



A Frost & Sullivan White Paper

Leveraging the Benefits of Multi-functional Radiology Imaging Technology

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INTRODUCTION

The growing demand for diagnostic imaging studies, including radiography, has put a strain on hospitals to find efficiencies in their workflows and capital investments. One unique solution recently launched by a leading diagnostic imaging technology vendor meets this demand in a novel way by combining radiography and fluoroscopy capabilities into a single system to provide benefits to clinicians, patients, and administration. Frost & Sullivan believes this kind of innovation will be necessary for healthcare providers to remain competitive and meet the needs of a growing population of patients seeking their services. As a growth consulting firm with an interest in tracking new medical technologies that have a transformational impact on providers and the healthcare industry, Frost & Sullivan believes Agfa Corporation Radiology Solutions' DR 800 will be critical for providers to more efficiently deliver imaging studies in a high-pressure setting.

THE AGFA DR 800: COMBINING RADIOGRAPHY AND FLUOROSCOPY IN AN ELEGANT DESIGN

For decades, Agfa has developed and manufactured an extensive range of high-grade radiology solutions and imaging systems. Launched in 2018, the Agfa DR 800 is the newest product in the company's digital radiography (DR) portfolio with the ability to conduct both fluoroscopy and digital radiography in one system. It also has the ability to allow physicians to simultaneously capture still images while they are performing fluoroscopy procedures. The DR 800 includes Agfa's Dynamic MUSICA image processing software, which enhances noise suppression and can also add brightness and density stabilization, thereby producing some of the highest-quality DR images available in the field.

In addition to providing the efficiency of radiography and fluoroscopy in one unit, the DR 800 also includes features that improve the safety of both patients and clinicians. The system is built around a 90-degree tilting table that can be controlled via its VarioDrive remote control technology. The unit's LiveVision technology provides radiation-free remote positioning via a camera, which allows for a first-person view of the patient. These features, combined with a slim footprint and the DR 800's over-the-table tube design, deliver ergonomic advantages that allow for a better experience for patients, physicians and technologists.



HOSPITALS SEEK SOLUTIONS FOR EXPANSION OF THEIR DIAGNOSTIC IMAGING OPERATIONS

Frost & Sullivan interviewed six radiology department heads from the United States, United Kingdom (U.K.) and Germany who discussed the challenges each of their facilities faced and the decision process that resulted in their adopting the DR 800. Many mentioned owning legacy systems that required separate rooms for digital radiography and fluoroscopy. Many of these facilities were spending their budgets on maintenance and infrastructure costs for two different rooms supporting these modalities. Adopting a hybrid system, like the DR 800, solved these issues by reducing maintenance costs, maximizing floor space use, and adding the capability to keep up with fluctuating patient volumes. One facility, the Troy Hospital in Ohio, opened its doors in June 2019 as part of the Kettering Health Network. The facility's radiology director said they chose the DR 800 because they knew that as a new facility they would need a multipurpose system that could accommodate the patient volume being referred from their ER, inpatient, and outpatient clinics.

The Royal United Hospitals Bath NHS FT installed its DR 800 in April 2018, making it the first facility in the world to implement the system. The hospital opted for the product because of the system's dual functionality and other benefits it can deliver. Rosie Freeman, Radiology Clinical Manager, mentioned that in 2018, the facility and its seven affiliated community hospitals performed 250,000 radiology exams. Of those, about 1,000 were fluoroscopy exams, which were all done at the main site. They found the demand for radiography exams was incrementally increasing every year but fluoroscopy procedures were stable, suggesting the need for a new solution.

"Our fluoroscopic procedure numbers were pretty static and the previous room was under utilized due to limitations in its range for examinations," Freeman said. "The older system was also a lot more closed and bulky when compared to the [Agfa] DR800, which is much more user-friendly"



After closer evaluation, Royal United Hospitals Bath NHS FT decided that instead of just buying another fluoroscopy system, it would be more efficient to acquire the DR 800, which could deliver both radiography and fluoroscopy in one.

“Dr. Rob Colliver, Consultant Radiologist, stated, “Having the DR 800 makes much better use of the room. We were overloaded with the plain film imaging but the fluoro room was low-use. Now, the room is being more efficiently used. We also chose the DR 800 because of its potential to provide a DSA package which would enable some interventional radiology procedures to be moved to this room and to provide a good back up.”

Katholisches Klinikum Nord GmbH/Marien Hospital was one of the first facilities in Germany to purchase a DR 800. Winfried Brockhaus, the chief radiographer at the hospital, mentioned that fluoroscopy exams have been decreasing in favor of CT exams at his facility. In his opinion, this has made the move to hybrid R/F systems like the DR 800 more pertinent. He stated, “The predecessor system we owned was a Philips machine, which had the fluoroscopy and interventional exam capability but not projection radiography. The interventional aspect was no longer needed because we no longer have those specialists, so we decided to go a different way. We wanted to be able to use the unit for the few fluoroscopy exams we still do and then projection radiography for the rest of the day.”

The DR 800 is designed with an over-the-table tube design, which allows the clinician more room to maneuver while positioning patients and conducting procedures. While most clinicians elect to use the remote control function, the design also allows clinicians to image closer to the patient with appropriate shielding in place.



Some customers interviewed also mentioned that the slim profile of the DR 800 allows the equipment to be installed closer to the wall, which makes better use of the space in the room. This design feature is possible in part because the detector is placed underneath the patient. Numerous hospitals described how this more open design allows them to accommodate larger patients in the DR 800 than with their previous R/F systems.

West Suffolk Hospital in the U.K. adopted the DR 800 in August 2018. Nigel Beeton, the radiology services manager, explained, “The older machines had the X-ray tube under the patient and the detector over the patient. The DR 800 has the X-ray tube over the patient and the detector underneath.”

Based on its research, Frost & Sullivan believes the main benefits of the DR 800 include supporting quality clinical care, improving operational and economic efficiency, and delivering improved patient and clinician satisfaction.



IMPROVING CLINICAL CARE WITH BETTER IMAGE QUALITY, DOSE MANAGEMENT AND ERGONOMIC DESIGN

Image Quality

Interviews with clinicians suggest a strong preference among many radiologists for images rendered using MUSICA image processing. The technology has been used for decades and is available in Agfa systems across its portfolio. MUSICA allows systems to deliver high image quality at the lowest reasonably achievable radiation dose. The software, currently in its third version, analyzes images in a layered format to optimize details by enhancing contrasts of clinically relevant structures. MUSICA improves image quality across a far wider dynamic range of images when compared to similar software from competitors. The software reduces noise using fractional multiscale denoising (FMD), which evaluates each pixel individually. Consequently, pixel burnout rarely occurs unless the image is extremely overexposed. Dynamic MUSICA applies the same image optimization to process moving images, such as those used in fluoroscopy. “[The DR 800] produces lovely images,” Freeman said. “It’s hard to quantify the image quality but we were really impressed with the MUSICA software on the DR 600, of which we owned three already. We haven’t been disappointed in the 800 either.”

The consistency in image quality and acquisition across Agfa systems provides radiologists with greater confidence that they can reliably compare images of the same anatomy over a period of time without the same risk of misreading. Beeton stated, “The clinicians are beside themselves with the image quality [of the DR 800]. It is one of the key features with this equipment. You can see detail on those images that you wouldn’t believe possible.”

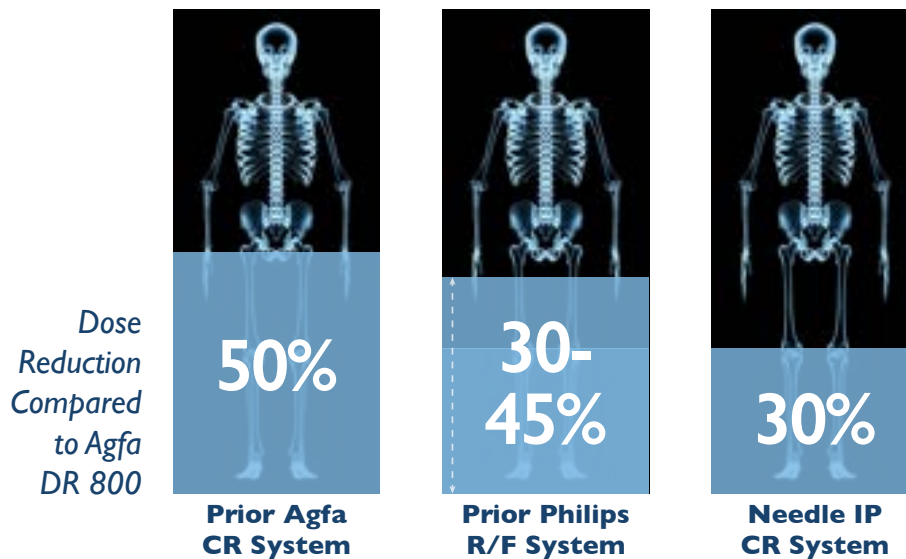
Brockhaus agreed, saying, “We are used to the image quality of MUSICA and we see it as something that gives our physicians diagnostic confidence. So it was very important for us to find a system that maintained that consistency.”

Dose Management

Achieving optimal image quality must always be measured against the corresponding radiation dosage delivered to the patient. Interviews suggest that one of the primary reasons the DR 800 was preferred to other systems is its ability to deliver the lowest possible radiation dose exposure to the patient and staff without compromising image quality. The integrated dose area product (DAP) meter in the DR 800 allows for automatic and accurate reporting of radiation dose. When combined with MUSICA and other features, the DR 800 was reported by customers to deliver a radiation dose 30% to 60% lower than other systems, depending on the competitor machine, the examination type and other variables. Customers stressed that the high image quality and low-dose benefits of Agfa products add the most value when dealing with pediatric patients since they are the most sensitive to radiation exposure.

Dose Reduction Benefit Reported by Early Adopter of the Agfa DR 800

Winfried Brockhaus, Chief Radiographer at Katholisches Klinikum Nord GmbH/Marien Hospital reported its DR 800 delivered significant dose reduction benefits compared to other equipment.



DR 800 SPEEDS WORKFLOW AND OPERATIONAL EFFICIENCY

The DR 800 is highly automated and requires no manual positioning. This feature, combined with the ease in accessibility and adjustment for different patients, as well as quick image processing, contributes to faster exam times, thereby maximizing the productivity of the staff.

Freeman of Royal United Hospitals Bath NHS FT stated, “[The DR 800] is so easy to use. It becomes second nature for radiographers. With no manual handling, it is all automated positioning. With the system, exams are probably about 50% quicker. The limiting factor is getting the patient on and off the table, but that cannot be done any quicker, which is why the number isn’t closer to 90%. Before [with the legacy system] we used to have to wait 90 seconds to process the image, it is now two to three seconds to get the image.”

The seamless transition between the fluoroscopy and digital radiography functionalities cuts down on set-up time between patients, allowing for efficient use of the system while eliminating the need for added staff or other logistical



modifications, as would be the case with having separate rooms or systems for each. The radiology function can also be used simultaneously with the fluoroscopy capability, so there is increased patient satisfaction due to the reduced wait time and need to transition between the two exams. This feature also saves time for physicians who can move on to their next patient much faster.

Max Grady, executive director of medical imaging at the recently opened Troy Hospital, said, “The DR 800 is used as a multipurpose room in our facility. It is the only X-ray room we have in this facility currently. So it’s doing everything for us—all of our ER patients, all of our outpatients, inpatients, all of our fluoroscopy exams. It’s capable of doing everything.”

The facility also uses the DR 800 for barium swallow studies for stroke patients, orthostatic tilt tests for cardiology patients, arthrograms, and more. “We are currently running 40% above projections in terms of patient volume but the DR 800 has been able to keep up with that. That’s a statement of how good of an investment it has been for us,” Grady said.

The DR 800 can also be configured to allow for high-speed tomosynthesis, which makes use of the X-ray technology in the system with new software features. This allows the multi-slice DR images to be quickly reconstructed into a 3D image within a minute compared to the typical slow processing in other systems, cutting down on image acquisition time. It produces studies that can be used for renal stone detection, fracture detection as well as for cancer follow-up. Hospitals interviewed by Frost & Sullivan believe that using their DR 800 in this way will allow them to use CT less, thereby reducing costs, time and radiation exposure.

For the Marien Hospital in Germany, the efficiency provided by the DR 800 was the main motivation for adopting the system. The hospital already had two traditional radiology systems: one in the emergency department and one in the radiology department. Having the DR 800 gave the hospital a reliable backup in case one of the radiology systems went down.

PATIENT AND RADIOLOGIST SATISFACTION AS AN IMMEDIATE BENEFIT

The DR 800 has been designed to maximize workflow while keeping technologists, physicians and patients comfortable and safe. While other systems may require extensive recalibration and repeated setup following each patient, the DR 800 is able to deliver quick turnaround times, which keep both staff and patients happy. The LiveVision technology in the DR 800 allows technologists to remotely position patients without being exposed to radiation. The unit’s motorized table has the capability to tilt 90 degrees in either direction and the X-ray tube can rotate a complete range of 180 degrees for use with a wall stand. The system is designed to accommodate heavier and taller patients than in previous designs. The table can be adjusted for standing, supine, prone and Trendelenburg positioning to provide maximum flexibility across a wide range of exams. “We wanted a system that had good patient access from all sides to be able to perform all the different exams,” Brockhaus said.

“Grady stated, “Clinicians have the option to do the exams remotely from behind the wall or they can stand right next to the patient, a few feet away. Our group heavily prefers the remote capability but if they need to go in the room, like for arthrograms to do an injection, they can easily do that, too.” ”

For patients with limited mobility, the DR 800 table can be adjusted to a low height for easy step-on, step-off access. It also has a higher weight limit and a more powerful motor than most other tables on the market, which allows it to accommodate obese patients—a significant concern that many hospitals have with their increasingly heavy populations. In addition, the table allows for easier patient transfer from stretcher or bed with clear access to the table. The design also makes off-table imaging possible for patients that cannot be moved from stretchers or wheelchairs.

Elizabeth Evans of AdventHealth Celebration Hospital added a DR 800 in 2019 to her facility after its legacy fluoroscopy system reached end of life. The facility is in a growing area and serves a high number of bariatric patients.

“With our older fluoro equipment, the radiologists had an issue with larger patients and being able to perform the procedures,” Evans said. “In procedures like a lumbar puncture where you need to place a needle in the patient’s spine, you need to be able to bring that fluoro tower up high enough that you have the space to put the needle in exactly where you need it and then conduct the fluoro exam. Even the table weight limit was a barrier on older systems and so we would have to turn patients away. This is no longer an issue for us.”

Grady explained, “The DR 800 over table tube goes out to 72 inches—a full 6 feet—which allows us to do chest X-rays on the table. For emergency patients, we do an abdominal series, which is one chest X-ray and two abdominal X-rays. Since we can get that 72 inches, we’re able to do all three of those exams very quickly and efficiently.”

The over table tube design has had some customers question whether patients and staff are exposed to additional radiation compared to previous designs. Interviews suggest that this was easily overcome by use of appropriate shielding, remote control positioning and proper protocols. No customers interviewed expressed any concern that the unique design was exposing patients and staff to additional risk that could not be controlled. Freeman added that her hospital monitors its staff and the data is analyzed by medical physicists who found no concerns with exposure, but of course are continuing to test in line with best practice.





CONCLUSION

Radiology departments across the world face the same challenges: deliver quality images, improve workflow, reduce costs and keep patients and caregivers satisfied. In most R/F systems, one of these benefits must be sacrificed at the expense of the others. Agfa's DR 800 breaks from this paradigm with an innovative, hybrid design supported by Agfa's MUSICA image processing software and ergonomic features that can bring radiology providers everything they seek for their new R/F rooms. The DR 800's ability to conduct digital radiography exams and fluoroscopy procedures, and the added ability to do tomosynthesis, makes it an easy choice for radiology department directors looking to optimize their programs. When purchasing a DR 800, these providers will gain all of the benefits described by the early adopters interviewed for this project. In addition, customers will be supported by a leader in diagnostic imaging technology committed to excellence.

"Agfa is very good at providing information about their products and work to implement improvements suggested by users of their systems," said Freeman.

ABOUT AGFA

Agfa NV is one of the world's leading companies in imaging technology. Agfa NV develops, manufactures and markets analogue and digital systems for the printing industry, for the healthcare sector, and for specific industrial applications. The group has more than 150 years of imaging experience. The healthcare division delivers diagnostic imaging solutions that set standards in productivity, safety, clinical value and cost effectiveness. Agfa is headquartered in Mortsel, Belgium. The company is present in 40 countries and has agents in another 100 countries around the globe.

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