Getting More from Less

Digital X-ray with uniform image-processing helps improve diagnostic confidence at the University Hospital Bern, Switzerland

Working at the University Hospital in Bern, Switzerland, with high expectation from the referring physicians and the parents of young patients, Dr. Wolf, Head of Paediatric Radiology Department, and his team are conscious of the mission they have in applying modern digital technology for better health care. Compared to adults, examinations with children require even more effort and dedication – both in imaging and interaction – to achieve similar results. With the latest generation of MRI and CT-scanners, and the constantly updated high-end ultrasound equipment, as well as the fully digital X-ray systems – all integrated in the RIS (radiology information system) and PACS (picture archiving and communication systems) – they have made a 'quantum leap' to a real digital imaging department and children's clinic. While they have long been a leading light in reducing dosage for paediatric X-ray, and lots of research and care is still devoted to this goal, there are further improvements emerging since they changed to digital radiography, such as greater diagnostic confidence, a shorter and less stressful examination for the children, and more personal care dedicated to them from the time saved through improved workflow.

Digital solution

The new DigitalDiagnost and PCR (Philips computed radiography with storage phosphor cassette) systems were installed in the spring of 2004, as part of a PACS implementation that made the operation of the department completely filmless within less than 3 months. Apart from reporting at a workstation, the distribution of images and reports to all the referring clinicians is also fully electronic. As the start of this digital workflow, the DigitalDiagnost was attractive, not only because of the long years of good experience with their previous Philips X-ray systems, and the quality of DigitalDiagnost that was well received by another paediatric clinic in Austria who had used the system for sometime; but also

More personal care is dedicated to children from the time saved through improved workflow.

(top) Dr. Wolf, Head of Paediatric Radiology, consciously carries on the mission in applying digital technology for better health care. The Department went completely filmless within less than 3 months.

(down) Mrs. Seydoux, Acting Chief Radiographer, confirms: "The examination is finished sooner."

because of a good offer to renovate the whole system, rather than just retrofit the existing system with a digital flat detector.

When looking at CR solutions, Philips was the only supplier at the time that offered image stitching – an absolute must for the spinal and long extremity examinations that are so important for the paediatric orthopaedists – and the only one that had uniform UNIQUE image-processing software for both CR and DR (direct digital radiography with flat detector). This is a significant benefit for the radiologist to ensure consistent impression of images acquired from different systems. With tremendous reduction of image adaptation that had to be otherwise done manually by the radiographer or the radiologist, this feature helps much in accurate diagnosis and easier reporting.

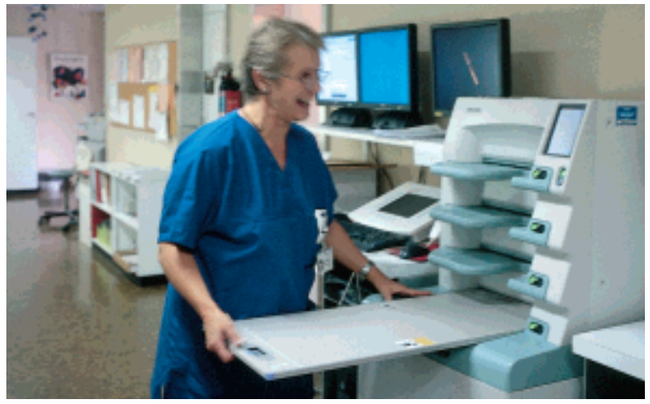
Workflow improvement

Because the level of experience with computers varied widely among the radiographers, Philips provided individual training on the modalities to ensure a smooth transition. The DigitalDiagnost and PCR systems "were not difficult to learn", confirms Mrs. Rosmarie Seydoux, Acting Chief Radiographer. The largest alteration was due to the working with the RIS and PACS. Instead of performing the examination and then looking after administrative tasks like before with the film/screen system, they now needed to look after the administration first. The advantage of this is that much of the setup of the generator is automated. Although for the radiographer, part of the time saved is used for quality assurance and preparation of the images for reporting and demonstration in the PACS system, Mrs. Seydoux continues that "the examination is finished sooner", which is always a benefit when working with children who often find it stressful, and need special, personal attention.

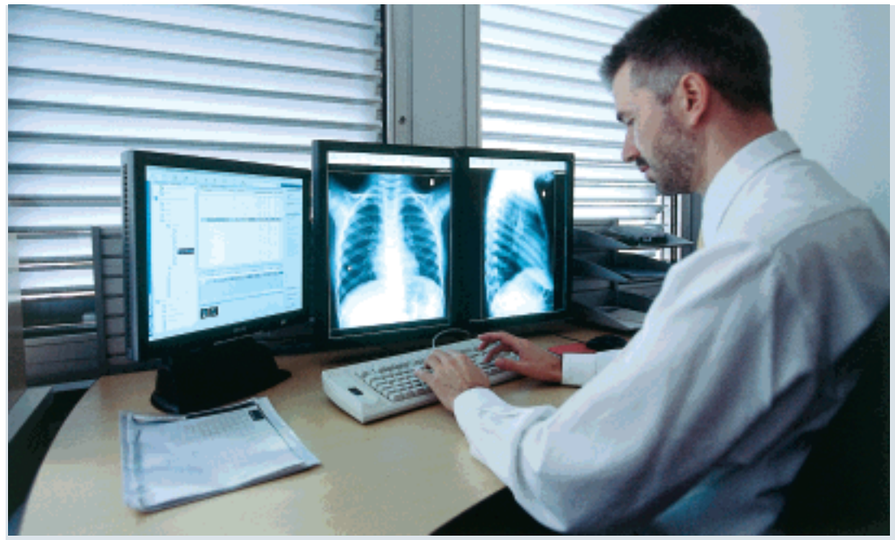
Low-dose research

It might have been expected that the use of digital flat detectors, which often enables dose reduction when used in adult radiography, would offer an important opportunity for further reducing X-ray dose. But, as Dr. Wolf explains, they were already using films with a speed class of 800, and had reduced dose to a very low level – because of the importance this has for young patients, whose rapidly growing tissue is far more sensitive to ionizing radiation. In fact, the dose levels were so low that it is only recently that digital technology has been able to offer sufficient sensitivity to make the change to digital beneficial: they had been watching the technology for a number of years, but "there was no DigitalDiagnost at the time", says Dr. Wolf. The DR technology it uses was the first that met the department's dose criteria. Given the quality of the image, Dr. Wolf is confident that DigitalDiagnost "should give us room to reduce dose further for specific indications in paediatric applications".

On the CR system, the department is the first European test-site for Philips double-read storage phosphor cassettes. In theory, the dual-layer phosphor coating changes speed class from 400 to 630, and Dr. Wolf reports that "there is a clear improvement in image quality". They are investigating whether this can be applied in reducing dose, or otherwise lowering the image noise. In another research project contracted with the Swiss Ministry of Health, they are investigating the benefits of copper filters in digital X-ray systems in collaboration with the medical physicists in the University of Lausanne, and the clinical scientists at Philips. When they have this physical data, Dr. Wolf and his team will re-evaluate the potential dose reduction for both the PCR and DigitalDiagnost systems. When it comes to paediatric radiology, exploiting the newest technology to lower the dose is always a priority.



The Department decided for Philips CR solutions, because it's the only vendor at the time offering CR image-stitching and uniform UNIQUE image-processing for CR and DR.



Dr. Wolf says: "With UNIQUE, you get very convincing results from CR and DR. You get consistent impression of images acquired from different systems."

Diagnostic confidence

Even before further reducing dose, the system has brought valuable improvements. Uniform image- processing means both DigitalDiagnost and PCR deliver comparable results. However, Dr. Wolf prefers the DigitalDiagnost for images where a high resolution is particularly important – for premature or newborn babies, but also when looking for small details in investigations of child abuse. "The clarification of details is better with the DigitalDiagnost, you really do see more, because it delivers a better image at the same dose", he says.

UNIQUE image-processing software has played a vital part in achieving the consistent, high-quality images from both the DigitalDiagnost and the PCR systems. UNIQUE harmonizes contrast levels, highlights faint details and adapts parameters to provide lots of detail and wide image dynamics, while still maintaining a natural, artefact-free appearance. Dr. Wolf comments, "you get more out of UNIQUE, you get more details, you get more soft tissue at the same time as good bone definition, bringing possibilities beyond what was achievable until now". He cites the example of a contusion of a knee joint. The orthopaedists were satisfied with images using the standard post-processing, but using UNIQUE, the skin contour, the subcutaneous fat and a finer bone-structure are visible simultaneously from the same raw data. "It is the difference between a good and an excellent image, and gives radiologists the chance to achieve the full potential of the system, to get more information and improve diagnostic confidence, based on the specific clinical requirement and the anatomy of the region being examined", he says.

Consistent quality

By applying the same criteria to both PCR and DigitalDiagnost images, UNIQUE also ensures that image consistency is high. "You get very convincing results from both systems with UNIQUE", says Dr. Wolf. Indeed, Mrs. Seydoux confirms that, "without looking very closely, the source of a final image can usually only be told by the different fonts used by the different systems."

Given that this consistent quality – which makes scheduling and processing easier for the radiographer, and reporting easier for the radiologists – has been achieved along with less stress on the young patients, this is a considerable gain for everybody concerned.