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Economy of Motion

Multi-geometry, one-detector digital X-ray helps solve clinical and economic challenges at the Hospital of the Brothers of Charity, Trier, Germany

Professor Hans-Peter Busch has a unique understanding of what makes a radiology department successful, from experience gathered as a physicist, then as a radiologist, and most recently as an economist (apart from heading the Radiology Department, he is also the Medical Director of the Brothers of Charity Hospital in Trier, Germany).

He often applies this combined perspective to help medical equipment manufacturers refine equipment for clinical applications. Philips is among these manufacturers, and Prof. Busch's Radiology Department was the first hospital worldwide to use the new one-detector DigitalDiagnost system for multi-purposes. Though initially installed in the Radiology Department, this DR (direct digital radiography with flat

detector) system is intended for the new trauma unit, where its flexible geometry and integrated CR (computed radiography with storage phosphor cassette) capabilities can be applied seamlessly to the full range of applications – addressing both clinical and economic challenges.

Patient safety and workflow efficiency

The Radiology Department of the Brothers of Charity Hospital offers the full spectrum of diagnostic imaging, except nuclear medicine and ultrasound which are grouped separately. Of the 65,000 examinations and interventions done in 2003, around 50,000 (ca. 77%) were traditional X-ray. Besides the room temporarily equipped with the

new one-detector DigitalDiagnost, there is another room with a dual-detector DR system, and another with CR, all from Philips. Normally, when a patient arrives for an examination, the main decision for the radiographer to make is the choice between CR and DR. With both systems providing the same diagnostic capability, the selection criteria comes down to the X-ray dosage (up to 50% reduction when using DR), and the immediate availability of the clinical image, without having to use cassettes. The immediacy of the DR images means two benefits. First, a much faster diagnosis for proper treatment – which is critical to the trauma patient. Second, a higher possible patient throughput – which needs to be maximised to ensure an adequate return on



The multi-geometry for flexible projections means the single system can be used for multi-applications.

the investment and running costs for the hospital. So, patients who are appropriate for these advantages, such as mobile, trauma and younger patients, are always examined on a DR system. In general, the CR system is mostly used for special cases, for example, chest X-ray for a bed-bound patient, or body-side arm X-ray for a trauma one.

Mrs. Marion Anschutz, Chief Radiographer in the department, says the ergonomics and ease of use of the DigitalDiagnost systems makes them the radiographer's personal preference. The big difference the radiographers noticed when they changed to DR was that it eliminated all of the running around the department with cassettes.

Because the new DigitalDiagnost uses the DigitalDiagnost software 1.4, the CR reader is also integrated into the single X-ray workstation, which means, when a patient does require examinations that mix DR and CR, the images from both systems are not separated in the PACS (picture archiving and communication systems), rather they are organised in one patient folder starting from the modality workstation. This makes the radiographer's work easier, and the workflow efficiency higher.

Image quality and dose management

Being the lead contractor of the DIMOND III research project of the European Commission on "image quality

and dose management for digital radiography", Prof. Busch and his department are very conscious of the purpose and sense of image quality – under proper dose management. Mrs. Anschutz adds that another important point is the new DigitalDiagnost automatically records the radiation dose used for each examination – required by German law – as easily for the CR exposures as it has always been for DR. Indeed, the dosage is superimposed on each image, which helps monitor the balance between image quality and dose reduction, namely to achieve the diagnostically required, clinically acceptable image quality – at the lowest level of X-ray dose.

Economic sense and cost/benefit requirements

Although, compared with a dual-detector DR system, examinations on the one-detector DigitalDiagnost may take a little longer due to projection change, Prof. Busch is, however, convinced that such a system also makes the better economic sense. Since the flat detector is the most costly component in a DR system, a single-detector system has a lower financial outlay, both to purchase and to maintain. Prof. Busch explains, "in our case, we were already very satisfied with the dual-detector DigitalDiagnost, and when we were looking at systems for the trauma unit, this one-detector system for multiple applications met our specific cost/benefit requirements".



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The system integration of the CR and DR is a similar decision-making criteria. Connecting the CR reader directly to the DigitalDiagnost workstation enables the reuse of much of the hardware and software. With the prices of CR readers decreasing "you get a significant increase in functionality for a limited extra financial outlay", says Prof. Busch.

New strategy for polytrauma

Because the Hospital is the most important neurological centre for the whole of the north-west of the Rhineland-Palatinate, it is building a new trauma unit, due to open in April 2005. Instead of mobile radiography equipment, this unit will be equipped with a multi-slice CT system and the new one-detector DigitalDiagnost. Significant here is that the multi-geometry of the new DigitalDiagnost for vertical, horizontal and lateral projections means it can be used for almost any application. And the uniformity of CR and DR in a single system ensures instant access to whatever is necessary. In the trauma unit, this means the CR will still be used "and the image impression is consistent to that of the DR", confirms Prof. Busch, "because it all comes from the same UNIQUE image-processing software. That is one of the major advantages of this system."

The X-ray room in the trauma unit accommodates an extended wall-track, which is long enough for a new design of X-ray-transparent trolley to be used beside the standard table. This eliminates the need of having to move the patient from a normal trauma trolley to the X-ray examination table, which is a vital benefit to the patient.

Effectively, when the new DigitalDiagnost moves to the trauma unit, it is acting as a self-sufficient room for the full range of traditional X-ray examinations. And this is the key point made by Prof. Busch: with the flexible geometry and the integration of CR and DR, it is a cost-effective solution, solving the pressing clinical challenges in a practical and economic way.



Prof. Busch, Head of Radiology and Medical Director, points out: "With the flexible geometry and the CR/DR integration, this solution meets our specific cost/benefit requirements".