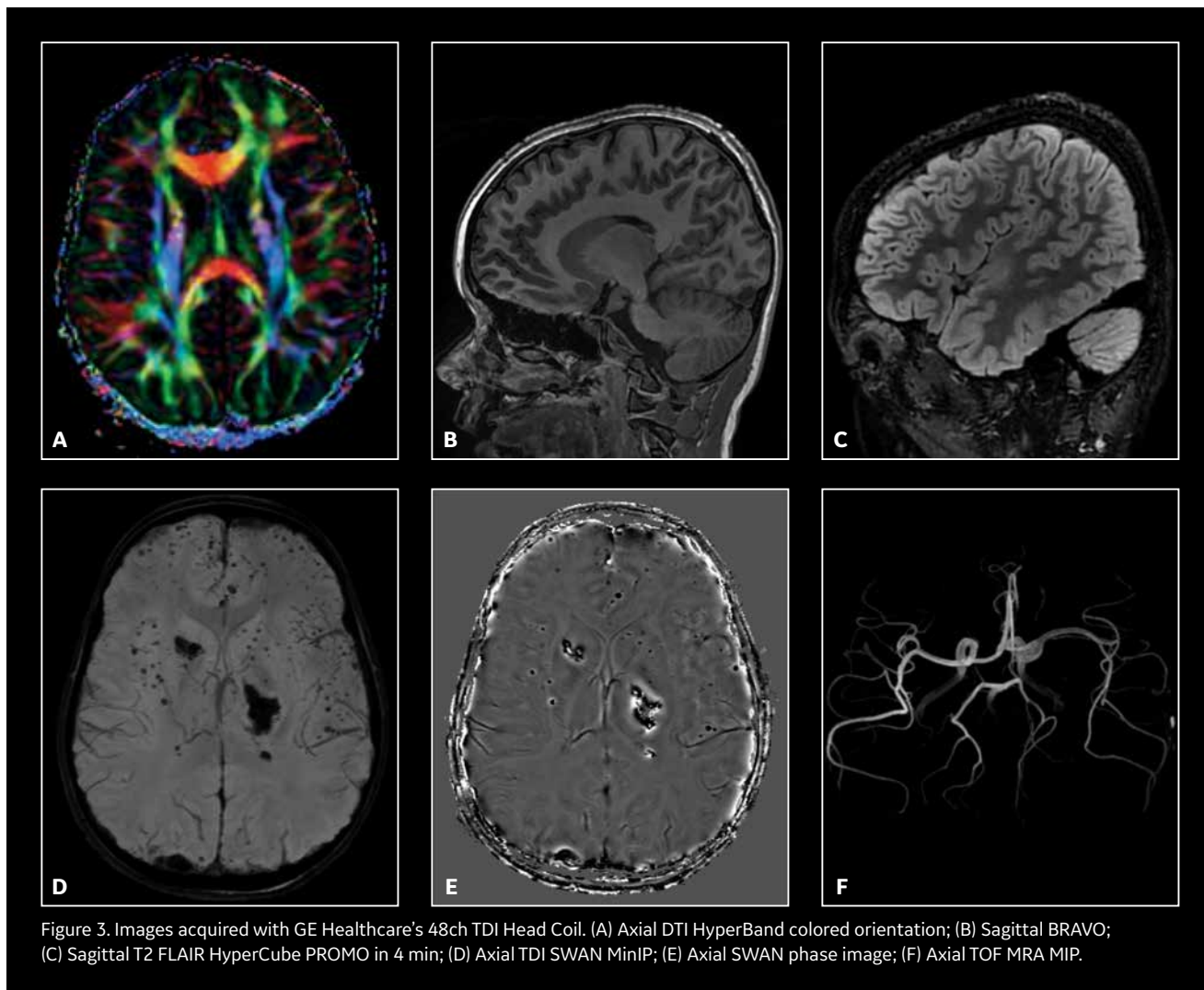


Figure 3. Images acquired with GE Healthcare's 48ch TDI Head Coil. (A) Axial DTI HyperBand colored orientation; (B) Sagittal BRAVO; (C) Sagittal T2 FLAIR HyperCube PROMO in 4 min; (D) Axial TDI SWAN MinIP; (E) Axial SWAN phase image; (F) Axial TOF MRA MIP.

“This is really what neuro images should look like... we are just raising the bar on imaging with this system and the 48-channel TDI Head Coil.”

Derek Maxfield

In orthopedics, which represents a large portion of the MR imaging service at Primary Children's, PROPELLER, T2 and the increased SNR are making a big difference. In moderately compliant teenaged children, technologists are now adding PROPELLER to account for any slight motion. The new generation high-density coils—the 18-channel T/R Knee, 16-channel T/R Wrist and the 16-channel Shoulder—are helping

to propel faster imaging speeds with increased image quality and resolution.

GE Healthcare's Flex Coils are also making an impact in patient care. While the imaging team tries to use dedicated coils whenever possible, Maxfield recalls a situation where a Flex Coil was used for spine imaging on a 4.5 lb. infant.

“The Flex Coils let us fill that gap for comprehensive body imaging and are our second line of defense when we don't have a coil to fit on a particular body area,” he says.

Derek Maxfield

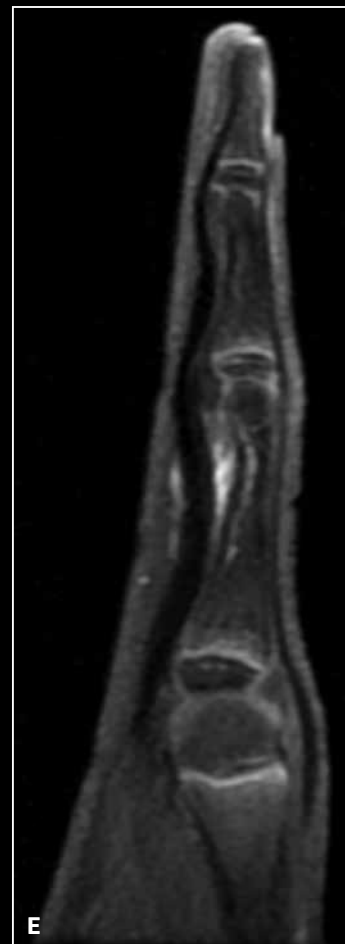


Figure 4. FSE Flex: (A) Sagittal PD FSE Flex in-phase and (B) water knee images; (C) Sagittal T1 FSE Flex in-phase and (D) water ankle images; and (E) Sagittal T1 FSE Flex finger image.

A Caring Suite

Calming anxious pediatric patients and their parents is a challenge in medical imaging and especially in MR. To help alleviate anxiety and fear of the MR scanner, Intermountain also implemented GE Healthcare's Caring Suite, an environment designed to help improve and humanize the patient experience through the reassuring senses of sight, sound and touch.

Sometimes, the most difficult aspect of a pediatric MR exam is that initial break from the parent—the child may cling to their parent and may be unwilling to enter the scanner.

“The Caring Suite really engages the child as they enter the room by providing a calming atmosphere and ambience. They can change the colors in the room, interact with pictures and watch a video on the TV, so they really feel in control. It really helps break that psychological barrier and also helps us to gain their trust and respect.”

Brian Davis



Figure 5. PROPELLER MB images: (A) Axial and (B) Coronal T1 FatSat of the shoulder and arm; (C) Sagittal T2, (D) Sagittal T1 FLAIR, (E) Sagittal T2 STIR, (F) Axial T1 and (G) Axial T2 of the L-Spine.

From the advanced SIGNA™ Works applications to the powerful new TDI and the Caring Suite, SIGNA Lift has enabled Intermountain to tap into all that the SIGNA Architect has to offer. According to Maxfield, in addition to benefiting patients, the system is also a great recruitment tool for attracting the best and brightest technologists.

Argyle points out that financial pressures will continue in healthcare and the upgrade path through SIGNA Lift is an excellent option that allows

facilities to spend more of their budget on acquiring the latest technology while spending less on construction.

Reference

1. U.S. News & World Report. Best Hospitals 2017-18. Available at: <https://health.usnews.com/best-hospitals/area/ut/primary-childrens-medical-center-6870280>.

“The ability to upgrade also offers a site that is growing or starting out with less advanced procedures a pathway to progress into new capabilities and more complex studies in an efficient and cost-effective timeframe,” says Argyle. “Most important for us, this has been an excellent tool that helps us focus on our philosophy of the child first and always.”

Jayson Argyle

