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MR Excellence Program is a beacon for optimizing MR imaging workflow and the patient experience

The MR Excellence Program and Imaging Insights dashboards unlock clinical value and operational efficiency through data intelligence and human expertise for targeted, individualized patient care. By measuring the current status of MR imaging throughout a department or center, facilities can improve MR imaging services to enhance the delivery of care and the patient experience.

Kirchberg Hospital, part of the Robert Schuman Hospital Foundation, is a multi-disciplinary healthcare provider situated in the Kirchberg quarter of Luxembourg City, Luxembourg. Comprised of four facilities—the Clinique Bohler, specializing in OB/GYN; the ZithaKlinic, a free-standing multi-specialty clinic; the Clinique Sainte-Marie, specializing in geriatric medicine; and Kirchberg Hospital. The facilities were organized under one foundation with the goal to further modernize and enhance the quality of care delivered to the residents of Luxembourg.

On average, 200,000 imaging exams are performed yearly across all four sites. Combined, the facilities have three MR systems, three CT scanners, seven radiology rooms, two mammography systems and four ultrasound machines. Since 2011, Kirchberg Hospital has collaborated with GE Healthcare in the evaluation of new solutions, including

DoseWatch, GE's dose management solution, in 2011 and the MR Excellence Program in 2018.

The MR Excellence Program combines machine-based data intelligence (Imaging Insights analytics) with human expertise (customer success experts) to unlock clinical value and operational efficiency within a radiology department. It uses LEAN and Change Acceleration Process tools to help department managers and staff better understand the data and make the appropriate decisions to enact clinical and operational improvements.

Imaging Insights is a set of dynamic and comprehensive dashboards that provide key acquisition and analytic measures that radiology department staff rely on to deliver excellence in imaging services. A multi-modality and vendor agnostic solution, Imaging Insights combines machine data

with workflow data from radiology information systems to measure key performance indicators (KPIs) in radiology.

As Radiology Manager for all four facilities under the Robert Schuman Hospital Foundation, Paolo Sana is committed to digitizing healthcare and elevating quality through advances in imaging technology. He was involved in the DoseWatch evaluation while in a prior position at the hospital and has been a key contributor to the evaluation of MR Excellence. The hospital has a SIGNA™ Artist 1.5T that performs on average 6,900 exams each year.

"The MR Excellence Program allows us to evaluate the impact of the operation and clinical improvements we took, step-by-step, to allow for a stable and sustainable change in our department," Sana says.

The MR Excellence Program was implemented at Kirchberg Hospital to help harmonize protocols across the same clinical indication, optimize scheduling times and monitor MR utilization and performance.

"When you discover the Imaging Insights dashboards, it is similar to when you discover the dashboard of your new car for the first time. Very quickly, you become familiar with it and can configure the dashboards to make them more useful and comprehensive to your facility and your specific clinical or operational needs."

Paolo Sana

Sana credits the development of a data team at Kirchberg Hospital during the DoseWatch evaluation and the inclusion of the staff that uses the SIGNA™ Artist each day for the success of the program. It is that teamwork and the feedback that helped drive decisions.

"We need the input of people from the field, who are most able to compare the data to their experiences so that the analysis and decisions fit with the clinical reality," he adds.

Sandrine Debelle, Radiographer and MR Excellent Program Leader at Kirchberg Hospital, agrees with Sana's assessment that a key first step is to customize the dashboards to the department and facility.

"You want consistency between the analytics and what is happening in the clinical routine," Debelle says. "Depending on your goals, the KPI indicators can be very different."

Since Kirchberg Hospital was involved in the test and pilot phase in the development of MR Excellence, there was a lot of communication and feedback with GE, including a team of digital experts. The collaboration between GE digital experts and the data team at Kirchberg Hospital was a main factor for the project's success.

Working with GE's digital experts as a part of the MR Excellence Program also helped Debelle tailor the indicators to the hospital's specific goals. She refers to this collaboration and guidance as the hospital's GPS, helping to sort out the tremendous volume of data that can be pulled from the Imaging Insights dashboards.

"Do not underestimate the importance of the data team," adds Sana. "They are really the pillars of the project and should be the first thing put in place before starting this type of project."

As a result of the successful pilot project, Kirchberg Hospital has purchased the MR Excellence solution and Debelle is excited at the prospect of implementing it.

The pilot project

Several key areas were targeted for the pilot evaluation project using Imaging Insights dashboards at Kirchberg Hospital: scheduling, protocol standardization, clinical excellence and patient experience.

"Without hesitation, MR Excellence improved scheduling for MR exams. Thanks to the dashboard analytics, we were able to quickly compare the schedule duration to the actual exam time. We then adjusted our exam scheduled slots so they fit with reality. As a result, we had an 11 percent increase in the volume of knee exams in just a few weeks, for example."
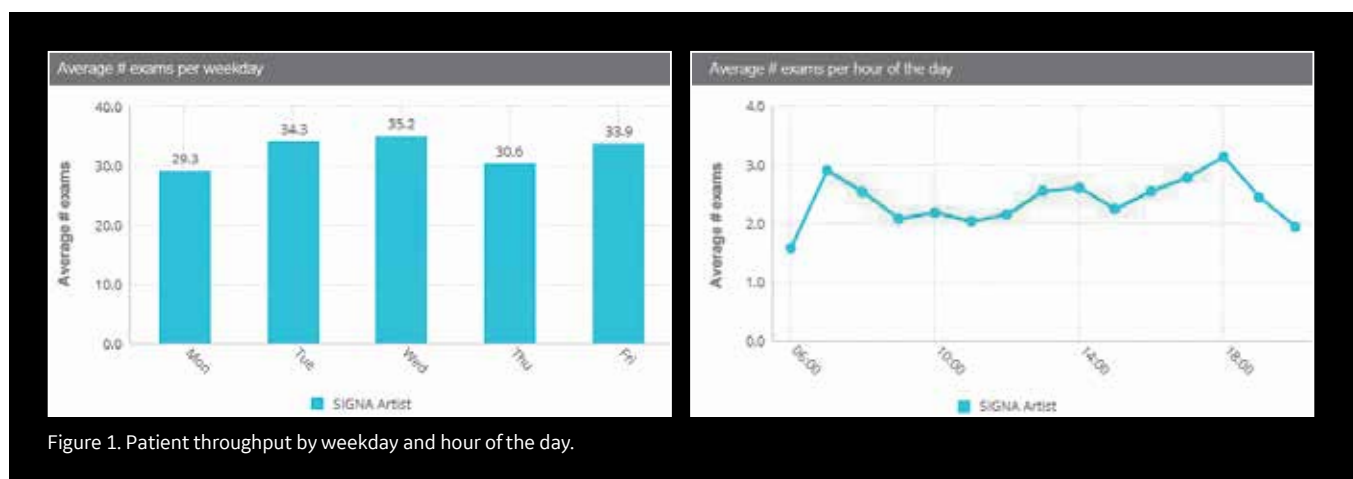
Paolo Sana

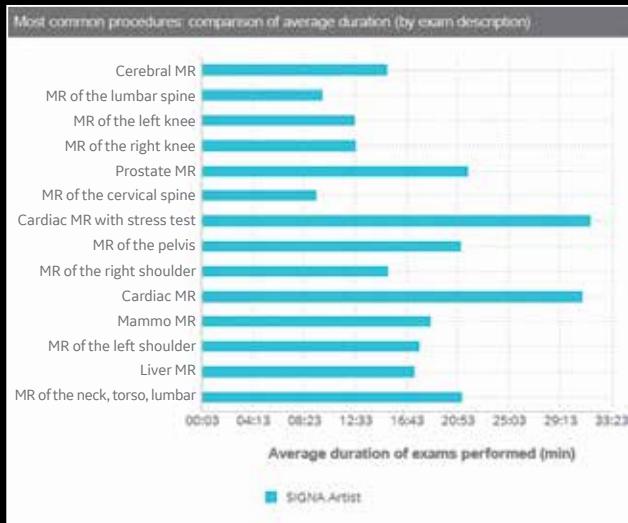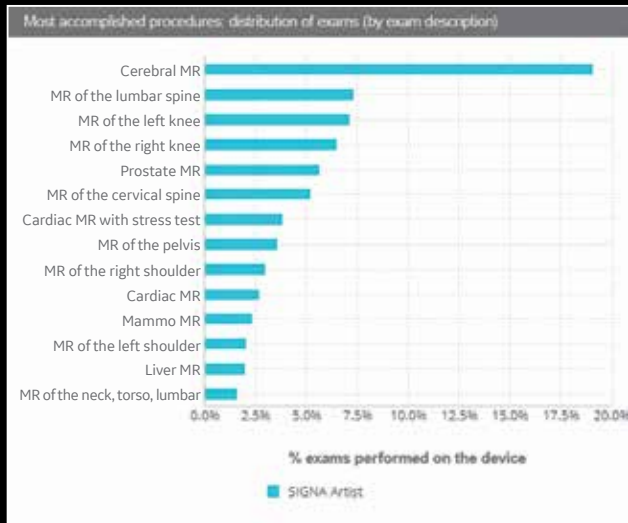Figure 1. Patient throughput by weekday and hour of the day.

Figure 2. A comparison of the most common MR exams (distribution) with the average exam duration.

Study description	System	# exams	Status	% difference	Scheduled slot (min.)	Total appointment time (min.)	Setup time before exam	Exam duration P75 (min.)	Setup time after exam (min.)
Cerebral MR	SIGNA Artist	618	●	8.9%	20	22	2	18	2
Cardiac MR with stress test	SIGNA Artist	333	●	16.1%	40	46	5	36	5
Cardiac MR	SIGNA Artist	223	●	11.2%	40	44	4	36	4
Prostate MR	SIGNA Artist	126	●	2.6%	30	29	2	25	2
Liver MR	SIGNA Artist	117	●	30.0%	20	26	2	22	2
MR of the left knee	SIGNA Artist	101	●	24.2%	15	19	2	15	2
MR of the right knee	SIGNA Artist	96	●	23.3%	15	18	2	14	2
MR of the lumbar spine	SIGNA Artist	93	●	10.4%	15	17	2	13	2
MR of the right shoulder	SIGNA Artist	86	●	13.3%	20	23	3	18	2

Figure 3. A comparison of the scheduled versus actual exam slots led to a reduction in appointment times for several common MR exams.
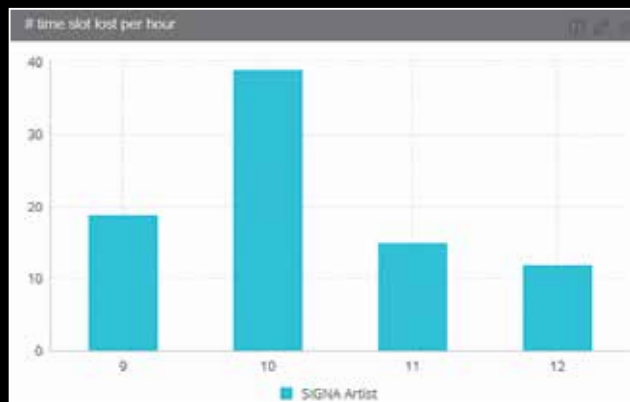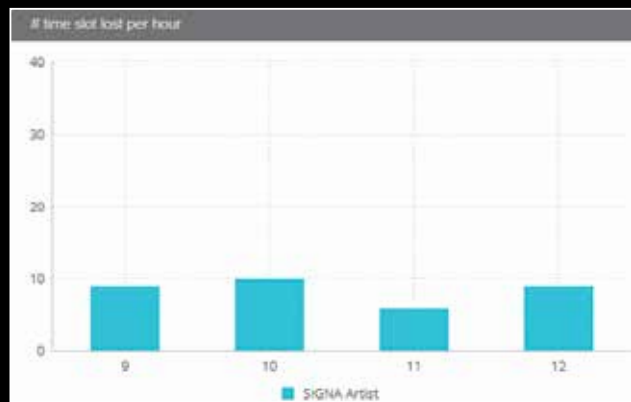
Before (Q4'17)   After (Q3'18)

Figure 4. With the Imaging Insight dashboards, inactive time of the MR scanner was quantified, leading to a change in scheduling rules.

Figure 5. Waiting times decreased by approximately 15 days.

In addition to evaluating the schedule for knee exams, the team also analyzed lumbar spine and cervical spine exams and found that the scheduling for all three exams could be reduced to 15-minute slots. This increased the volume of exams but also shortened patient wait times to get an appointment.

"This impact shows how using the dashboard analysis to make a decision can improve the patient experience. It has also changed the way our staff works with the introduction of MR Excellence. There has been less downtime because we can detect inactivity slots, understand why they are happening and take action to reduce them."

Paolo Sana

According to Debelle, any change made based on the Imaging Insights dashboard data goes through a step-by-step process. The data team first follows the indicators and analyzes the data. Then, modifications are proposed and communicated to all stakeholders. With the Imaging Insights dashboards, she could analyze exam duration with exam distribution to identify the most common and most lengthy MR exams (Figures 1 and 2).

For example, the first step is to assess throughput for each day and each hour of the day. Then, by evaluating the exam mix and average duration, Debelle can investigate how to improve quality of care and workflow. She can compare scheduled exam times with the actual appointment time (Figure 3) and MR system downtime (Figure 4) to quantify the time that the SIGNA™ Artist is idle and not scanning patients.

"From this data, we were able to determine that at 10 am and 11 am, we had 20 minutes of inactivity, or no patient scanning, in the MR room," Debelle explains. "By changing our scheduling rules, we were able to reduce the inactivity by almost 30 percent for a more consistent patient workflow."

The result has been a 15 percent increase in patient throughput, or an average of 16 more exams each week. Further, patient wait time to get an appointment for a knee, lumbar spine or cervical spine exam—the hospital's top three MR procedures—decreased by 15 days (Figure 5).

Protocol standardization was another key area where Kirchberg Hospital utilized the power of MR Excellence to measure and quantify variability.

"We have always placed a priority on our radiologists' opinions and their different ways of working and reading studies," says Sana. This process, common for many hospitals, led to changes in protocols and an increase in the number of protocols for a particular exam.

Consistency of studies is a factor in the overall quality of MR imaging, from the image acquisition to the interpretation. Plus, having more protocols means it takes more time and work to optimize each variation for image quality and acquisition time.

Protocols used in Q4'17 for the head exam		Protocols used in Q3'18 for the head exam	

Study protocol name	# exams SIGNA Artist
1 CRANE HK	228
1 CRANE	83
1. HYPOPHYSE	16
1.CAI HK	10
1 CRANE REDUCTION ACOUST	4
ORL	4
1 CRANE ACCUSTIC REDUCTI	2
1 CRANE AVC HK	1
1 CRANE AVC	1
1 CRANE PEDIA	1
1 CRANE FLEX CLAUSTRO	1

Study protocol name	# exams SIGNA Artist
1 CRANE HK	400
1. HYPOPHYSE HK	29
1 CRANE AVC	26
1.CAI HK	9
1 CRANE ACCOUSTIC REDUCT	6
ORL	1

Figure 6. A 47 percent decrease in the number of protocols.

Using the Imaging Insights dashboard, Debelle was able to analyze protocol variations by exam type. She could also see which protocols were most often utilized. Based on this analysis, the department decreased the number of protocols on the SIGNA™ Artist by 47 percent (Figure 6).

"Every protocol is now optimized for image quality and acquisition time and dedicated to the particular indication," Debelle says. As an example, the department had 11 protocols for a head exam prior to the MR Excellence Program; after implementing the MR Excellence Program, the hospital has six protocols for head exams.

An improved imaging experience
The MR Excellence Program allows Debelle to be more aware of the many factors that can influence patient workflow. Through the Imaging Insights dashboard, the MR Excellence Program enables her and her team to find new ways to improve workflow, scheduling, clinical excellence and the patient experience.

"Participating in the pilot evaluation of the MR Excellence Program has allowed me to discover a new, important facet of my job that is very closely tied to the MR exam," says Debelle. "This data allows us to find areas of improvement in the planning and workflow that really enable a team approach to embrace and implement change."

A key facet of the program was to create buy-in from the staff at all levels. Sana and Debelle shared the goals with the MR team, specifically how the data could help improve patient management and workflow and create a more efficient and productive working environment.

"We wanted the MR team to see the data and dashboard as a tool that facilitates our daily work and allows the caregiver to spend more time with the patient," says Sana. "The entire digitization of the hospital in general is to enhance the quality of care we can deliver and further benefit the patient experience. Patients are more aware today of how their care is delivered, from waiting times to the caregiver's empathy."

With the explosion in imaging utilization over the last two decades coupled with the emergence of information technology (IT) and digitization in healthcare, patients may feel disconnected from their caregivers and the care process. MR Excellence provides an opportunity to utilize data and IT to identify areas of improvement in the entire imaging workflow.

"The MR Excellence Program and the Imaging Insights dashboards are like a lighthouse that delivers a live view of the MR imaging department, so we can improve performance, optimize system utilization and reduce variability, all which impact the patient experience."

Paolo Sana Ⓢ