Healthcare transformation, we’ll take you...

The future of radiology

INTERVIEW INSIDE WITH:

» Jan Leeuws on Agfa HealthCare’s commitment to dose reduction
Radiology has a unique position in the patient care continuum: through imaging and reporting, radiology interacts and interfaces across the board with every player, from the referring physician, to the clinician, to the patient themselves.

So in a patient-centric healthcare model, no one is better placed than the radiologist to provide the connection between them all.

The radiologist, armed with expertise and specialization, can act as consultant, advisor and active participant in the patient’s care. But to access these opportunities to add value, the radiologist needs support – support that will increasingly be offered by new technologies and tools that are now coming into play.

These tools are paving the way for the radiology department to become an image management competence center for the hospital – making the radiologist the “information manager”! They enhance the radiologist’s imaging role, for example, by allowing a decrease in patient dose and by extending the clinical depth of radiology analysis. But they also enhance collaboration – across desktops, departments and hospital walls to reach every stakeholder in the patient’s care.

With its long history in imaging, Agfa HealthCare has the vision and knowledge to support the radiologist’s path into this future. In the pages of this THERE magazine, we will show you how our clinical imaging diagnostic platform maximizes the value of radiology. How our solutions provide a smarter radiology workflow and allow greater clinical decision support. How they help the hospital reach its goals and objectives with business analytical tools.

Our solutions help the radiologist to see more clearly and to share that clarity. And ultimately to create stronger links between care givers and patients.

© 2014 Agfa HealthCare NV. All rights reserved. Published by Agfa HealthCare NV B-2640 Mortsel – Belgium.
Delivering on dose reduction promises

Dr Steven Mendelsohn, Chief Executive Officer/Medical Director of Zwanger-Pesiri Radiology, New York, explains his commitment to dose reduction and why he believes a change in attitudes will be driven by patients rather than radiology professionals.

"Agfa HealthCare was telling me about the DX-D 300’s dose reduction capabilities... Much to my surprise it was able to provide high image quality at a lower dose."

Dr Steven Mendelsohn, Chief Executive Officer / Medical Director

With more than 60 years’ experience in the field of radiology, Zwanger-Pesiri is one of the largest non-hospital based radiology practices in the US today. Committed to investing in only the latest technology, its 12 Long Island sites serve 2,000 patients a day. Its staff of 60 radiologists comprises a number of specialties including Vascular Imaging, Interventional Radiology, Neuroradiology, Musculoskeletal Imaging, Abdominal Radiology, Cardiovascular Radiology and Breast Imaging.

With such a diverse and large patient base and so many radiologists to manage, workflow is a key consideration, which is why the DX-D 300 DR system, with its Cesium Iodide detector technology and immediate image availability, was its solution of choice.

"We installed our first Agfa HealthCare DR solution, the DX-D 300, in our Elmont site in August of 2013," says Dr Mendelsohn. "We chose it primarily because the workflow was so efficient, it was easy for the technologists to set up and the images were quickly available. At the time, Agfa HealthCare was telling me about its dose-reduction capabilities, but, to be frank, I didn’t really believe them. But they kept on telling me about it so we decided to set up a study to compare the results.

"We had two competitive units from other suppliers available on the same site, so that provided the ideal opportunity to test out what we were being told."

The study parameters

The study sought to determine if the DX-D 300 required less exposure and patient dose versus two other systems in use at Zwanger-Pesiri Radiology. It also compared the doses used to those used for similar examinations in other facilities, based on available published studies[1]. The study comprised PA Chest, Lateral Skull and AP Hand exposures taken on phantoms used to simulate patient exposures. In each case the phantom was positioned just as a patient would be and the standard exposure made.

Workflow rather than dose reduction the initial driver

“We installed our first Agfa HealthCare DR solution, the DX-D 300, in our Elmont site in August of 2013,” says Dr Mendelsohn. “We chose it primarily because the workflow was so efficient, it was easy for the technologists to set up and the images were quickly available. At the time, Agfa HealthCare was telling me about its dose-reduction capabilities, but, to be frank, I didn’t really believe them. But they kept on telling me about it so we decided to set up a study to compare the results.

“We had two competitive units from other suppliers available on the same site, so that provided the ideal opportunity to test out what we were being told.”

Average dose reductions of 41% achieved

The results showed that while the amount varied depending on the type of exam, the average dose on most was 41% lower with the Agfa HealthCare system versus the other systems—an admittedly unexpected result for Zwanger-Pesiri.

Says Dr Mendelsohn, “Much to my surprise, the DX-D 300 was able to provide high image quality at a lower dose. For me, that’s great in one way and possibly bad in another. It’s good because we can promote our commitment to dose reduction to our patients and now have the figures to prove it, but,” he adds laughingly, “it could possibly be bad because Agfa HealthCare will want to raise the price we pay! Although, to be honest, I would be prepared to pay a little more for the level of dose reduction we achieved. Agfa HealthCare has done a really wonderful job with it.”

The success of the first DX-D 300 has led to the purchase of another five units, because, as Dr Mendelsohn says, “It’s a no brainer. We simply plug and play. They are robust and reliable, with little down time and are competitively priced. Plus, you get the dose reduction.”

Dose reduction has become a compelling story

And dose reduction is a subject on which Dr Mendelsohn believes patients are becoming increasingly well informed.

“However you look at it, radiation is not good but we are in global denial about it. Dose reduction has become a very compelling story; all radiologists need to be cognitive of patient dose and assure that patients are becoming better informed and will increasingly ask questions. But, change will ultimately be driven from the grass roots rather than by the radiologists themselves because our financial model does not currently place a premium on it.”

Sufficiently concerned was Dr Mendelsohn over the need to reduce dose that six years ago he tried an experiment in dose reduction himself at the Zwanger-Pesiri sites. “As we got new CT equipment in, little by little we began lowering the radiation dose used in our studies. We didn’t tell anyone we were doing it and gradually the images became grainier year-on-year. Finally, it got to the point where the radiologists began to comment on it so we asked them: ‘Is it still diagnostic quality?’ and their answer was ‘yes’. So, while radiologists want their images to be crisp and clear, they don’t necessarily need to be such high dose to fulfil their role as a diagnostic tool.”

The best of both worlds

Dr Mendelsohn does acknowledge, however, that with the advent of Cesium Iodide phosphor detectors and MUSICA imaging processing software used as part of the DX-D 300 solution, Zwanger-Pesiri is now able to achieve the best of both worlds—significant dose reduction while still achieving the high quality images that radiologists have come to expect and are more comfortable working with.

And MUSICA is software that has also proven its worth to both Jeanine Santorelli, Zwanger-Pesiri’s Chief Technical Officer and Lead X-ray Technologist Mark Morales, who works out of Zwanger-Pesiri’s Patchogue site.

“With so many sites and such a large population to serve, our biggest challenge is one of workflow,” says Jeanine. “To meet demand, we have a lot of teams that rotate across our sites, so ease of use when switching between solutions is paramount.”

Sample of study results

Entrance Surface Dose (ESD) required for a 23 cm chest. The Agfa HealthCare DX-D 300 DR system required 47% less dose than competitive DR System A and 27% less dose than competitive DR System B.


Dr Steven Mendelsohn, Chief Executive Officer/Medical Director of Zwanger-Pesiri Radiology, New York, USA

MUSICA is software that has also proven its worth to both Jeanine Santorelli, Zwanger-Pesiri’s Chief Technical Officer and Lead X-ray Technologist Mark Morales, who works out of Zwanger-Pesiri’s Patchogue site.

“With so many sites and such a large population to serve, our biggest challenge is one of workflow,” says Jeanine. “To meet demand, we have a lot of teams that rotate across our sites, so ease of use when switching between solutions is paramount.”

Dose reduction has become a very compelling story: all radiologists need to be cognitive of patient dose and aware that patients are becoming better informed and will increasingly ask questions.

Mark agrees: “The capabilities created by Agfa HealthCare’s NX workstations with MUSICA software – the fact that it’s user-friendly, easy to use when correcting errors, has a fairly standardized intuitive user interface and self-explanatory color coded dose bar, as well as its dose reduction capabilities - means that we can get the best image in the shortest possible time. It's what I like to call 'set it and forget it' – you hit a button and it walks you through what you need to do. It's a lot less cumbersome than others I have used.

"Add to that that any time you can get a cassette out of a technologist's hands you up your productivity and with the DX-D 300 our workflow has sped up. The patient has a positive experience and leaves happy."

And a happy patient is Zwanger-Pesiri's ultimate aim, as Jeanine explains. "With the advent of Google and other information sites, patients are becoming more knowledgeable and more prepared to question their dose exposure. It's got to be true that we are using the lowest possible dose for their images. With the automation and accuracy offered by the DX-D 300 with Cesium Iodide detectors and MUSICA, we can speed them through the process and make it easier for referrals to access their information.

"Ultimately, it's all about delivering better quality care for our patients."
Collaboration and specialization: driving forces for healthcare technology

*Today, healthcare is multi-disciplinary; that is simply the reality. What we need to address is how we will deal with this. We already see some standardization, but it will evolve further. Standardized pathways will cover the complete patient care cycle: from initial visit, to diagnosis and treatment, and through follow-up. Scientific and technological standards will also continue to evolve, improving care and increasing predictability and quality of outcome for everybody. At the same time, cost and regulation are driving decision-making and investment, and they will be a market force for the future.*

*Collaboration and specialization – and even sub-specialization – create a dynamic circle. As healthcare professionals increasingly specialize, they must be able to collaborate to offer complete patient care. Simultaneously, the ability to collaborate will encourage more specialization, because the specialist does not have to be an ‘on-site’ contributor.*

*We can and will be able to go wherever needed to find the best specialist for a particular case: to ask for advice from a specialist in Australia if that’s what we need. Right now, this type of cooperation is based on ‘goodwill’. But I am convinced that in the future, we will achieve global exchange and cooperation on a more formal level.*

Technology is no longer the main barrier to collaboration and integration:

*Agfa HealthCare for example has a range of tools that let hospitals work together at a very close level, even if they are geographically remote. But national healthcare systems block hospitals from using technology to cooperate across country borders, on a day-to-day basis. How will we overcome that? It isn’t clear…* 

New models for collaboration, but which will last:

*Certainly, social media and mobile technology are increasingly bringing care providers together. I see especially the younger generation of radiologists at our clinic using mobile applications bringing care providers together. I see especially the younger* 

“This role will go far beyond simply presenting the images. The radiologist must make sense of the images and ensure that imaging offers true added value for the referring physician. Reports have to include not only text and images, but also other information to create ‘actionable knowledge’. Knowledge that allows the clinician to act directly, based on the diagnosis provided by the radiologist.”

“In some places, notably the US, high technology is creating high risks for radiologists, which will impact their future in a different way. The risk of litigation is increasing, and patients sometimes pay for imaging out of their own pockets, so they are more demanding. This makes some radiologists hesitant about using high tech imaging, but it is important not to let the risks prevent adoption of the technologies. Instead, the solution is to mitigate the risk through improved quality control procedures. As an example, at some hospitals, two or three radiologists will interpret the images independently, and then compare the outcome. If they have different conclusions, they organize ‘consensus meetings’.

A holistic approach with a 360° view of the patient

*“This patient-centric, multidisciplinary future of healthcare will involve the use of mobile applications to bring care providers together. I see especially the younger generation of radiologists at our clinic using mobile applications bringing care providers together. I see especially the younger* 

“Next, we will be implementing the HYD-Media™ Archiving and Document Management System (DMS). It will allow us to integrate all patient data and images including business intelligence. So we will be able to view all aspects of the hospital from each and every office, and even analyze everything that is happening across the entire hospital trust. From an operational perspective, this is going to be a very useful tool when we negotiate budgets with heads of departments, because we will have full, analyzable information at our fingertips.

“Another key evolution for us this coming year is moving forward with implementing digital ward rounds. The Agfa HealthCare approach is providing a 360° view of the patient. This means all images and all reports available in the digital system will be accessible wherever required during the care chain, from anywhere in our clinic. If patients in the hospital have to be referred to the ENT department at another of our sites, for example, ENT should be able to see all the info about the patient’s preceding diagnoses and treatment, even before they arrive. To achieve this, everything has to be fully integrated: it’s a holistic approach. We are now working with Agfa HealthCare to make our digital ward rounds a reality by the beginning of next year.

“We are very pleased to continue to work with Agfa HealthCare on meeting our clinic’s evolving needs. Integration is key for us, and Agfa HealthCare is very good at it, especially in terms of innovation and an integrated workflow, providing access to all data to give that true 360° view of the patient. When we work with Agfa HealthCare, we feel that both our organizations are converging industry interests and healthcare provider interests into a single, shared interest. That’s how we will bring down the boundaries to healthcare, together.”
Setting new standards
Diane Smith, Manager of Medical Imaging for the Huron Perth Health Care Alliance, St Marys, Canada explains why installing a full DR solution with MUSICA 3rd generation at its St Marys Memorial Hospital site is the first stage in setting new standards both across the Alliance and in Canada.

One of four sites that form part of the Huron Perth HealthCare Alliance, St Marys is a 20-bed community hospital dealing with trauma care and outpatient services. Its imaging solutions comprise ultrasound and X-ray departments staffed by a team of six imaging professionals.

"All of the imaging equipment within the Alliance was approaching the end of its useful life", explains Diane Smith, manager of medical imaging for St Marys, "so the management team had to make a decision as to whether we could extend its life by upgrading our existing CR solutions or choose to make the move to new technology and all its undoubted benefits.

Agfa HealthCare solution fundamental to standardizing our imaging capabilities

"Although our St Marys site had the most immediate need, we knew we would require a rolling process of CR solution upgrading over the next few years, and I had a vision of standardizing our imaging solution across the four sites within the Alliance. We had, therefore, to consider not simply what we needed immediately but what would be right for the future of all the imaging departments. Taking all of that into account, the decision to go in direct radiology was a fairly straightforward one."

Automation and image quality two of the key criteria

Given the importance of such a fundamental change, ensuring they replaced their落后 successful CR offering with the best and most appropriate solution was one that received critical consideration, as Diane explains. "When specifying the solution, we set a number of clearly defined criteria by which to assess any tenders. The most important was to have a solution that was fully automated – not something that everyone can offer. But we also needed to have this allied with high image quality and ease of use. Another key factor was that the solution had to be capable of fitting within the physical constraints we already had. There was no budget to make alterations to the fabric of the building itself and no opportunity to change the ventilation, so we really needed a turnkey solution.

MUSICA 3 delivers outstanding imaging results

“What made the AgfaHealthCare solution so attractive to us was that not only was the DX-D 600 fully automated, it came with both a fixed and wireless detector for maximum flexibility and workflow and with MUSICA 3 image processing software, with its reputation for image quality."

"To be honest", says Diane, "I had seen and heard a lot about MUSICA 3 in a previous role, but had never had the opportunity to see its results first-hand. It is truly incredible the level of detail that MUSICA 3 provides and the radiologists have worked closely with the applications team to achieve the highest quality images possible."

Early on during the tendering process, Diane and her team had the opportunity to visit Agfa HealthCare’s site in Greenville, USA to see the solution in action and question Agfa HealthCare’s onsite team. Impressed with knowledge and attitude of the Agfa HealthCare team

Says Diane, "We wanted to see and experience the exact solution that we were hoping to install on site here in Canada. I took our charge technologist and our quality assurance technologist with me when we visited. Each of them was charged with assessing their own element of speciality within the solution as well as gaining a view of the solution as a whole. We all found the Agfa HealthCare technologists on site were very well educated and highly skilled at using the equipment. They were able to do all the maneuvering we required to really illustrate how we would be using the solution in Canada and were really open to discussing potential improvements.

“Another element of the solution that I found really encouraging was the control panel. While reviewing the solution we were able to see just how user friendly and intuitive it is to use. Given that those of us trialling it were from the management team and not so hands-on in a day-to-day role, it reassured me that the learning curve for the team back in Canada would not prove to be as big as I had expected. It also means that staff rotation is going to be much simpler since they are all working on the new solution due to their familiarity with it.”

DX-D 100 interim solution was incomparable with our existing mobiles

As with any busy working imaging environment, one issue that needed to be addressed was how to continue working while the new solution was being installed. For that, Agfa HealthCare offered its DX-D 100 mobile solution as an interim solution.

“Being able to transfer equipment to other rooms and use the mobile solution meant we could carry on as usual without needing to divert patients,” says Diane. “While we had experience of mobile solutions, the DX-D 100 was beyond comparison. The flexibility it offered in terms of the studies it could do, together with the level of quality imaging it delivered, meant that the trauma doctors could easily see results immediately on screen without having to wait for more formal results. Everyone was so impressed with it that they don’t want to work with our older models now! As a result we are working on keeping the DX-D 100 we have and potentially adding more than one to our portfolio in the future.”

Outstanding project management from start to finish

Looking to that future, Diane is confident in the choices she has made in respect of the DR solution but also with regard to having Agfa HealthCare as a long term team member. "Our experience has been that Agfa HealthCare is prepared to go the extra mile not simply in terms of providing the right solution, but also in developing our long-term relationship. The project management from start to finish was outstanding; and when issues did arise – primarily because of unforeseen structural issues – we found the team really solution-focused and committed to solving our problems.

Service level agreements that provide both reassurance and confidence for the future

“And knowing that we have a well-defined seven year service arrangement reassures me that we have the right people looking after our solution; of particular importance when you understand this is the first installation of its type in Canada.”

DX-D 600

- Two-detector, high-productivity, high-throughput general radiography system with three configuration options: from manual, to semi-automatic, to fully-automatic
- Cesium iodide DR detector technology, giving significant patient dose reduction potential
- Specialty-tuned MUSICA for gold standard image processing, and NK workstation, hr smoother workflow
- DICOM connectivity to PACS, HIS/RIS
- Can be integrated with our CR systems, bundling the high quality and flexibility strengths of each technology
“Agfa HealthCare has long been committed to delivering dose reduction capabilities to our customers,” says Jan Leeuws. “As one of the first imaging companies to bring needle plate detector technology to the market, both within our CR solutions portfolio and later in our DR solutions, we recognized the need for a balance between high image quality and the management of dose. When we introduced the cesium detector panels, which deliver greater Detective Quantum Efficiency (DQE) and higher image quality at a significantly reduced dose, radiologists enjoyed their first steps on the road to optimizing the balance between dose and image quality. In fact, the dose reduction achieved using our cesium detector can reach a potential of 50% to 60% dose reduction* for both CR and DR.”

Prioritizing neonatal and pediatric patients

However, as Jan explains, achievements in dose reduction are still at a very early stage. “Currently a small number of X-ray exposures are benefiting from lower dose – so there is still a lot of ground to cover. But, empowering radiologists to lower dose – particularly within the neonatal and pediatric field – continues to inform much of our work as this is the most vulnerable group when it comes to dose.”

Says Jan, “When a baby or small child is very unwell, they can often require chest X-rays every hour. Optimizing the capabilities to manage dose is, we believe, fundamental to helping the medical field deliver dose reductions in the future.”

A powerful portfolio of dose reduction tools

Agfa HealthCare’s dose reduction arsenal comprises a number of well-established solutions as well as more recent additions to the portfolio. The aforementioned cesium phosphor technology is enhanced and empowered by third generation MUSICA image processing software. Renowned for delivering diagnostic-value images, MUSICA, together with cesium phosphor technology, enables radiologists to lower the dose by making it easy to see details for diagnosis.

When allied with the productivity and centralized dose monitoring capabilities of the NX Multi-Modality workation and the PACS Dose Management solution, this combination of solutions delivers a powerful set of tools for dose control and follow-up.

Committed to delivering on dose reduction

With dose reduction an increasingly hot topic, Jan Leeuws, Business Unit Manager Digital Radiography, highlights Agfa HealthCare’s ongoing role in driving forward solutions that meet both current and future challenges.

“Another dose management tool element is our PACS Dose Management solution,” explains Jan. It tracks the patient’s radiation exposure across modalities, departments and institutions; provides research-quality data on dose levels and supports hospitals’ and departments’ efforts to comply with regulations and available guidelines.

Empowered by technological excellence

As Jan explains, “Clinicians using NX Workstations are able to determine the correct patient exposure and avoid ‘dose creep’ by capturing the X-ray parameters and keeping statistics, hospital physicians can monitor and manage dose through access to records, charts and graphs generated by the NX Workstation. Exposures can be tracked and monitored for trends, such as an overall drift up or down or even comparisons among technologies.”

In profile
Jan Leeuws • Business Unit Manager Digital Radiography

“Delivering solutions that satisfy today’s legislation or guidelines is simply not enough; we need to anticipate and develop solutions to satisfy future needs too.”
Changing perspectives through retraining is essential

Jan is quick to add that, “providing improved technological capabilities is just one element of progress; re-training staff is another key factor. Simply presenting staff with dose lowering capabilities and expecting them to immediately adopt a lower dose approach is not realistic,” says Jan. “A core part of achieving dose reduction lies in the education and re-training of staff.

“At Agfa HealthCare, we have had extensive experience over the years in helping customers transition smoothly from film to DR and all stages in between. We know the value of taking people along with you, of changing mind-sets and adopting a step-by-step approach to digital technology implementation.”

Partners of choice

Of course, Agfa HealthCare does not work alone in developing new capabilities within this area. “Live studies at key healthcare sites across the world are essential to refining and enhancing new and existing solutions, as Jan explains. “We regularly work with interested parties to assess the practical application of our solutions. Studies are also currently being undertaken on sites in Leuven and Munich, which will help inform how the solutions are further developed. We also actively support organisations such as Eurosafe, ImageGently and ImageWisely.”

Advancing dose management for future needs as well

As to the future, Agfa HealthCare has a range of specialist teams working together to deliver a cohesive dose management strategy and Jan is clear that prevention of dose is better than reduction.

“Delivering solutions that satisfy today’s legislation or guidelines is simply not enough; we need to anticipate and develop solutions to satisfy future needs too. We are committed to protecting the long-term health of the public and that means advancing our knowledge and understanding of dose management to inform future developments.”

Testing with board certified Radiologists has determined that Cesium Bromide (CR) and Cesium Iodide (DIR) Detectors when used with MUSICA processing can provide dose reductions of between 30 to 60% when compared to traditional Barium Fluoride Bromide CR systems. Contact Agfa HealthCare for more details.

A core part of achieving dose reduction lies in the education and re-training of staff.
When radiologist Prof. Dr. Reinhard Loose first joined Klinikum Nürnberg Nord as head of the radiology department in 1996, he took immediate action to bring the department up to speed with digital technology: “I started networking our X-ray equipment and creating PACS structures as quickly as I could,” he explains. But he didn’t stop there. As the technology became available to make images accessible at any location — including on the wards, thanks to web viewers — it was rolled out throughout the hospital around the turn of the millennium. And the hospital continues to adopt new technologies for imaging, from computed radiography (CR) to direct radiography (DR), supporting the radiology department in providing service not only to patients, but also to other departments and caregivers in the hospital.

Radiology as a service provider

For Prof. Loose, radiology has a role to play far beyond the department’s walls. One of the key specialties at Klinikum Nürnberg is oncology. In addition to tumor diagnosis and therapy, the hospital maintains one of the largest lung clinics in Germany. Accordingly, the radiology department focuses on oncological diagnosis and intervention, handling more than 120,000 patients per year.

Next to providing day-to-day radiology services, the team led by Prof. Loose offers 24-hour emergency diagnosis and intervention. “Our role is not just in imaging, but also during interventions. Sometimes, we get a call from the operating room that they can’t continue because they urgently need an angiography, embolization or other procedure. One of our radiologists takes care of it: to me, that’s what a clinical radiology department should do,” says Prof. Loose. The main focus remains on inpatient diagnosis, however. During staff meetings, discussing X-rays takes a high priority. “We spend four hours a day discussing X-ray images, and five hours a week on tumor boards,” says Prof. Loose.

Digital technology brings sites together

With his wealth of experience in digital technology and his background both as a nuclear physicist and in programming data processing systems for physics and medical applications, Prof. Loose had the ideal expertise to lead the hospital’s digital transformation. But he and his team have faced many challenges. Klinikum Nürnberg is one of the largest municipal hospitals in Europe, offering the full range of medical specialties. The hospital has 35 clinics and institutes, 2,370 beds, and 6,000 employees, and treats 100,000 inpatients and 90,000 outpatients every year.

Since 1994 the hospital has consisted of two main sites, ‘Nord’ (north) in the center of Nuremberg and ‘Süd’ (south) in the southeastern part of the city. The Nord site consists of a large number of small campus-style buildings situated far apart.

The medical physics department is now responsible for more than 120 X-ray units at both of the hospital’s main sites, most of which are mobile devices in operating rooms and on the wards. Initially, the hospital used traditional film technology. “The technologist would bring enough film cassettes for three or four patients, make the exposures and then take them to the darkroom. It was a huge difference in the process and productivity of radiography,” says Prof. Loose. Introducing CR made a huge difference. The film was replaced by a CR system, and the digital format images could be checked, stored in the PACS and interpreted immediately, but getting the images to the radiologist still took some time.

We decided to introduce the DX-D 100 from Agfa HealthCare. We opted for a cesium iodide (CsI) detector, which we anticipated could be operated with a 30% to 40% lower dose. It is linked into the hospital’s network by WLAN, so images are available immediately after exposure.

Prof. Dr. Reinhard Loose, Radiologist, Klinikum Nürnberg Nord, Nürnberg, Germany
Agfa HealthCare was the only provider to make its solution compatible with certified third-party software – in this case a RIS client with DICOM worklist.

Prof. Dr. Reinhard Loose

The drive for change came with the new East campus, which brought together all intensive care units (ICUs) on one site. “With CR, the radiology assistant would have to take 15 to 20 cassettes to the East campus every morning, which obviously wasn’t sustainable. So we decided to introduce a mobile direct radiography (DR) system with flat panel detector. We chose the DX-D 100 from Agfa HealthCare,” explains Prof. Loose. “We opted for a cesium iodide (CsI) detector, which we estimated would let us use 30% to 40% lower dose. It is linked into the hospital’s network by WLAN, so images are available immediately after exposure.”

This first DX-D 100 also signaled the start of the radiology department’s gradual transition to DR, which started with the refitting of one X-ray room with a flat panel detector. The strategy is now to use CR only in specific cases – such as mobile X-ray on smaller wards. “We need to prioritize where it is most effective to implement mobile DR,” explains Prof. Loose. Opposite this newly equipped DR suite is a CR suite, which has been upgraded with the DX-D Retrofit. “The detector is identical to the one in the DX-D 100 DR solution, so we can share them, which increases productivity and cost efficiency,” says Prof. Loose.

The integration of the DX-D 100 and DX-D Retrofit was essentially a matter of ‘plug and play’, as medical physicist Christoph Guhl explains: “The technicians from Agfa HealthCare preconfigured the software so all we had to do was swap the systems around. The integration was completed in a day.”

Fast and flexible

This flexibility confirmed to Prof. Loose that the Agfa HealthCare systems were the right choice. What’s more: “Agfa HealthCare was the only provider to make its solutions compatible with certified third-party software – in this case a RIS client with DICOM worklist. This makes it much easier and faster for the technologists to make a digital workflow entry for e.g. additional images directly via the RIS client,” says Prof. Loose. He was also impressed by the efficiency of the CsI detector, especially the high image quality in relation to dose.

The DX-D Retrofit has proved to be a very reliable system for the day-to-day clinical practice. In fact, it has allowed the radiology department to close a lung workstation that used to perform 20,000 exposures per year; these exams are now carried out on the system using a Wi-Fi based detector. This system is operated with the NX Workstation, which receives the DICOM workflow with all the image parameters. DICOM Structured Reporting provides all the dose parameters after the image capture. “So we have the same data embedded in the image for all workstations – X-ray tube voltage, tube current-time product, exposure time and dose area product,” explains Prof. Loose.

As the images can be viewed immediately, the technologists save one to two minutes per image. “It’s ideal for the technologists: simple and fast. We radiologists needed time to get used to the new imaging technology, as it is very different from the images produced with CR. But we see a lot more detail with the same dose.”

Next up: next generation MUSICA and dose reduction

With the physically spread-out wards of the hospital, the large number of mobile systems remains an absolute necessity. But Prof. Loose would like to see all these wards to be equipped with the DX-D Retrofit. He also wants a second DX-D 100 in the large surgical ICU. Both this ICU and the post-anesthesia care unit handle enough patients to make the installation worthwhile. According to Prof. Loose, the acquisition would “pay for itself” when carrying out around 25 images per day.

And Prof. Loose continues looking ahead. The next challenge to tackle: dose reduction. “Agfa HealthCare has announced the launch of the next generation of its MUSICA image processing software. Once we roll out the new software, we will start adjusting dose parameters and optimizing image quality.”

DX-D Retrofit

- Easy installation, quickly up and running
- Choice of Cesium Iodide (CsI) or Gadolinium Oxy-Sulphide (GOS) detector conversion screens
- Potential dose reduction
- Specially tuned MUSICA, for gold-standard image processing, and NX workstation for smoother workflow
- Connectivity to PACS, HIS/RIS and images

DX-D 100

- Wireless mobile imaging excellence
- Instant high-quality image capture
- Immediate image validation, transfer and access (HIS/RIS/PACS integration)
- Specially tuned MUSICA, for gold-standard image processing, and NX workstation, for smoother workflow
- Dose reduction potential
- Easy handling of a broad range of general X-ray exams

The technicians from Agfa HealthCare were very well prepared. They preconfigured the software to the point where we simply had to swap the systems around. The integration process was completed in a day.

Christoph Guhl, Medical Physicist, Klinikum Nürnberg Nord
A simple safety net that saves lives

Dr. Max Ryan, Consultant Radiologist at the Cork University Hospital explains how an established and widely accessible technology – the smart phone – helped him create his ground-breaking yet simple application for actual and potential lung cancer sufferers.

New technology is often hailed for its potential healthcare benefits but, for Dr. Max Ryan, consultant radiologist at the Cork University Hospital, it was an established and widely accessible technology – the smart phone – that helped him create his ground-breaking yet simple application for actual and potential lung cancer sufferers.

“Following a series of delayed diagnoses of lung cancer in Ireland, it became apparent that one of the key issues was that there was no alert system in place by which radiologists could notify clinicians when they came across something significant and unexpected but unrelated during an X-ray examination,” says Dr. Max Ryan. “For instance, if a lung tumour was detected as a result of a referral from orthopedics rather than from oncology, how could the radiologist be sure that the results were notified to and acted upon by the referring clinician?”

“It also became clear that this situation was more likely to be an issue in accident and emergency departments. With clinicians working shifts and often handing care over to colleagues, they are less likely to have continuous contact with the patient, which makes taking ownership more difficult.”

Implementing the solution through IMPAX, Agfa HealthCare’s PACS

As a lead on the Irish National Quality Assurance Initiative for Radiology, one of Max’s goals was to devise a system, both automated and audible, through which to alert referring physicians of unexpected findings.

“I wanted to find a more efficient way than simply having the radiologist try to contact the physicians by telephone or contact their team. I knew there had to be a way to create a simple alert system that could not only ensure that the findings were notified to the relevant clinicians, but were also electronically recorded. The recording was really important from both a patient care and Quality Assurance perspective because, should a clinician fail to respond, it means that others within a chain of nominated people would be notified to ensure that patients didn’t come to harm as a consequence of failing through the net.”

As with the very best ideas, Max’s solution was, as he himself is quick to admit, a very simple one: to create an alert system – RadAlert – that uses smart phones and a dedicated IMPAX workstation application that notifies physicians by email and/or text if significant and unexpected radiology findings are noted by the reporting radiologist.

“I was keen to keep the processes as streamlined as possible but also needed to ensure that we had a secure and auditable process. With so many of the clinicians already having access to our PACS system, I asked Agfa HealthCare if there was a way we could incorporate the solution I had mapped out within its functionality. Agfa HealthCare then brought Rivendale Solutions, one of its local partners, on board to help with the alert and GUI development.”

As a result, now, when significant and unexpected imaging findings are identified, radiologists can activate the alert system by selecting the appropriate RadAlert icon on any PACS workstation. By clicking this icon, a page opens which allows the radiologist to choose one of three options. These include Unexpected and Significant Clinical Findings, Urgent, and Critical findings from a dedicated drop-down menu system. An email alert is sent to the responsible consultant and, should that consultant fail to respond in a timely manner, the system is configured so that other relevant personnel are alerted. A permanent audible record is held on the Radiology Information System (RIS), which allows the radiology department to monitor and take action in the unlikely event that a referring physician fails to respond to a RadAlert notification. A hospital policy has been developed to include an escalation process should there be a pattern of repeat behaviour – although it is a situation that has yet to arise.

“For every significant and unexpected finding, the radiologist may engage the RadAlert system within PACS, either during or after the creation of the report,” explains Max. “By selecting the icon, the report is automatically electronically tagged to include date, time and details of the clinician contacted. Authorized reports are automatically transferred to both RIS and PACS where they can be read hospital-wide and acted upon. Paper copies of all reports are printed by the radiology department and sent by mail to consultants as a further backup.”

“The system provides reassurance not only for patients, but also for the radiologists.”

Significant and Unexpected results

Mindful that overdue or misuse of the system could lead to loss of effectiveness if recipients developed text and email fatigue, Max has set very strict policy criteria for when the system should be used. “The system records three categories of findings: Critical, Urgent, and Significant and Unexpected (see Faculty of Radiologists in Ireland/ National Quality Assurance Programme Guidelines). The alert system is only used when the radiologist’s findings are both Significant and Unexpected,” Max explains. “So, for instance, if someone is already being treated for cancer, finding a lung nodule would not necessarily be unexpected. If, however, someone comes into accident and emergency with a sprained hand and investigation shows a bone tumour, the findings would be considered to be both Significant and Unexpected and the clinician would, therefore, be notified. By using the alert system for only the most time critical results, it ensures that the emails are treated with the importance they deserve.”

Staff understanding and buy-in are essential

As with any successful solution, the attitude of staff to its implementation has been essential to its success. “The system did require a small amount of staff training but, once everyone was aware of what the system does and the benefits it would deliver when used properly, we had no real issues. That is particularly gratifying given that the physicians had to agree to have their mobile phones numbers available within the system!”

“We created a clear communication strategy by adopting a Super User training approach, where I trained the first level of users, who then trained the people they were working with. It has enabled everyone to be clear about when and how to use the system correctly.”

Subsequent implementation has been essential to its success. “The system did require a small amount of staff training but, once everyone was aware of what the system does and the benefits it would deliver when used properly, we had no real issues. That is particularly gratifying given that the physicians had to agree to have their mobile phones numbers available within the system!”

“We created a clear communication strategy by adopting a Super User training approach, where I trained the first level of users, who then trained the people they were working with. It has enabled everyone to be clear about when and how to use the system correctly.”
With the alert system now in its third year, it is currently being used by approximately 150 consultants at Cork University Hospital and Mercy University Hospital, Cork. Galway University Hospital, Ireland and the University Hospital Birmingham, in the UK, are also soon to come on line, and interest is beginning to be shown further afield as the system becomes more widely known about.

Since the implementation of the system, there has not be one missed case of lung cancer diagnosis.

Life-enhancing proven results

For the patients in Ireland, there is little doubt that it has paid dividends. During its first full two years of operation, 524 Significant and Unexpected results were flagged, of which 25% proved to be cancers. Commenting on the figures, Max says, “We always knew there would be an element of overcall, but the number is manageable. Since the implementation of the system, there has not been one case of missed lung cancer diagnosis so we are happy to live with the current ratio of alert to findings.”

While the system was originally developed for lung cancer sufferers, it can also be used for other types of cancer and also non-cancer related diagnoses and Max is already looking to add functionality to the solution. “I have recently asked Agfa HealthCare to look into adding another function: to record whether the radiologist agrees or disagrees with the clinician’s initial interpretation of radiology findings. This functionality is particularly useful in accident and emergency departments. If there is a disagreement, then the radiologist report will be flagged on the RIS system with a priority flag for urgent attention by the referring physician.”

The fact that new cancer was confirmed on almost one third of the chest radiograph alerts indicates the importance of clinicians receiving and acting on these alerts. The study also highlights that 20% of potential cancer alerts were not officially acknowledged by the clinician. Even though the majority of patients did receive timely follow-up, there were still some delayed diagnoses and follow-up failures to be addressed.

First year results

372 alerts were issued over the 1 year study period. 49% (181) of alerts were issued due to a suspected cancer diagnosis and of those 67% (121) arose from a chest X-ray report.

57% of the “cancer” alerts were acknowledged by clinicians within 3 days, however, 19% of the “cancer” alerts were never acknowledged and 5 of these patients did not receive the recommended follow-up.

CT follow-up was recommended in 103 chest radiograph reports and was performed in less than 1 month in 50% (51). However 5 patients had to wait more than 90 days for the CT scan and of those patients, 2 patients subsequently had a confirmed lung cancer on CT.

20% (21) of patients never had a CT thorax for reasons including loss to follow-up, resolution on subsequent plain imaging, etc.

Analysis of subsequent CT thorax results found that previously undiagnosed cancer was detected in 31% (56) patients.
The Istituto Clinico Prof. Dr. R. De Blasi enhances patient care and increases patient throughput by combining a new, top-of-the-line DR solution with the easy Retrofit upgrade of its existing CR investment.

Offering a full range of radiology services every day of the week requires streamlined workflow and optimized efficiency. Spread over four floors and 2,800 m2 in a building located in the center of Reggio Calabria, the Istituto Clinico Prof. Dr. Raffaele De Blasi is using digital radiography to achieve that ambitious goal. One of the area’s largest outpatient clinics accredited by the Italian National Healthcare System, it serves some 600 patients every day in its various departments, including diagnostic imaging (CR), health center and clinical laboratory.

The clinic aims to offer top-class service, with a staff of about 100 specialists and the most advanced technologies. In 2014, the clinic installed the DX-D 800* direct radiography (DR) system, which not only significantly speeded up radiology services, but also provided benefits in dose reduction potential and image quality. After experiencing the advantages, the clinic decided to also upgrade an existing computed radiography (CR) system with DX-D Retrofit. The clinic’s results with the two DR solutions are impressive: the number of exams carried out per day is higher, overall exam time is reduced and the clinic has been able to add new imaging applications.

Digitizing to streamline workflow

First opened in 1979, the Istituto Clinico Prof. Dr. Raffaele De Blasi is owned by the Lamberti-Castronuovo family. Dr. Fabrizio Lamberti Castronuovo manages the radiology department, which includes X-rays, a CT with both multi-slice and cone beam devices (for dental applications), an MRI and ultrasound.

Over the past decade the clinic digitized its services, aiming to streamline workflow and reduce the risk of human error. Its overall goal was to offer all types of radiology service, any day of the week, without requiring patients to make an appointment.

The clinic turned to Agfa HealthCare’s DR solutions to support it in achieving this ambition. Dr. Lamberti Castronuovo had a first experience with Agfa HealthCare’s digital radiography systems at the Università Cattolica del Sacro Cuore in Rome, and the clinic had already implemented a DX-M CR system for mammography and dental orthopantomography. The staff appreciated how the efficient, easy-to-use, multi-slot digitizer streamlined the daily workload, while the NIP (needle plate technology) cassettes allowed potential dose reduction for patients.

To move forward, the clinic next opted for a complete series of radiology solutions: the high-performing DX-D 800 DR system with remote control, the cost-efficient DX-D Retrofit solution for upgrading existing investments, and IMPAX RIS/PACS. “The IMPAX RIS/PACS helps us keep control of 100% of our information. This is the first investment that I would suggest to a clinic,” says Dr. Lamberti.

Dose reduction potential and greater flexibility

The DX-D 800 is a complete digital X-ray room fitted with a dynamic, portable and removable flat-panel detector. It provides enhanced versatility and flexibility in diagnostics through its direct digital dynamic remote-controlled fluoroscopy and radiography system. But it also offers the clinic something more: the potential to reduce patient X-ray dose when used with Cesium Iodide detectors.

“One of the general benefits of digital radiography systems is less exposure and patient dose. Once the DX-D 800 was installed, we were able to verify this reduction for ourselves. For example, for a chest radiography, when using Cesium Iodide detectors, we now use only 1/3 of the previous dose. This reduction is even higher for other exams. And we can now perform all kinds of radiology examinations, including imaging using contrast media, for digestive and urogenital tests, in a quicker way and with high image quality.”

To optimize the clinic’s equipment investment, Dr. Lamberti Castronuovo also decided to keep an existing CR system and upgrade it to the benefits of DR with the DX-D Retrofit. The solution consists of a flat panel detector (DX-D 30C), a retrofit box and an NX workstations with MUSICA image processing software. “We carried out three weeks of field testing with the Retrofit and were amazed at how our nine-year old CR system improved. With a limited investment, it is as if it has gotten a second youth!”

MUSICA image quality impresses clinic radiologists

The DX-M includes Agfa HealthCare’s gold-standard MUSICA image processing, and with the new investments in 2014, the clinic also upgraded to next generation MUSICA (MUSICA 3). “This software has had a big role to play in the radiologists’ satisfaction,” Dr. Lamberti explains. “It’s amazing to see what MUSICA – especially MUSICA 3 – can achieve: images are sharper and details are clearer. What more can radiologists ask for?”

The clinic also opted to subscribe to a full support and service contract. “We can call Agfa HealthCare whenever we need, and in a few hours the situation is solved. The service is truly excellent.”

With two DR solutions in place, the clinic has increased the number of examinations that can be performed per day. The single touch and remote-controlled user interface with preset protocols reduces examination time, while the flexibility of the DX-D 800 allows additional applications.

“With these systems, we can offer a quicker service, with less downtime, which means patients face shorter waits and less stress,” says Dr. Lamberti Castronuovo. “That means we have reduced our costs but at the same time we have more patients – a good equation for success! And finally, our investments in Agfa HealthCare DR mean we are now preferred over other diagnostic centers, thanks to our state-of-the-art technologies.”

“With the DX-D 800, we can now provide the local community with best in class radiography technology.”

Dr. Fabrizio Lamberti Castronuovo, Owner, Medical Director of Radiology

*Note: DX-D 800 is not available in Canada or the U.S.
A vibrant health care center in Eastern Belgium

Situated in the Belgian province of Limburg, close to the Dutch and German borders, the Ziekenhuis Oost-Limburg (ZOL) hospital is experiencing a steady increase in patients. Guest contributor, Diagnostic Imaging magazine, explains how the radiology department is handling the corresponding rise in examinations.

The department has just undergone an extensive layout re-design and refurbishment to improve the patient experience. On top of all this, the department has recently switched to a new PACS system. We spoke to Dr Martijn Grieten, Head of Radiology, about this hive of activity.

Let’s start at the beginning. Please tell us about your hospital, the Ziekenhuis Oost-Limburg (ZOL).

Well, first of all I should say that ZOL is actually not one hospital but rather a group of three individual hospitals located in and around the city of Genk, which is one of the main towns of the Belgian province of Limburg. Lying on the borders of The Netherlands and Germany, Limburg is also not far from France and Luxembourg. Thus, within a 100 km radius around Genk, the so-called “Euregio” hinterland behind our hospital includes the Dutch city of Maastricht and Eindhoven, the German city of Aachen and the Belgian cities of Antwerp, Brussels and Liège. So our hospital is a supra-regional public hospital, offering a complete care package from basic to highly specialized medicine. Over the three sites, we have a total of 811 beds (and 256 daycare beds) with more than 2000 full time equivalent employees and no fewer than 236 physicians. Our particular expertise covers gyn/obs and infertiltity; oncology & radiotherapy; nephrology; neurosurgery; neonatology; cardiology; stroke cardiac surgery; urology and intensive care. Annually we have 35000 hospitalizations plus 67 000 “day hospital” admissions and nearly half a million consultations. There are 2000 ambulatory visits. We have 45000 emergency admissions and 34000 surgical procedures carried out each year. There are 2000 babies born in the hospital each year.

However there is much, much more to our hospital than just a list of patient numbers and specialties. A core aspect of the overall philosophy of the hospital — and this is not just an abstract concept, but one that we really try to put into practice — is patient friendliness. This emphasis on putting the patient at the center of our activities is one that we also actively apply in the department of radiology.

Ok, let’s turn to radiology. What personnel and equipment are available to provide the service the hospital expects?

The overall mission of our department is clear: the provision of safe and efficient medical imaging, using the appropriate imaging modality for the particular pathology involved or clinical question to be answered. In general we’re very well equipped with up-to-date imaging systems. Nevertheless in some areas such as MRI, we can be under particular pressure to provide the short waiting time and high quality service our referring physicians expect. We basically have all the imaging modalities: X-ray, mobile X-ray, CT, Cone beam CT, mammography units and biopsy facilities, interventional X-ray, MRI and ultrasound.

The main campus, Sint Jan, focusses more on the high-tech imaging modalities and the other campuses on more routine scans with high throughput and efficiency.

All told, as you might expect, the most common imaging procedure carried out is straightforward radiography, with more than 115000 X-rays performed each year. Next comes ultrasound with approximately 42 000 procedures per year. There are 38000 CT examinations and approximately 22000 MRI procedures each year. And, for two reasons this work-load is growing all the time. First there is the background aging of the population which brings with it more cases requiring radiological examinations. Then, the hospital itself is expanding so there are more doctors bringing with them more patient consultations.

On the personnel side, to support all this in our department we have no fewer than 20 radiologists and two assistants, 63 nurses and technologists, two IT nurses, two research associates, 16 medical management assistants, four logistics specialists and a medical physicist.

And on top of all this continuing and growing, patient throughput, your department is just coming to the end of a major refurbishment process.

Actually it’s more than just a refurbishment, it’s a complete re-design of the layout of the department. This was started more than a year ago and is now nearing completion. And it is a real, practical example of what I was saying earlier: namely putting a priority on patient friendliness. So often radiology departments put the sole priority on the technical aspects of generating high quality images. Of course that is vital. However the reality is that the patient, who is at the heart of all this, will probably never even see the images that we radiologists are so proud of. The patient is much more likely to be impressed (or otherwise) by the actual circumstances of the imaging procedure and how he is received for his imaging exam. Apparently mundane aspects such as the condition of the waiting room, the facilities in the dressing rooms and the support of the staff during and after the exam are very important for the patient.

As if all this wasn’t enough, a year or so ago you decided to change your PACS system as well. Why was this?

We were talking earlier about the patient friendliness aspects of the refurbishment of our department. That’s important, but of course it goes without saying that behind this we need not only to generate high quality images (from all our modalities) but also have efficient PACS systems for our radiologists to produce the reports. These reports are, after all, the ‘end-product’ of our department. The referring physicians will only consult the report rather than scroll through all the images. Efficient RIS/PACS systems and especially ones that can be optimally configured to meet our requirements are vital for the continuing optimal functioning of the department. When it became clear that our previous old PACS system was coming to the end of its useful life, we knew that the continued efficient functioning of the department required a new PACS.

So we considered the financial implications of our decisions process changing or preparation room, is one we don’t take lightly. The inevitability of the refurbishment is very positive. Likewise, despite the inevitable inconvenience during the construction process, the staff appreciates the new working environment.

Dr. Martijn Grieten, Head of Radiology

As if all this wasn’t enough, a year or so ago you decided to change your PACS system as well. Why was this?
What system did you choose and why?

We went for the Agfa HealthCare IMPAX system which we installed about two years ago. In addition to the basic performance characteristics of the system, one of the reasons for this choice was that our RIS system was the Q-doc system from Agfa HealthCare. Efficient compatibility between RIS and PACS is essential; we considered that the likelihood of this is increased if both systems are provided by the same company. Although “pick and mix” approaches of RIS and PACS from different suppliers are theoretically possible, in practice issues such as compatibility of updates are much simpler when the same supplier is involved.

And how is the PACS performing in practice? Any teething troubles? What particular features do you appreciate most?

We have the IMPAX 6.5.1 version and we’re very happy with the system. The installation process and transition from the old system itself was essentially trouble-free, taking a couple of months, mainly for the transfer of our 54TB memory of archived images. The close integration of the RIS/PACS is shown by the fact that the radiologists are now mostly unaware that the RIS is actually running in the background when they’re reading their images. The stability of the system is fine with crashes almost non-existent. Our imaging systems are sourced from the main instrument suppliers, e.g. our CTs come from Siemens, Ultrasound is mostly from Philips and we have one GE MRI and one Siemens MRI system. Connectivity and PACS access to all these images is not an issue. Neither is the geographical separation of the three hospitals that make up our group.

One minor inconvenience of the new system was the absence of a built-in 3D viewer. We solved this easily by incorporating the 3D viewer from the old PACS system we used to have. Apparently new versions of the Agfa HealthCare PACS system, will have an integrated 3D viewer, so we will be very interested in that. In addition to the usual tools for the organizing of and processing of images provided in all PACS, there are two or three features of the IMPAX system that we particularly appreciate; work lists and structured reporting.

Work lists

The creation and organization of efficient work lists that we can easily create with the new system is really useful. The customized configuration of the system is easy. For example, we have set up rules so that immediately the prioritization of patients can be visualized on screen via color codes indicating categories of patients such as emergencies; those from the intensive care unit or those on the waiting lists.

Structured reporting

At the beginning, this feature was viewed with a lot of scepticism, even resistance by many of our radiologists. There were several reasons for the initial doubts, the most important being the fear that having pre-set fields in the report would in some way restrict the radiologist’s freedom and ability to correctly and accurately describe the images they were reading. In addition the radiologists had become very skilled at dictation and could easily and quickly incorporate all the necessary formatting notes into blank report forms.

However with the old non-structured system, the inconsistency of the final reports was recognized as a drawback. One radiologist might dictate a full page report for a case and another only a few lines for the same case. What is very gratifying is that after the initial doubts, now that our radiologists have practical experience of the use of structured reporting, they are all converted and fully convinced of the advantages of it, even going to the extent of requesting that the approach be adopted as widely as possible.

Business Intelligence (BI)

The IMPAX Business intelligence module (BI) is interconnected with the RIS and PACS. It is extremely useful for the optimal management of the department since basically it allows unlimited mining of all our vast amounts of data. So, for example at a stroke I can see for each imaging modality a complete breakdown of our patients by age. Such information is vital for example to justify the decision to make things easier for our more elderly patients by providing more spacious preparation and changing rooms.

Another example is that the BI module enabled quantitation of the overloading of our MRI facilities that I alluded to earlier. This led to a reorganization so that we could extend our MRI activities, which now operate seven days a week, 15 hours a day. Even with this, our MRI waiting lists are continuing to grow. Again data from the BI module showed that, at least in part, this was due to some MRI patients coming across the border from The Netherlands, where initially waiting lists were even worse than ours. Clearly a concerted approach to the question of MRI supply and demand is needed. The BI mined data is indispensable in deciding exactly how the problem should best be tackled.

At a much more immediate level, the BI module also provides dashboards which can show key performance indicators that are continually monitored. For example, the progress of patients through the imaging process can be seen in realtime, quantitating the numbers of waiting patients or those awaiting results, etc. In this way, bottlenecks can be highlighted or regular time inefficiencies in patient workflow identified so that, more importantly, timely corrective action can be initiated.
When every detail matters

PRIM.DR. Hans Peter Sochor, Chief Radiologist and Medical Director at Diagnosticum Gersthof, Vienna, explains his experience of MUSICA in practice.

MUSICA, the next generation of Agfa HealthCare’s “gold standard” in digital image processing, uses a new process called Fractional Multiscale Processing (FMP) to show a previously unknown level of detail in digital radiographs. Sophisticated algorithms break the image down into different frequency ranges, each of which is then optimized. Hans Peter Sochor, chief radiologist at Landesklinikum Hollabrunn and medical director at Diagnosticum Gersthof, provided vital input for the development process.

Wide-ranging capacity

The radiology department headed by Dr. Sochor in Gersthof, Vienna brings together a range of imaging procedures in a state-of-the-art diagnostic center, Diagnosticum Gersthof. The department carries out 60,000 conventional X-ray examinations every year in addition to magnetic resonance imaging and computerized tomography.

“Once it became clear where improvement was needed, Agfa HealthCare invested a great deal of time, effort, and dedication to make things happen. Non-university institutions like ours don’t always find manufacturers to be such good listeners. This is an excellent result!”

PRIM. DR. Hans Peter Sochor, Chief Radiologist & Medical Director

Patience and persistence...

Was it due to the settings, device optimization or even a defect in the unit? Product specialists in Austria and Germany ruled out all three possibilities, and even a detector with higher Detector Quantum Efficiency (DQE) failed to provide the hoped-for breakthrough. It finally came when Dr. Piet Veyrat-Belk, head of image processing software development at Agfa HealthCare’s Belgian headquarters, stepped in.

Months of collaboration followed. “We looked at the images together and I explained what was missing and what I needed in the relevant places to reach a given diagnosis with more confidence,” recalls Dr. Sochor. “It’s not always easy to find a common language between the medical and the technical side, but we felt our way forward one point at a time.”

The reward for their hard work was version 3 of MUSICA, a test version of which has been on trial in Dr. Sochor’s department for around one year. Following a successful final validation it is now available as an option with all CR and DR systems from Agfa HealthCare.

… lead to convincing results

“With some examinations it’s simply not enough to apply a single image processing algorithm to all areas of an image,” says Dr. Sochor. “For example small joints as opposed to large bones. The FMP process addresses this very problem. The before and after images speak for themselves.”

Another main aim during the development phase was to minimize the amount of postprocessing required in the diagnostic center. “For me this is another crucial aspect,” says Dr. Sochor. “I diagnose around 100 to 150 patients a day in skeletal diagnosis alone. If it adds up: If I spend an extra 30 seconds on postprocessing for each patient, I’ve soon lost a whole hour.” MUSICA 3 comes to the rescue: “With lungs I still tend toward a flatter grading, but for the skeleton I don’t normally have to do anything at all.”

And the dose? “One thing is certain: Dose reduction is only in the patient’s interest if reliable diagnosis can be ensured. In this dilemma, sophisticated image processing algorithms like those in MUSICA 3 open up new possibilities. For small extremities, where exposure times are short anyway, it’s less crucial – but with a lung, or pediatric radiology in general, it’s very important.”

Benefit for both sides

“Dr. Sochor has started a small revolution at Agfa HealthCare with some entirely justified criticism,” sums up Bernd Hoberg. Product Manager for Germany, Austria and Switzerland at Agfa HealthCare. “This has triggered a valuable learning process.”

In the words of Dr. Sochor: “Once it became clear where improvement was needed, Agfa HealthCare invested a great deal of time, effort, and dedication to make things happen. Non-university institutions like ours don’t always find manufacturers to be such good listeners. This is an excellent result!”

Bernd Hoberg
Product Manager DACH, Agfa HealthCare

MUSICA

• Consistently high image quality regardless of body size and constitution
• Better visualization of all image details
• Excellent contrast resolution
• Detailed representation of the...
Putting IT in context

Dirk Colaert, Chief Medical Officer, Agfa HealthCare, explains how by letting computers learn the context and meaning of data, semantic technology can make them smarter assistants throughout the healthcare chain.

For me, integrated care is the end solution we are aiming at in healthcare, and I don’t think we can achieve it without some kind of semantic technology.

Dirk Colaert, Chief Medical Officer, Agfa HealthCare

Over the years, IT has been spreading its tendrils through all areas of life – including the healthcare and hospital sectors. It has become a critical tool for administration and documentation. From admitting patients, to ensuring proper billing, to creating an image-enabled electronic health record, IT has been helping hospitals to improve patient care while cutting costs and creating smoother, more efficient workflows.

It has also been extending its presence and usefulness in the clinical domain, although rather more slowly. There is a clear demand from the market for smarter medical IT systems: systems that not only collect data, but that can actually guide and advise clinicians in making decisions about diagnosis, treatment and more.

Dirk Colaert is leading a team within Agfa HealthCare that is working to find ways to make our solutions smarter, by letting them analyze clinical data, determine a potentially critical health condition in a patient, and give advice to the user. How can they do this? One way is by incorporating semantic technology*, which can be an important tool in helping us to achieve our strategy of providing every-more connected and smarter health IT systems to our customers.

What does it all mean?

“In clinical decision making, context is key,” says Dirk Colaert. “But it is exactly this context that computers and information systems lack. Without understanding the context of words or data, how can they reason, or offer ‘smart’ support to healthcare providers? And how can we in the healthcare industry – and at Agfa HealthCare – achieve true collaboration between stakeholders, interoperability between systems and, ultimately, integrated care? Semantic technology will help us do all this.”

Semantic technology, or more specifically ‘semantic web technology’, enables computer systems to understand the data and its context and to link different pieces of data to make ‘the whole story’. “It is a way to tell computers what the meaning of the data is,” clarifies Dirk. “Traditional procedural computer languages often ‘hardwire’ and hide the knowledge inside. But this hardwiring is static. If knowledge changes, you need to change the procedure, hence the code. Semantic web technology is declarative, and thus more dynamic: you can adapt it more easily, in even the individual doctor’s needs.”

He offers a basic example: “Let’s consider an application field associated by the designer of the application with the concept ‘hypertension’. If we link that application field to a SNOMED code, then the meaning of this field is fully defined. From that moment, systems can start reasoning about this field because it is no longer ambiguous. Different fields in the application can be linked to the same code and the system will know all these fields as ‘hypertension’, regardless of the actual technical field names. Moreover, the system becomes more interoperable with other systems that also use SNOMED as a way to add semantics to their data. For systems that don’t, convergence between different coding systems can be done.”

The concept isn’t new: in the 1980s and 1990s, semantic technology gained a lot of awareness and created high expectations. But it never really got out of the academic/research phase, says Dirk, who offers several reasons, including the much more limited power of computers and of web technology available at that time. But as that technology has evolved, semantic technology advanced, as well.

Outside of healthcare, the uptake of this technology has grown significantly, Dirk explains: “Google, for example, uses a lot of semantic web technology.”

Transparent and complete interoperability

Another big change supporting the development of semantic technology is the growing awareness of the need for true interoperability. “We know that we need to break out of the boundaries of the hospitals, to connect and share data with all the stakeholders, from the GP, to the home nurse, to the patient himself. For different systems to work together, they have to understand the data, and that means semantic interoperability. Over the past 5 to 7 years, we have seen this more and more in public tenders for funded research from the European Commission: they almost always now include the word ‘semantic’ in the calls for research project proposals.”

Using semantic data, he explains, hospitals can converge the data from all of their different systems, including the ORBIS® hospital and clinical information system (HIS/CIS) and IMPAX® RIS/PACS, to create a consolidated and formal layer of clinical and operational information. “Then you can perform business intelligence or analytics using all of the data, which is of course better than using partial data. As we say, ‘the value of the sum is greater than the sum of the values’. In other words, your analytics will have more value.”

Semantic technology can either be built directly into systems, or can be added as a layer on top of the existing programming. There are arguments for each and probably we will need both approaches. Dirk explains that the Agfa HealthCare CRS research team in Trier has been investigating a semantic layer on ORBIS: “A semantic layer on top of ORBIS will make it easier for facilities to get at high-level data. For example, ORBIS is a very flexible system, with a form generator that allows users to configure their own forms. Currently, if the user wants to add, say, blood pressure to the form, he just creates the prompt ‘blood pressure’ and adds an input field next to it. He and other users know what the input field is about, because they can read, interpret and thus understand the prompt next to it. But for the computer it will remain a useless field because there is no way to determine the meaning of this input field. However, by connecting it to the appropriate code in a coding system (like SNOMED), the computer has an unambiguous definition of the field and can start reasoning about it.”
“Finally, ambiguity is further eliminated because any definition is ultimately pointing to an URI (see textbox). This is why we always talk about semantic ‘web’ technology. If a URI points to a definition of the SNOMED code for ‘hypertension’, there is no way that this URI can end up in a definition of ‘diabetes’."

The ultimate goal: integrated care

Overall, says Dirk, semantic technology is one of the fundamental technologies that will allow a better, optimized patient care. “Because it ‘understands’ the data, the computer can provide smarter support. If a patient is diagnosed with hypertension and this information is put in the system in a ‘semantic way’, then the system could easily search other patient files to find similar cases, and present the different therapeutic options used in those previous cases, together with their outcomes. This would support the doctor in his clinical decision process. Of course, the doctor is always free to accept or ignore the suggestions!”

For Dirk, though, the advantages go far beyond the individual user. “For me, integrated care is the goal we are aiming for in healthcare, and I don’t think we can achieve it without some kind of semantic technology. I can imagine a scenario where a GP sends a patient to the hospital for a procedure. At the hospital, the specialist can immediately see all the relevant data from the GP, and potentially call up diagnosis and treatment details for similar cases. After the patient is discharged, the GP will receive information on follow-up, the home nurse and patient will receive instructions, even the pharmacy can call up the prescriptions – in a synchronized and ‘just-in-time’ way! So we are talking about a complete and transparent interoperability of all systems (governed by privacy and security, of course), offering informed, supported and synchronized steps for all stakeholders. It is difficult to imagine a solution that is flexible, trustworthy and collaborative without semantic technology.”

Natural Language Processing

No discussion of semantic technology would be complete without bringing up Natural Language Processing (NLP), says Dirk. While semantic technology deals with formalized data, NLP works with free-form data, such as discharge letters. But although they exist in “different worlds”, as he says, they are complementary. “Seventy to 80% of data in the hospital is still in ‘free text’. We could use NLP to extract concepts and meanings from the free text, and then merge it with the structured data, for a global clinical view of the patient.”

He offers the example of HYDMEDIA: “Using NLP to search the digital archive in a smart way, we could ask for the discharge letters from the last month of all patients with cardiovascular disease. And not only would the system find the letters specifically including the words ‘cardiovascular disease’, but because it understood the context, it could find related pathologies, such as ‘myocardial infarctions’ and ‘hypertension’.”

Something to prove

Agfa HealthCare is well placed to take semantic technology further in the healthcare industry because it already has experience with the technology, thanks to the dedicated research team Dirk is part of, as well as the team in Trier. And it is well connected to both standardization bodies and academic communities working on the technology. Now, it is time to prove the concept in the field, and discussions are underway with several university hospitals to pilot it in ORBIS. At the same time, Agfa HealthCare is collaborating with companies that have NLP modules, to build it into its products. Step by step, semantic technology is moving out of the academic and research domain and into real applications, but there is a long way to go, and Dirk believes Agfa HealthCare still has much work to do. “This technology will allow us to solve problems we can’t solve today, and in a cheaper, more flexible, more dynamic and more sustainable way. So while it might take some time and effort, I am convinced that semantic technology can prove its value to all stakeholders, from our company, to the hospital, to the individual users, and all the way to the patient.”

Dirk Colaert is Chief Medical Officer for Agfa HealthCare, and leads the research team on semantic technology. Before joining Agfa HealthCare, he was a practicing GP, and, with some colleagues, started up a company making medical record systems. This company was bought by Quadrat, which was later bought by Agfa HealthCare in 2000.

"Semantic technology is one of the fundamental technologies that will allow a better, optimized patient care. Because it ‘understands’ the data, the computer can provide smarter support."

X-ray equipment from the beginning of 20th century
SOMC has a long-term relationship with Agfa HealthCare, and has piloted other solutions in the past. The hospital was already using IMPAX ES PACS, and was very pleased with the benefits they offer. “We were able to really leverage our existing Agfa HealthCare solutions,” comments Noel Pemberton, Administrative Director of SOMC Medical Imaging. “Our turnaround was already great, so there was a high bar for the new solution to reach.”

“But we could see the new approach was truly revolutionary,” Dr. Logan continues. “With Enterprise Imaging for Radiology, RIS and PACS are merged into a single platform, for total, holistic image management. This creates opportunities for radically improved productivity, efficiency and cost-effectiveness.”

Evolutions in imaging management are being driven both by technological advances and by the changing organizational needs. It answers the need for a scalable solution that consolidates all images and data into a single storage area, with information from disparate third-party systems.

**Improving performance and satisfaction**

The pilot began in 2011, with the new solution running parallel with IMPAX RIS and PACS. “The collaboration and two-way communication with Agfa HealthCare have been very important, and we have worked closely with them to provide feedback on various aspects of the solution,” says Noel Pemberton. “It has been a unique experience.” While both solutions are currently being used within the hospital, they expect a switch to using only the one soon.

“In terms of productivity figures, it varies by radiologist,” comments Dr. Logan. “But the more a radiologist uses the new solution, the greater the increase in productivity.”

“We can also get our report turnaround time down to 20-30 minutes,” Noel Pemberton adds, “which is from the time the radiologist receives the exam to when the final report is available to the clinician. This speed is a real benefit for the clinician and the patient.”

**Feeling the benefits throughout the healthcare continuum**

The impact is felt far beyond radiology. “This solution is not just about radiology productivity. Instant, seamless access to reports and images helps everyone, from the clinician to the patient. It’s key for all specialties,” insists Noel Pemberton.

Dr. Logan agrees: “Timely, accurate and easy-to-read reports are key to decision-making, while faster reports and images also improve referring physician satisfaction.”

While all of the Enterprise Imaging for Radiology features and advances have not had a positive impact, the improved voice recognition has been a huge advantage for SOMC. “It allows free-speaking, with excellent accuracy, more confident reports, less editing and less chance of errors,” says Dr. Logan. SOMC provided valuable feedback on this feature, leading to the ability to edit the report during dictation and speed up the reporting process even more.

Sectional reporting also enhances the value of the reports, says Dr. Logan. “By standardizing how the information is presented, it saves time for the radiologist creating the report, while offering enough customizability to be flexible. It also saves time for the clinician or referring physician, because it is easier to find the salient points and is more predictable to read. This decreases the number of questions and the need for addenda, and increases the confidence clinicians and referring physicians have in our reports and their satisfaction with the SOMC product.”

**Intuitive and user-friendly**

While implementing the new solution requires a change in approach by the hospital and staff, Dr. Logan and Noel Pemberton are fully convinced that the new platform provides ample benefits. Dr. Logan: “This is a real enterprise solution. While it takes time for some people to feel completely comfortable when switching to the new approach, we find that it is instantaneously adopted by new physicians. This demonstrates the intuitiveness of the interface and the user-friendly navigation. And outside of radiology, the users didn’t even see a change in how they have to work, only in the report structure. Enterprise Imaging for Radiology is the future is the future of image and data management, and we are 100% behind it.”

---

**Unbridled access to images and enhanced productivity for SOMC**

High imaging-volume US hospital takes on the future with new Enterprise Imaging for Radiology platform.

The more a radiologist uses Enterprise Imaging for Radiology, the greater the increase in productivity.

Dr. Scott Logan, Chief Radiologist and Director of Medical Imaging, Southern Ohio Medical Center, Portsmouth, Ohio, USA

With its high volume of medical imaging, productivity is constantly a focus for Southern Ohio Medical Center (SOMC). The hospital carries out some 150,000 imaging exams each year, and offers 24/7 radiology services. In this environment, image management via the RIS/PACS is key, says Dr. Scott Logan, Chief Radiologist and Senior Medical Director of SOMC Medical Imaging.

So when Agfa HealthCare approached the hospital about piloting its work-in-progress, SOMC was definitely interested. “With its new Enterprise Imaging for Radiology solution, Agfa HealthCare is moving in a new direction, away from standard PACS and towards a new platform,” comments Dr. Logan. “We are committed to being at the forefront of imaging technology and its evolution, so we agreed to pilot the solution in the US, and participate in getting it ready to be launched in the market.” This decision has already brought the hospital a host of benefits, including simplified and more refined processes, increased productivity and throughput, and an enhanced user experience.

**Single platform, holistic image management**

SOMC is a 222-bed, not-for-profit hospital in Portsmouth, Ohio, USA, with a medical staff of more than 140 physicians and specialists, 2,200 employees, and more than 800 volunteers. It provides emergency and surgical care, as well as a wide range of other healthcare services, to rural Ohio. The hospital consists of 13 different campuses and centers, including sites dedicated to cancer, family practice, hospice care and more.

To provide its 24/7 radiology services, SOMC has eight radiologists and works with a ‘nighthawk’ service that provides preliminary interpretations at night. “24/7 radiology is pretty standard in the US,” explains Dr. Logan. “There is no downtime in patient management, and images need to be evaluated immediately. Hospitals have to be set up to support this.”

---

**Improving performance and satisfaction**

The pilot began in 2011, with the new solution running parallel with IMPAX RIS and PACS. “The collaboration and two-way communication with Agfa HealthCare have been very important, and we have worked closely with them to provide feedback on various aspects of the solution,” says Noel Pemberton. “It has been a unique experience.” While both solutions are currently being used within the hospital, they expect a switch to using only the one soon.

“In terms of productivity figures, it varies by radiologist,” comments Dr. Logan. “But the more a radiologist uses the new solution, the greater the increase in productivity.”

“We can also get our report turnaround time down to 20-30 minutes,” Noel Pemberton adds, “which is from the time the radiologist receives the exam to when the final report is available to the clinician. This speed is a real benefit for the clinician and the patient.”

**Feeling the benefits throughout the healthcare continuum**

The impact is felt far beyond radiology. “This solution is not just about radiology productivity. Instant, seamless access to reports and images helps everyone, from the clinician to the patient. It’s key for all specialties,” insists Noel Pemberton.

Dr. Logan agrees: “Timely, accurate and easy-to-read reports are key to decision-making, while faster reports and images also improve referring physician satisfaction.”

While all of the Enterprise Imaging for Radiology features and advances have not had a positive impact, the improved voice recognition has been a huge advantage for SOMC. “It allows free-speaking, with excellent accuracy, more confident reports, less editing and less chance of errors,” says Dr. Logan. SOMC provided valuable feedback on this feature, leading to the ability to edit the report during dictation and speed up the reporting process even more.

Sectional reporting also enhances the value of the reports, says Dr. Logan. “By standardizing how the information is presented, it saves time for the radiologist creating the report, while offering enough customizability to be flexible. It also saves time for the clinician or referring physician, because it is easier to find the salient points and is more predictable to read. This decreases the number of questions and the need for addenda, and increases the confidence clinicians and referring physicians have in our reports and their satisfaction with the SOMC product.”

**Intuitive and user-friendly**

While implementing the new solution requires a change in approach by the hospital and staff, Dr. Logan and Noel Pemberton are fully convinced that the new platform provides ample benefits. Dr. Logan: “This is a real enterprise solution. While it takes time for some people to feel completely comfortable when switching to the new approach, we find that it is instantaneously adopted by new physicians. This demonstrates the intuitiveness of the interface and the user-friendly navigation. And outside of radiology, the users didn’t even see a change in how they have to work, only in the report structure. Enterprise Imaging for Radiology is the future is the future of image and data management, and we are 100% behind it.”

---

**Unbridled access to images and enhanced productivity for SOMC**

High imaging-volume US hospital takes on the future with new Enterprise Imaging for Radiology platform.
A brief history of radiology